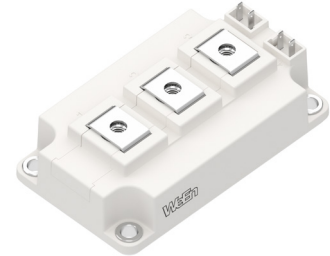


## 1. General description

WMG400H12T2S is a Half Bridge module consisting of two 400A, 1200V IGBTs with inverse diodes, which excels in providing high current density. The integrated field stop trench IGBTs and FRDs provide lower conduction losses and switching losses, enabling designers to achieve high efficiency and superior reliability.



## 2. Features and benefits

- Half Bridge topology
- Low switching losses
- Low Vcesat
- Compact design
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

## 3. Applications

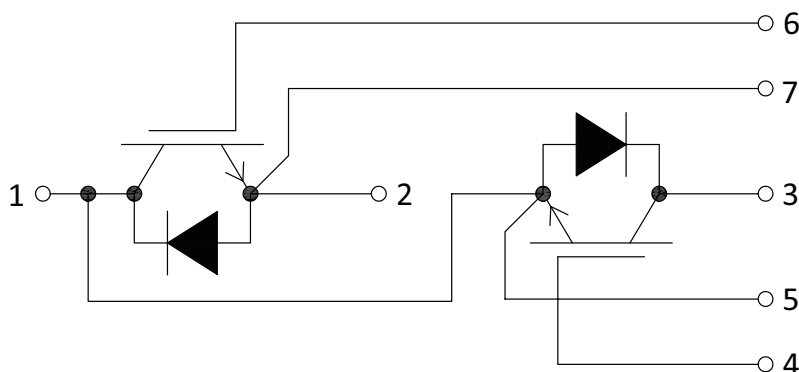
- Motor Drives
- Servo Drives
- Electronic welder Systems

## 4. Ordering information

Table 1. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WMG400H12T2S	WeEnPACK-62mm	WMG400H12T2ST	Tray	10	WeEnPACK-62mmPHB-A	10-Feb-2025

## 5. Circuit diagram



## 6. Limiting values

Table 2. Limiting values

Symbol	Parameter	Test Condition	Value	Unit
<b>IGBT</b>				
$V_{CE}$	Collector-emitter voltage		1200	V
$V_{GE}$	Gate-emitter voltage		$\pm 20$	V
$I_{CN}$	Implemented collector current		800	A
$I_C$	Continuous collector current	$T_C = 80\text{ }^\circ\text{C}$ , limited by $T_{jmax}$	400	A
$I_{Cpulse}$	Pulsed collector current	tp limited by $T_{jmax}$	1200	A
$P_{tot}$	Total power dissipation	$T_C = 80\text{ }^\circ\text{C}$	1684	W
$T_{jmax}$	Maximum junction temperature		175	$^\circ\text{C}$
<b>Diode</b>				
$V_{RRM}$	Diode repetitive peak reverse voltage		1200	V
$I_{FN}$	Diode Implemented collector current		800	A
$I_F$	Diode continuous forward current	$T_C = 80\text{ }^\circ\text{C}$ , limited by $T_{jmax}$	400	A
$I_{FRM}$	Diode repetitive peak forward current	tp limited by $T_{jmax}$	1200	A
$P_{tot}$	Total power dissipation	$T_C = 80\text{ }^\circ\text{C}$	864	W
$T_{jmax}$	Maximum junction temperature		175	$^\circ\text{C}$

## 7. Module package thermal & insulation properties

Table 3. Thermal & Insulation properties

Symbol	Parameter	Test Condition	Value	Unit
$V_{ISOL}$	RMS isolation voltage	$T_j = 25\text{ }^\circ\text{C}$ , all terminals shorted, $f = 50\text{ Hz}$ , $t = 1\text{ min}$	2500	V
$d_{Creep}$	Creepage distance	terminal to heatsink	11.5	mm
$d_{Clear}$	Clearance	terminal to heatsink	10	mm
CTI	Comperative tracking index		> 200	
$T_{stg}$	Storage temperature		-40 to 125	$^\circ\text{C}$

