



Product / Process Change Notification (PCN)							
<input checked="" type="checkbox"/> Major Change <input type="checkbox"/> Minor Change							
PCN Number: PCN_WPME-FDSM_20241118 Affected Series: WPME-FDSM Affected Order Codes: 173950536 PCN Date: 2024-10-18 (YYYY-MM-DD) Effective Date: 2024-11-18 (YYYY-MM-DD)	Change Category: <input checked="" type="checkbox"/> Equipment/Location <input checked="" type="checkbox"/> General Data <input checked="" type="checkbox"/> Material <input type="checkbox"/> Process <input checked="" type="checkbox"/> Product Design <input checked="" type="checkbox"/> Shipping/Packaging <input checked="" type="checkbox"/> Supplier <input type="checkbox"/> 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: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Attachment: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No						
Description of Change: <p>Due to an improvement of the production capability, Würth Elektronik eiSos has shifted the production of the affected order codes to a new factory location.</p> <p>With the aim of an extended product applicability, Würth Elektronik eiSos has updated the internal bill of materials and layout inside the module to ensure the best performance and the electrical specifications.</p> <p>There will be no change in fit or quality.</p> <p>The new revision of the affected order codes will be sent out after the previous revision is out of stock (according to FIFO - first-in, first-out).</p>							
Details of Change: All changes indicated below apply to all order codes in this PCN.							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="color: red; text-align: left; padding: 2px;">Previous production line</th> <th style="color: green; text-align: left; padding: 2px;">New production line</th> </tr> </thead> <tbody> <tr> <td style="color: red; padding: 2px;">Lot number beginning with: 489xxxxxxxxxxx</td> <td style="color: green; padding: 2px;">Lot number beginning with: 676xxxxxxxxxxx</td> </tr> <tr> <td style="color: red; padding: 2px;">Country of origin: China</td> <td style="color: green; padding: 2px;">Country of origin: China</td> </tr> </tbody> </table>		Previous production line	New production line	Lot number beginning with: 489xxxxxxxxxxx	Lot number beginning with: 676xxxxxxxxxxx	Country of origin: China	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

17395xx36
Magi³C Power Module
 WPME-FDSM - Fixed Step Down Regulator Module

Maximum Input 36V / 500mA / Fixed Output 3.3V, 5V, 12V or 15V



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 external input and output capacitors as well as an input filter.

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

It is pin compatible with the common 78xx linear regulator series. The high efficiency reduces the power dissipation and in many cases a heatsink and assembly parts are unnecessary.

24V to 3.3V conversion achieves up to 83% efficiency.
 24V to 5V conversion achieves up to 88% efficiency.
 24V to 12V conversion achieves up to 94% efficiency.
 24V to 15V conversion achieves up to 96% efficiency.

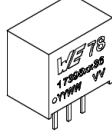
The standard THT (11.6 x 10.16 x 7.55mm) package allows for easy assembly.

TYPICAL APPLICATIONS

- Point-of-Load DC-DC applications
- Replacement for linear regulators
- Interface and microcontroller supplies
- General purpose

FEATURES

- Peak efficiency up to 97%
- Current capability up to 500mA
- Input voltage up to 36V
- Minimum input voltage / output voltage: 4.75 Vin / 3.3 Vout (173950336), 6.5 Vin / 5 Vout (173950536), 15 Vin / 12 Vout (173951236), 19 Vin / 15 Vout (173951536)
- No minimum load required
- Partially integrated input and output capacitors
- Integrated inductor
- Low output voltage ripple (<45mV_{pp} typ.)
- Current mode control
- Pulse skipping for high efficiency at light loads
- Internal soft-start
- Short circuit protection
- Cycle by cycle current limit
- Pin compatible with the FDSM power module series
- Operating ambient temperature range: -40°C to 85°C
- RoHS & REACH compliant
- Case and potting material UL 94 Class V0 (flammability testing) certified
- Complies with EN55032 class B conducted and radiated emissions standard



TYPICAL CIRCUIT DIAGRAM

After Change

173950536
Magi³C Power Module
 WPME-FDSM - Fixed Step Down Regulator Module

Maximum Input 36V / 0.5A / Fixed Output 5V



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 external input and output capacitors as well as with an input filter.

