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WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Product / Process Change Notification (PCN)

☒ Major Change
☐ Minor Change

PCN Number:	PCN_WPME-FDSM_173950375_20250120
Affected Series:	WPME-FDSM
Affected Part Number:	173950375
PCN Date:	2024-12-20 (YYYY-MM-DD)
Effective Date:	2025-01-20 (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
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E-Mail:	pcn.eisos@we-online.com

Datasheet Change:
☒ Yes ☐ No

Attachment:
☒ Yes ☐ No

DESCRIPTION OF CHANGE:

Due to an improvement of the production capability, Würth Elektronik eiSos has shifted the production of the affected part number to a new factory location.
With the aim of an extended product applicability, Würth Elektronik eiSos has updated the BOM used in the module to ensure the best performance and the electrical specifications.
There will be no change in fit or quality of the product.
The new revision of the affected part number will be sent out after the previous revision is out of stock (according to FIFO - first-in, first-out).

DETAILS OF CHANGE:

All changes indicated below apply to the part number in this PCN.

Previous production line	New production line
Lot number beginning with: 489xxxxxxxxxxx Country of origin: China	Lot number beginning with: 676xxxxxxxxxxx Country of origin: China

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The part numbers of the FDSM series are now distributed in single datasheets instead of the previous family datasheet approach

Before Change

17395xx75
MagI³C Power Module
WPME-FDSM - Fixed Step Down Regulator Module

Maximum Input 74.5V / 0.5A / Fixed Output 3.3V, 5V or 12V

DESCRIPTION

The FDSM series of the MagI³C Power Module family is a fixed output voltage, fully integrated DC-DC power supply including the controller IC, inductor and capacitors all in one package.

For optimal performance the module is recommended for use with an external input capacitor, reducing design effort and complexity to a minimum.

The FDSM ensures fast time to market and low development costs.

The module is specially suited for high transient 48V bus applications such as industrial motor drive control systems.

48V to 3.3V conversion achieves up to 89%. 48V to 5V conversion achieves up to 93%. 48V to 12V conversion achieves up to 95% efficiency.

The standard THT (11.5 x 9 x 17.5)mm package allows for easy assembly.

TYPICAL APPLICATIONS

FEATURES

- Peak efficiency up to 95%
- Current capability up to 0.5A
- Input voltage up to 74.5V
- Minimum input voltage / output voltage:
  - 9V / 3.3V (173950375)
  - 9V / 5V (173950575)
  - 18V / 12V (173951275)
- No minimum load required
- Partially integrated input and output capacitors
- Integrated inductor
- Low output voltage ripple (<50mV$_{pp}$)
- Current mode control
- Internal soft-start
- Thermal shutdown
- Short circuit protection
- Cycle by cycle current limit
- Pin compatible with the FDSM power modules series
- Ambient temperature range: -40°C to 85°C
- RoHS & REACh compliant
- Case and potting material UL 94 (flammability testing) certified
- Complies with EN55032 (CISPR-32) class B conducted and radiated emissions standard

After Change

173950375
MagI³C Power Module
WPME-FDSM - Fixed Step Down Regulator Module

Maximum Input 74.5V / 0.5A / Fixed Output 3.3V

DESCRIPTION

The FDSM series of the MagI³C Power Module family is a fixed output voltage, fully integrated DC-DC power supply including the controller IC, inductor and capacitors all in one package.

For optimal performance the module is recommended for use with an external input capacitor, reducing design effort and complexity to a minimum.

The FDSM ensures fast time to market and low development costs.

The module is specially suited for high transient 48V bus applications such as industrial motor drive control systems.

The 173950375 module achieves an efficiency up to 78%.