## 8. Electrical characteristics

Table 4. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>IGBT characteristics</b>							
$V_{CEsat}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}; I_C = 400\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	1.5	-	V	
		$V_{GE} = 15\text{ V}; I_C = 400\text{ A}; T_j = 150\text{ }^\circ\text{C}$	-	1.7	-	V	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C = 4\text{ mA}; V_{CE} = V_{GE}; T_j = 25\text{ }^\circ\text{C}$	4.2	5.3	6.4	V	
$I_{CES}$	Zero gate voltage collector current	$V_{CE} = 1200\text{ V}; V_{GE} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	1	mA	
$I_{GES}$	Gate leakage current	$V_{GE} = 20\text{ V}; V_{CE} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	600	nA	
$Q_G$	Gate charge	$V_{CC} = 600\text{ V}; I_C = 200\text{ A}; V_{GE} = \pm 15\text{ V}$	-	2.55	-	$\mu\text{C}$	
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ KHz}; T_j = 25\text{ }^\circ\text{C}$	-	45.7	-	nF	
$C_{oes}$	Output capacitance		-	0.68	-	nF	
$C_{res}$	Reverse transfer capacitance		-	0.19	-	nF	
$t_{d(on)}$	Turn-on delay time	$T_j = 25\text{ }^\circ\text{C}$ $V_{CC} = 600\text{ V}; I_C = 400\text{ A}; V_{GE} = \pm 15\text{ V}; R_g = 1.0\text{ }\Omega$	-	25	-	nS	
$t_r$	Rise time		-	37	-	nS	
$t_{d(off)}$	Turn-off delay time		-	280	-	nS	
$t_f$	Fall time		-	100	-	nS	
$E_{on}$	Turn-on energy		-	4.9	-	mJ	
$E_{off}$	Turn-off energy		-	23.4	-	mJ	
$t_{d(on)}$	Turn-on delay time		$T_j = 150\text{ }^\circ\text{C}$ $V_{CC} = 600\text{ V}; I_C = 400\text{ A}; V_{GE} = \pm 15\text{ V}; R_g = 1.0\text{ }\Omega$	-	23	-	nS
$t_r$	Rise time			-	46	-	nS
$t_{d(off)}$	Turn-off delay time	-		311	-	nS	
$t_f$	Fall time	-		192	-	nS	
$E_{on}$	Turn-on energy	-		9.2	-	mJ	
$E_{off}$	Turn-off energy	-		32.5	-	mJ	
$R_{thJC}$	Thermal resistance, junction to case	per IGBT	-	0.056	-	K/W	
$T_{jop}$	Operation temperature		-40	-	150	$^\circ\text{C}$	
<b>Inverter Diode characteristics</b>							
$V_F$	Diode forward voltage	$I_F = 400\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	4.0	-	V	
		$I_F = 400\text{ A}; T_j = 150\text{ }^\circ\text{C}$	-	3.2	-	V	
$Q_{rr}$	Reverse recovery charge	$T_j = 25\text{ }^\circ\text{C}$ $V_R = 600\text{ V}; I_F = 400\text{ A}; di/dt = 9000\text{ A}/\mu\text{s};$	-	10100	-	nC	
$I_{rrm}$	Peak reverse recovery current		-	294	-	A	
$E_{rr}$	Reverse recovery energy		-	5.2	-	mJ	
$Q_{rr}$	Reverse recovery charge	$T_j = 150\text{ }^\circ\text{C}$ $V_R = 600\text{ V}; I_F = 400\text{ A}; di/dt = 7000\text{ A}/\mu\text{s};$	-	24660	-	nC	
$I_{rrm}$	Peak reverse recovery current		-	385	-	A	
$E_{rr}$	Reverse recovery energy		-	14.3	-	mJ	
$R_{thJC}$	Thermal resistance, junction to case	per diode	-	0.11	-	K/W	
$T_{jop}$	Operation temperature		-40	-	150	$^\circ\text{C}$	

## 9. NTC - thermistor

**Table 5. NTC - Thermistor**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R <sub>25</sub>	Rated resistance	T <sub>c</sub> = 25 °C	-	5000	-	Ω
R <sub>100</sub>		T <sub>c</sub> = 100 °C		465±5%		Ω
B <sub>25/50</sub>	B-value	$R_2=R_{25} \exp.[B_{25/50}(1/T_2-1(298.15K))]$		3380±5%		K

