



GP350MHB06S

Half Bridge IGBT Module

Replaces January 2000 version, DS4923-4.0

DS4923-5.0 October 2001

FEATURES

- n - Channel
- High Switching Speed
- Low Forward Voltage Drop
- Isolated Base

APPLICATIONS

- PWM Motor Control
- UPS

The Powerline range of modules includes half bridge, chopper, dual and single switch configurations covering voltages from 600V to 3300V and currents up to 2400A.

The GP350MHB06S is a half bridge 600V n channel enhancement mode insulated gate bipolar transistor (IGBT) module. The module is suitable for a variety of medium voltage applications in motor drives and power conversion.

The IGBT has a wide reverse bias safe operating area (RBSOA) for ultimate reliability in demanding applications.

These modules incorporate electrically isolated base plates and low inductance construction enabling circuit designers to optimise circuit layouts and utilise earthed heat sinks for safety.

Typical applications include dc motor drives, ac pwm drives and ups systems.

ORDERING INFORMATION

Order as: **GP350MHB06S**

Note; When ordering, use complete part number.

KEY PARAMETERS

V_{CES}		600V
$V_{CE(sat)}$	(typ)	2.0V
I_{C25}	(max)	500A
I_{C75}	(max)	350A
$I_{C(PK)}$	(max)	1000A

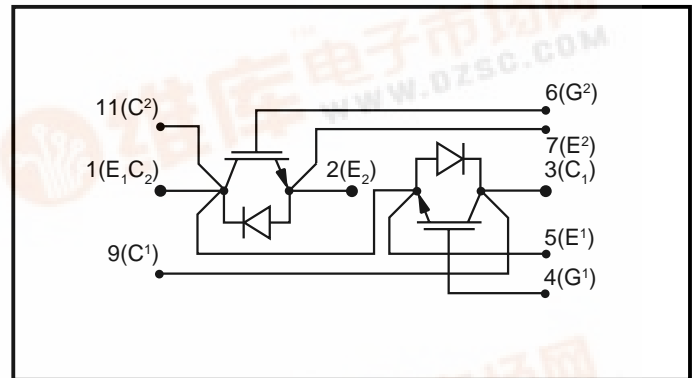


Fig. 1 Half bridge circuit diagram

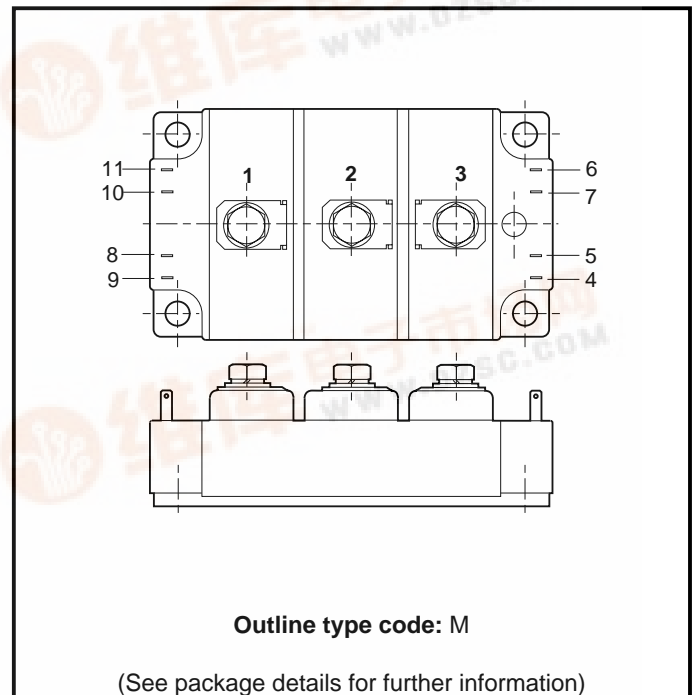


Fig. 2 Electrical connections - (not to scale)

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.



