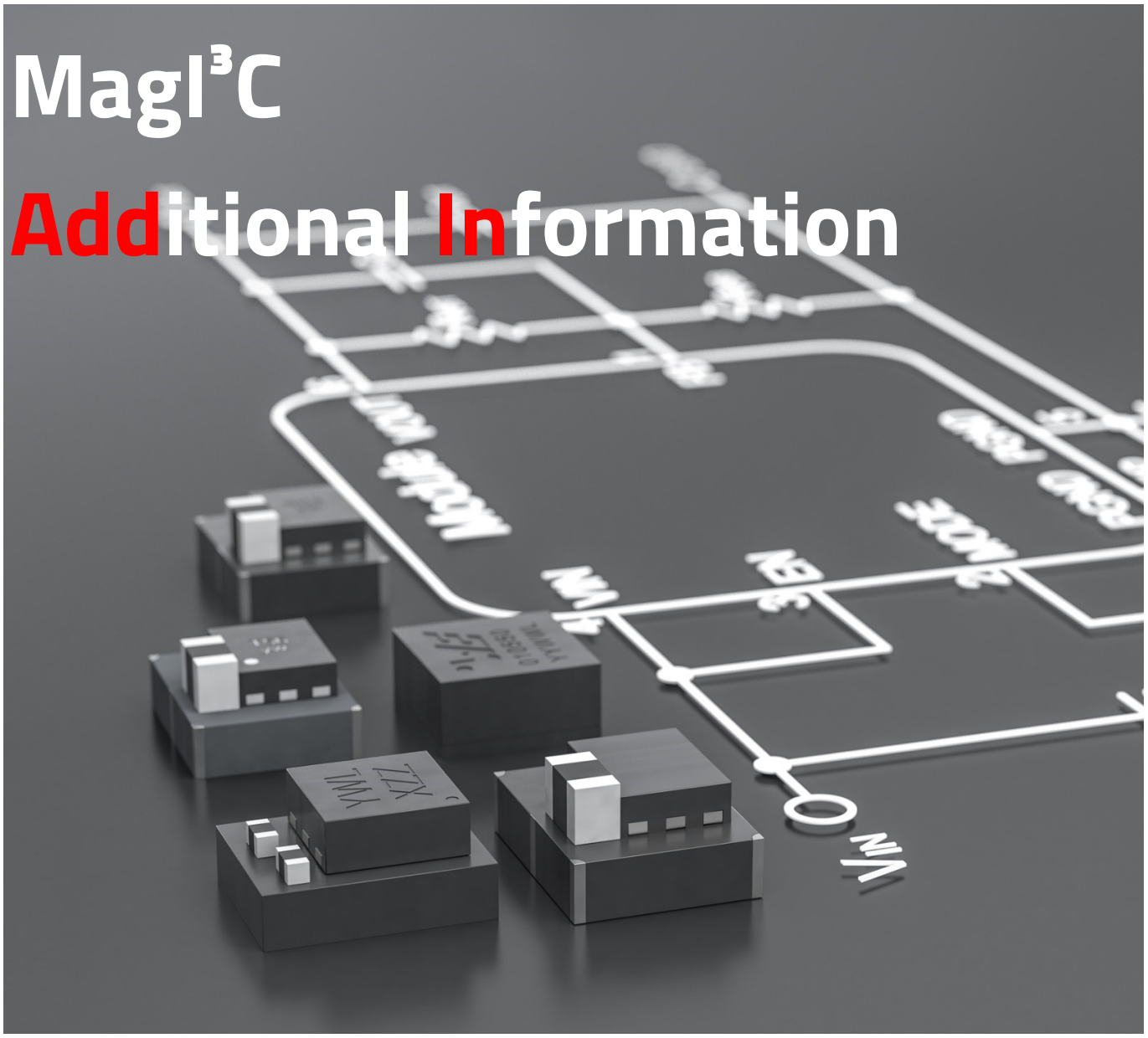
MagI³C

Additional Information



MagI³C Power Modules are easy-to-use DC/DC converters with integrated regulator IC, power inductor and capacitors. Design and layout reviews as well as support with EMI filter design are offered as service for all customers. Datasheets contain detailed specifications and application information.

For more information, please visit:
www.we-online.com/powermodules.

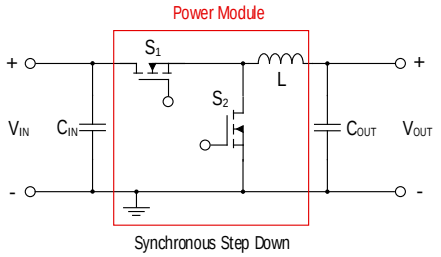
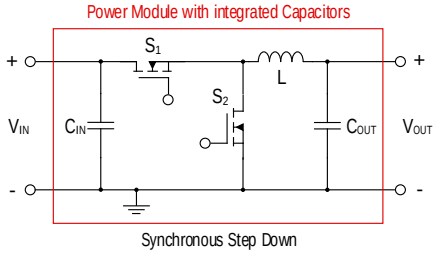
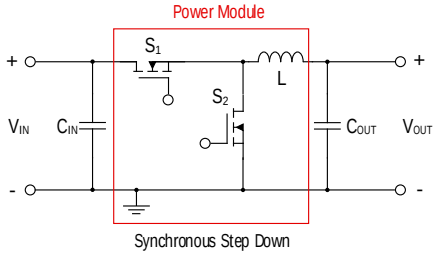
- Simple design-in process
- Design and layout support
- EMI filter design for EN55032 class B compliance
- Evaluation boards for all products
- REDEXPERT for selection
- MagI³C Power module designer for design in support