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

The module is pin compatible with the common 78xx linear regulator series. The high efficiency reduces the power dissipation and in many cases a heatsink and assembly parts are unnecessary.

The 173950536 module achieves an efficiency up to 90%.

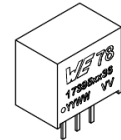
The standard THT (11.6 x 7.6 x 10.4mm) package allows for easy assembly.

TYPICAL APPLICATIONS

- Point-of-Load DC-DC applications
- Replacement for linear regulators
- Interface and microcontroller supplies
- General purpose

FEATURES

- Peak efficiency up to 90%
- Current capability up to 0.5A
- Input voltage up to 36V
- 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



TYPICAL CIRCUIT DIAGRAM

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

Before Change

ELECTRICAL SPECIFICATIONS

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} = 24V (173950336, 173950536, 173951236 and 173951536), I_{OUT} = 500mA, T_A = 25°C, unless otherwise noted.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMIT			UNIT	
			MIN ⁽¹⁾	TYP ⁽³⁾	MAX ⁽¹⁾		
I _{CL}	Current limit threshold	Output Current				A	
		V _{IN} = 24V	-	1.5	-		
V _{OUT}	Regulated output voltage	Output Voltage				V	
		173950336	-	3.3	-		
		173950536	-	5	-		
		173951236	-	12	-		
		173951536	-	15	-		
	Line regulation	I _{OUT} = 500mA	-0.4	±0.2	0.4	%	
	Load Regulation	10% to 100% load	-	±0.6	-	%	
	Total output voltage regulation	Full load, full input voltage range	-4	±2	4	%	
	Output voltage ripple	External 2x C _{OUT} = 10µF, 25V, XSR, 20MHz BWL					
		V _{OUT} = 3.3V	I _{OUT} = 500mA	-	6	-	mV _{pp}
V _{OUT} = 5V		I _{OUT} = 500mA	-	5	-	mV _{pp}	
V _{OUT} = 12V		I _{OUT} = 500mA	-	30	-	mV _{pp}	
V _{OUT} = 15V		I _{OUT} = 500mA	-	40	-	mV _{pp}	
f _{SW}	Switching frequency	Continuous conduction mode (CCM)	-	710	-	kHz	
I _{IN}	No load input current	Input Current				mA	
		Operating, switching	-	0.1	1		
η	Efficiency, I _{OUT} = 500mA	Efficiency				%	
		V _{IN} = 4.75V, V _{OUT} = 3.3V	-	92	-		
		V _{IN} = 24V, V _{OUT} = 3.3V	-	81	-		
		V _{IN} = 36V, V _{OUT} = 3.3V	-	78	-		
		V _{IN} = 6.5V, V _{OUT} = 5V	-	95	-		
		V _{IN} = 24V, V _{OUT} = 5V	-	86	-		
		V _{IN} = 36V, V _{OUT} = 5V	-	84	-		
		V _{IN} = 16V, V _{OUT} = 12V	-	95	-		
		V _{IN} = 24V, V _{OUT} = 12V	-	94	-		
		V _{IN} = 20V, V _{OUT} = 15V	-	97	-		
V _{IN} = 24V, V _{OUT} = 15V	-	95	-				

After Change

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} = 24V, V_{OUT} = 5V, I_{OUT} = 0.5A, T_A = 25°C, unless otherwise noted.