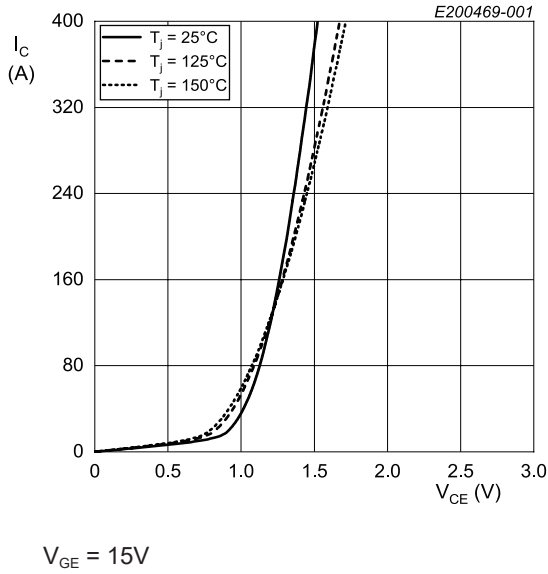


Fig. 1. IGBT typical output characteristics

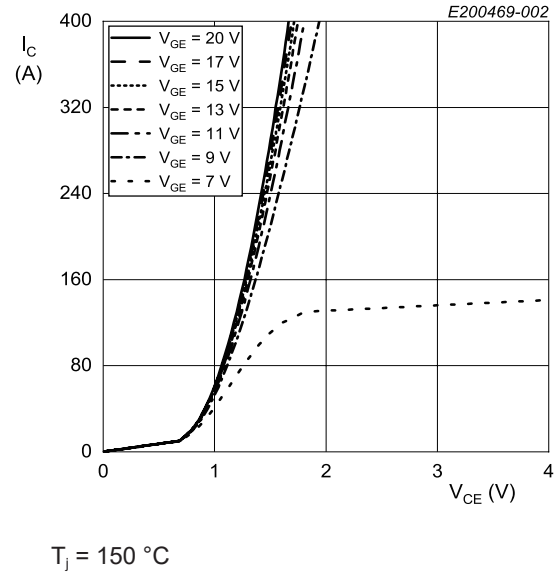


Fig. 2. IGBT typical output characteristics

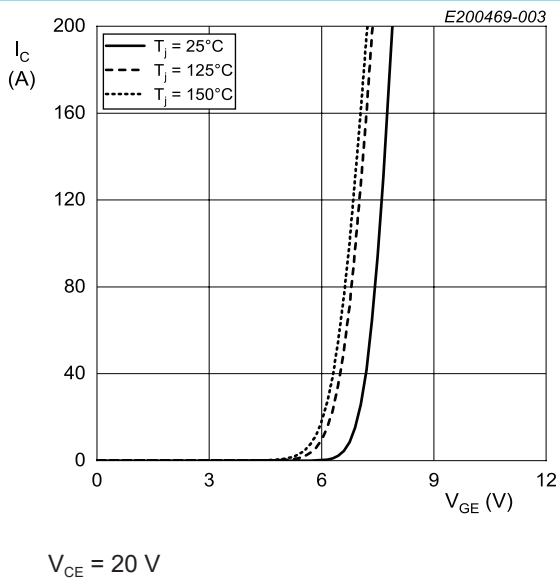


Fig. 3. IGBT typical transfer characteristics

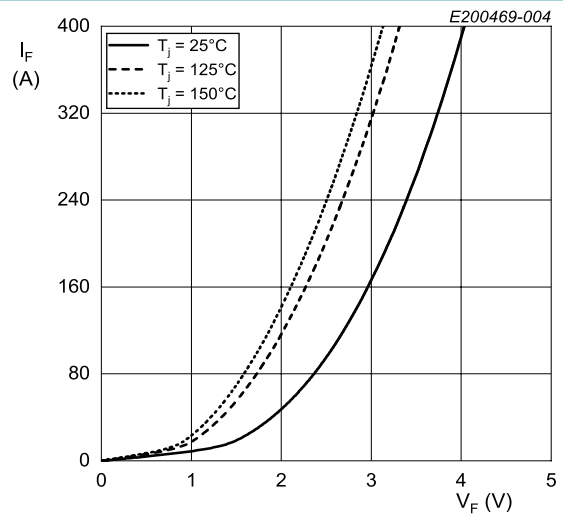
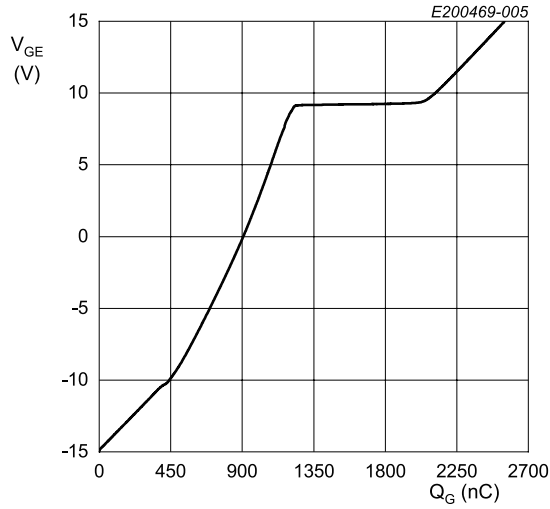
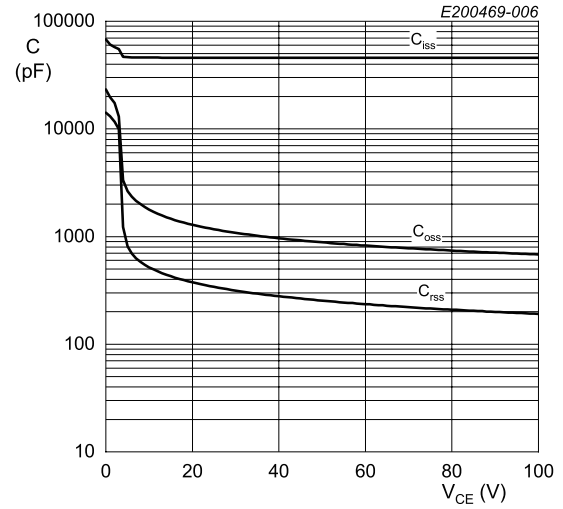