CONTENTS

1 TOPOLOGIES AND STRUCTURES

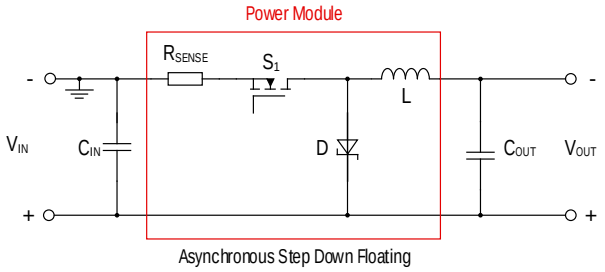
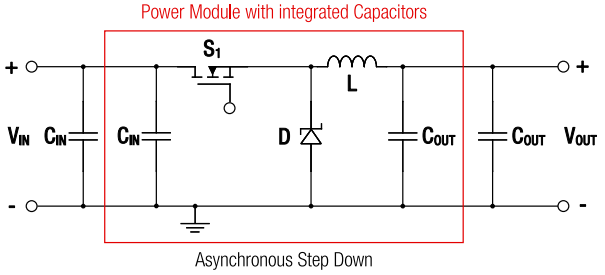
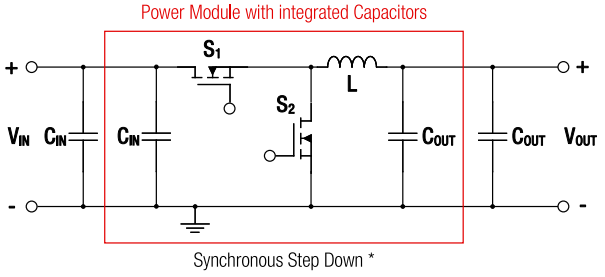
1.1 Non-Isolated MagI³C Power Modules

Table 1: Non-Isolated MagI³C Power .

Match Code	Package	Order Code	Topology(1)
VDLM	LGA-12	171013801 171023801 171033801 171013802 171023802 171033802	
	LGA-16	171011801 171021801 171031801	
VDRM	TO-263	171012401 171012402 171010601 171020601 171030601 171032401 171050601	
	BQFN-39	171020302 171040302 171060302	
	BQFN-41	171021501	
VDMM	LGA-6	171010501 171010502 171010550 171960501	
	LGA-8	17193601	
	LGA-12	171936001	

(1) The recommended additional circuitry (CIN & COUT) can be found in the DESIGN EXAMPLE section of the respective power module datasheet.

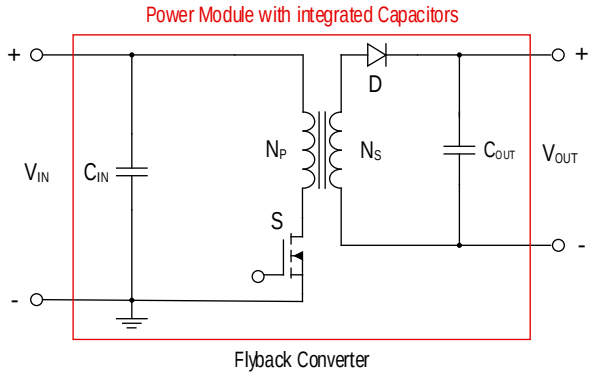
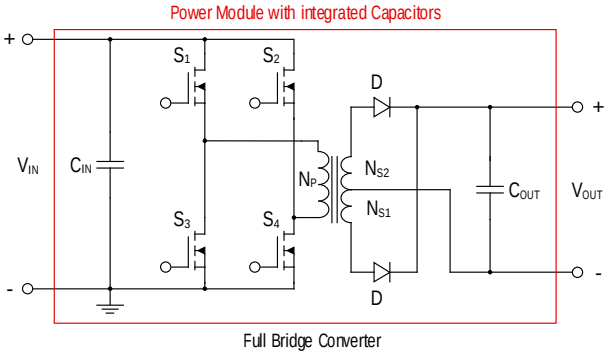
Table 2: Non-Isolated MagI³C Power Modules.

Match Code	Package	Order Code	Topology(1)
LDHM	TO263	172946001	
FDSM	SIP-3	173950378 173950578 173010378 173010578 173010342 173010542 173020336 173020536 173021236	
		173950336 173950536 173951236 173951536 173010335 173010535 173011235 173011535 173950375 173950575 173951275	

(1)The recommended additional circuitry (CIN & COUT) can be found in the DESIGN EXAMPLE section of the respective power module datasheet.

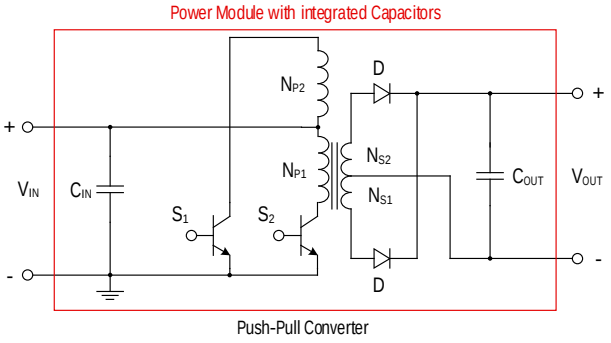
1.2 Isolated MagI³C Power Modules

Table 3: Isolated MagI³C Power Modules.

