

1. General description

WeEnPACK-ED3 half bridge module with WeEn 1200V Gen3 SiC MOSFET and anti-parallelled SiC SBD.



2. Features and benefits

- Half bridge topology
- Low V_{SD} with SiC SBD anti-parallelled
- Low $R_{DS(on)}$
- Low Switching Losses
- Low Q_g and C_{rss}
- Low Inductive Design
- Integrated with NTC temperature sensor

3. Applications

- Power inverters
- AC-DC, DC-DC converters
- Electricity quality optimizers
- Photovoltaics & wind power converters
- Motor drives

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V _{DS}	drain-source voltage	T _j = 25 °C		1200			V
I _D	drain current	V _{GS} = 18 V; T _C = 50 °C; T _j ≤ 175 °C		484			A
P _{tot}	total power dissipation	T _C = 25 °C		1351			W
T _j	junction temperature			-40 to 150			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 18 V; I _D = 600 A; T _j = 25 °C		-	2.5	-	mΩ
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 600 A; V _{DS} = 800 V; V _{GS} = -4 V/18 V; T _j = 25 °C		-	1220	-	nC
Q _{GD}	gate-drain charge			-	155	-	nC
Source-drain diode							
Q _r	recovered charge	I _F = 600 A; di/dt = 1000 A/μs; V _R = 400 V; T _i = 25 °C;		-	tbd	-	nC

5. Pinning information

Table 2. Pinning information

Simplified outline	Circuit diagram
* Please refer to the package outline description for actual pin order.	

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WMSC4R0H12E1-D	WeEnPACK-ED3	tbd	tbd	tbd	tbd	tbd

7. Marking

Table 4. Marking codes

Type number	Marking codes
WMSC4R0H12E1-D	WMSC4R0H12E1-D

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	Unit
T_{stg}	storage temperature			-40 to 125	°C
$T_{j,op}$	operating junction temperature			-40 to 150	°C
$T_{j,max}$	maximum junction temperature	Intermittent condition with shortened lifetime		-40 to 175	°C
V_{ISOL}	RMS isolation voltage	$T_j = 25\text{ °C}$; all terminals shorted; $f = 50\text{ Hz}$; $t = 1\text{ s}$		2500	V
MOSFET					
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		1200	V
$V_{GS,max}$	gate-source voltage	Absolute maximum values		-10 to 22	V
$V_{GS,op}$	gate-source voltage	Recommended operational values		-4 to 18	V
P_{tot}	total power dissipation	$T_c = 25\text{ °C}$		1351	W
I_D	drain current	$V_{GS} = 18\text{ V}$; $T_c = 50\text{ °C}$; $T_j \leq 175\text{ °C}$		484	A
		$V_{GS} = 18\text{ V}$; $T_c = 90\text{ °C}$; $T_j \leq 175\text{ °C}$		400	A
I_{DM}	peak drain current	pulse width t_p limited by $T_{j,max}$		970	A
E_{as}	single pulse drain-to-source avalanche	$I_{AS} = 47\text{ A}$; $L = 1\text{ mH}$; $V_{DD} = 100\text{ V}$; $T_{j(init)} = 25\text{ °C}$; per MOSFET		1105	mJ
Diode					
V_{RRM}	repetitive peak reverse voltage			1200	V
I_{SD}	continuous source-drain current	$T_c \leq 50\text{ °C}$; DC		110	A

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	per MOSFET	simulation result(0.38 mm Al ₂ O ₃)	-	0.111	-	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per MOSFET, $\lambda_{grease} = 3\text{ W/(m}\cdot\text{K)}$, thickness = 100 μm		-	0.126	-	K/W
$R_{th(j-c)}$	thermal resistance from junction to case	per Diode		-	0.418	-	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per Diode, $\lambda_{grease} = 3\text{ W/(m}\cdot\text{K)}$, thickness = 100 μm		-	0.475	-	K/W

Note: Module is ESD sensitive. Handling precautions are recommended.

