

1. General description

WeEnPACK-B2 module with WeEn 1200V Gen2 SiC MOSFET and Solder pin type. Integrated with NTC temperature sensor. Featured with extremely low V_{SD} with special internal configuration.



2. Features and benefits

- Half bridge topology
- Solder pin configuration
- Low $R_{DS(on)}-T_j$ coefficient
- Low Switching Losses
- Low Q_g and C_{rss}
- Mimimized circuit impedance
- Improved chip synchronization performance

3. Applications

- Power inverters
- AC-DC converters
- DC-DC converters
- Active power factor correctors
- Motor drives


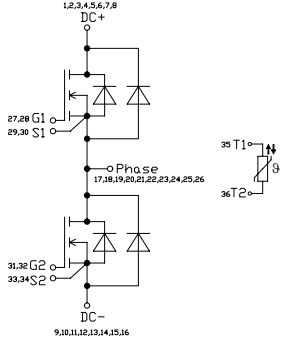
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DS}	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$			1200		V
I_D	drain current	$V_{GS} = 18\text{ V}; T_h = 25\text{ }^\circ\text{C}$			233		A
P_{tot}	total power dissipation	$T_h = 25\text{ }^\circ\text{C}$			272		W
$T_{j,op}$	operating junction temperature				-40 to 150		$^\circ\text{C}$
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 15\text{ V}; I_D = 250\text{ A}; T_j = 25\text{ }^\circ\text{C}$		-	4.0	-	m Ω
		$V_{GS} = 18\text{ V}; I_D = 250\text{ A}; T_j = 25\text{ }^\circ\text{C}$		-	3.2	6	m Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 250\text{ A}; V_{DS} = 800\text{ V}; V_{GS} = 0\text{ V}/18\text{ V}; T_j = 25\text{ }^\circ\text{C}$		-	945	-	nC
Q_{GD}	gate-drain charge			-	205	-	nC
Source-drain diode							
Q_r	recovered charge	$I_{SD} = 250\text{ A}; V_{GS} = -4\text{ V}/18\text{ V}; V_R = 600\text{ V}; di/dt = 3730\text{ A}/\mu\text{s}; R_g = 3\text{ }\Omega$		-	1685	-	nC

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WMSC004H12B2S-D	WeEnPACK-B2	WMSC004H12B2S-D6T	Tray	14	WeEnPACK-B2PHB-C	19-Feb-2025

7. Marking

Table 4. Marking codes

Type number	Marking codes
WMSC004H12B2S-D	WMSC004H12B2S-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; $f = 50\text{ Hz}$; $t = 1\text{ s}$		3500	V
MOSFET					
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		1200	V
$V_{GS,max}$	gate-source voltage	Absolute maximum values		-12 to 24	V
$V_{GS,op}$	gate-source voltage	Recommended operational values		-4 to 18	V
P_{tot}	total power dissipation	$T_h = 25\text{ °C}$		272	W
I_D	drain current	$V_{GS} = 18\text{ V}$; $T_h = 25\text{ °C}$		223	A
		$V_{GS} = 18\text{ V}$; $T_h = 100\text{ °C}$		147	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ us}$; $T_h = 25\text{ °C}$		450	A
E_{as}	single pulse drain-to-source avalanche	$I_{AS} = 30\text{ A}$; $L = 1\text{ mH}$; $V_{DD} = 100\text{ V}$; $T_{j(init)} = 25\text{ °C}$; each die		450	mJ
Body Diode					
I_{SD}	DC body diode forward current	$T_h = 25\text{ °C}$; $V_{GS} = -4\text{ V}$		100	A
$I_{SD,pulse}$	Pulse body diode current	verified by design, t_p limited by $T_{j,max}$		450	A