Match Code	Package	Order Code	Topology(1)
VISM	SIP-8	1779106325	
FISM	SIP-4	1779205111 1779205211 1779205311 1779405211 1779405311	
	SIP-7	1779205141 1779205241 1779205341 1779405241 1779405341	
	SMT-8	1769205241 1769205341 1769405241 1769405341	
FIMM	LGA-7	1769205132	

(1) The recommended additional circuitry (CIN & COUT) can be found in the DESIGN EXAMPLE section of the respective power module datasheet.

Table 4: Isolated MagI³C Power Modules.

Match Code	Package	Order Code	Topology[1]
FISM	SIP-4	177920501 177920511 177920521 177920531 1779405111	
	SIP-7	177920514 177920524 177920534 1779405141	
	SMT-8	176920502 176920512 176920522 176881212 176861512 1769205041 1769205141 1769405141	

[1]The recommended additional circuitry (CIN & COUT) can be found in the DESIGN EXAMPLE section of the respective power module datasheet.

2 FEATURES

Table 5: Features.

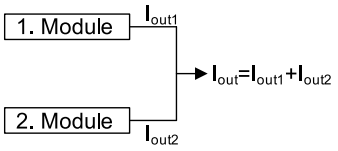
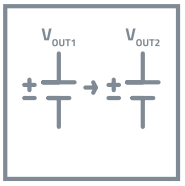
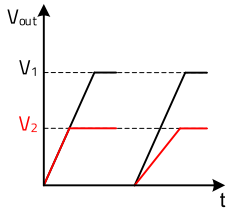
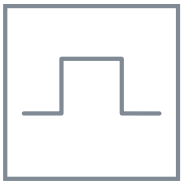
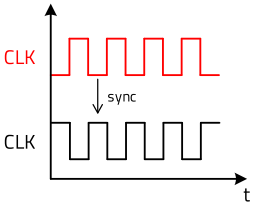
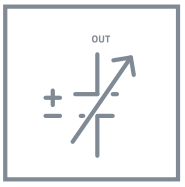
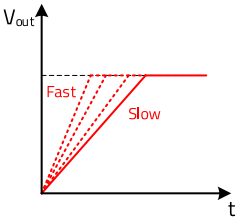
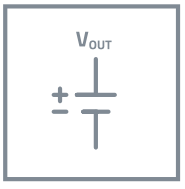
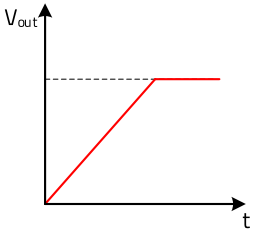
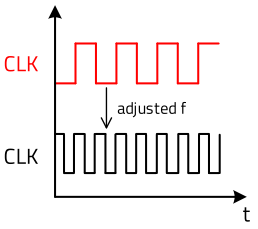
	**Parallel Operation** Module outputs can be used in parallel to deliver higher overall current. ⇒ High scalability	
	**Voltage Tracking** Simultaneous V_{OUT} rise of two power modules during start-up (same slope or same time reaching nominal voltage). ⇒ e.g. two power supplies in FPGAs with critical V_{CC} rise requirements	
	**Synchronization** A power module switching frequency can be synchronized by an external clock. ⇒ Avoids interference. Reduces input peak currents	
	**Adjustable Soft Start** During start-up the slope of the rise of V_{OUT} can be adjusted. ⇒ No overshoot at V_{OUT} ⇒ Smooth start-up current	
	**Fixed Soft Start** The slope of the rise of the output voltage during start up is fixed. ⇒ No overshoot at V_{OUT}	
	**Adjustable Frequency** The switching frequency of the power module can be adjusted. ⇒ Tune module performance between efficiency and output ripple ⇒ Avoiding critical frequencies in sensitive applications	

Table 6: Features.

