Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK
MORE THAN YOU EXPECT

Product / Process Change Notification (PCN)

☐ Major Change
☒ Minor Change

PCN Number: PCN_WPME-VDMM_20241016

Affected Series: WPME-VDMM

Affected Order Codes: 171960501, 171010501, 171010502, 171010550

PCN Date: 2024-07-16 (YYYY-MM-DD)

Effective Date: 2024-10-16 (YYYY-MM-DD)

Change Category:
☐ Equipment/Location
☒ General Data
☐ Material
☐ Process
☐ Product Design
☐ Shipping/Packaging
☐ Supplier
☐ Software

Contact: Product Management

Phone: +49 (0) 7942 - 945 5001

Fax: +49 (0) 7942 - 945 5179

E-Mail: pcn.eisos@we-online.com

Datasheet Change:
☒ Yes ☐ No

Attachment:
☒ Yes ☐ No

Description of Change:
For the purpose of a datasheet information enlargement, Würth Elektronik eiSos has updated the electrical specifications, the design flow and the handling recommendations. The updated datasheets are attached to this PCN.
This is a datasheet correction only. There will be no change in form, fit, function, quality or reliability of the products.

Details of Change:
Changes 1 through 5 apply to all order codes indicated in this PCN.

1. Line and load regulation units have been changed

171960501

Before Change

Line regulation	V_{IN} = 2.7V to 5V, T_A = 25°C, MODE = high	-	±0.2	-	%/V
Load regulation	V_{IN} = 2.7V, V_{OUT} = 1.8V over I_{OUT} range, MODE = high, T_A = 25°C	-	±0.5	-	%/A

After Change

Line regulation	V_{IN} = 2.7V to 5.5V, MODE = high	—	0.2	—	%
Load regulation	0A ≤ I_{LOAD} ≤ 0.6A, MODE = high	—	0.5	—	%

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171010501

Before Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V, MODE = low	-	0.05	-	%/V
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	-	-0.9	-	%/A

After Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V,	—	0.05	—	%
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	—	0.9	—	%

171010502

Before Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V, MODE = low	-	0.05	-	%/V
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	-	-0.9	-	%/A

After Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V, MODE = low	—	0.05	—	%
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	—	0.9	—	%

171010550

Before Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V, MODE = low	-	0.04	0.2	%/V
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	-	-0.9	-	%/A

After Change

Line regulation	V_{IN} = V_{OUT}+1V to 5.5V, MODE = low	—	0.04	0.2	%
Load regulation	500mA ≤ I_{LOAD} ≤ 1A	—	-0.9	—	%

2. Input current values have been corrected

171960501

Before Change

Input quiescent/shutdown current						
I_{SD}	Shutdown current	V_{ENABLE} = 0V T_A = 25°C	-	0.1	1	µA
I_{IN}	No load input current	MODE = high, EN = high, switching with no load, V_{OUT} = 1.8V, T_A = 25°C	-	6	-	mA
		MODE = low, EN = high, switching with no load, V_{OUT} = 1.8V, T_A = 25°C	-	3	-	mA
I_Q	Quiescent current	MODE = low, EN = high no switching, T_A = 25°C	-	30	-	µA

After Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	V_{EN} = 0V	—	0.1	1	µA
I_{IN}	No load input current	Mode = high, Enable = high, switching with no load	—	6	—	mA
		Mode = low, Enable = high, switching with no load	—	80	—	µA
I_Q	Quiescent current	Mode = low, Enable = high, no switching	—	60	—	µA

171010501

Before Change

Input quiescent/shutdown current						
I_{SD}	Shutdown current	V_{ENABLE} = 0V T_A = 25°C	-	0.1	1	µA
I_{IN}	No load input current	MODE = high, EN = high, switching with no load, V_{OUT} = 1.8V, T_A = 25°C	-	6	-	mA
		MODE = low, EN = high, switching with no load, V_{OUT} = 1.8V, T_A = 25°C	-	3	-	mA
I_Q	Quiescent current	MODE = low, EN = high no switching, T_A = 25°C	-	30	-	µA

After Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	ENABLE = low	—	0.1	—	µA
I_{IN}	No load input current	V_{OUT} = 3.3V, ENABLE = high, switching, no load	—	40	—	µA
		ENABLE = high, switching, no load	—	25	—	µA
I_Q	Quiescent current	ENABLE = high, no switching	—	22	—	µA

171010502

Before Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	V_{EN} = low, V_{IN} = 5V	-	0.5	-	µA
I_{IN}	No load input current	MODE = high, Enable = high, switching with no load, V_{OUT} = 1.8V	-	13	-	mA
		MODE = low, Enable = high, switching with no load, V_{OUT} = 1.8V	-	25	-	µA
I_Q	Quiescent current	MODE = high, Enable = high, no switching, V_{OUT} = 1.8V	-	25	-	µA
		MODE = low, Enable = high, no switching, V_{OUT} = 1.8V	-	25	-	µA

After Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	V_{EN} = low, V_{IN} = 5V	—	0.1	—	µA
I_{IN}	No load input current	MODE = high, switching with no load	—	12.8	—	mA
		MODE = low, switching with no load	—	27	—	µA
I_Q	Quiescent current	MODE = high, no switching	—	23.5	—	µA
		MODE = low, no switching	—	22.5	—	µA

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USt.-IdNr. DE220618976

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171010550

Before Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	V_{EN} = low, V_{IN} = 5V	-	0.1	-	µA
		V_{EN} = low, V_{IN} = 2.5V	-	0.09	-	µA
I_{IN}	No load input current	MODE = high, Enable = high, switching with no load	-	13	-	mA
		MODE = high, Enable = high, switching with no load	-	25	-	µA
I_Q	Quiescent current	MODE = high, Enable = high, no switching, V_{IN} = 2.5V	-	25	-	µA
		MODE = high, Enable = high, no switching	-	25	-	µA

After Change

Input Quiescent and Shutdown Current						
I_{SD}	Shutdown current	ENABLE = low	—	0.1	—	µA
I_{IN}	No load input current	V_{OUT} = 3.3V, MODE = low, switching, no load	—	40	—	µA
		V_{OUT} = 3.3V, MODE = high, switching, no load	—	12.7	—	mA
		V_{IN} = 3.3V, MODE = low, switching, no load	—	27.7	—	µA
		V_{IN} = 3.3V, MODE = high, switching, no load	—	9.6	—	mA
I_Q	Quiescent current	MODE = low, ENABLE = high, no switching	—	22	—	µA
		MODE = high, ENABLE = high, no switching	—	250	—	µA

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3. Modes of operation page rewritten

171960501

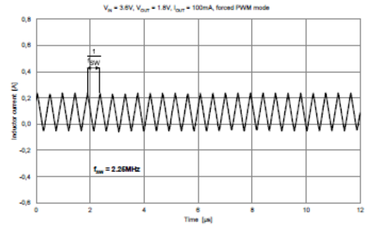
Before Change

LIGHT LOAD OPERATION

Under light load conditions the 171960501 behaves differently according to the MODE pin setting.