Fig. 4. Diode typical forward characteristics



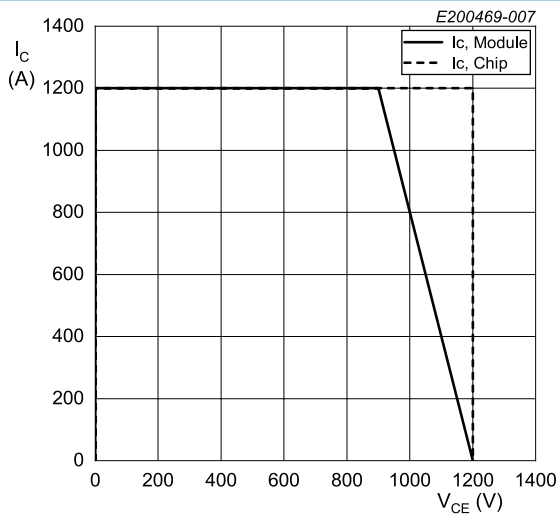
$I_C = 200 \text{ A}; V_{CC} = 600 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$

Fig. 5. Typical gate charge



$V_{GE} = 0; f = 1 \text{ KHz}; T_J = 25 \text{ }^\circ\text{C}$

Fig. 6. Typical capacitance as a function of collector emitter voltage



$R_g = 1.0 \text{ } \Omega; V_{GE} = \pm 15 \text{ V}; T_J = 150 \text{ }^\circ\text{C}$