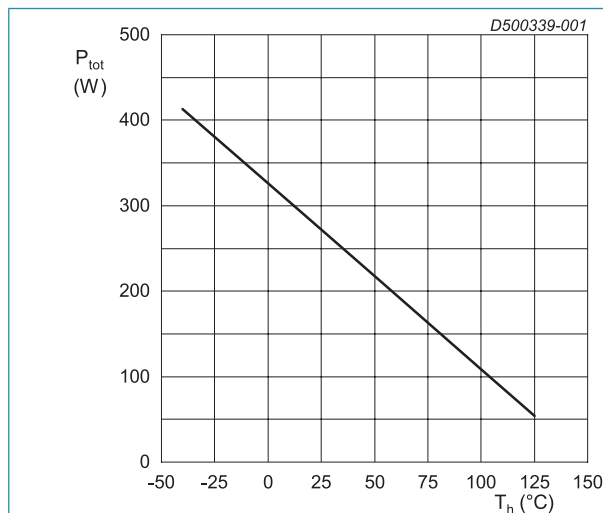


Fig. 1. Power dissipation as a function of heatsink temperature; maximum values

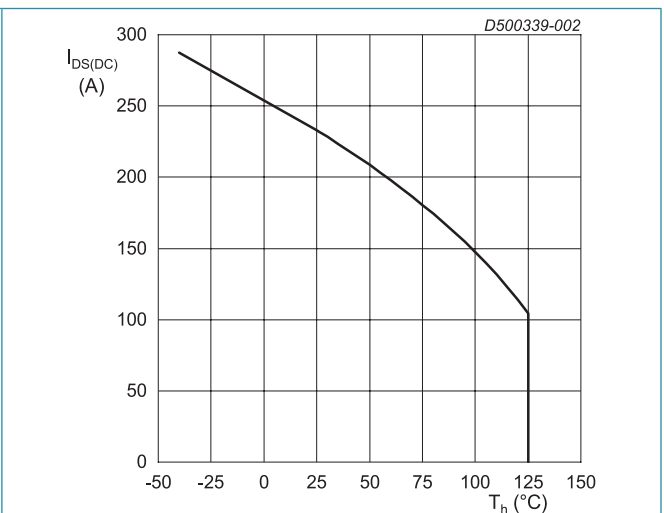


Fig. 2. Continuous Drain Current as a function of heatsink temperature

9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	per MOSFET		-	0.1	-	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per MOSFET, $\lambda_{grease} = 3 \text{ W/(m}\cdot\text{K)}$, $thick_{grease} = 50 \text{ }\mu\text{m}$		-	0.46	-	K/W
Internal Isolation		basic insulation (class 1, IEC 61140)		Al ₂ O ₃			
d_{Creep}	Creepage distance	terminal to heatsink		-	11.5	-	mm
		terminal to terminal		-	6.3	-	mm
d_{Clear}	Clearance	terminal to heatsink		-	10	-	mm
		terminal to terminal		-	5	-	mm
CTI	Comperative tracking index			>200			
F	Mounting force per clamp			40	-	80	N
G	Approximate Weight			-	36	-	g