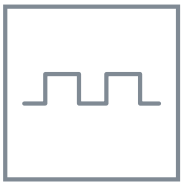
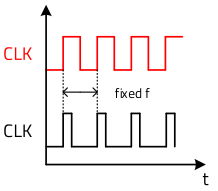
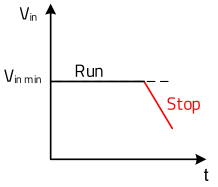
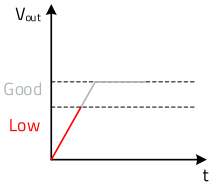
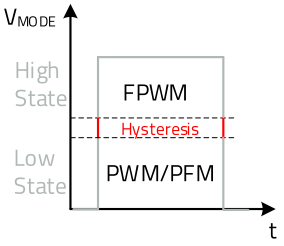
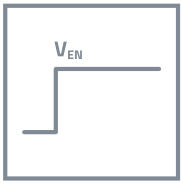
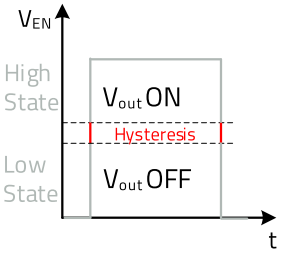
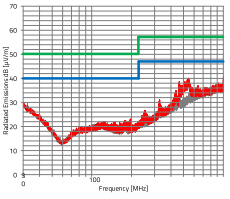
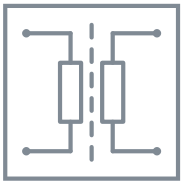
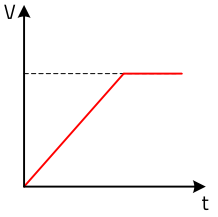
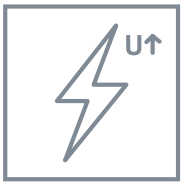
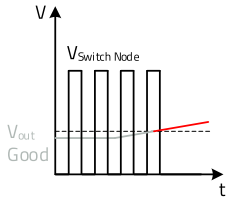
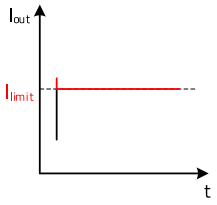
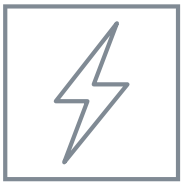
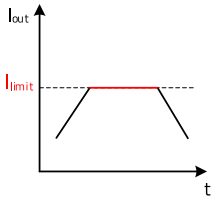
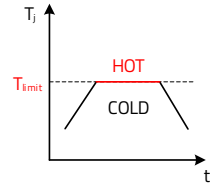
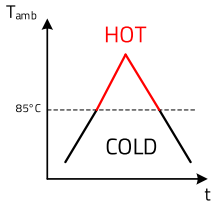
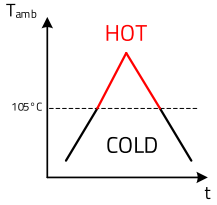
	**Fixed Frequency** The switching frequency of the power module is fixed. ⇒ Simple Design ⇒ Design for optimum balance between speed versus efficiency	
	**Programmable UVLO** Turns off the power module output in the event of an input voltage dropping below a defined limit value. ⇒ Avoids undefined behavior of the power module during input voltage failures	
	**Power Good** Detects the value of V_{OUT} and indicates if it is within the nominal range. ⇒ Monitoring for diagnostics/signalling ⇒ Allows sequencing	
	**Mode** Selectable mode of operation. To operate in power saving mode (PWM/PFM) set the Mode pin to low level. To operate in low output voltage ripple mode (FPWM) set the Mode pin to high level. ⇒ Allows tuning of module performance based on application needs	
	**Enable / Control** Module turns on after the voltage level at EN / Ctrl pin switches from low to high. Changing the voltage level from high to low will shut down the module. ⇒ Allows control over the startup and shut down behavior of the module	
	**Low Radiation** The module is compliant to the European standard: EN 55032 class B (CISPR 32) conducted and radiated. ⇒ Time saving design	
	**Functional Isolation** Functional isolation up to 4kV. ⇒ Avoids ground loops and ground level offset, interference in signal path or sensor systems ⇒ Ensures overvoltage protection	

Table 7: Features.

	**Output Overvoltage Protection** During an overvoltage condition the module stops switching. ⇒ Protects downstream components from damage due to overvoltage	
	**Short Circuit Protection** During a short circuit condition, the output current is limited. ⇒ Protect overheating of the power module	
	**Overcurrent Protection** During an overcurrent condition, the output current is limited. ⇒ Limits overheating of the power module	
	**Over temperature Protection** Turns off the power module when the junction temperature exceeds a dangerous limit. ⇒ Prevents catastrophic failures during accidental device overheating	
	**Recommended Maximum Ambient Temperature** Maximum ambient operating temperature when using a standard board layout. ⇒ Consideration of derating depending on operating condition (frequency, layout, V_{IN}, V_{OUT})	 
		

3 MTBF VALUES

Table 8: MTBF Values.

Matchcode	Order Code	@25°C (h)	@55°C (h)	@70°C (h)	@85°C/100°C (h)
Fixed Step Down Regulator Module (FDSM)	173 950 378	$4185 \cdot 10^3$		$2182 \cdot 10^3$	
	173 950 578				
	173 010 378				
	173 010 578				
	173 950 336	$2000 \cdot 10^3$			
	173 950 536				
	173 951 236				
	173 951 536				
	173 010 335				
	173 010 535				
	173 011 235				
	173 011 535				
	173 020 336				
	173 020 536				
	173 021 236				
	173 010 342	$8600 \cdot 10^3$		$3380 \cdot 10^3$	
	173 010 542				
	173 950 375	$6849 \cdot 10^3$			$1337 \cdot 10^3$
	173 950 575				
	173 951 275				
Variable Step Down Regulator Module (VDRM)	171 040 302		$1 \cdot 10^{10}$		
	171 020 302				
	171 060 302				
	171 021 501		$1.79 \cdot 10^9$		
	171 050 601		$3.46 \cdot 10^7$		
	171 032 401		$5.476 \cdot 10^8$		
	171 020 601		$5.54 \cdot 10^8$		
	171 012 401				
	171 012 402				
	171 010 601				
	171 030 601				
Variable Step Down LGA Module (VDLM)	171 011 801		$3.41 \cdot 10^{10}$		
	171 021 801				
	171 031 801				
	171 013 801		$1.0 \cdot 10^{10}$		
	171 023 801				
	171 033 801				
	171 013 802				
	171 023 802				
	171 033 802				

Table 9: MTBF VALUES.