Fig. 7. Reverse bias safe operating area

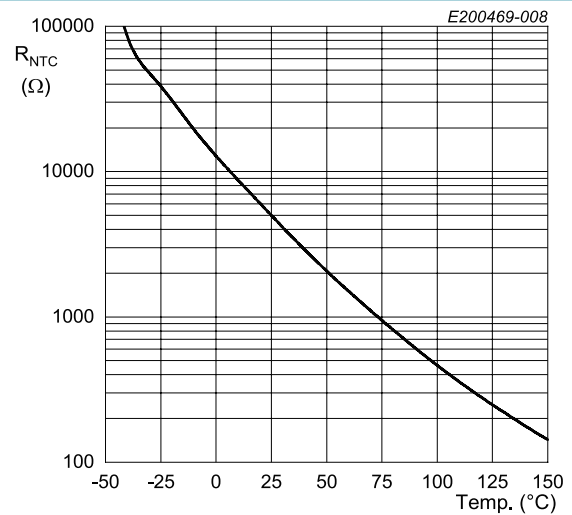


Fig. 8. Typical NTC characteristic as a function of temperature

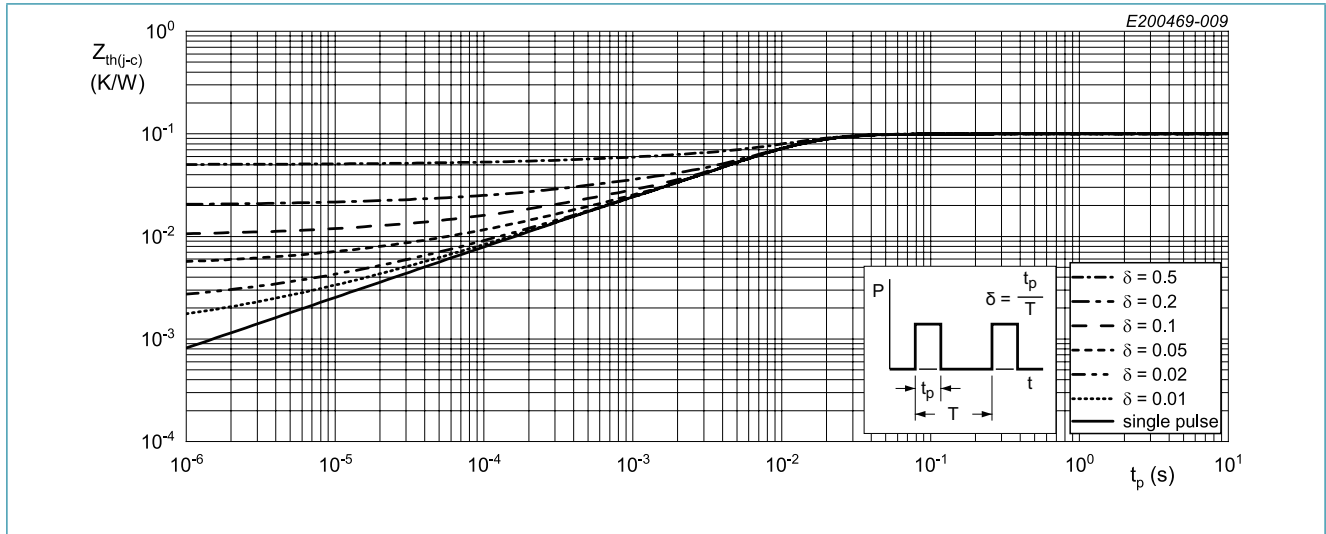