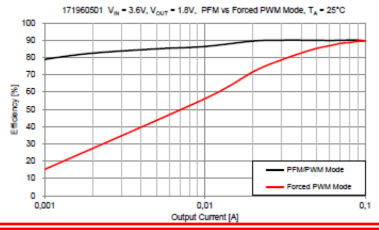
Forced PWM mode

Pulling the MODE pin high selects the forced PWM mode. In this mode the device constantly functions in PWM mode, switching at the default 2.25 MHz fixed switching frequency, independently of the load (see figure below). This mode of operation eases the filtering requirements to help with noise sensitive applications.

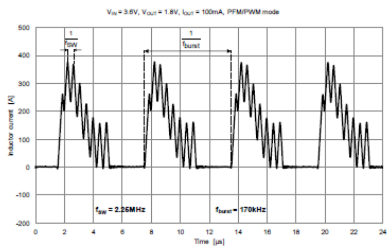


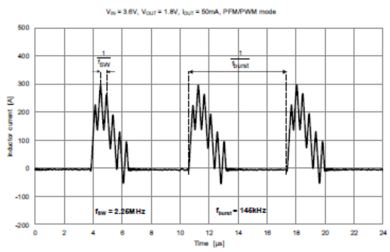
PFM/PWM mode

Setting the MODE pin low selects the PFM/PWM mode. This mode achieves a much higher efficiency at light loads (normally below 100mA), as shown in the picture below.



In PFM/PWM mode the energy is delivered in bursts to the load (see figure below). Within each burst the device switches at the default switching frequency and the energy is delivered to both the load and the output capacitor. Between two bursts, the device does not switch (the load demand is supported by the output capacitor) and the current consumption is significantly reduced, leading to higher efficiency compared to the forced PWM mode. The frequency of the bursts (f_{burst}) depends on the load and it is much lower than the default switching frequency (see picture below at two different load conditions). When the load current is above 100mA, the transition from the PFM mode to the PWM mode takes place automatically.





Please consider that the burst frequency f_{burst} can differ from the example measurements above depending on several parameters (e.g. C_{OUT}, C_{FF}).

After Change

15 MODES OF OPERATION

The MODE pin of the 171960501 can be pulled either high or low to alter the light load performance of the power module based on the application requirements.
When pulled high, PWM operation will be forced throughout the entire load current range. When pulled low, PFM operation will occur during light load conditions.
The power module will operate in one of three modes, depending on the operating conditions.

15.1 Pulse Width Modulation (PWM) Operation

The power module operates at a fixed switching frequency of 2.25MHz where the duty cycle (D) is determined by the following equation:

$$D = \frac{V_{OUT}}{V_{IN}} \tag{4}$$

The on-time is determined by the duty cycle and the switching frequency as follows:

$$t_{ON} = \frac{D}{f_{SW}} \tag{5}$$

The on and off-times can be related to the switching frequency as follows:

$$\frac{1}{f_{SW}} = t_{ON} + t_{OFF} \tag{6}$$

15.2 100% Duty Cycle Operation

When the input voltage approaches the output voltage and the duty cycle approaches 100%, the power module will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage.

15.3 Pulse Frequency Modulation (PFM) Operation

If the MODE pin is pulled low PFM operation is initiated when the power module enters discontinuous mode. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.
The frequency of the bursts depends on the load and is significantly lower than the default switching frequency. As the output current demand increase the bursts become more frequent until the module automatically transitions out of PFM operation.
The burst frequency is a function of input voltage, output voltage, output current, C_{FF}, and C_{OUT}. Changing any of these parameters will alter the device's behavior during PFM operation.

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
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eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010501

Before Change	After Change
MODES OF OPERATION The MicroModule will operate in one of four modes, depending on the operating conditions. **Constant on-time (COT) operation** The MicroModule operates at a fixed switching frequency of 4MHz where the duty cycle (DC) is determined by the following equation: $DC = \frac{V_{OUT}}{V_{IN}}$ (4) The on-time is determined by the duty cycle and the switching frequency as follows: $t_{ON} = \frac{DC}{f_{SW}}$ (5) The on and off-times can be related to the switching frequency as follows: $\frac{1}{f_{SW}} = t_{ON} + t_{OFF}$ (6) The mode of operation has a minimum off-time value of 60ns. **Fixed off-time operation** When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the MicroModule fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle. **100% duty cycle operation** When the input voltage approaches the output voltage and the duty cycle approaches 100%, the MicroModule will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage. **Power save operation** Power save operation is initiated when the MicroModule enters discontinuous mode, typically occurring between 0mA and 300mA. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.	**15 MODES OF OPERATION** The power module will operate in one of four modes, depending on the operating conditions. **15.1 Constant On-Time (COT) Operation** The power module operates at a fixed switching frequency of 4MHz where the duty cycle (D) is determined by the following equation: $D = \frac{V_{OUT}}{V_{IN}}$ (4) The on-time is determined by the duty cycle and the switching frequency as follows: $t_{ON} = \frac{D}{f_{SW}}$ (5) The on and off-times can be related to the switching frequency as follows: $\frac{1}{f_{SW}} = t_{ON} + t_{OFF}$ (6) The mode of operation has a minimum off-time value of 60ns. **15.2 Fixed Off-Time Operation** When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the power module fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle. **15.3 100% Duty Cycle Operation** When the input voltage approaches the output voltage and the duty cycle approaches 100%, the power module will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage. **15.4 Pulse Frequency Modulation (PFM) Operation** PFM operation is initiated when the power module enters discontinuous mode. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.

Würth Elektronik eiSos GmbH & Co. KG Sitz Waldenburg, Registergericht Stuttgart HRA 580801
Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
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USt.-IdNr. DE220618976

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010502

Before Change	After Change

Before Change

MODES OF OPERATION

The MODE pin of the 171010502 can be pulled either high or low to alter the light load performance of the module based on the application requirements.
When pulled high, COT operation will be forced throughout the entire load current range. When pulled low, power save operation will occur during light load conditions.
The MicroModule will operate in one of four modes, depending on the operating conditions.

Constant on-time (COT) operation

The MicroModule operates at a fixed switching frequency of 4MHz where the duty cycle (DC) is determined by the following equation:

$$DC = \frac{V_{OUT}}{V_{IN}} \quad (4)$$

The on-time is determined by the duty cycle and the switching frequency as follows:

$$t_{ON} = \frac{DC}{f_{SW}} \quad (5)$$

The on and off-times can be related to the switching frequency as follows:

$$\frac{1}{f_{SW}} = t_{ON} + t_{OFF} \quad (6)$$

The mode of operation has a minimum off-time value of 60ns.

Fixed off-time operation

When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the MicroModule fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle.

100% duty cycle operation

When the input voltage approaches the output voltage and the duty cycle approaches 100%, the MicroModule will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage.

Power save operation

Power save operation is initiated when the MicroModule enters discontinuous mode, typically occurring between 0mA and 300mA. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.

After Change

15 MODES OF OPERATION

The MODE pin of the 171010502 can be pulled either high or low to alter the light load performance of the power module based on the application requirements.
When pulled high, COT operation will be forced throughout the entire load current range. When pulled low, PFM operation will occur during light load conditions.
The power module will operate in one of four modes, depending on the operating conditions.