ABSOLUTE MAXIMUM RATINGS - PER ARM

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{GE} = 0V$	600	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Collector current	DC, $T_{case} = 25^{\circ}\text{C}$	500	A
		DC, $T_{case} = 75^{\circ}\text{C}$	350	A
$I_{C(PK)}$		1ms, $T_{case} = 25^{\circ}\text{C}$	1000	A
		1ms, $T_{case} = 75^{\circ}\text{C}$	700	A
P_{max}	Maximum power dissipation	(Transistor)	1750	W
V_{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor	DC junction to case per arm	-	70	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance - diode	DC junction to case	-	160	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance - Case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	15	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor	-	150	$^{\circ}\text{C}$
		Diode	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	- 40	125	$^{\circ}\text{C}$
-	Screw torque	Mounting - M6	-	5	Nm
		Electrical connections - M6	-	5	Nm

ELECTRICAL CHARACTERISTICS
 $T_j = 25^\circ\text{C}$ unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$	-	-	2	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$	-	-	-	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 1	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 10\text{mA}, V_{GE} = V_{CE}$	4	-	7.5	V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 350\text{A}$	-	2.0	2.6	V
		$V_{GE} = 15V, I_C = 350\text{A}, T_j = 125^\circ\text{C}$	-	2.2	2.8	V
I_F	Diode forward current	DC	-	-	215	A
I_{FM}	Diode maximum forward current	$t_p = 1\text{ms}$	-	-	700	A
V_F	Diode forward voltage	$I_F = 350\text{A}$,	-	1.51	2.31	V
		$I_F = 350\text{A}, T_j = 125^\circ\text{C}$	-	1.5	2.3	V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$	-	22500	-	pF

INDUCTIVE SWITCHING CHARACTERISTICS

 $T_j = 25^\circ\text{C}$ unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 350\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 50\% V_{CES}$ $R_{G(\text{ON})} = R_{G(\text{OFF})} = 5\Omega$ $L \sim 100\text{nH}$	-	730	-	ns
t_f	Fall time		-	250	-	ns
E_{OFF}	Turn-off energy loss		-	26	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	320	-	ns
t_r	Rise time		-	150	-	ns
E_{ON}	Turn-on energy loss		-	10	-	mJ
t_{rr}	Diode reverse recovery time	$I_F = 350\text{A}$	-	190	-	ns
Q_{rr}	Diode reverse recovery charge	$V_R = 50\% V_{CES}, dI_F/dt = 1000\text{A}/\mu\text{s}$	-	12	-	μC

 $T_j = 125^\circ\text{C}$ unless stated otherwise.

$t_{d(\text{off})}$	Turn-off delay time	$I_C = 350\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 50\% V_{CES}$ $R_{G(\text{ON})} = R_{G(\text{OFF})} = 5\Omega$ $L \sim 100\text{nH}$	-	910	-	ns
t_f	Fall time		-	490	-	ns
E_{OFF}	Turn-off energy loss		-	40	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	380	-	ns
t_r	Rise time		-	250	-	ns
E_{ON}	Turn-on energy loss		-	35	-	mJ
t_{rr}	Diode reverse recovery time	$I_F = 350\text{A}$	-	280	-	ns
Q_{rr}	Diode reverse recovery charge	$V_R = 50\% V_{CES}, dI_F/dt = 1000\text{A}/\mu\text{s}$	-	18	-	μC