Table 7: Electrical specifications.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMIT			UNIT		
			MIN ⁽¹⁾	TYP ⁽³⁾	MAX ⁽¹⁾			
I _{CL}	Current limit threshold	Output Current				A		
		-	3.7	-	-			
V _{OUT}	Regulated output voltage	Output Voltage				V		
		-	5	-	-			
		Line regulation	-	-	0.3		%	
		Load Regulation	10% to 100% load	-	-		0.6	%
		Total output voltage regulation	-	-	3		%	
Output voltage ripple	-	30	-	-	mV _{pp}			
f _{SW}	Switching frequency	Switching Frequency				kHz		
		220	460	660	-			
I _{IN}	No load input current	Input Current				mA		
		-	0.18	-	-			
η	Efficiency	Efficiency				%		
-	-	-	90	-	-	%		

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

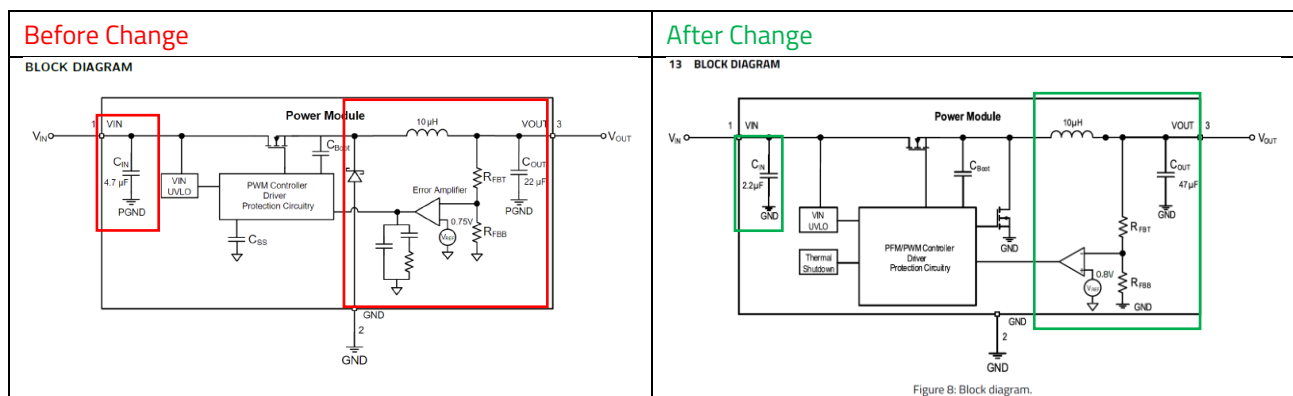
Before Change				After Change																																											
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The datasheet MTBF specifications have been adjusted based on the new design.

Before Change					After Change																											
RELIABILITY					9 RELIABILITY																											
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The diagrams shown in chapter TYPICAL PERFORMANCE CURVES are updated based on new electrical specifications. The used test conditions stay the same as before.

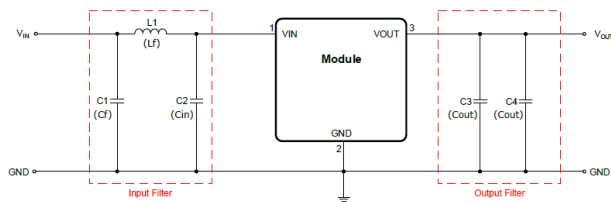
Due to the change of the integrated IC, the internal BOM is changed. The changes in component values and new internal reference voltage are indicated in the BLOCK DIAGRAM chapter.



The EMI filter components in the design example have been updated to match the MLCC filter components shown in the EMI graph chapter. The polymer capacitor-based filter from the previous datasheet, version 3.0, has been verified to still fulfill the CISPR-32 limits.

Before Change

Recommended External Circuit for Best Performance



The 17395xx36 family integrates both the input and output capacitors. It is also recommended to use two 10µF input capacitors for 173950336 and 173950536 or four 4.7µF input capacitors for 173951236 and 173951536, C1 and C2, for high impedance input wires or traces and two 10µF output capacitor, C3 and C4, for applications where a low output voltage ripple is required.