Matchcode	Order Code	@25°C (h)	@55°C (h)	@70°C (h)	@85°C/100°C (h)
LED Step Down High Current Module (LDHM)	172 946 001		$5.51 \cdot 10^8$		
Variable Step Down MicroModule (VDMM)	171 960 501			$2123 \cdot 10^3$	
	171 01 0 501			$42 \cdot 10^6$	
	171 010 502				
	171 010 550				
	171 930 601		$13 \cdot 10^7$		
	171 936 001		$29 \cdot 10^6$		
Fixed Isolated SIP/SMT Module (FISM)	177 920 501	$22380 \cdot 10^3$			$9300 \cdot 10^3$
	177 920 511				
	177 920 521				
	177 920 531				
	177 920 514	$13200 \cdot 10^3$			$5200 \cdot 10^3$
	177 920 524				
	177 920 534				
	177 920 511 1	$7941 \cdot 10^3$			$2360 \cdot 10^3$
	177 920 521 1				
	177 920 531 1				
	177 940 511 1				
	177 940 521 1				
	177 940 531 1				
	177 920 514 1	$7057 \cdot 10^3$			$2282 \cdot 10^3$
	177 920 524 1				
	177 920 534 1				
	177 940 514 1				
	177 940 524 1				
	177 940 534 1				
	176 920 502	$3000 \cdot 10^3$			/950 · 10^3
	176 861 512				
	176 881 212				
	176 920 512				
	176 920 522				
	176 920 504 1	$7541 \cdot 10^3$			$2398 \cdot 10^3$
	176 920 514 1				
	176 920 524 1				
	176 920 534 1				
	176 940 514 1				
	176 940 524 1				
	176 940 534 1				
Fixed Isolated MicroModule (FIMM)	176 920 513 2	$34500 \cdot 10^3$			$16000 \cdot 10^3$
Variable Isolated SIP Module (VISM)	177 910 63215		$3.93 \cdot 10^8$		

4 RELIABILITY TO263 & BQFN PACKAGE TYPE (VDRM)

Table 10: Reliability TO263 & BQFN package type (VDRM).

Test	Reference	Test conditions
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Autoclave	JESD22-A102	Preconditioning Temperature: 121°C Testing Time: 96h 100% RH, 2atm
Highly Accelerated Stress Test	JESD22-A110	Preconditioning (MSL3) Temperature: 110°C Testing Time: 264h Humidity: 85% RH, 17.7psi
Powered Temperature Cycle	JESD22-A105	Preconditioning (MSL3) Temperature: -40°C to 125°C Testing Time: 1000 cycles Test Cycles/h: 3 Min. soak time: 7 min.
Temperature Cycle	JESD22-A104	Preconditioning (MSL3) Temperature: -40°C to 125°C Testing Time: 1440 cycles
High Temperature Storage Life	JESD22-A103	Temperature: 150°C Testing Time: 1000h
ESD Human Body Model	JESD22-A114	Voltage: 2000V
ESD Charge Device Model	JESD22-C101	Voltage: 750V
Vibration	MIL-STD-202, Method 204	10G for 20 minutes 12 cycles each of 3 orientations Test from 10-2000 Hz
Mechanical Shock	MIL-STD-202, Method 213	Acceleration + Time: 100G for 6ms
Latch up	JESD78	+/-100mA, according to MSV
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%
Solderability	JESD22-B102E	Temperature: Acc. datasheet solder profile reference
5TR - Five Times Reflow	Internal	Peak reflow temperature acc. datasheet solder profile reference

5 RELIABILITY LGA PACKAGE TYPE (VDMM & VDLM)

Table 11: Reliability LGA package type (VDMM & VDLM).

Test	Reference	Test conditions
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Unbiased Highly Accelerated Stress Test	JESD22-A118B	Temperature: 110°C Testing Time: 264h Humidity: 85% RH.
Temperature Cycle	JESD22-A104	Preconditioning (MSL3) Temp: -40°C/125°C Testing time: 1000 cycles Test Cycles/h: 3 minimum soak time: 1min
Low Temperature Storage Life	JESD22-A119A	Temperature: -40C Testing Time: 1000h
High Temperature Storage Life	JESD22-A103	Temperature: 125C Testing Time: 1000h
ESD Human Body Model	JESD22-A114	Voltage: 2000V, 4000V
ESD Charge Device Model	JESD22-C101	Voltage: 750V
Vibration	MIL-STD-202, Method 204	10G for 20 minutes 12 cycles each of 3 orientations Test from 10-2000 Hz
Mechanical Shock	MIL-STD-202, Method 213	Acceleration + Time: 100G for 6ms
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%
Solderability	JESD22-B102E	Temperature: Acc. datasheet solder profile reference
5TR - Five Times Reflow	Internal	Peak reflow temperature acc. datasheet solder profile reference

6 RELIABILITY SIP-3 PACKAGE TYPE (FDSM)

Table 12: Reliability SIP-3 package type (FDSM).