Fig. 9. Typical Transient thermal impedance IGBT

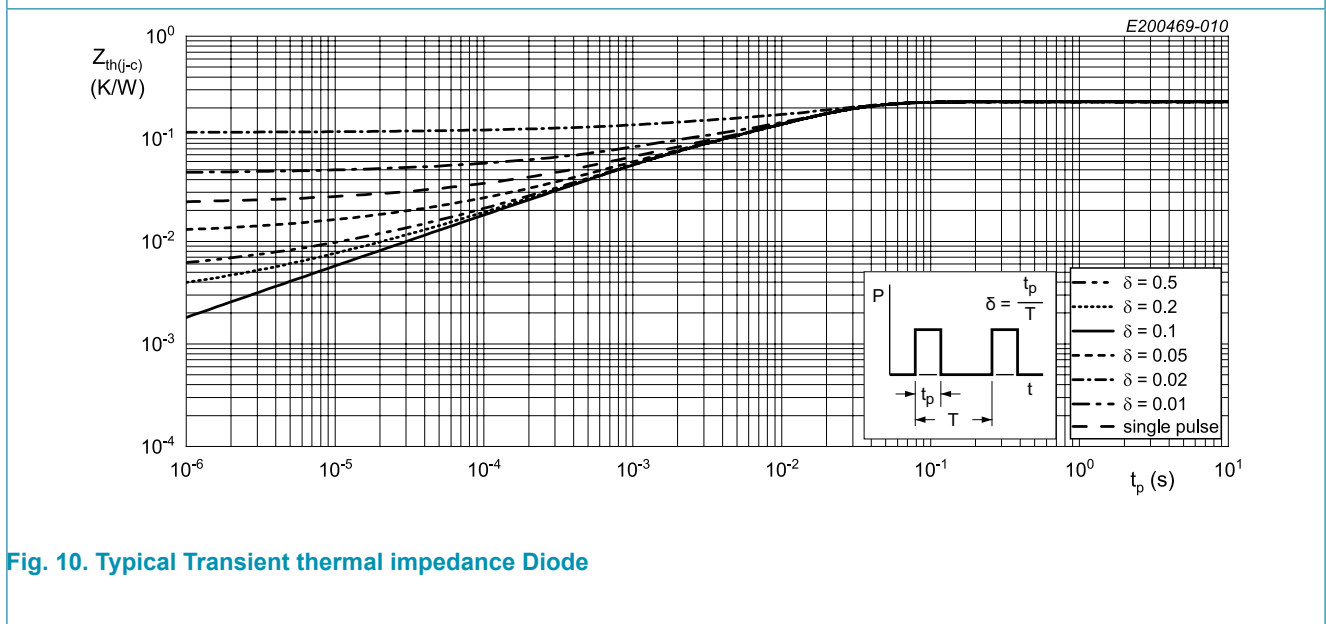
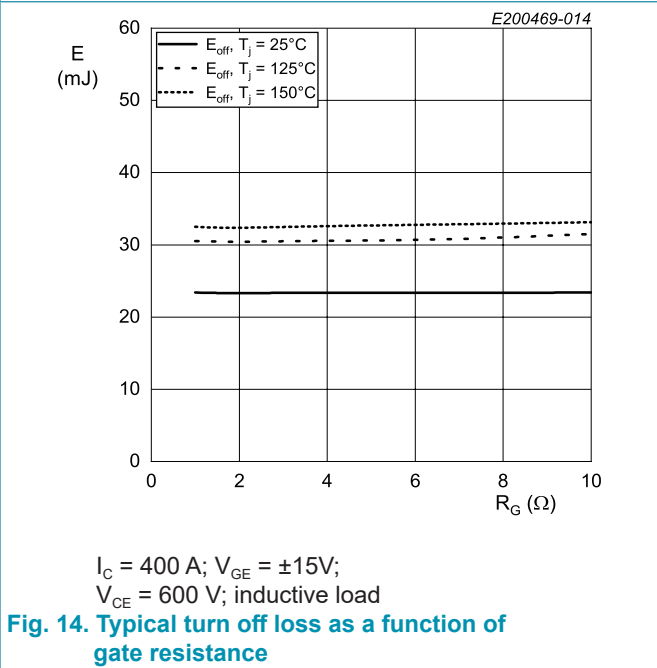
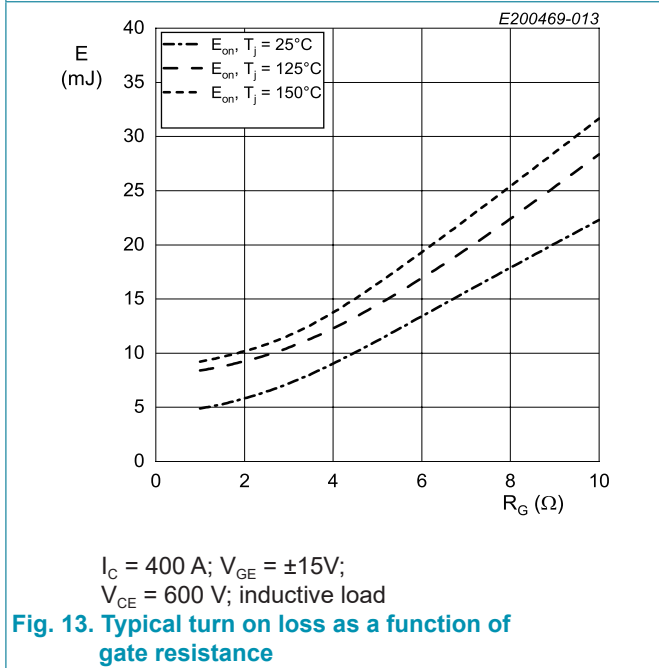
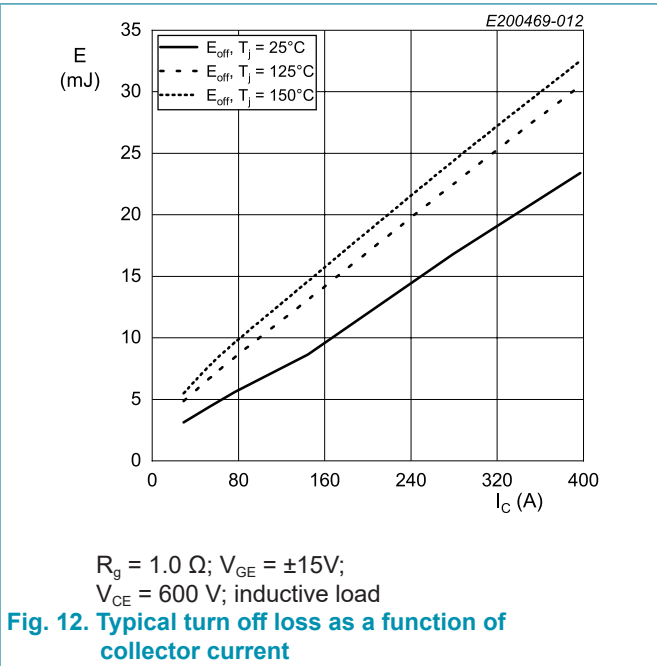