Bill of Materials (173950336, 173950536)

Symbol	Description	Filter	Quantity	Order Code	Manufacturer
U1	Mag1C Power Module (not mounted)		1	17395xx36	Würth Elektronik
L1	Filter inductor, 1µH, PD2 family, $I_{SAT} = 5.72A$, $I_R = 4A$	Input	1	7447730	Würth Elektronik
C1, C2	Aluminum capacitor 10µF/63V	Input	2	875115852001	Würth Elektronik
C3, C4	Ceramic chip capacitor 22µF/25V X5R, 1210	Output	2	885012109014	Würth Elektronik

After Change

17.2 Schematic

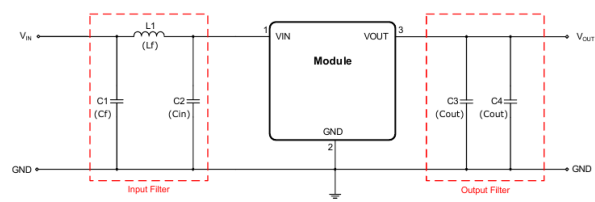


Figure 14: Design example schematic.

17.3 Bill of Materials

Table 11: Design example bill of materials.

DESIGNATOR	DESCRIPTION	FUNCTION	QUANTITY	ORDER CODE	MANUFACTURER
U1	Mag1C power module	Power supply	1	173950536	WE
L1	Filter inductor, 1µH, PD2 family, $I_{SAT} = 5.72A$, $I_R = 4A$	Input Filter	1	7447730	WE
C1	Ceramic chip capacitor 4.7µF, 50V, X7R, 1210	Input Filter	2	885012209048	WE
C2	Ceramic chip capacitor 4.7µF, 50V, X7R, 1210	Input Filter	2	885012209048	WE
C3, C4	Ceramic chip capacitor 10µF/25V, X7R, 1206	Output Filter	2	885012208069	WE

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 T_s	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