Test	Reference	Test conditions
High Temperature Storage Life	JESD22-A103	Temperature: 125°C Testing Time: 500h
Low Temperature Storage Life	JESD22-119A	Temperature: -55°C Test Time: 500h
Steady State Humidity	MIL-STD-202, Method 106	Temperature: 65± 2°C Testing Time: 504h Humidity: 95%RH
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Vibration	MIL-STD-202, Method 204	5G for 20 minutes 12 cycles each of 3 orientations(x/y/z) Test from 10-2000 Hz
Solderability	Internal	Wave soldering
Temperature Cycle	JESD22-A104	Temperature: -40°C to 85°C Testing Time: 500 cycles Test Cycles/h: 3 Min. soak time: 1 min
Mechanical Shock	MIL-STD-202, Method 213	Condition C, max. 100G, D=6ms
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%

7 RELIABILITY SIP-4 / SIP-7 / SIP-8 PACKAGE TYPE (FISM & VISM)

Table 13: Reliabilty SIP-4 / SIP-7 / SIP-8 package type (FISM & VISM).

Test	Reference	Test conditions
High Temperature Storage Life	JESD22-A103	Temperature: 125°C Testing Time: 500h
Low Temperature Storage Life	JESD22-119A	Temperature: -55°C Test Time: 500h
Steady State Humidity	MIL-STD-202, Method 106	Temperature: 65± 2°C Testing Time: 504h Humidity: 95%RH
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Vibration	MIL-STD-202, Method 204	5G for 20 minutes 12 cycles each of 3 orientations(x/y/z) Test from 10-2000 Hz Hz
Solderability	Internal	Wave soldering
Temperature Cycle	JESD22-A104	Temperature: -40°C to 85°C Testing Time: 500 cycles Test Cycles/h: 3 Min. soak time: 1 min
Mechanical Shock	MIL-STD-202, Method 213	Condition C, max. 100G, D=6ms
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%

8 RELIABILITY SMT-8 PACKAGE TYPE (FISM)

Table 14: Reliability SMT-8 package type (FISM).

Test	Reference	Test conditions
High Temperature Storage Life	JESD22-A103	Temperature: 125°C Testing Time: 1000h
Low Temperature Storage Life	JESD22-119A	Temperature: -55°C Test Time: 1000h
Steady State Humidity	MIL-STD-202, Method 106	Temperature: 65± 2°C Testing Time: 504h Humidity: 95%RH
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Vibration	MIL-STD-202, Method 204	5G for 20 minutes 12 cycles each of 3 orientations(x/y/z) Test from 10-55 Hz
JESD22-B102E	Temperature: Acc. datasheet solder profile reference	JESD22-B102E
Temperature Cycle	JESD22-A104	Temperature: -40°C to 85°C Testing Time: 1000 cycles Test Cycles/h: 3 Min. soak time: 1 min
Moisture Resistance	MIL-STD-202 Method 106G	Temp: 25-65C (± 2°C) Humidity: 95 Test time: 160h, 10 cycle each 16h, ramp up 2.5h, ramp down 2.5h, soak 3h
Mechanical Shock	MIL-STD-202, Method 213	Condition C, max. 100G, D=6ms
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%
5TR - Five Times Reflow	Internal	Peak reflow temperature acc. datasheet solder profile reference

9 RELIABILITY LGA-7 PACKAGE TYPE (FIMM)

Table 15: Reliability LGA-7 package type (FIMM).

Test	Reference	Test conditions
High Temperature Operational Life	JESD22-A108	Tj: 125°C Testing Time: 1000h
Unbiased Highly Accelerated **S**tress **T**est	JESD22-A118B	Temperature: 110°C Humidity: 85% RH Testing Time: 264h
Temperature Cycle	JESD22-A104	Preconditioning (MSL3) Temp: -40°C/125°C Testing time: 1000 cycles Test Cycles/h: 3 minimum soak time: 1min
Low Temperature Storage Life	JESD22-A119A	Temperature: -40C Testing Time: 1000h
High Temperature Storage Life	JESD22-A103	Temperature: 125C Testing Time: 1000h
ESD Human Body Model	JESD22-A114	Voltage: 2000V, 4000V
ESD Charge Device Model	JESD22-C101	Voltage: 750V
Vibration	MIL-STD-202, Method 204	10G for 20 minutes 12 cycles each of 3 orientations Test from 10-2000 Hz
Mechanical Shock	MIL-STD-202, Method 213	Acceleration + Time: 100G for 6ms
Physical Dimension	JESD22-B100/B108	Test acc. POD Tolerance: ±2%
Solderability	JESD22-B102E	Temperature: Acc. datasheet solder profile reference
5TR - Five Times Reflow	Internal	Peak reflow temperature acc. datasheet solder profile reference

10 UL NUMBERS

Table 16: UL Numbers.