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

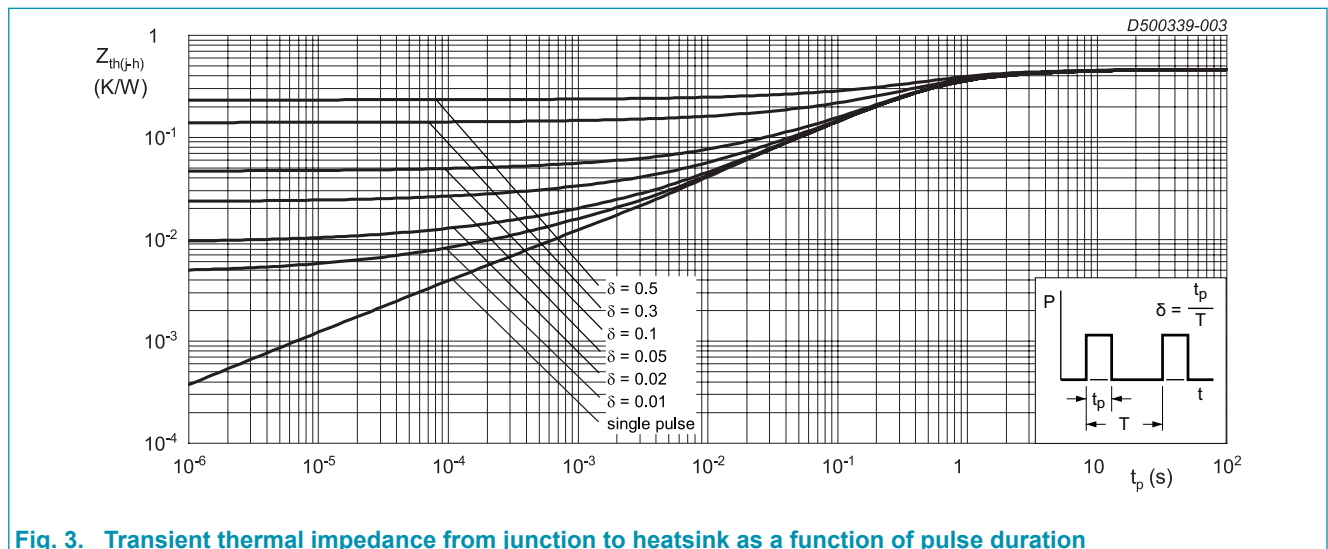


Fig. 3. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Characteristics

Table 7. Characteristics

MOSFET							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 500 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ\text{C}$		1200	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 100 \text{ mA}; V_{DS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		1.9	2.5	3.5	V
		$I_D = 100 \text{ mA}; V_{DS} = 10 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$		-	1.9	-	V
I_{DSS}	drain leakage current	$V_{DS} = 1200 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	1	500	μA
I_{GSS}	gate leakage current (absolute value)	$V_{GS} = 24 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	50	500	nA
		$V_{GS} = -12 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	50	500	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 15 \text{ V}; I_D = 250 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$		-	4.0	-	m Ω
		$V_{GS} = 18 \text{ V}; I_D = 250 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$		-	3.2	6	m Ω
		$V_{GS} = 18 \text{ V}; I_D = 250 \text{ A}; T_j = 125 \text{ }^\circ\text{C}$		-	4.7	-	m Ω
		$V_{GS} = 18 \text{ V}; I_D = 250 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$		-	5.2	-	m Ω
		$V_{GS} = 18 \text{ V}; I_D = 250 \text{ A}; T_j = 175 \text{ }^\circ\text{C}$		-	5.5	-	m Ω
R_G	gate resistance	$f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$; each die with 4.7 Ω $R_{G(ext)}$ in series		-	1.08	-	Ω
g_{fs}	transconductance	$V_{DS} = 20 \text{ V}; I_D = 250 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$		-	84	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 250 \text{ A}; V_{DS} = 800 \text{ V}; V_{GS} = 0 \text{ V}/18 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	945	-	nC
Q_{GS}	gate-source charge			-	240	-	nC
Q_{GD}	gate-drain charge			-	205	-	nC
C_{iss}	input capacitance	$V_{DS} = 1000 \text{ V}; V_{GS} = 0 \text{ V}; f = 100 \text{ KHz}; T_j = 25 \text{ }^\circ\text{C}$		-	23	-	nF
C_{oss}	output capacitance			-	1181	-	pF
C_{rss}	reverse transfer capacitance			-	71	-	pF
E_{oss}	Coss stored energy			-	590	-	μJ
$t_{d(on)}$	turn-on delay time		$V_{DS} = 800 \text{ V}; V_{GS} = -4 \text{ V}/18 \text{ V}; R_{G(ext)} = 5.1 \text{ } \Omega; I_D = 250 \text{ A}; L = 100 \text{ } \mu H; T_j = 25 \text{ }^\circ\text{C}$		-	76	-
t_r	rise time			-	62	-	ns
$t_{d(off)}$	turn-off delay time			-	246	-	ns
t_f	fall time			-	54	-	ns
E_{on}	turn-on energy			-	13510	-	μJ
E_{off}	turn-off energy			-	8310	-	μJ

Body diode							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _{SD}	source-drain voltage	V _{GS} = -4 V; I _{SD} = 250 A; T _j = 25 °C		-	3.2	-	V
		V _{GS} = -4 V; I _{SD} = 250 A; T _j = 150 °C		-	3.9	-	V
Dynamic characteristics							
I _{rrm}	reverse recovery current	I _{SD} = 250 A; V _{GS} = -4 V/18 V; V _R = 600 V; di/dt = 3730 A/μs; R _g = 3 Ω; T _j = 25 °C		-	89	-	A
t _{rr}	reverse recovery time			-	32	-	ns
Q _r	recovered charge			-	1685	-	nC
E _{rec}	reverse recovery energy			-	304	-	μJ
NTC thermistor							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
R ₂₅	Rated resistance	T _{NTC} = 25 °C		-	5000	-	Ω
R ₁₀₀		T _{NTC} = 100 °C			493±5%		Ω
B _{25/50}	B-value	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15K))]$			3380		K
	Maximum operating temperature			-	200	-	°C
	Dissipation costant			-	2	-	mW/K
	Thermal time constant			-	≤10	-	s

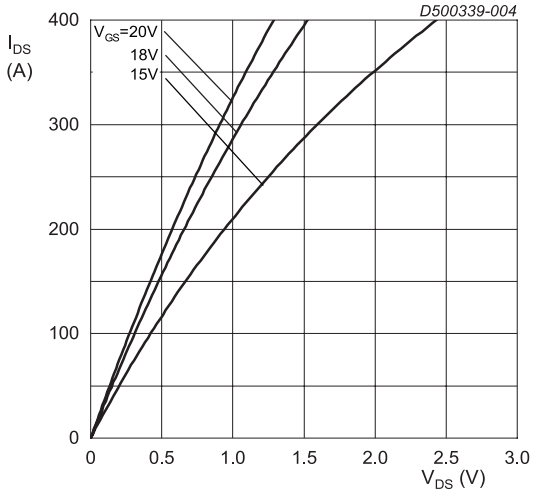


Fig. 4. Output characteristics; drain current as a function of drain-source voltage; typical values
 $T_j = -40\text{ °C}; t_p < 200\ \mu\text{s}$

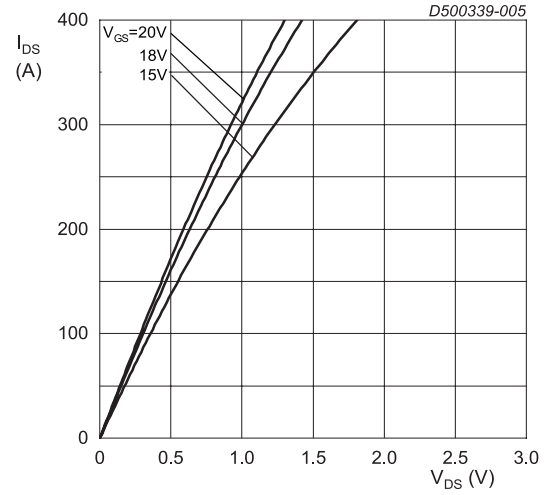


Fig. 5. Output characteristics; drain current as a function of drain-source voltage; typical values
 $T_j = 25\text{ °C}; t_p < 200\ \mu\text{s}$