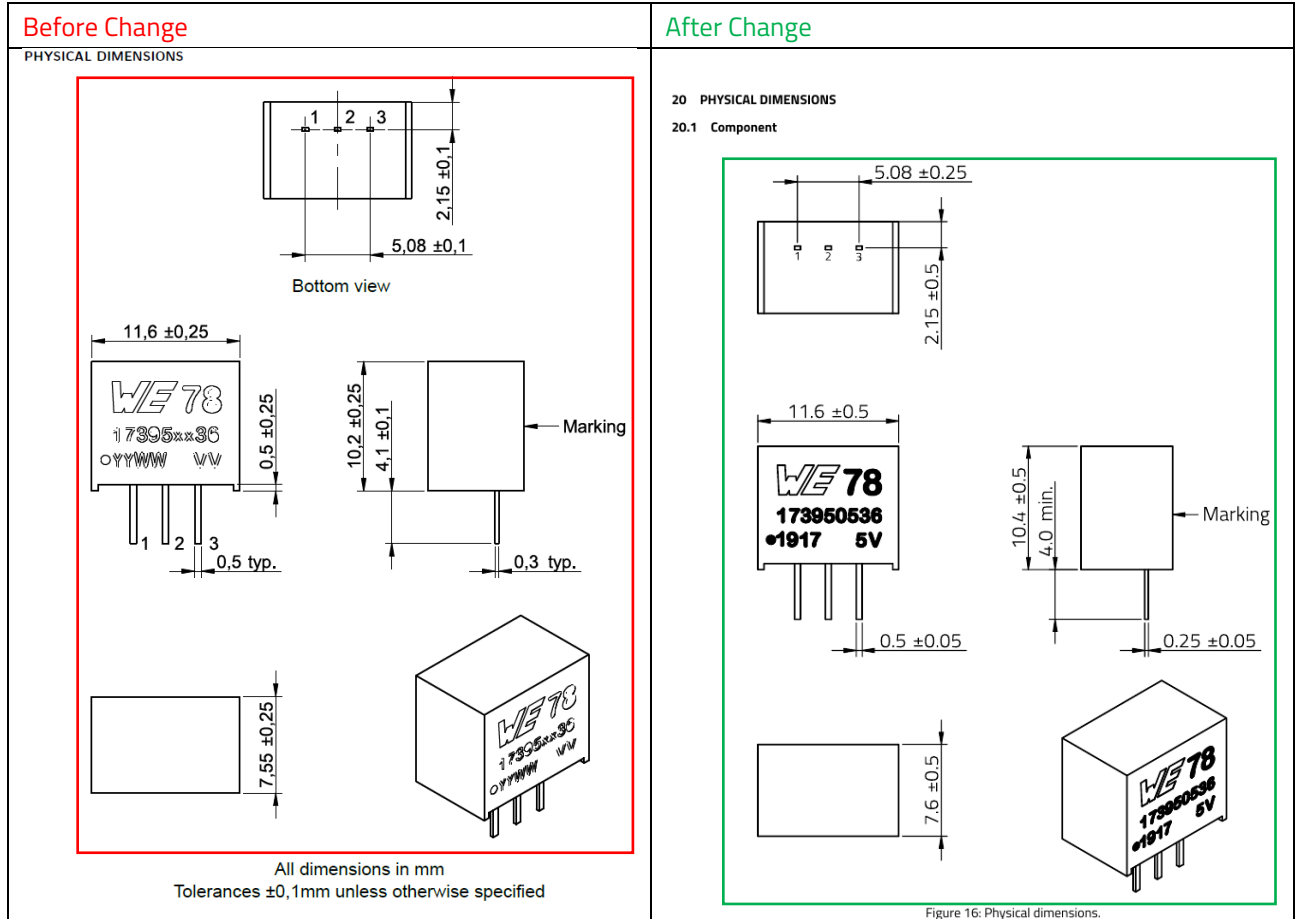
After Change

19.1 Soldering Profile

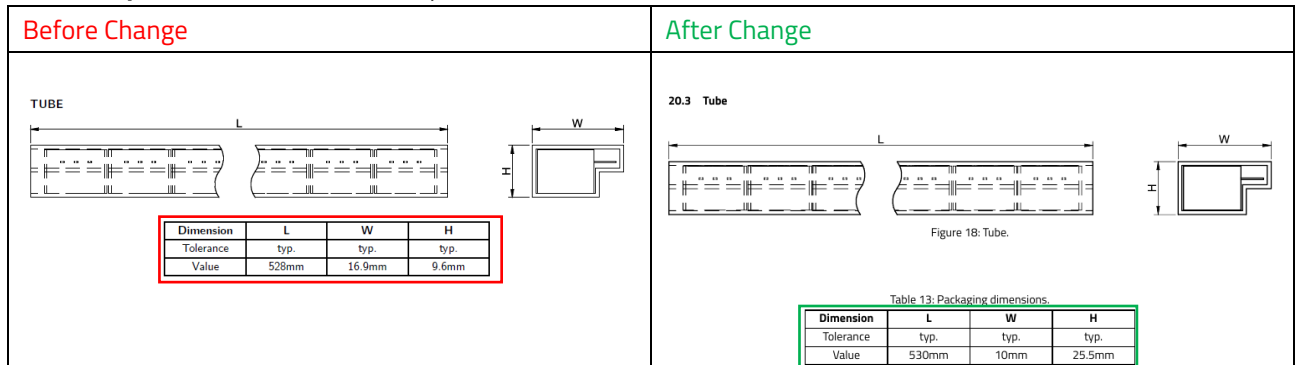
Table 12: Wave solder profile.

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 T_s	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

The mechanical dimensions have been updated based on new production. The SIP-3 land pattern will remain the same and the device dimensions and tolerances have changed slightly.



The tube specifications have been adjusted.





Reliability / Qualification of Change:

Additional reliability testing was performed and passed.
 Details regarding 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
High Temperature Operational Life	78	JESD22-A108	Tj: 125°C Testing Time: 1000h	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