Type	Package	Material	Cert. Nr. material	Cert. Nr. power module
Variable Step Down Regulator Module (VDRM)	BQFN-39	EME-G770H	E41429	not applicable
	BQFN-41			
	TO-263-7EP	EME-G760	E41429	not applicable
Variable Step Down LGA Module (VDLM)	LGA-12EP	EME-E670F	E41429	not applicable
	LGA-16EP	EME-670F	E41429	not applicable
Variable Step Down MicroModule (VDMM 0.6A/1A)	LGA-6EP	not applicable	not applicable	not applicable
Variable Step Down MicroModule (VDMM 1.2A)	LGA-6EP	EME-G3111A	E41429	not applicable
Variable Step Down MicroModule (VDMM 0.3A)	LGA-8EP	EME-E670F	E41429	not applicable
Variable Step Down MicroModule (VDMM 0.3A)	LGA-12	EME-E670F	E41429	not applicable
Fixed Step Down Regulator Module (FDSM)	SIP-3	Case: WH-9100 Potting: KET132-A/B	Case: E150608 Potting: E174951	not applicable
Fixed Step Down Regulator Module (FDSM VIN =74.5V)	SIP-3	Case: WH-9100 Potting: Stobicast Polyole L780.01 A/B	Case: E150608 Potting: E302173	not applicable
Fixed Isolated MicroModule (FIMM)	LGA-7	WH-9100	E150608	E497615
Fixed Isolated SIP Module (FISM) - No SCP family -	SIP-4 SIP-7	Case: WH-9100 Potting: IR-401	Case: E150608 Potting: E129811	E487909
Fixed Isolated SMT Module (FISM) - No SCP family -	SMT-8	Case: WH-9100	Case: E150608	
Fixed Isolated SIP Module (FISM) - - Continuous SCP family -	SIP-4	Case: WH-9100 Potting: IR-401	Case: E150608 Potting: E129811	E497615
	SIP-7			
Fixed Isolated SMT Module (FISM) - Continuous SCP family -	SMT-8	Case: WH-9100	Case: E150608	
Variable Isolated SIP Module (VISM)	SIP-8	not applicable	Case: E497615 Potting: E497615	E497615
LED Step Down High Current Module (LDHM)	TO-263-7EP	EME-G760	E41429	not applicable

11 MOISTURE SENSITIVITY LEVEL (MSL)

Table 17: Moisture sensitivity level description.

Floor Life		
MSL-Level	Time	Condition
1	**Unlimited**	**≤ 30° / 85% RH**
2	1 Year	≤ 30° / 60% RH
2a	4 Weeks	≤ 30° / 60% RH
3	**168 Hours**	**≤ 30° / 60% RH**
4	72 Hours	≤ 30° / 60% RH
5	48 Hours	≤ 30° / 60% RH
5a	24 Hours	≤ 30° / 60% RH
6	TOL (time of label)	≤ 30° / 60% RH

NOTE: According to JEDEC standard MSL are not applicable for THT (FISM, FDSM, VISM) components.

Table 18: Marking description.

Matchcode	Package	Mounting	MSL
Variable Step Down MicroModule (VDMM)	LGA-6EP (0.6 to 1.0A)	SMD	**1**
	LGA-6EP (1.2A)	SMD	**3**
	LGA-8EP	SMD	
	LGA-12	SMD	
Variable Step Down Regulator Module (VDRM)	BQFN-39	SMD	
	BQFN-41	SMD	
	TO-263-7EP	SMD	
Variable Step Down LGA Module (VDLM)	LGA-16EP	SMD	
	LGA-12EP	SMD	
LED Step Down High Current Module (LDHM)	TO-263-7EP	SMD	
Fixed Isolated MicroModule (FIMM)	LGA-7	SMD	
Fixed Isolated SMT Module (FISM)	SMT-8	SMD	**1**

12 SOLDERING PROFILE & SOLDERING CYCLES "SMT"

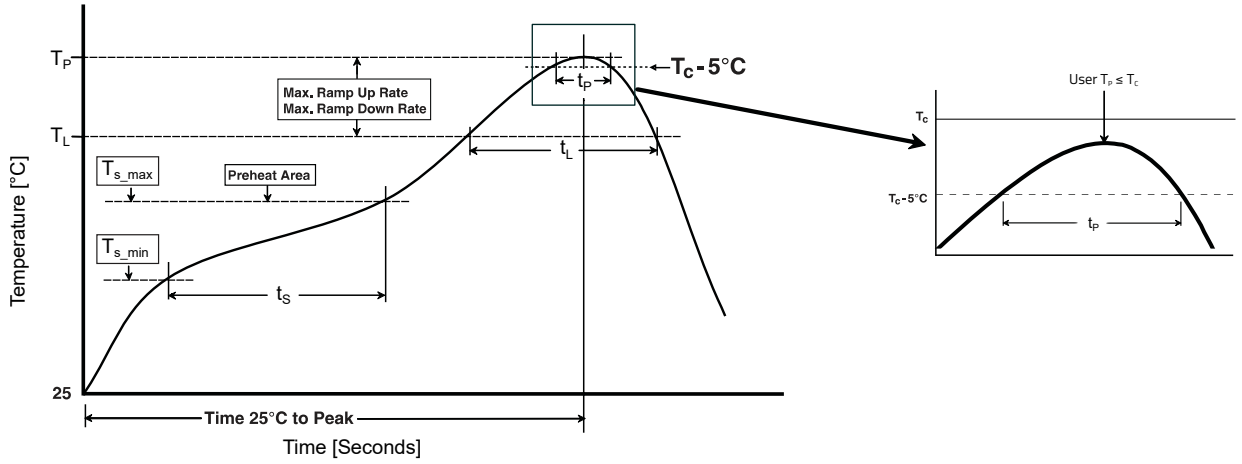


Table 19: SOLDERING PROFILE & SOLDERING CYCLES "SMT".