TYPICAL CHARACTERISTICS

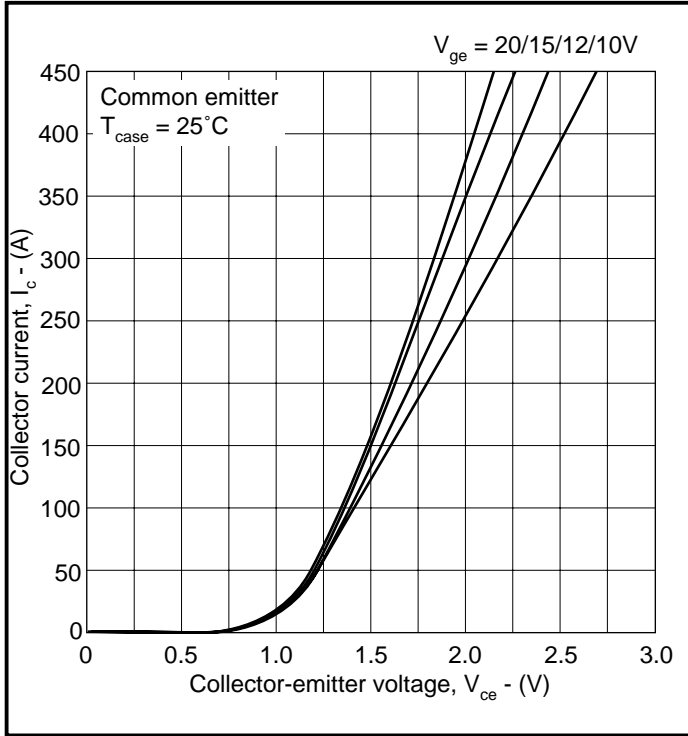


Fig.3 Typical output characteristics

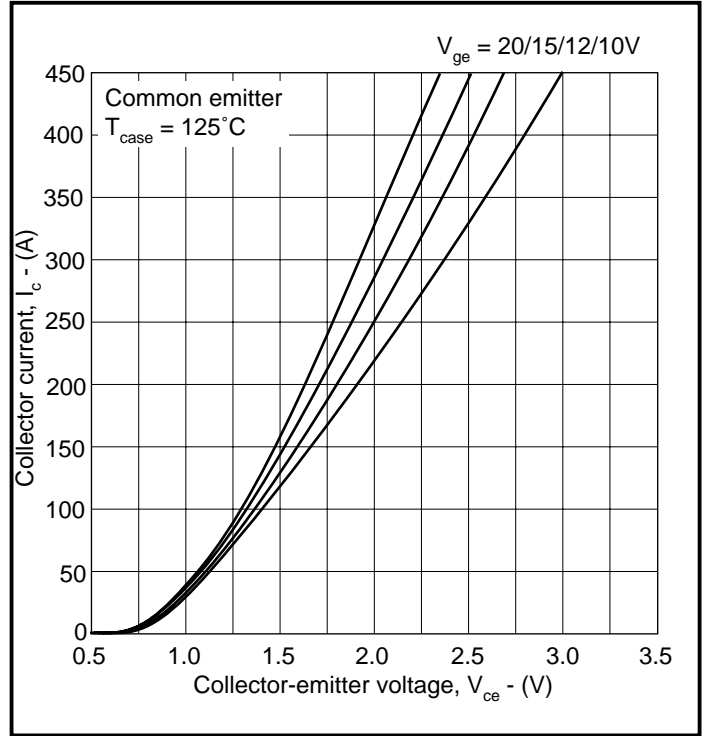


Fig.4 Typical output characteristics

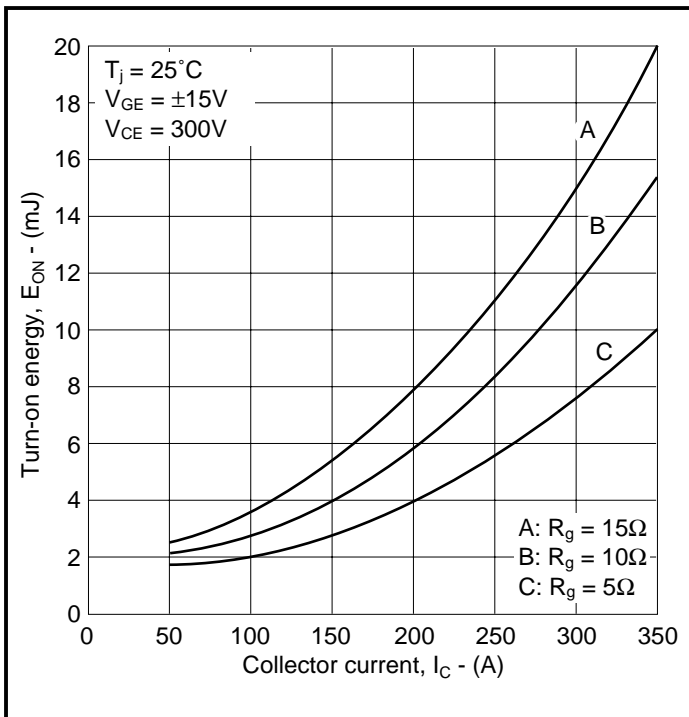


Fig.5 Typical turn-on energy vs collector current