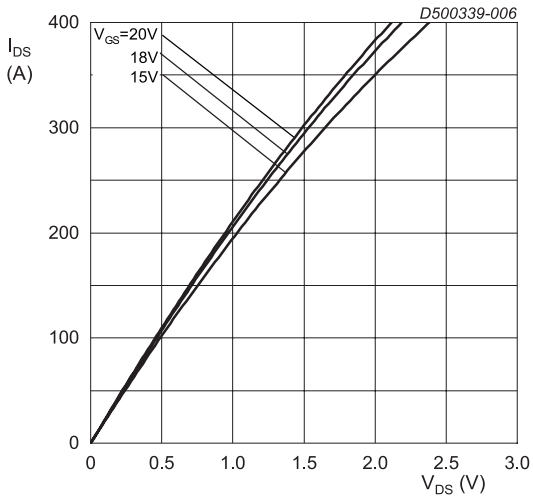


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values
 $T_j = 150\text{ °C}; t_p < 200\ \mu\text{s}$

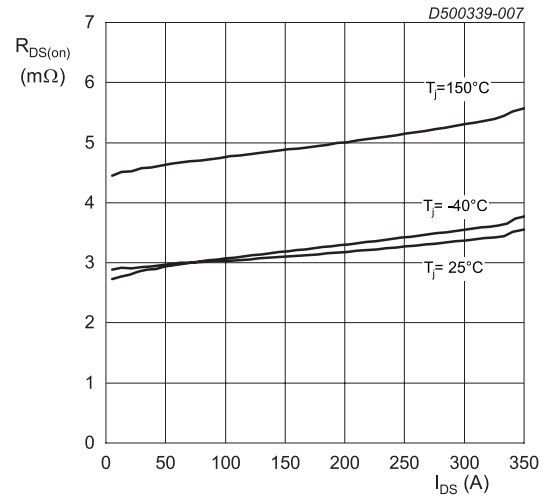
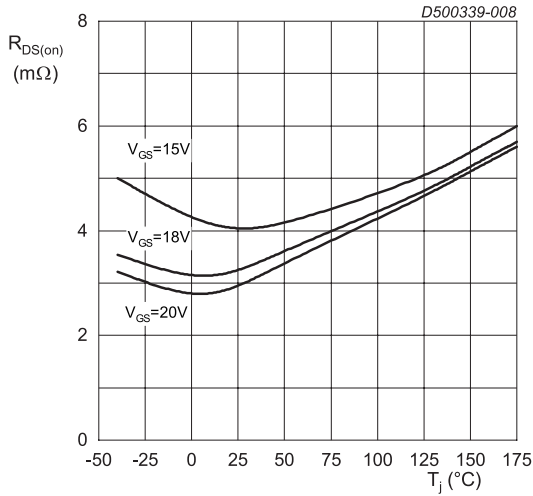
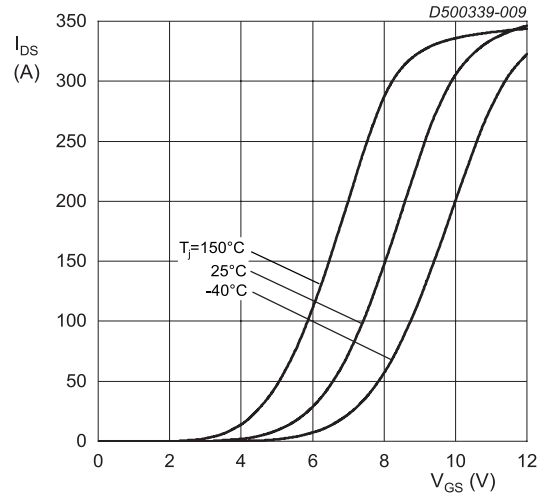


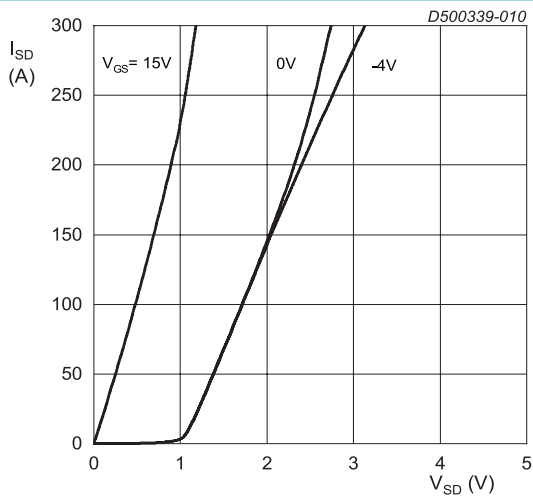
Fig. 7. Drain-source on-state resistance as a function of drain current; typical values
 $V_{GS} = 18\text{ V}; t_p < 200\ \mu\text{s}$