FEATURES

- Peak efficiency up to 78%
- Current capability up to 0.5A
- Input voltage up to 74.5V
- No minimum load required
- Partially integrated input and output capacitors
- Integrated inductor
- Low output voltage ripple (<50mV$_{pp}$)
- PFM/PWM mode
- Internal soft-start
- Thermal shutdown
- Short circuit protection
- Cycle by cycle current limit
- Pin compatible with the FDSM power modules series
- Ambient temperature range: -40°C to 85°C
- RoHS & REACH compliant
- Complies with EN55032 (CISPR-32) class B conducted and radiated emissions standard

The datasheet electrical specifications (maximum / electrical) have been adjusted based on the new design.

Before Change

5 ABSOLUTE MAXIMUM RATINGS

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

Table 3: Absolute maximum ratings.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input pin voltage 17395xx75	-0.3	90	V
VOUT	Output pin voltage 3.3Vout / 5Vout version	-0.3	16	V
	Output pin voltage 12Vout version	-0.3	25	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (Human Body Model), according to EN61000-4-2 [4]	-4	4	kV

After Change

5 ABSOLUTE MAXIMUM RATINGS

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

Table 5: Absolute maximum ratings.

SYMBOL	PARAMETER	LIMIT		UNIT
		MIN[1]	MAX[1]	
VIN	Input pin voltage	-0.3	100	V
VOUT	Output pin voltage	-0.3	6.3	V
$T_{storage}$	Assembled, non-operating storage temperature	-40	125	°C
V_{esd}	ESD Voltage (Human Body Model), according to EN61000-4-2 [4]	-4	4	kV

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Geschäftsführer Thomas Garz, Alexander Gerfer, Dirk Knorr, Josef Wörner
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USt.-IdNr. DE220618976

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7 ELECTRICAL SPECIFICATIONS

Caution:
MIN and MAX limits are valid for the recommended ambient temperature range of -40°C to 85°C. Typical values represent statistically the utmost probable values at the following conditions: V_{IN}= 48V (173950375, 173950575 and 173951275), I_{OUT}= 0.5A, T_A = 25°C, unless otherwise noted.

Table 5: Electrical specifications.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMIT MIN[1]	LIMIT TYP[3]	LIMIT MAX[1]	UNIT
Output Current						
I_{CL}	Current limit threshold	V_{OUT} = 3.3	-	1.1	-	A
		V_{OUT} = 5	-	1.2	-	A
		V_{OUT} = 12	-	0.9	-	A
Output Voltage						
V_{OUT}	Regulated output voltage	173950375	-	3.3	-	V
		173950575	-	5	-	V
		173951275	-	12	-	V
	Line regulation	I_{OUT} = 0.5A	-0.4	±0.2	0.4	%
	Load Regulation	10% to 100% load	-0.6	±0.4	0.6	%
	Total output voltage regulation	V_{OUT} = 3.3V, I_{OUT} = 0.5A	-4.5	±3.5	4.5	%
		V_{OUT} = 5V / 12V, I_{OUT} = 0.5A	-3	±2	3	%
	Output voltage ripple	External 2x C_{OUT} = 10µF, 25V, X5R, 20MHz BWL[6]				
		3.3V, 0.5A	-	40	-	mV_{pp}
		5V / 12V, 0.5A	-	30	-	mV_{pp}
Switching Frequency						
f_{SW}	Switching frequency	V_{OUT} = 3.3V, I_{OUT} = 0.5A	-	166	-	kHz
		V_{OUT} = 5V, I_{OUT} = 0.5A	-	250	-	kHz
		V_{OUT} = 12V, I_{OUT} = 0.5A	-	400	-	kHz
Input Current						
I_{IN}	No load input current	Operating, switching	-	0.3	1	mA
Efficiency						
η	Efficiency, I_{OUT} = 0.5A	V_{IN} = 9V, V_{OUT} = 3.3V	-	89	-	%
		V_{IN} = 48V, V_{OUT} = 3.3V	-	81	-	%
		V_{IN} = 9V, V_{OUT} = 5V	-	92	-	%
		V_{IN} = 48V, V_{OUT} = 5V	-	86	-	%
		V_{IN} = 18V, V_{OUT} = 12V	-	95	-	%
		V_{IN} = 48V, V_{OUT} = 12V	-	91	-	%

7 ELECTRICAL SPECIFICATIONS

Caution:
MIN and MAX limits are valid for the recommended ambient temperature range of -40°C to 85°C. Typical values represent statistically the utmost probable values at the following conditions: V_{IN}= 48V, V_{OUT}= 3.3V, I_{OUT}= 0.5A, T_A = 25°C, unless otherwise noted.