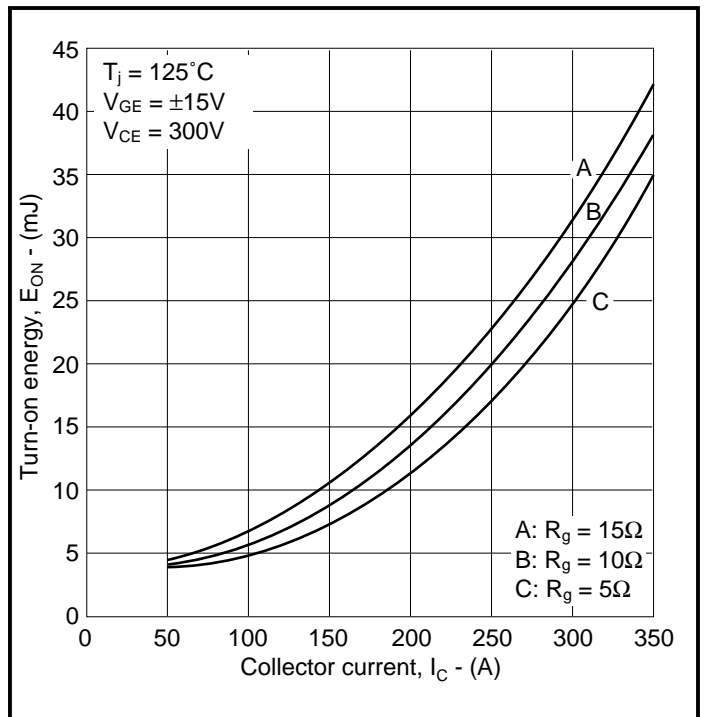


Fig.6 Typical turn-on energy vs collector current

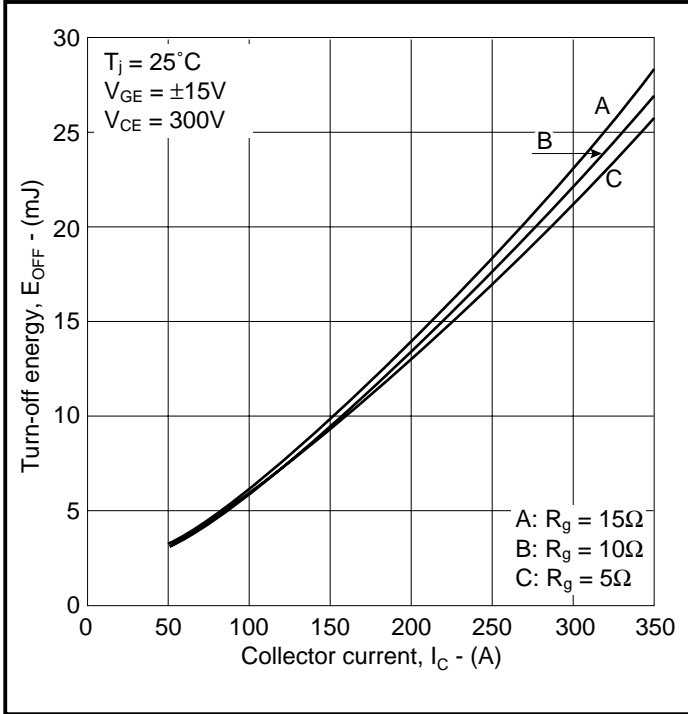


Fig.7 Typical turn-off energy vs collector current

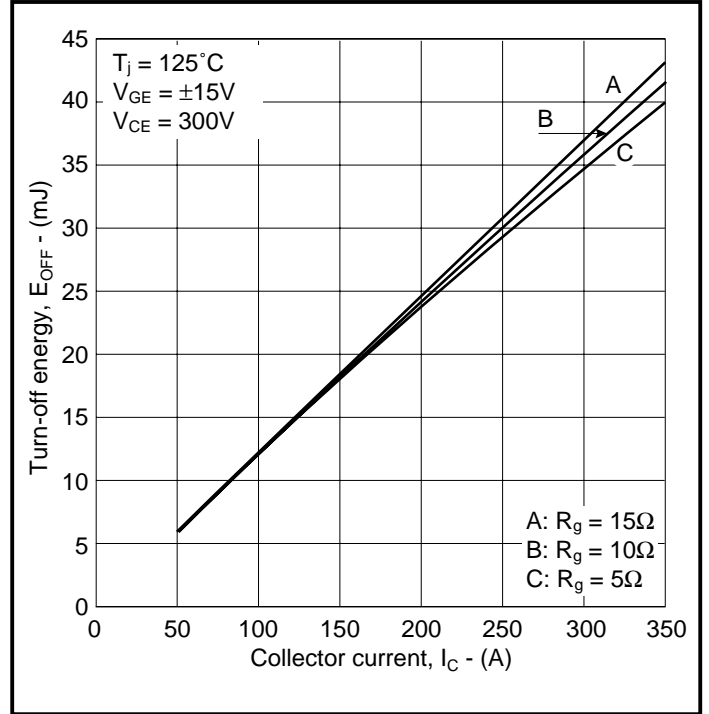