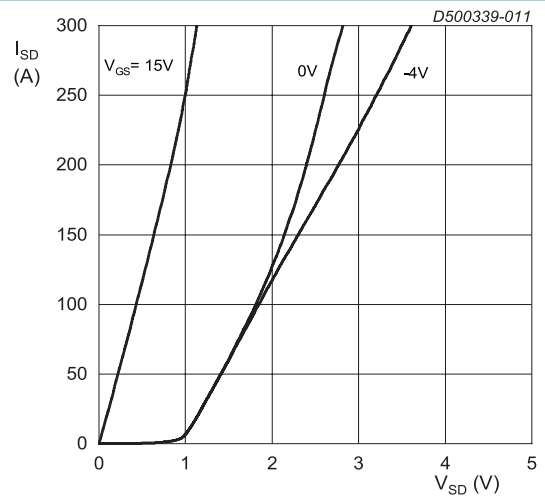
$I_{DS} = 250 A; t_p < 200 \mu s$
Fig. 8. Drain-source on-state resistance as a function of junction temperature



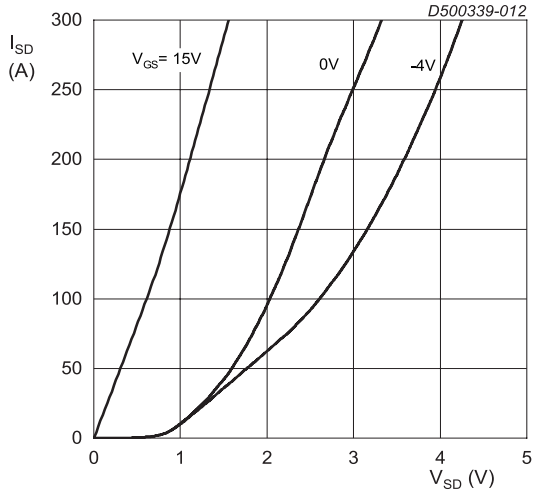
$V_{DS} = 20 V; t_p < 200 \mu s$
Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values



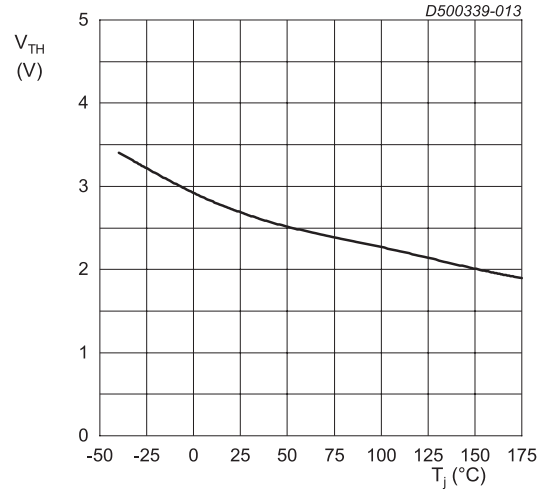
$T_j = -40^{\circ}C; t_p < 200 \mu s$
Fig. 10. Body diode forward characteristics; typical values



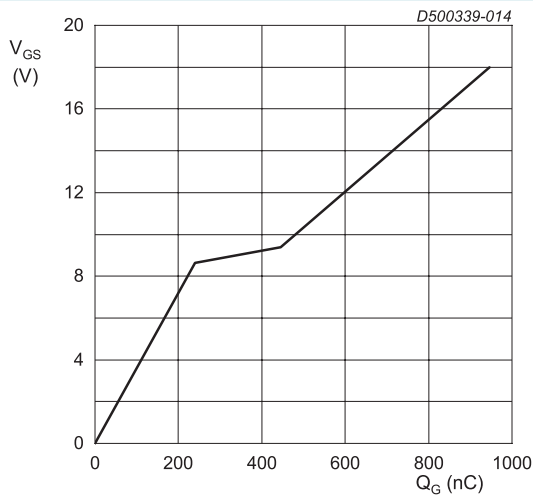
$T_j = 25^{\circ}C; t_p < 200 \mu s$
Fig. 11. Body diode forward characteristics; typical values



$T_j = 150\text{ }^\circ\text{C}; t_p < 200\text{ }\mu\text{s}$
Fig. 12. Body diode forward characteristics; typical values



$V_{DS} = 10\text{ V}; I_{DS} = 100\text{ mA}$
Fig. 13. Threshold voltage as a function of junction temperature



$I_{DS} = 250\text{ A}; I_{GS} = 0.1\text{ mA}; V_{DS} = 800\text{ V}; T_j = 25\text{ }^\circ\text{C}$
Fig. 14. Gate-source voltage as a function of gate charge; typical values