15.1 Constant On-Time (COT) Operation

The power module operates at a fixed switching frequency of 4MHz where the duty cycle (D) is determined by the following equation:

$$D = \frac{V_{OUT}}{V_{IN}} \quad (4)$$

The on-time is determined by the duty cycle and the switching frequency as follows:

$$t_{ON} = \frac{D}{f_{SW}} \quad (5)$$

The on and off-times can be related to the switching frequency as follows:

$$\frac{1}{f_{SW}} = t_{ON} + t_{OFF} \quad (6)$$

The mode of operation has a minimum off-time value of 60ns.

15.2 Fixed Off-Time Operation

When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the power module fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle.

15.3 100% Duty Cycle Operation

When the input voltage approaches the output voltage and the duty cycle approaches 100%, the power module will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage.

15.4 Pulse Frequency Modulation (PFM) Operation

If the MODE pin is pulled low PFM operation is initiated when the power module enters discontinuous mode. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.
The frequency of the bursts depends on the load and is significantly lower than the default switching frequency. As the output current demand increase the bursts become more frequent until the module automatically transitions out of PFM operation.
The burst frequency is a function of input voltage, output voltage, output current, C_{FF}, and C_{OUT}. Changing any of these parameters will alter the device's behavior during PFM operation.

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

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171010550

Before Change

MODES OF OPERATION

The MODE pin of the 171010550 can be pulled either high or low to alter the light load performance of the module based on the application requirements.
When pulled high, COT operation will be forced throughout the entire load current range. When pulled low, power save operation will occur during light load conditions.
The MicroModule will operate in one of four modes, depending on the operating conditions.

Constant on-time (COT) operation

The MicroModule operates at a fixed switching frequency of 4MHz where the duty cycle (DC) is determined by the following equation:

$$DC = \frac{V_{OUT}}{V_{IN}} \quad (4)$$

The on-time is determined by the duty cycle and the switching frequency as follows:

$$t_{ON} = \frac{DC}{f_{SW}} \quad (5)$$

The on and off-times can be related to the switching frequency as follows:

$$\frac{1}{f_{SW}} = t_{ON} + t_{OFF} \quad (6)$$

This mode of operation has a minimum off-time value of 60ns.

Fixed off-time operation

When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the MicroModule fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle.

100% duty cycle operation

When the input voltage approaches the output voltage and the duty cycle approaches 100%, the MicroModule will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage.

Power save operation

Power save operation is initiated when the MicroModule enters discontinuous mode, typically occurring between 0mA and 300mA. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.

After Change

15 MODES OF OPERATION

The MODE pin of the 171010550 can be pulled either high or low to alter the light load performance of the power module based on the application requirements.
When pulled high, COT operation will be forced throughout the entire load current range. When pulled low, PFM operation will occur during light load conditions.
The power module will operate in one of four modes, depending on the operating conditions.

15.1 Constant On-Time (COT) Operation

The power module operates at a fixed switching frequency of 4MHz where the duty cycle (D) is determined by the following equation:

$$D = \frac{V_{OUT}}{V_{IN}} \quad (4)$$

The on-time is determined by the duty cycle and the switching frequency as follows:

$$t_{ON} = \frac{D}{f_{SW}} \quad (5)$$

The on and off-times can be related to the switching frequency as follows:

$$\frac{1}{f_{SW}} = t_{ON} + t_{OFF} \quad (6)$$

This mode of operation has a minimum off-time value of 60ns.

15.2 Fixed Off-Time Operation

When the minimum off-time of 60ns is reached and the duty cycle must increase futher, the power module fixes the off-time to 60ns and begins increasing the on-time. This results in a decrease in switching frequency proportional to the increase in duty cycle.

15.3 100% Duty Cycle Operation

When the input voltage approaches the output voltage and the duty cycle approaches 100%, the power module will leave the high side MOSFET on continuously and the output voltage will be limited by the input voltage. Further decreases of input voltage will result in a corresponding decrease in output voltage.

15.4 Pulse Frequency Modulation (PFM) Operation

If the MODE pin is pulled low PFM operation is initiated when the power module enters discontinuous mode. A burst of switching cycles increases the output voltage above the set value followed by a period of dead time where the output current is only delivered by the output capacitor. This results in slightly increased output voltage ripple in exchange for significantly increased conversion efficiency.
The frequency of the bursts depends on the load and is significantly lower than the default switching frequency. As the output current demand increase the bursts become more frequent until the module automatically transitions out of PFM operation.
The burst frequency is a function of input voltage, output voltage, output current, C_{FF}, and C_{OUT}. Changing any of these parameters will alter the device's behavior during PFM operation.

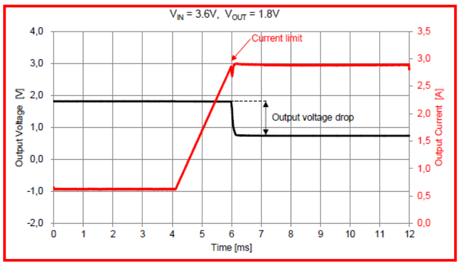
4. Overcurrent graph has been updated

171960501

Before Change

Overcurrent protection (OCP)

For protection against load faults, the MagI³C MicroModule incorporates cycle-by-cycle current limiting (see I_{OCP} in "Electrical Specification" on page 5). During an overcurrent condition the output current is limited and the output voltage drops (see figure below). When the overcurrent condition is removed, the output voltage returns to the nominal voltage.



After Change

17.1 Overcurrent Protection (OCP)

For protection against load faults, the 171960501 MagI³C power module incorporates a current limit (see I_{OCP} in ELECTRICAL SPECIFICATION). During an overcurrent condition the output current is limited and the output voltages drops (see figure below). When the overcurrent condition is removed, the output voltage returns to the nominal voltage.

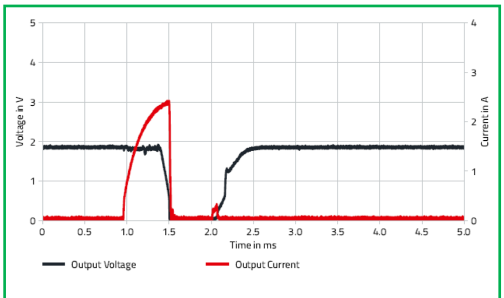


Figure 21: 171960501 OCP V_{IN} = 3.6V, V_{OUT} = 1.8V.