Package	Preheat time from T_{smin} to T_{smax}	Preheat temp. min. T_{smin}	Preheat temp. max. T_{smax}	Liquidous temp. T_L	Max Time maintaine above T_L (t_{Lmax})	Class. temp. T_C	Time within 5°C of actual peak Temp.	Ramp-up Rate (T_L to T_P)	Ramp-down rate (T_P to T_L)
LGA-6EP	90 sec	150°C	180°C	217°C	90 sec	240°C	20 sec	3°C/sec	3°C/sec
LGA-7	90 sec	150°C	180°C	217°C	90 sec	250°C	20 sec	3°C/sec	3°C/sec
LGA-8EP	90 sec	150°C	180°C	217°C	90 sec	260°C	20 sec	3°C/sec.	6°C/sec.
LGA-12EP	90 sec	150°C	200°C	217°C	60 sec	250°C	20 sec	3°C/sec	3°C/sec
LGA-12	90 sec	150°C	200°C	217°C	60 sec	260°C	20 sec	3°C/sec	3°C/sec
LGA-16EP	90 sec	150°C	200°C	217°C	60 sec	250°C	20 sec	3°C/sec	3°C/sec
BQFN-39	120 sec	150°C	180°C	217°C	90 sec	250°C	30 sec	3°C/sec	3°C/sec
BQFN-41	120 sec	150°C	180°C	217°C	90 sec	250°C	30 sec	3°C/sec	3°C/sec
TO-263-7EP	120 sec	150°C	180°C	217°C	60 sec	245°C	20 sec	3°C/sec	6°C/sec
SMT-8	120 sec	150°C	180°C	217°C	90 sec	245°C	20 sec	3°C/sec	3°C/sec

NOTE: All power modules support max. 2 solder cycles!

13 SOLDERING PROFILE "THT"

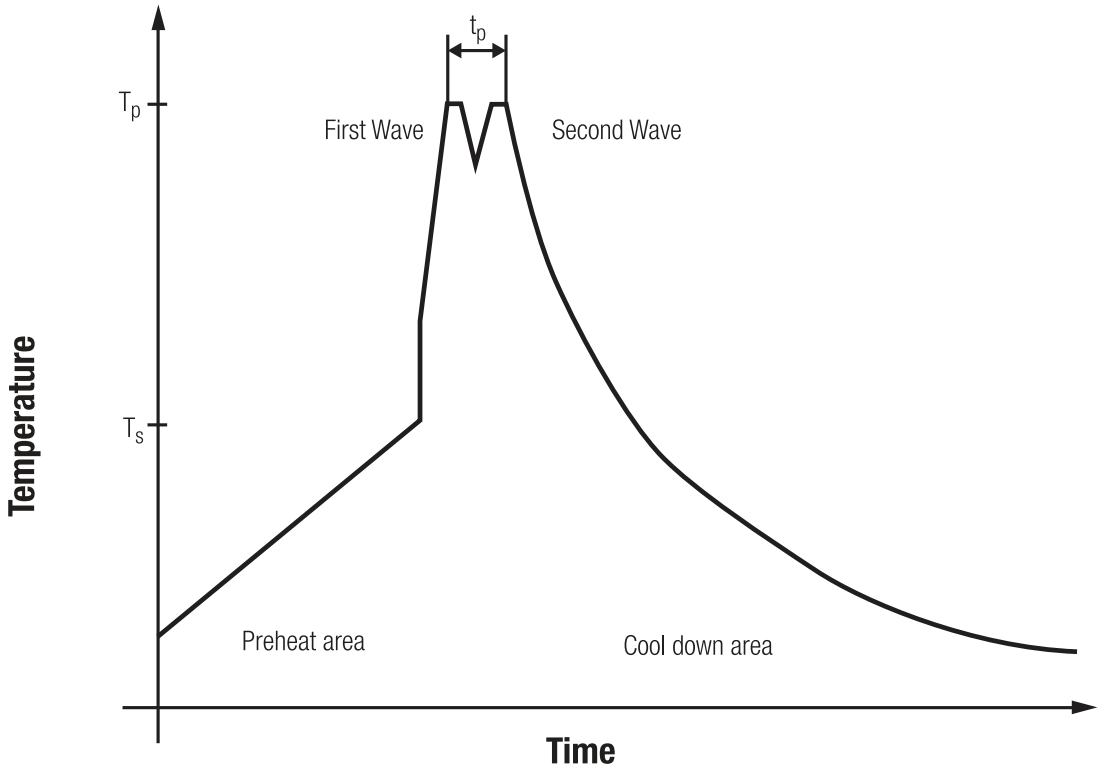


Table 20: SOLDERING PROFILE "THT" .

Ordercode	Profil Features	Old Standard (Pb)	New Standard (Pb-free)
177 920 5x1 (SIP-4) **177 9x0 5x1 1 (SIP-4)** **177 920 5x4 (SIP-7)** **177 910 632 15 (SIP-8)** **173 xxx xxx (SIP-3)**	Time within the peak temperature t_P	10 sec max. 5s each wave	10 sec max. 5s each wave
	Average slew rate	~200°C/sec	~200°C/sec
	Final preheat temperature T_S	~130°C/sec	~130°C/sec
	Peak–temperature T_P	+235°C	+260°C
	Cooling rate	-5°C/sec	-5°C/sec
	Heating rate	4°C/sec	4°C/sec

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