Table 7: Electrical specifications.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMIT MIN[1]	LIMIT TYP[3]	LIMIT MAX[1]	UNIT
Output Current						
I_{CL}	Current limit threshold		—	1.2	—	A
Output Voltage						
V_{OUT}	Regulated output voltage		—	3.3	—	V
	Line regulation		—	—	1.5	%
	Load Regulation	10% to 100% load	—	—	2.0	%
	Total output voltage regulation		-4	±3	4	%
	Output voltage ripple		—	30	—	mV_{pp}
Switching Frequency						
f_{SW}	Switching frequency		—	350	—	kHz
Input Current						
I_{IN}	No load input current	Operating, switching	—	0.18	—	mA
Efficiency						
η	Efficiency		—	78	—	%

The datasheet package specifications have been adjusted based on the new design.

Before Change	After Change

10 PACKAGE SPECIFICATIONS

Table 8: Package specifications.

ITEM	PARAMETER	TYP[3]	UNIT
Case	Black flame-retardant and heat-resistant plastic (UL94 V-0)	-	-
Potting material	Silicone, UL94V-0	-	-
Weight		3.8	g
Vibration	5g for 20 min	MIL-STD-202, Method 204	

10 PACKAGE SPECIFICATIONS

Table 10: Package specifications.

ITEM	PARAMETER	TYP[3]	UNIT
Case	Black flame-retardant and heat-resistant plastic (UL94 V-0)	-	-
Potting material	Silicone, UL94V-0	-	-
Weight		4	g
Vibration	5g for 20 min	MIL-STD-202, Method 204	

The datasheet MTBF specifications have been adjusted based on the new design.

Before Change	After Change

9 RELIABILITY

Table 7: Reliability.

SYMBOL	PARAMETER	TEST CONDITIONS	TYP[3]	UNIT
MTBF	Mean time between failures	MIL-HDBK-217F, 25°C	$5000 \cdot 10^3$	h

9 RELIABILITY

Table 9: Reliability.

SYMBOL	PARAMETER	TEST CONDITIONS	TYP[3]	UNIT
MTBF[6]	Mean Time Between Failures	MIL-HDBK-217F, 25°C	$6849 \cdot 10^3$	h
		MIL-HDBK-217F, 85°C	$1337 \cdot 10^3$	h

The diagrams shown in chapter TYPICAL PERFORMANCE CURVES are updated based on new electrical specifications. The used test conditions stay the same as before.

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Due to the change of IC and change the internal BOM is changed. The changes in component values and new internal reference voltage are indicated in the BLOCK DIAGRAM chapter.

Before Change

13 BLOCK DIAGRAM

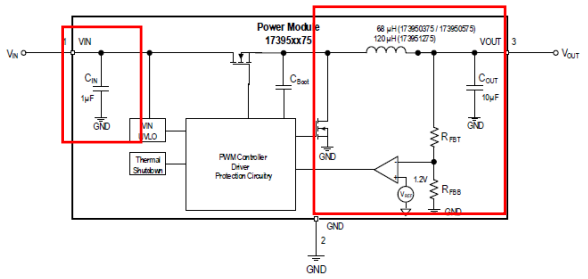

Figure 16: 17395xx75 block diagram.