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Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
USt.-IdNr. DE220618976

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010501

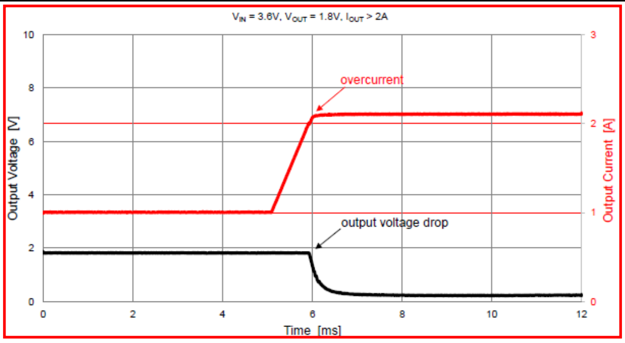
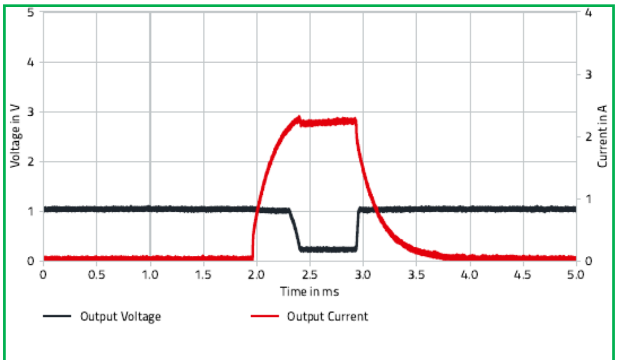
Before Change	After Change
	

Figure 16: 171010501 overcurrent protection V_{IN} = 3.6V, V_{OUT} = 1.8V, I_{OUT} > 2A.

171010502

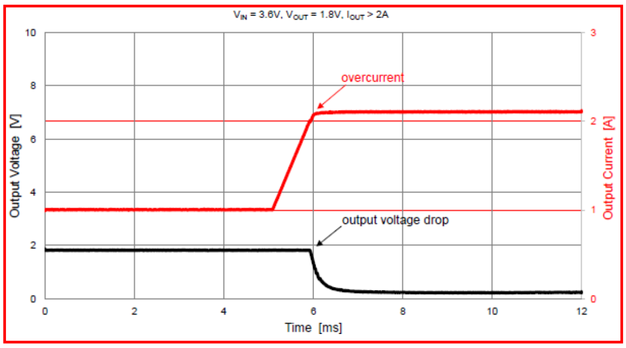
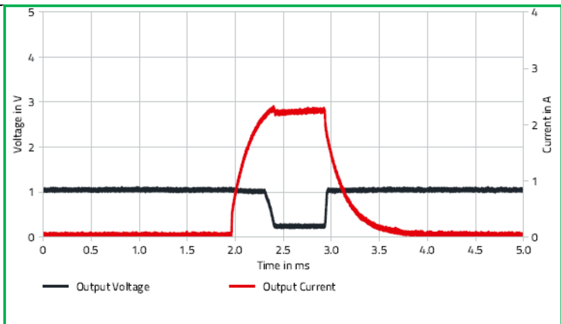
Before Change	After Change
	

Figure 21: 171010502 overcurrent protection V_{IN} = 3.6V, V_{OUT} = 1.8V, I_{OUT} > 2A.

171010550

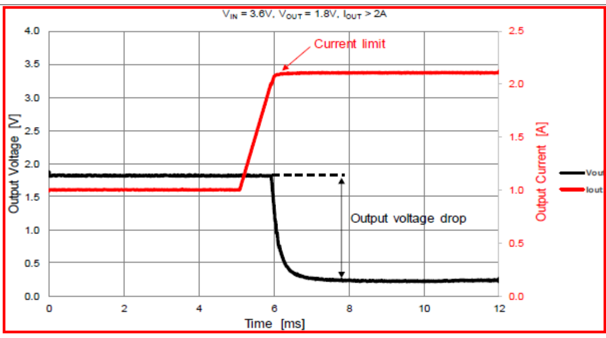
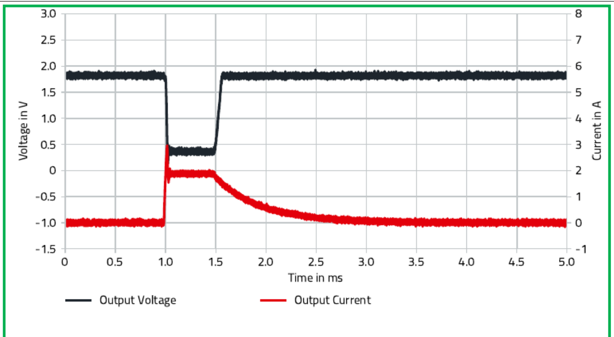
Before Change	After Change
	

Figure 20: 171010550 overcurrent protection V_{IN} = 3.6V, V_{OUT} = 1.8V, I_{OUT} > 2A.

5. Updated handling recommendations section to new formatting

171960501

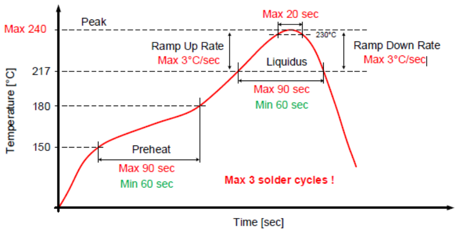
Before Change

HANDLING RECOMMENDATIONS

1. The power MicroModule is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033).
2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year.
3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hours (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.

SOLDER PROFILE

1. Only Pb-Free assembly is recommended according to JEDEC J-STD020.
2. Measure the peak reflow temperature of the MagI³C MicroModule in the middle of the packaged IC on top.
3. Ensure that the peak reflow temperature does not exceed 235°C ±5°C as per JEDEC J-STD020.
4. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds.
5. Reflow time above liquidus (217°C) must not exceed 90 seconds.
6. Maximum ramp up rate is 3°C per second.
7. Maximum ramp down rate is 3°C per second.
8. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020.
9. **Maximum number of allowed reflow cycles is three.**
10. **For minimum risk, solder the MicroModule in the last reflow cycle of the PCB production.**
11. For soldering process please consider lead material copper (Cu) and lead finish tin (Sn).
12. For solder paste use a SAC 305 alloy (Sn 96.5 / Ag 3.0 / Cu 0.5) type 3 or higher.
13. The profile shown below is valid for convection reflow only.
14. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer at their own risk.



After Change

20 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033.
2. The components should be sealed and stored in a controlled environment prior to soldering or other use.
3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon.
4. Maximum numbers of reflow cycles is two.
5. For minimum risk, solder the module in the last reflow cycle of the PCB production.
6. Please consider that the leads are finished with AgPd.
7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
8. The profile below is valid for convection reflow only.
9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

21 SOLDERING PROFILE

Table 13: Reflow soldering profile.

Profile Feature	Symbol	Value
Preheat temperature minimum	T_{s_min}	150°C
Preheat temperature maximum	T_{s_max}	180°C
Preheat time from T_{s_min} to T_{s_max}	t_s	60-90 seconds
Liquidous temperature	T_L	217°C
Time maintained above T_L	t_L	60-90 seconds
Classification temperature	T_C	240°C
Peak package body temperature	T_P	$T_P \leq T_C$
Time within T_C - 5°C and T_C	t_P	$t_P \leq$ 20 seconds
Ramp-up Rate (T_L to T_p)		3°C/second maximum
Ramp-down rate (T_p to T_L)		3°C/second maximum
Time 25°C to peak temperature		8 minutes maximum

Please refer to JEDEC J-STD020E for further information pertaining to reflow soldering of electronic components.