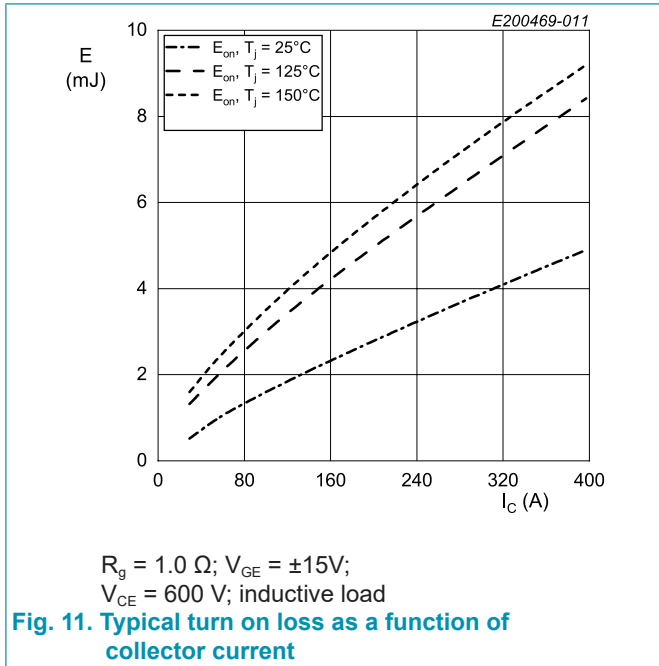
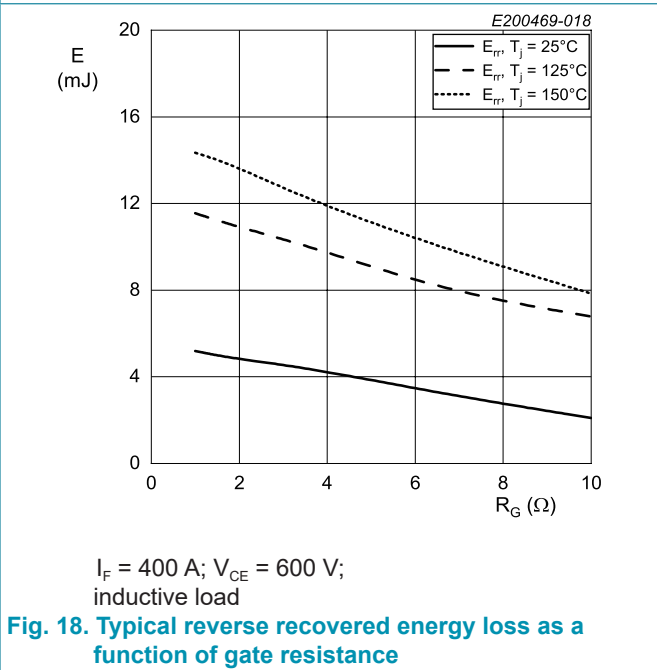
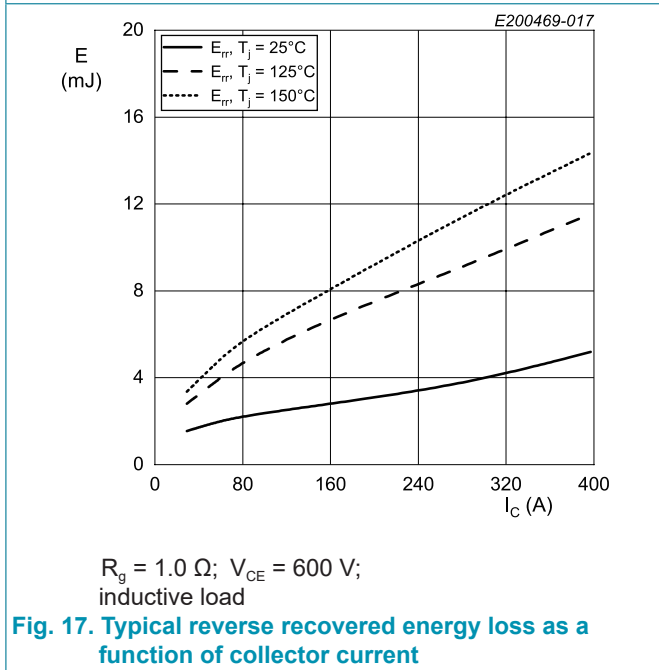
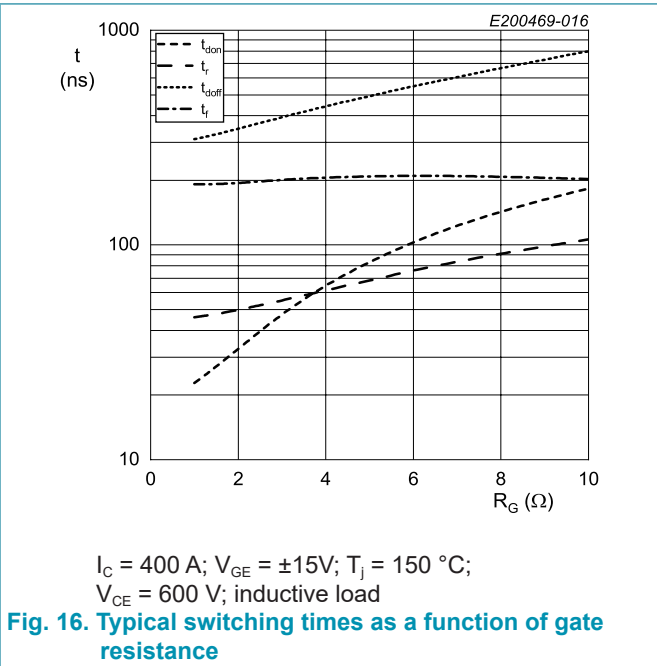
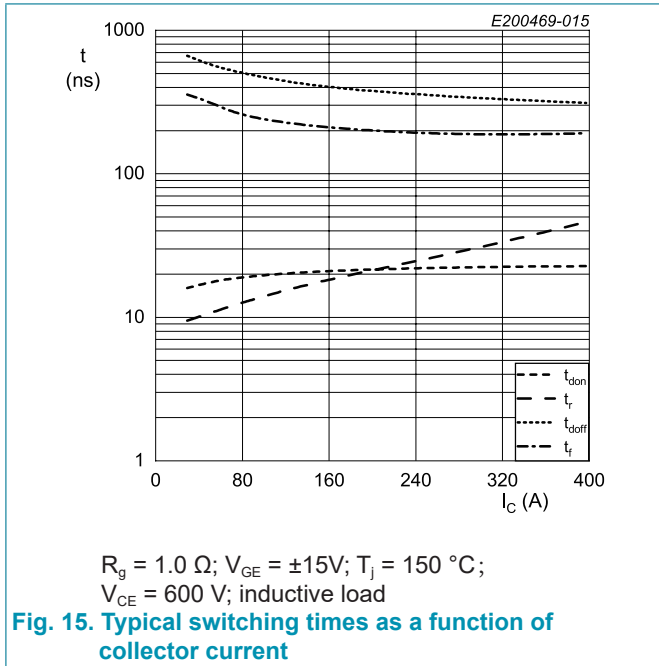