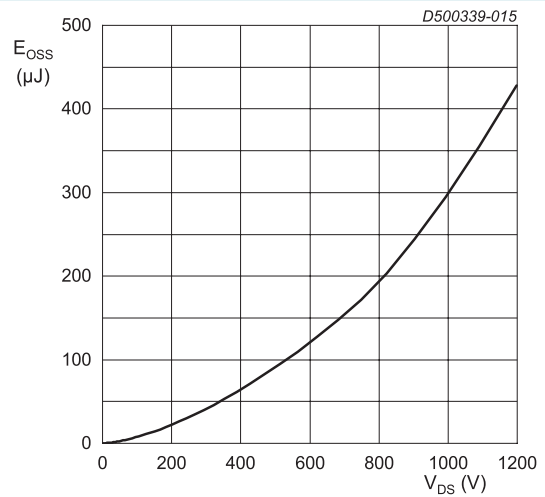
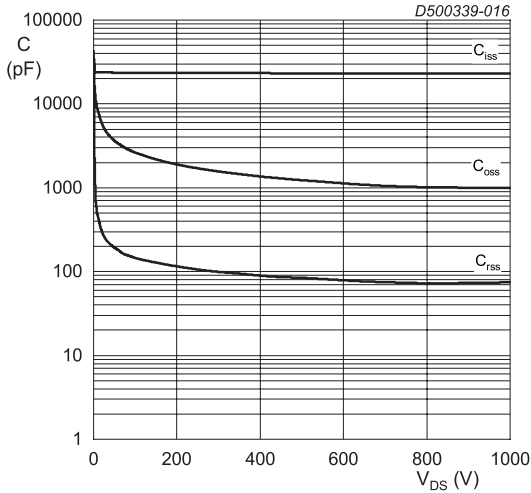
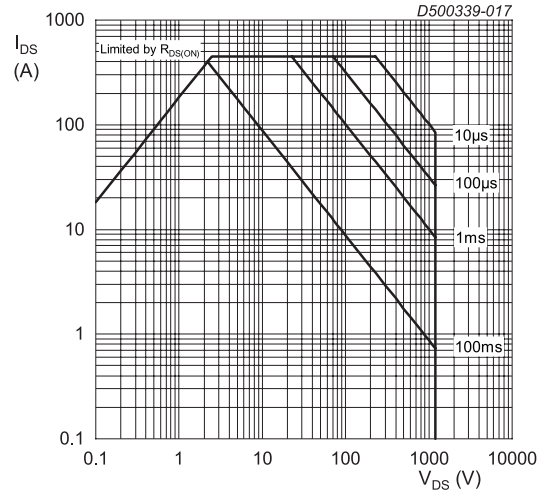


Fig. 15. Output capacitor stored energy as a function of drain-source voltage



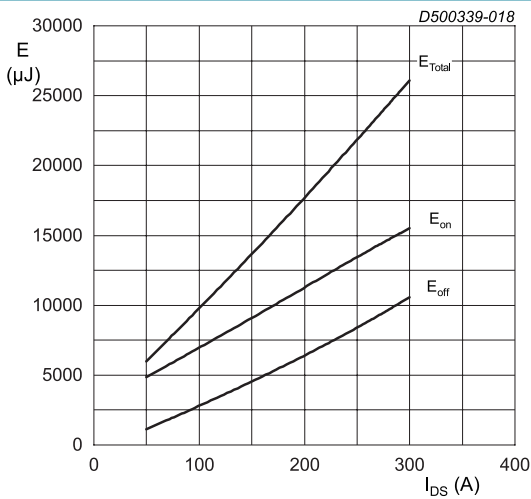
$V_{DS} = 0 - 1000 \text{ V}$
 $T_j = 25 \text{ }^\circ\text{C}; V_{AC} = 25 \text{ mV}; f = 100 \text{ KHz}$

Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



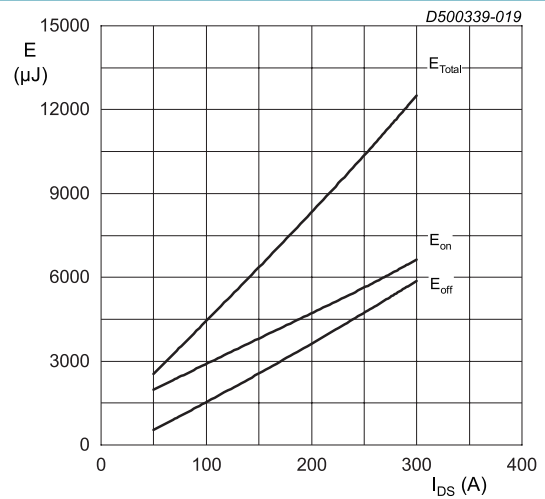
$T_j = 25 \text{ }^\circ\text{C}; D = 0$
 Parameter: t_p