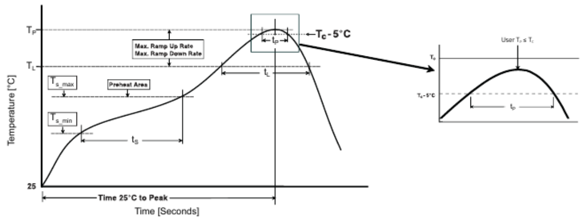


Figure 27: Soldering profile.

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010501

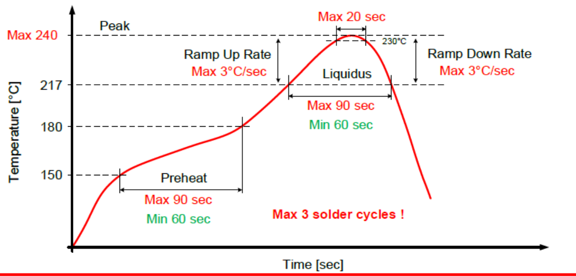
<table>
<tr><th>Before Change</th><th>After Change</th></tr>
<tr><td>

HANDLING RECOMMENDATIONS

1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033).
2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year.
3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.

SOLDER PROFILE

1. Measure the peak reflow temperature of the MagI³C power module in the middle of the top view.
2. Ensure that the peak reflow temperature does not exceed 235°C ±5°C.
3. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds.
4. Reflow time above liquidus (217°C) must not exceed 90 seconds.
5. Maximum ramp up is rate 3K per second
6. Maximum ramp down rate is 3K per second
7. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020.
8. Maximum numbers of reflow cycles is three.
9. For minimum risk, solder the module in the last reflow cycle of the PCB production.
10. For soldering process please consider lead material silver (Ag) and palladium (Pd).
11. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
12. Below profile is valid for convection reflow only
13. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk



</td><td>

19 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033.
2. The components should be sealed and stored in a controlled environment prior to soldering or other use.
3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon.
4. Maximum numbers of reflow cycles is two.
5. For minimum risk, solder the module in the last reflow cycle of the PCB production.
6. Please consider that the leads are finished with AgPd.
7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
8. The profile below is valid for convection reflow only.
9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

20 SOLDERING PROFILE

Table 13: Reflow soldering profile.

Profile Feature	Symbol	Value
Preheat temperature minimum	T_{s_min}	150°C
Preheat temperature maximum	T_{s_max}	180°C
Preheat time from T_{s_min} to T_{s_max}	t_S	60-90 seconds
Liquidous temperature	T_L	217°C
Time maintained above T_L	t_L	60-90 seconds
Classification temperature	T_C	240°C
Peak package body temperature	T_P	$T_P \leq T_C$
Time within T_C - 5°C and T_C	t_P	$t_P \leq 20$ seconds
Ramp-up Rate (T_L to T_p)		3°C/second maximum
Ramp-down rate (T_p to T_L)		3°C/second maximum
Time 25°C to peak temperature		8 minutes maximum

Please refer to JEDEC J-STD020E for further information pertaining to reflow soldering of electronic components.

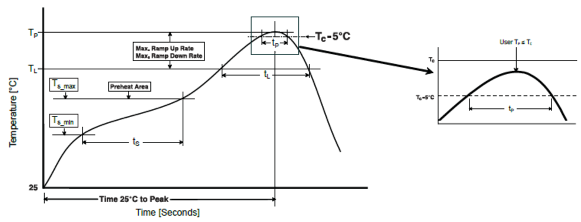


Figure 21: Soldering profile.

</td></tr>
</table>

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Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
USt.-IdNr. DE220618976

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010502

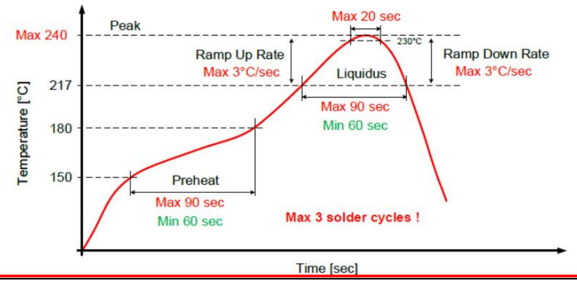
Before Change

HANDLING RECOMMENDATIONS

1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033).
2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year.
3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.

SOLDER PROFILE

1. Measure the peak reflow temperature of the MagI³C power module in the middle of the top view.
2. Ensure that the peak reflow temperature does not exceed 235°C ±5°C.
3. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds.
4. Reflow time above liquidus (217°C) must not exceed 90 seconds.
5. Maximum ramp up is rate 3K per second
6. Maximum ramp down rate is 3K per second
7. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020.
8. Maximum numbers of reflow cycles is three.
9. For minimum risk, solder the module in the last reflow cycle of the PCB production.
10. For soldering process please consider lead material silver (Ag) and palladium (Pd).
11. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
12. Below profile is valid for convection reflow only
13. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk



After Change

19 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033.
2. The components should be sealed and stored in a controlled environment prior to soldering or other use.
3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon.
4. Maximum numbers of reflow cycles is two.
5. For minimum risk, solder the module in the last reflow cycle of the PCB production.
6. Please consider that the leads are finished with AgPd.
7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
8. The profile below is valid for convection reflow only.
9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

20 SOLDERING PROFILE

Table 13: Reflow soldering profile.

Profile Feature	Symbol	Value
Preheat temperature minimum	T_{s_min}	150°C
Preheat temperature maximum	T_{s_max}	180°C
Preheat time from T_{s_min} to T_{s_max}	t_s	60-90 seconds
Liquidous temperature	T_L	217°C
Time maintained above T_L	t_L	60-90 seconds
Classification temperature	T_C	240°C
Peak package body temperature	T_P	$T_P \leq T_C$
Time within T_C - 5°C and T_C	t_P	$t_P \leq$ 20 seconds
Ramp-up Rate (T_L to T_p)		3°C/second maximum
Ramp-down rate (T_p to T_L)		3°C/second maximum
Time 25°C to peak temperature		8 minutes maximum

Please refer to JEDEC J-STD020E for further information pertaining to reflow soldering of electronic components.

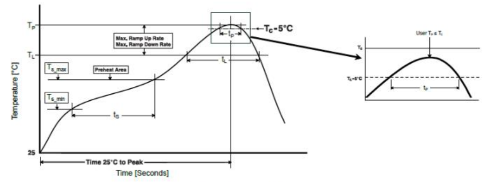


Figure 26: Soldering profile.

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Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
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Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

171010550

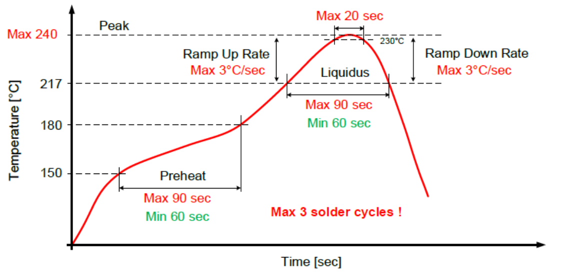
Before Change

HANDLING RECOMMENDATIONS

1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033).
2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year.
3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.