14 CIRCUIT DESCRIPTION

The MagI³C power modules 17395xx75 are all synchronous step-down regulator with integrated IC, power inductor, input and output capacitors. The control scheme is based on a constant on-time (COT) regulation loop.

The V_{OUT} of the regulator is divided by the internal feedback resistor network and fed into the error amplifier, which compares this signal with the internal 1.2V reference. The error amplifier controls the on-time of a fixed frequency pulse width generator, which drives the MOSFET.

To achieve a regulated output voltage the off-time is modulated. It is stable with low ESR output capacitors. No external compensation network is required. This architecture supports fast transient response and very small output voltage ripple values (<50mV$_{pp}$) are achieved.

After Change

13 BLOCK DIAGRAM

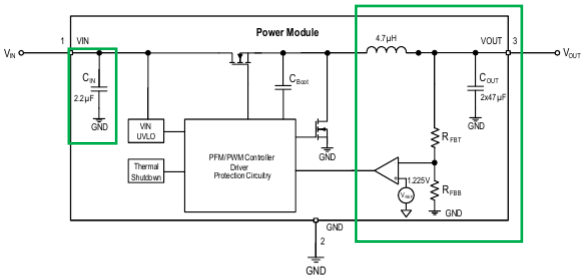

Figure 8: Block diagram.

14 CIRCUIT DESCRIPTION

The MagI³C power module 173950375 is based on a synchronous step-down regulator with integrated IC, power inductor, input and output capacitors. The control scheme is based on a constant on-time (COT) regulation loop.

The V_{OUT} of the regulator is divided by the internal feedback resistor network and fed into the error amplifier, which compares this signal with the internal 1.225V reference. The error amplifier controls the on-time of a fixed frequency pulse width generator, which drives the MOSFET.

To achieve a regulated output voltage the off-time is modulated. It is stable with low ESR output capacitors. No external compensation network is required. This architecture supports fast transient response and very small output voltage ripple values (<50mV$_{pp}$) are achieved.

The handling recommendations for the wave solder profile have been expanded to include the maximum allowable time for each wave.

Before Change

18.1 Solder Profile

Table 10: Wave solder profile.

Profile Feature	Old standard (Pb)	New (Pb-free)
Time within peak temperature t_p	10s	10s
Average ramp-up rate between T_s and T_p	200°C/s	200°C/s
Final preheat temperature Ts	130°C/s	130°C/s
Peak temperature T_p	+235°C/s	+260°C/s
Ramp-down rate	-5°C/s	-5°C/s
Heating rate during preheat	4°C/s	4°C/s

After Change

19.1 Soldering Profile

Table 12: Wave solder profile.

Profile Feature	Old standard (Pb)	New (Pb-free)
Time within peak temperature t_p	max. 10s max. 5s each wave	max. 10s max. 5s each wave
Average ramp-up rate	200°C/s	200°C/s
Final preheat temperature Ts	130°C/s	130°C/s
Peak temperature T_p	+235°C/s	+260°C/s
Ramp-down rate	-5°C/s	-5°C/s
Heating rate during preheat	4°C/s	4°C/s

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The mechanical dimensions have been updated based on new production. The SIP-3 package shape stays the same but with slightly deviated package width and adjusted tolerances.

Before Change	After Change

19 PHYSICAL DIMENSIONS

19.1 Component

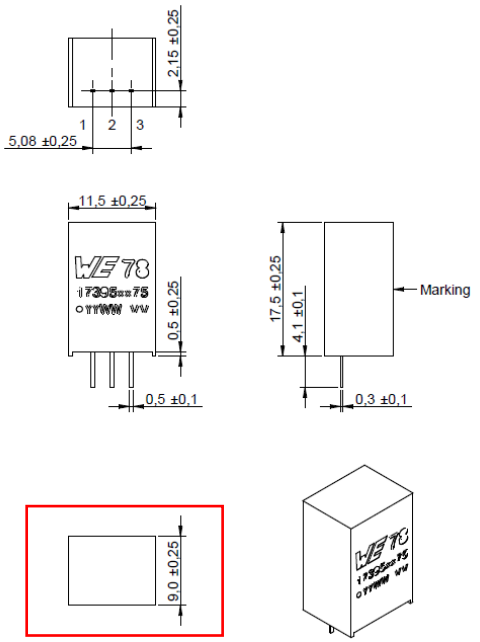

Figure 33: Physical dimensions.