Fig. 17. Forward bias safe operating area



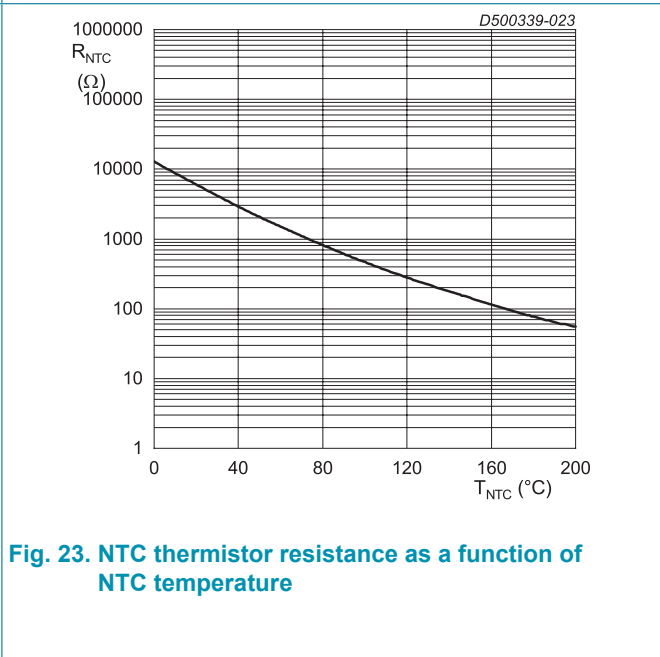
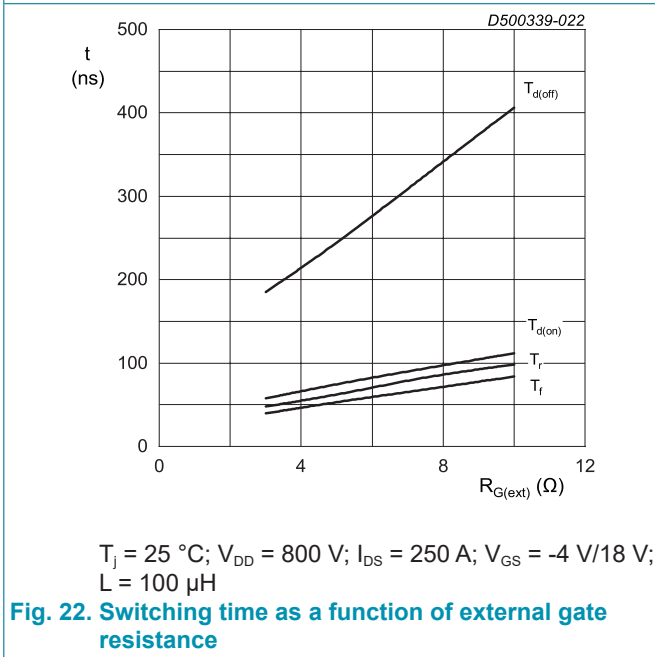
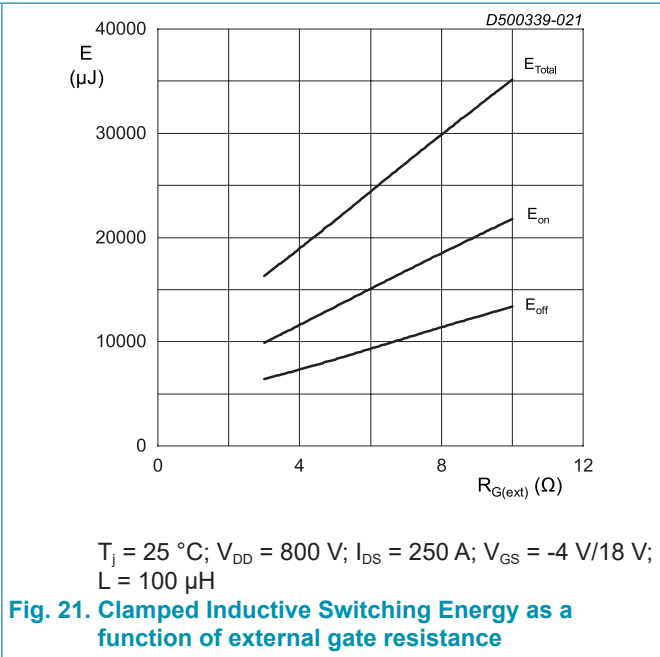
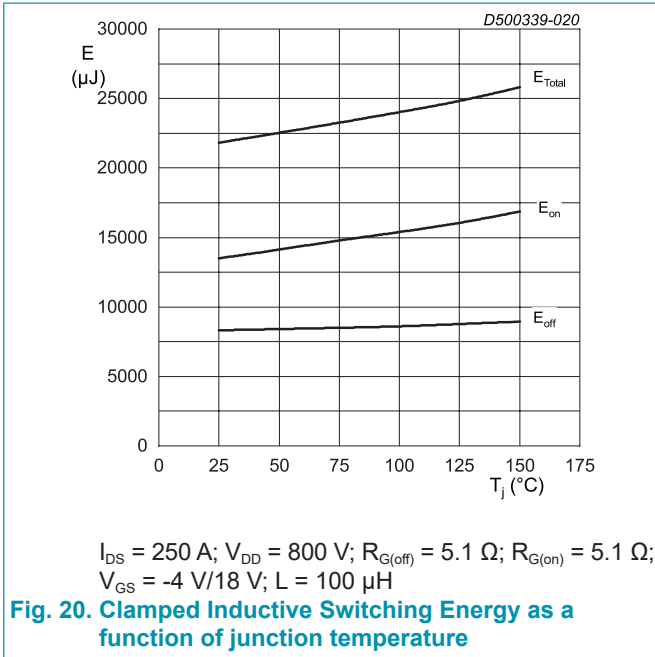
$T_j = 25 \text{ }^\circ\text{C}; V_{DD} = 800 \text{ V}; R_{G(off)} = 5.1 \text{ } \Omega; R_{G(on)} = 5.1 \text{ } \Omega;$
 $V_{GS} = -4 \text{ V}/18 \text{ V}; L = 100 \text{ } \mu\text{H}$