SOLDER PROFILE

1. Only Pb-Free assembly is recommended according to JEDEC J-STD020.
2. Measure the peak reflow temperature of the MagI^{3}C power module in the middle of the top view.
3. Ensure that the peak reflow temperature does not exceed 235°C ±5°C as per JEDEC J-STD020.
4. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds.
5. Reflow time above liquidus (217°C) must not exceed 60 seconds.
6. Maximum ramp up is rate 3°C per second
7. Maximum ramp down rate is 3°C per second
8. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020.
9. Maximum numbers of reflow cycles is two.
10. For minimum risk, solder the module in the last reflow cycle of the PCB production.
11. For soldering process please consider lead material copper (Cu) and lead finish tin (Sn).
12. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
13. Below profile is valid for convection reflow only
14. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk



After Change

19 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033D).
2. The parts are delivered in a sealed bag (Moisture Barrier Bag = MBB) and should be processed within one year.
3. When opening the moisture barrier bag, check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033D recommendation.
5. Maximum number of solder cycles is two.
6. For minimum risk, solder the module in the last solder cycle of the PCB production.
7. Please consider that the leads are finished with NiPdAu.
8. It is recommended to use a standard SAC Alloy such as SAC 305, type 3 or higher.
9. The profile below is valid for convection reflow only.
10. Vapor phase soldering following the reflow soldering profile has been experimentally verified.
11. Other soldering methods and profiles for soldering have not been verified and have to be validated by the customer at their own risk.

20 SOLDERING PROFILE

Table 13: Reflow soldering profile.

Profile Feature	Symbol	Value
Preheat temperature minimum	T_{s_min}	150°C
Preheat temperature maximum	T_{s_max}	180°C
Preheat time from T_{s_min} to T_{s_max}	t_s	60-90 seconds
Liquidous temperature	T_L	217°C
Time maintained above T_L	t_L	60-90 seconds
Classification temperature	T_C	260°C
Peak package body temperature	T_P	$T_P \leq T_C$
Time within T_C - 5°C and T_C	t_P	$t_P \leq 20$ seconds
Ramp-up Rate (T_L to T_p)		3°C/second maximum
Ramp-down rate (T_p to T_L)		3°C/second maximum
Time 25°C to peak temperature		8 minutes maximum

Please refer to JEDEC J-STD020E for further information pertaining to reflow soldering of electronic components.

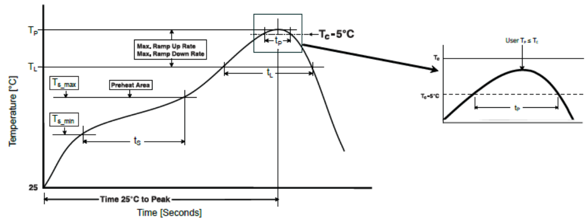


Figure 25: Soldering profile.

Changes 6 through 8 apply only to 171960501, 171010501 and 171010502.

6. MSL level changed from 3 to 1

171960501

Before Change

HANDLING RECOMMENDATIONS

1. The power MicroModule is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033).
2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year.
3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card.
4. Parts must be processed after 168 hours (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.

After Change

20 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD-020F.
2. The components should be sealed and stored in a controlled environment prior to soldering or other use.
3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon.
4. Maximum numbers of reflow cycles is three.
5. For minimum risk, solder the module in the last reflow cycle of the PCB production.
6. The component lead material is silver (Ag) and palladium (Pd).
7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
8. Below profile is valid for convection reflow only.
9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

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Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

171010501	
Before Change	After Change
HANDLING RECOMMENDATIONS 1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033). 2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year. 3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card. 4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

171010502	
Before Change	After Change
HANDLING RECOMMENDATIONS 1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033). 2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year. 3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card. 4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

7. Reduced number of allowable solder cycles from 3 to 2

171960501	
Before Change	After Change
SOLDER PROFILE 1. Only Pb-Free assembly is recommended according to JEDEC J-STD020. 2. Measure the peak reflow temperature of the MagI³C MicroModule in the middle of the packaged IC on top. 3. Ensure that the peak reflow temperature does not exceed 235°C ±5°C as per JEDEC J-STD020. 4. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds. 5. Reflow time above liquidus (217°C) must not exceed 90 seconds. 6. Maximum ramp up rate is 3°C per second. 7. Maximum ramp down rate is 3°C per second. 8. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020. 9. **Maximum number of allowed reflow cycles is three.** 10. **For minimum risk, solder the MicroModule in the last reflow cycle of the PCB production.** 11. For soldering process please consider lead material copper (Cu) and lead finish tin (Sn). 12. For solder paste use a SAC 305 alloy (Sn 96.5 / Ag 3.0 / Cu 0.5) type 3 or higher. 13. The profile shown below is valid for convection reflow only. 14. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer at their own risk.	**20 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD-020F. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. The component lead material is silver (Ag) and palladium (Pd). 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. Below profile is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

171010501	
Before Change	After Change
SOLDER PROFILE 1. Measure the peak reflow temperature of the MagI³C power module in the middle of the top view. 2. Ensure that the peak reflow temperature does not exceed 235°C ±5°C. 3. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds. 4. Reflow time above liquidus (217°C) must not exceed 90 seconds. 5. Maximum ramp up is rate 3K per second 6. Maximum ramp down rate is 3K per second 7. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020. 8. Maximum numbers of reflow cycles is three. 9. For minimum risk, solder the module in the last reflow cycle of the PCB production. 10. For soldering process please consider lead material silver (Ag) and palladium (Pd). 11. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 12. Below profile is valid for convection reflow only 13. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

Würth Elektronik eiSos GmbH & Co. KG Sitz Waldenburg, Registergericht Stuttgart HRA 580801
Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
USt.-IdNr. DE220618976

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

WÜRTH ELEKTRONIK
MORE THAN YOU EXPECT

171010502	
Before Change	After Change
SOLDER PROFILE 1. Measure the peak reflow temperature of the MagI^{3}C power module in the middle of the top view. 2. Ensure that the peak reflow temperature does not exceed 235°C ±5°C. 3. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds. 4. Reflow time above liquidus (217°C) must not exceed 90 seconds. 5. Maximum ramp up is rate 3K per second 6. Maximum ramp down rate is 3K per second 7. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020. 8. Maximum numbers of reflow cycles is three. 9. For minimum risk, solder the module in the last reflow cycle of the PCB production. 10. For soldering process please consider lead material silver (Ag) and palladium (Pd). 11. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 12. Below profile is valid for convection reflow only 13. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

8. Added statements about open-air storage of components and baking within inert gas

171960501	
Before Change	After Change
HANDLING RECOMMENDATIONS 1. The power MicroModule is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033). 2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one yeqr. 3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card. 4. Parts must be processed after 168 hours (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.	**20 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

171010501	
Before Change	After Change
HANDLING RECOMMENDATIONS 1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033). 2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year. 3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card. 4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