10. Characteristics

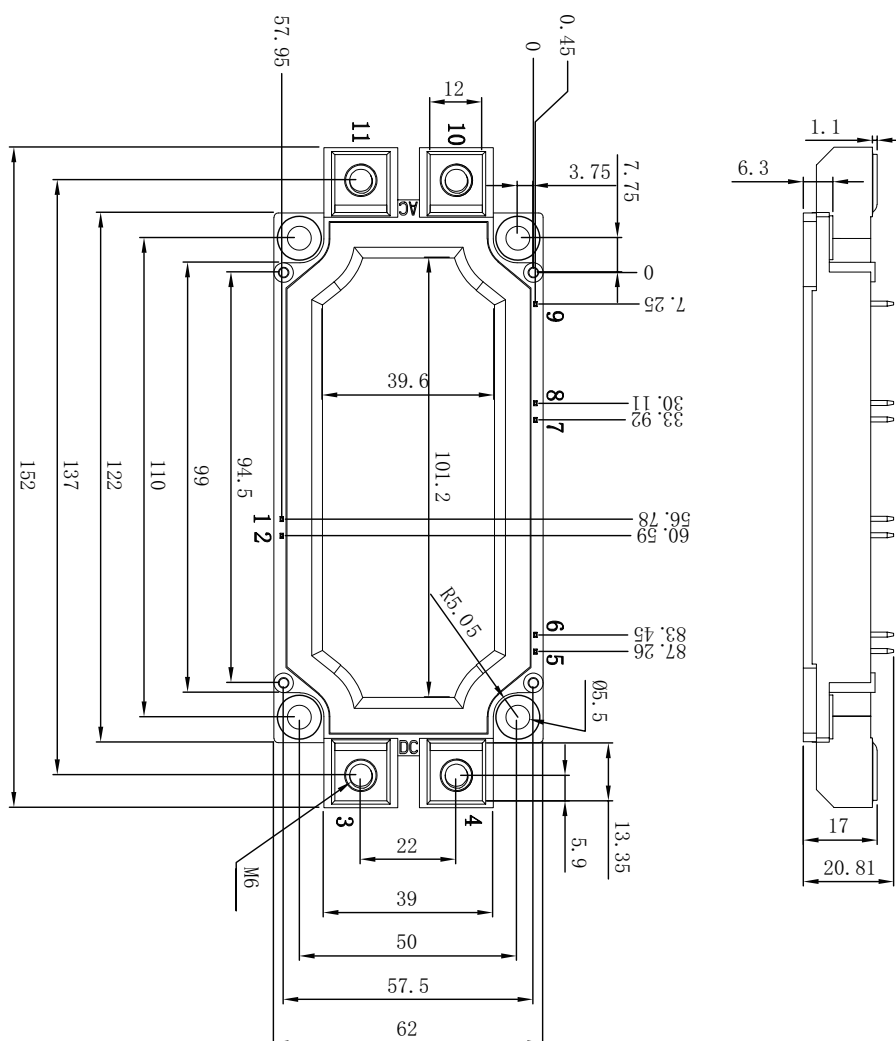
Table 7. Characteristics

MOSFET							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 500 \mu A$; $V_{GS} = 0 V$; $T_J = 25 ^\circ C$		1200	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 100 mA$; $V_{DS} = V_{GS}$; $T_J = 25 ^\circ C$		2.4	3.0	4.0	V
		$I_D = 100 mA$; $V_{DS} = V_{GS}$; $T_J = 175 ^\circ C$		-	2.0	-	V
I_{DSS}	drain leakage current	$V_{DS} = 1200 V$; $V_{GS} = 0 V$; $T_J = 25 ^\circ C$		-	4	1000	μA
		$V_{DS} = 1200 V$; $V_{GS} = 0 V$; $T_J = 175 ^\circ C$		-	110	-	μA
I_{GSS}	gate leakage current (absolute value)	$V_{GS} = 22 V$; $V_{DS} = 0 V$; $T_J = 25 ^\circ C$		-	-	500	nA
		$V_{GS} = -10 V$; $V_{DS} = 0 V$; $T_J = 25 ^\circ C$		-	-	500	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 15 V$; $I_D = 600 A$; $T_J = 25 ^\circ C$		-	2.9	-	m Ω
		$V_{GS} = 18 V$; $I_D = 600 A$; $T_J = 25 ^\circ C$		-	2.5	4.0	m Ω
		$V_{GS} = 18 V$; $I_D = 600 A$; $T_J = 175 ^\circ C$		-	4.8	-	m Ω
R_G	gate resistance, each side	$f = 1 MHz$, $T_J = 25 ^\circ C$		-	1.5	-	Ω
g_{fs}	transconductance	$V_{DS} = 20 V$; $I_D = 600 A$; $T_J = 25 ^\circ C$		-	tbd	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 600 A$; $V_{DS} = 800 V$; $V_{GS} = -4 V/18 V$; $T_J = 25 ^\circ C$		-	1220	-	nC
Q_{GS}	gate-source charge			-	470	-	nC
Q_{GD}	gate-drain charge			-	155	-	nC
C_{iss}	input capacitance	$V_{DS} = 800 V$; $V_{GS} = 0 V$; $f = 100 kHz$; $T_J = 25 ^\circ C$		-	29.8	-	nF
C_{oss}	output capacitance			-	1435	-	pF
C_{rss}	reverse transfer capacitance			-	49.5	-	pF
E_{oss}	Coss stored energy			-	459	-	μJ

Diode							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 200 A; T _J = 25 °C		-	1.9	2.1	V
		I _F = 200 A; T _J = 175 °C		-	3.2	3.7	V
Dynamic characteristics							
t _{rr}	reverse recovery time	I _F = 600 A; V _R = 400 V; di/dt = 1000 A/μs; T _J = 25 °C		-	tbd	-	ns
Q _r	recovered charge			-	tbd	-	nC
I _{rrm}	reverse recovery current			-	tbd	-	A
E _{rec}	reverse recovery energy			-	tbd	-	μJ

NTC thermistor							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
R_{25}	Rated resistance	$T_{NTC} = 25 \text{ }^\circ\text{C}$		-	tbd	-	Ω
R_{100}		$T_{NTC} = 100 \text{ }^\circ\text{C}$			tbd		Ω
$B_{25/50}$	B-value	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$			tbd		K
	Maximum operating temperature			-	tbd	-	$^\circ\text{C}$
	Dissipation costant			-	tbd	-	mW/K
	Thermal time constant			-	tbd	-	s

11. Package outline



12. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 17 April 2026