Fig. 10. Typical Transient thermal impedance Diode

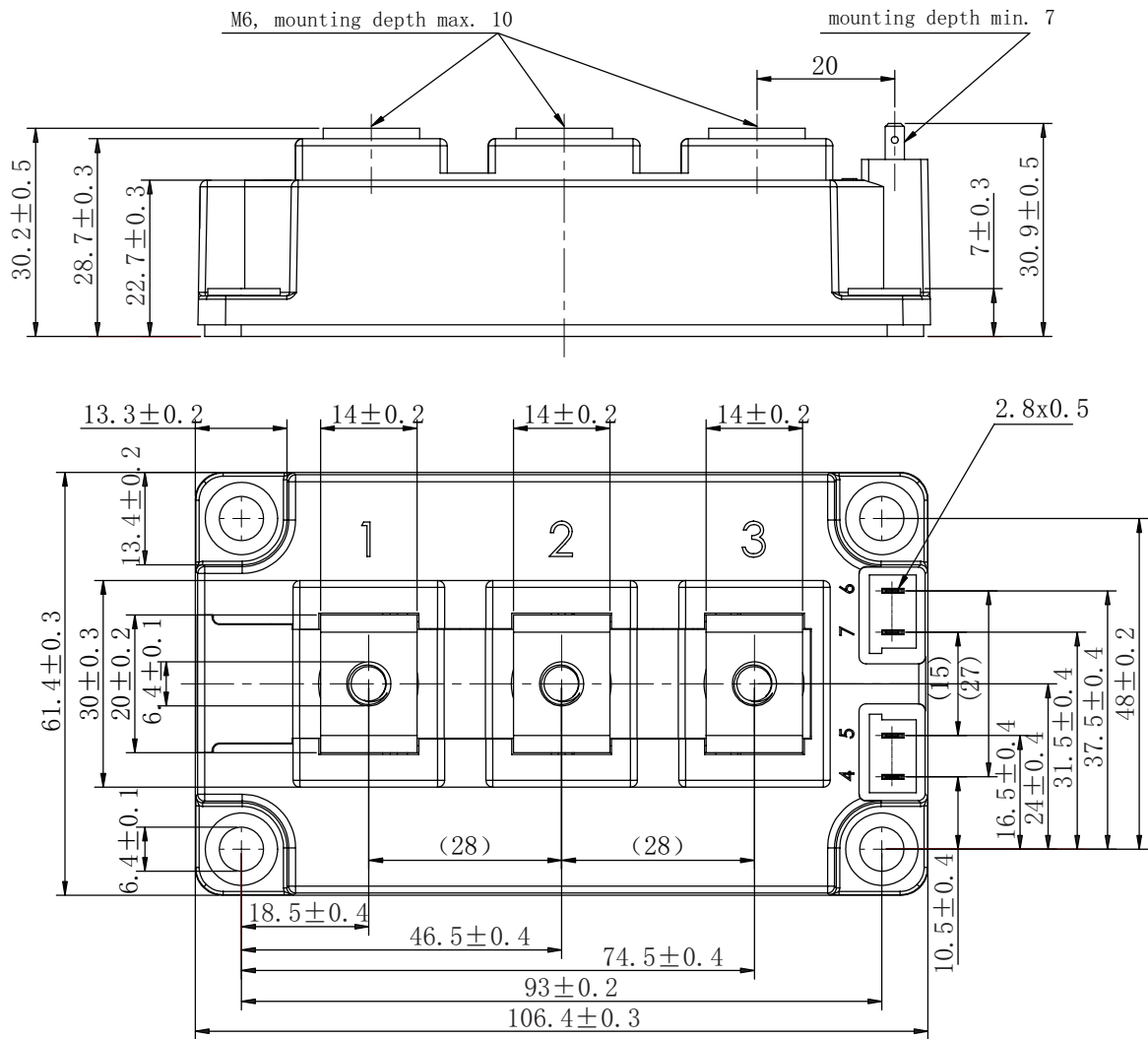




10. Package outline

Package Outline

Dimensions in mm



## 11. 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.
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