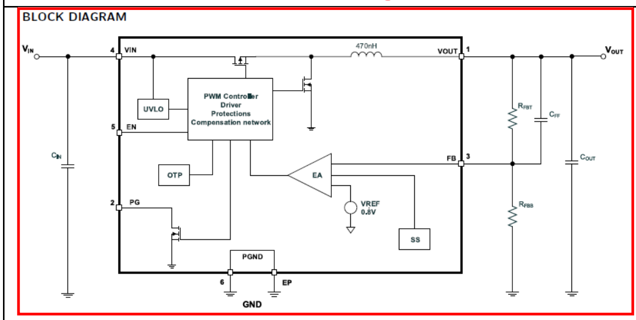
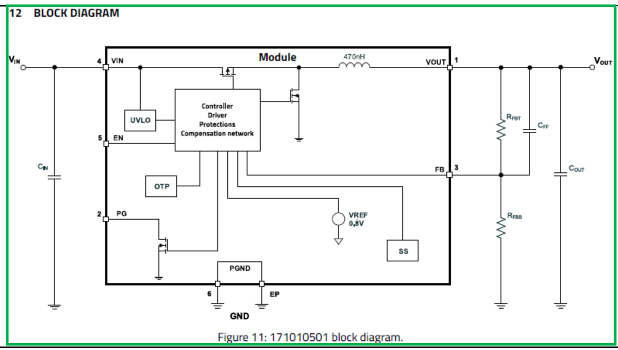
171010502	
Before Change	After Change
HANDLING RECOMMENDATIONS 1. The power module is classified as MSL3 (JEDEC Moisture Sensitivity Level 3) and requires special handling due to moisture sensitivity (JEDEC J-STD033). 2. The parts are delivered in a sealed bag (Moisture Barrier Bags = MBB) and should be processed within one year. 3. When opening the moisture barrier bag check the Humidity Indicator Card (HIC) for color status. Bake parts prior to soldering in case indicator color has changed according to the notes on the card. 4. Parts must be processed after 168 hour (7 days) of floor life. Once this time has been exceeded, bake parts prior to soldering per JEDEC J-STD033 recommendation.	**19 HANDLING RECOMMENDATIONS** 1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033. 2. The components should be sealed and stored in a controlled environment prior to soldering or other use. 3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon. 4. Maximum numbers of reflow cycles is two. 5. For minimum risk, solder the module in the last reflow cycle of the PCB production. 6. Please consider that the leads are finished with AgPd. 7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher. 8. The profile below is valid for convection reflow only. 9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

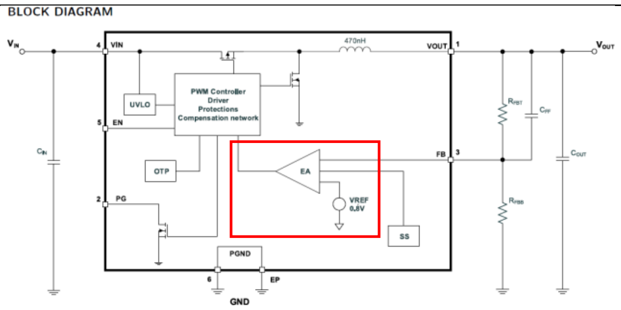
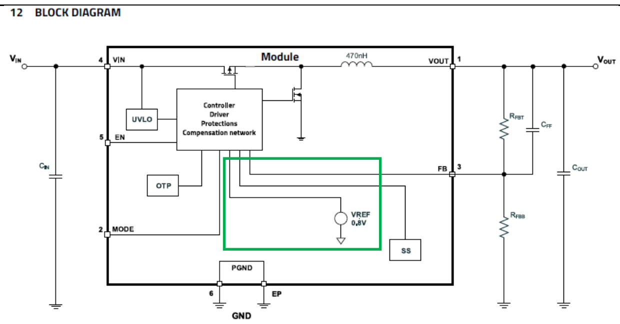
Würth Elektronik eiSos GmbH & Co. KG Sitz Waldenburg, Registergericht Stuttgart HRA 580801
Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
USt.-IdNr. DE220618976

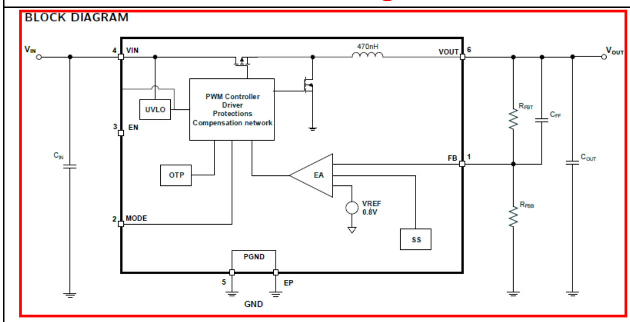
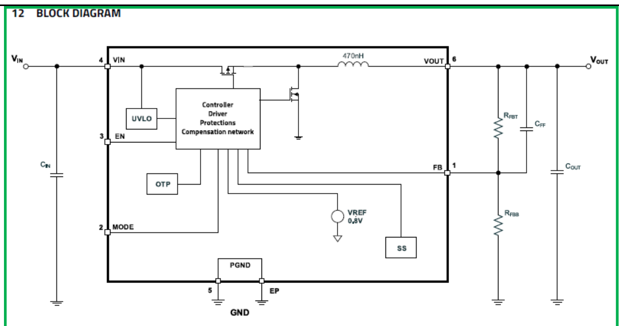
Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

Change 9 applies only to 171010501, 171010502, and 171010550

9. Block diagram has been updated

171010501	
Before Change	After Change
	 Figure 11: 171010501 block diagram.

171010502	
Before Change	After Change
	 Figure 14: 171010502 block diagram.

171010550	
Before Change	After Change
	 Figure 13: 171010550 block diagram.

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

Changes 10 and 11 apply only to 171010501 and 171010502

10. Absolute maximum voltage ratings have been corrected

171010501

Before Change

ABSOLUTE MAXIMUM RATINGS

Caution:
Exceeding the listed absolute maximum ratings may affect the device negatively and may cause permanent damage.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input Voltage	-0.3	6	V
VOUT	Output Voltage	-0.3	V_{IN}-0.3	V
FB	Feedback	-0.3	V_{IN}-0.3	V
EN	Enable	-0.3	V_{IN}-0.3	V
MODE	Power Good	-0.3	V_{IN}-0.3	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (HBM), all pins vs. PGND (C=100pF, R=1.5kΩ)	-4	4	kV

After Change

4 ABSOLUTE MAXIMUM RATINGS

Caution:
Exceeding the listed absolute maximum ratings may affect the device negatively and may cause permanent damage.