20 PHYSICAL DIMENSIONS

20.1 Component

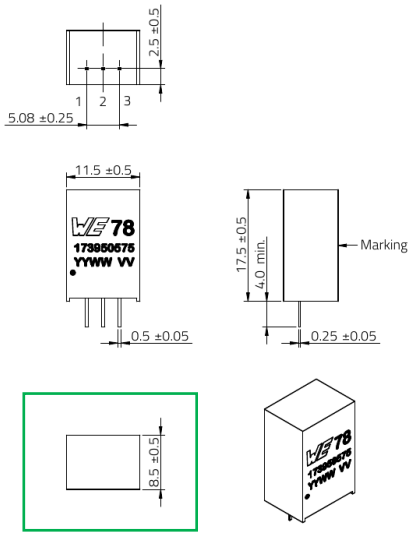

Figure 17: Physical dimensions.

The tube specifications have been adjusted.

Before Change	After Change

19.3 Tube

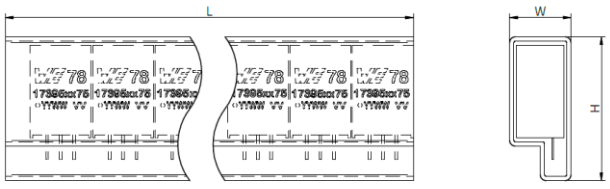

Figure 35: Tube.

Table 11: Packaging dimensions.

Dimension	L	W	H
Tolerance	typ.	typ.	typ.
Value	530mm	10mm	25.5mm

20.3 Tube

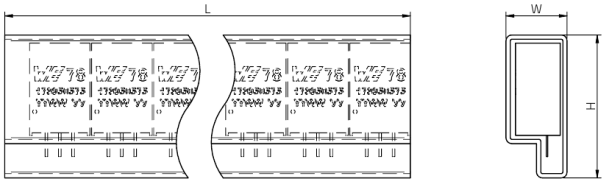

Figure 19: Tube.

Table 13: Packaging dimensions.

Dimension	L	W	H
Tolerance	typ.	typ.	typ.
Value	520mm	18.90mm	23.80mm

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RELIABILITY / QUALIFICATION OF CHANGE:

An additional reliability testing was performed and approved.

Additional details of the tests can be found in the table below:

Test Item	Sample Size	Reference	Test Conditions	Acceptance
Temperature Cycling	25	JESD22 Method JA-104	Temperature: -40°C to 85°C Testing Time: 500 cycles Test Cycles/h: 3 Min. soak time: 1 min	Approved
Electrical Characterization	30	User Spec.	measure electrical DC performance @25 °C, - 40 °C, 105 °C Transient performance tests @25°C Thermal derating measurement.	Approved
Low Temperature Storage Life	25	JESD22-A119	500hrs @ -55°C	Approved
High Temperature Storage Life	25	JESD22-A119	500hrs @ 125°C	Approved
Steady State Humidity	25	MIL-STD-202, Method 106	Temperature: 65± 2°C Testing Time: 504h Humidity: 95%RH	Approved
Mechanical Shock	30	MIL-STD-202-213	3 shocks in each direction (x, -x, y, -y, z, -z), peak value of 100 g, duration 6 ms, half-sine, velocity change 12.3 ft/s.	Approved
Vibration	30	MIL-STD-202-204	5 g for 20 min, 12 cycles each of 3 orientations. Test from 10 Hz to 2000 Hz.	Approved

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