Fig. 18. Clamped Inductive Switching Energy as a function of drain current



$T_j = 25 \text{ }^\circ\text{C}; V_{DD} = 600 \text{ V}; R_{G(off)} = 3 \text{ } \Omega; R_{G(on)} = 3 \text{ } \Omega;$
 $V_{GS} = -4 \text{ V}/18 \text{ V}; L = 100 \text{ } \mu\text{H}$

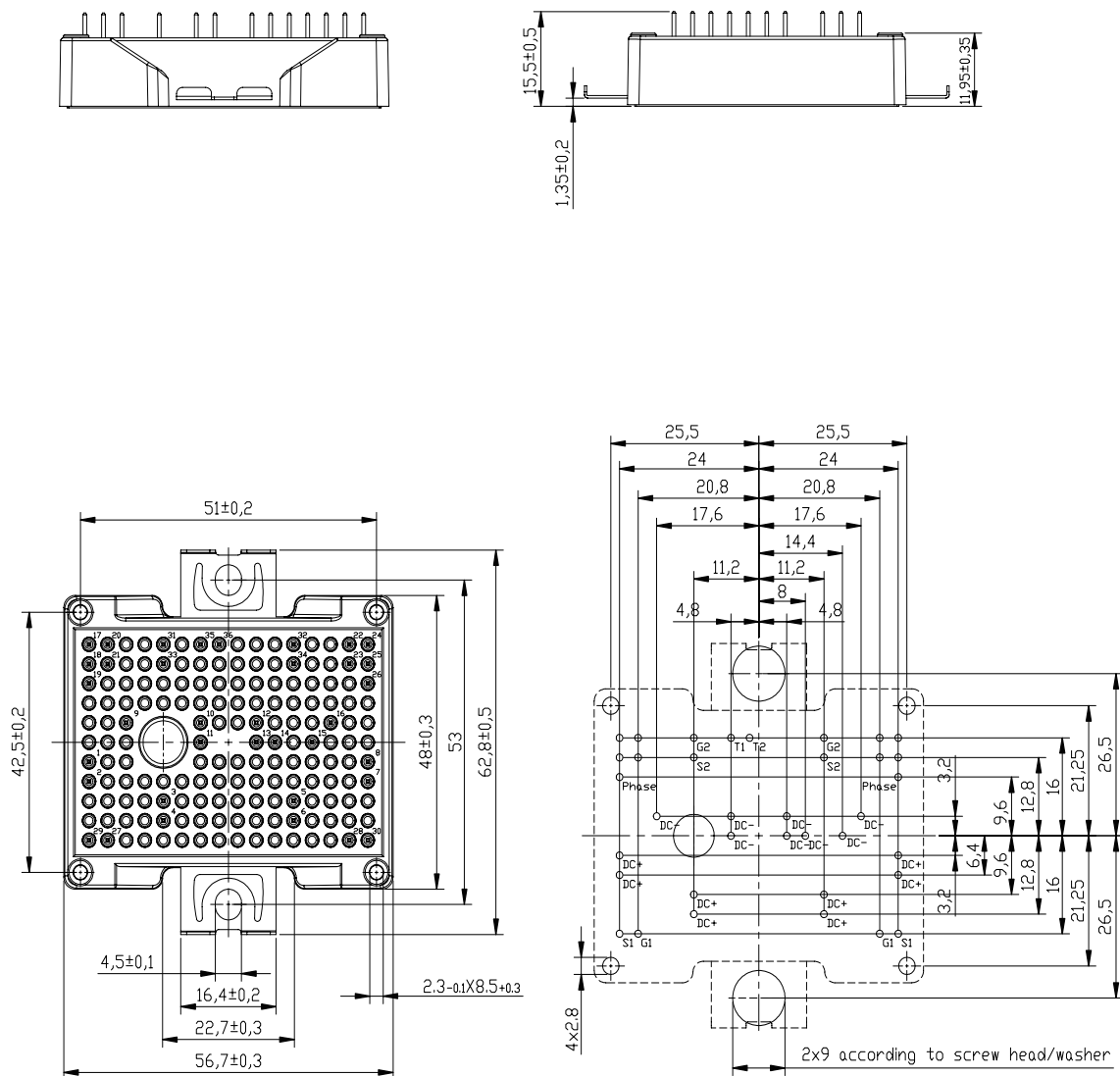
Fig. 19. Clamped Inductive Switching Energy as a function of drain current



11. Package outline

Package Outline

Dimensions in mm



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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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