Table 4: Absolute maximum ratings.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input pin voltage	-0.3	6	V
VOUT	Output pin voltage	-0.3	V_{IN}+0.3	V
FB	Feedback pin voltage	-0.3	V_{IN}+0.3	V
EN	Enable pin voltage	-0.3	V_{IN}+0.3	V
PG	Power good pin voltage	-0.3	V_{IN}+0.3	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (HBM), according to EN61000-4-2[4]	-4	4	kV

171010502

Before Change

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input Voltage	-0.3	6	V
VOUT	Output Voltage	-0.3	V_{IN}-0.3	V
FB	Feedback	-0.3	V_{IN}-0.3	V
EN	Enable	-0.3	V_{IN}-0.3	V
MODE	Power Good	-0.3	V_{IN}-0.3	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (HBM), All pins vs. PGND (C=100pF, R=1.5kΩ)	-4	4	kV

After Change

Table 4: Absolute maximum ratings.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input pin voltage	-0.3	6	V
VOUT	Output pin voltage	-0.3	V_{IN}+0.3	V
FB	Feedback pin voltage	-0.3	V_{IN}+0.3	V
EN	Enable pin voltage	-0.3	V_{IN}+0.3	V
MODE	Mode pin voltage	-0.3	V_{IN}+0.3	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (HBM), All pins vs. PGND (C=100pF, R=1.5kΩ)[4]	-4	4	kV

11. Feedback resistor value in the design flow table has been corrected

171010501

Before Change

V_{OUT}	1.2V	1.5V	1.8V	2.5V	3.3V	3.6V	5V
R_{FBB} (E96)	200kΩ	115kΩ	80.6Ω	47.5kΩ	32.4kΩ	28.7kΩ	13.8kΩ

After Change

Table 11: Output voltage selection.

V_{OUT} (V)	1.2	1.5	1.8	2.5	3.3	3.6	5
R_{FBB} (E96) (kΩ)	200	115	80.6	47.5	32.4	28.7	19.1

171010502

Before Change

V_{OUT}	1.2V	1.5V	1.8V	2.5V	3.3V	3.6V	5V
R_{FBB} (E96)	200kΩ	115kΩ	80.6Ω	47.5kΩ	32.4kΩ	28.7kΩ	13.8kΩ

After Change

Table 11: Output voltage selection.

V_{OUT} (V)	1.2	1.5	1.8	2.5	3.3	3.6	5
R_{FBB} (E96) (kΩ)	200	115	80.6	47.5	32.4	28.7	19.1

Würth Elektronik eiSos GmbH & Co. KG Sitz Waldenburg, Registergericht Stuttgart HRA 580801
Komplementär Würth Elektronik eiSos Verwaltungs-GmbH, Sitz Waldenburg, Registergericht Stuttgart HRB 581033
Geschäftsführer Thomas Wild, Alexander Gerfer, Dirk Knorr, Josef Wörner
Bankverbindung UniCredit Bank AG Stuttgart, Konto 322 620 136, BLZ 600 202 90, IBAN DE86 6002 0290 0322 6201 36, SWIFT/BIC HYVEDEMM473
USt.-IdNr. DE220618976

Würth Elektronik eiSos GmbH & Co. KG
EMC & Inductive Solutions
Max-Eyth-Straße 1 · 74638 Waldenburg · Germany
Tel. +49 7942 945-0 · Fax +49 7942 945-5000
eiSos@we-online.com · www.we-online.com

Changes 12 and 13 apply only to 171960501

12. Lead finish information has been corrected

171960501

Before Change

SOLDER PROFILE

1. Only Pb-Free assembly is recommended according to JEDEC J-STD020.
2. Measure the peak reflow temperature of the MagI³C MicroModule in the middle of the packaged IC on top.
3. Ensure that the peak reflow temperature does not exceed 235°C ±5°C as per JEDEC J-STD020.
4. The reflow time period during peak temperature of 235°C ±5°C must not exceed 20 seconds.
5. Reflow time above liquidus (217°C) must not exceed 90 seconds.
6. Maximum ramp up rate is 3°C per second.
7. Maximum ramp down rate is 3°C per second.
8. Reflow time from room (25°C) to peak must not exceed 8 minutes as per JEDEC J-STD020.
9. **Maximum number of allowed reflow cycles is three.**
10. **For minimum risk, solder the MicroModule in the last reflow cycle of the PCB production.**
11. For soldering process please consider lead material copper (Cu) and lead finish tin (Sn).
12. For solder paste use a SAC 305 alloy (Sn 96.5 / Ag 3.0 / Cu 0.5) type 3 or higher.
13. The profile shown below is valid for convection reflow only.
14. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer at their own risk.

After Change

20 HANDLING RECOMMENDATIONS

1. The power module is classified as MSL1 (JEDEC Moisture Sensitivity Level 1) according to JEDEC J-STD033.
2. The components should be sealed and stored in a controlled environment prior to soldering or other use.
3. If the components are to be baked prior to soldering, the baking must be performed with the components in an inert gas such as nitrogen or argon.
4. Maximum numbers of reflow cycles is two.
5. For minimum risk, solder the module in the last reflow cycle of the PCB production.
6. Please consider that the leads are finished with AgPd.
7. For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
8. The profile below is valid for convection reflow only.
9. Other soldering methods (e.g. vapor phase) are not verified and have to be validated by the customer at their own risk

13. Storage temperature range has been corrected

171960501

Before Change

ABSOLUTE MAXIMUM RATINGS

Caution:
Exceeding the listed absolute maximum ratings may affect the device negatively and may cause permanent damage.

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN [1]	MAX [1]	
VIN	Input voltage pin	-0.3	6	V
VOUT	Output voltage pin	-0.3	V_{IN}	V
FB	Feedback pin	-0.3	V_{IN}	V
EN	Enable pin	-0.3	V_{IN} +0.3	V
MODE	Mode pin	-0.3	V_{IN}	V
$T_{storage}$	Assembled, non-operating storage temperature	-65	150	°C
V_{ESD}	ESD voltage (HBM), VIN and VOUT vs. PGND (C=100pF, R= 1.5kΩ) according to AEC-Q100-002[3]	-4	4	kV
V_{ESD}	ESD voltage (HBM), EN, MODE and FB vs. PGND (C=100pF, R= 1.5kΩ) according to AEC-Q100-002[3]	-2	2	kV

After Change

4 ABSOLUTE MAXIMUM RATINGS

Caution:
Exceeding the listed absolute maximum ratings may affect the device negatively and may cause permanent damage.

Table 4: Absolute maximum ratings.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input pin voltage	-0.3	6	V
VOUT	Output pin voltage	-0.3	V_{IN}	V
FB	Feedback pin voltage	-0.3	V_{IN}	V
EN	Enable pin voltage	-0.3	V_{IN}+0.3	V
MODE	Mode pin voltage	-0.3	V_{IN}	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (HBM), VIN and VOUT vs. PGND according to EN61000-4-2[4]	-4	4	kV
V_{esd}	ESD Voltage (HBM), EN, MODE and FB vs. PGND according to EN61000-4-2[4]	-2	2	kV

Change 14 applies only to 171010550

14. Information about vapor phase soldering has been added

171010550

Before Change

14. Other soldering methods (e.g.vapor phase) are not verified and have to be validated by the customer on his own risk

After Change

10. Vapor phase soldering following the reflow soldering profile has been experimentally verified.
11. Other soldering methods and profiles for soldering have not been verified and have to be validated by the customer at their own risk.

Reliability / Qualification of Change:

As the components themselves have not been changed, there were no reliability tests performed in conjunction with this PCN.