Fig.8 Typical turn-off energy vs collector current

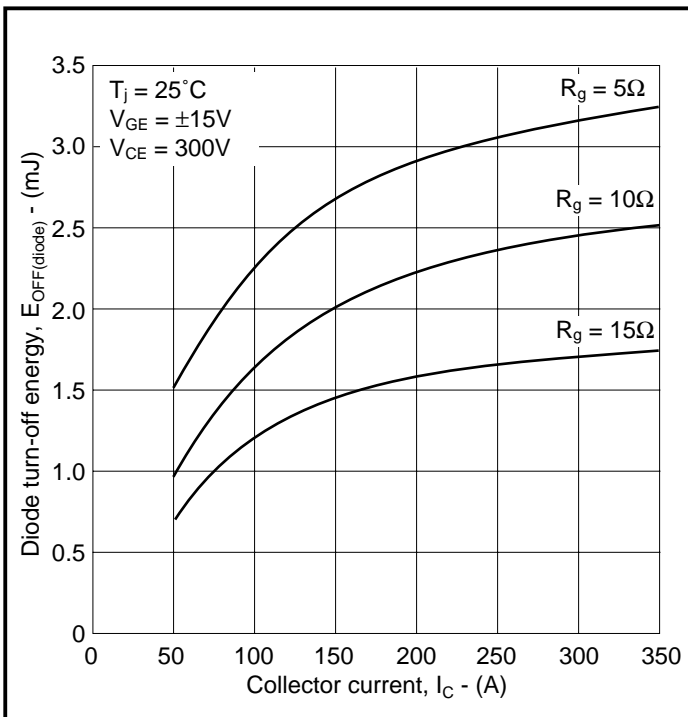


Fig.9 Typical diode turn-off energy vs collector current

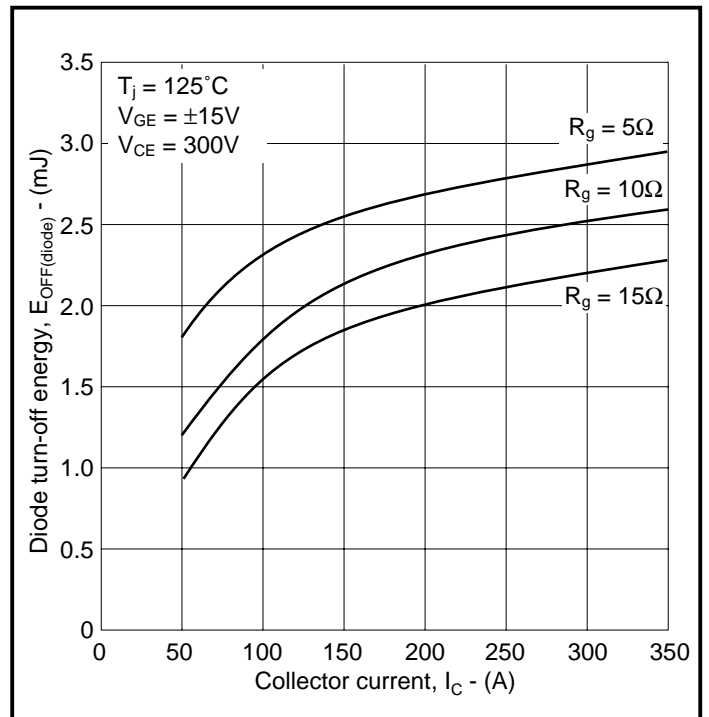


Fig.10 Typical diode turn-off energy vs collector current

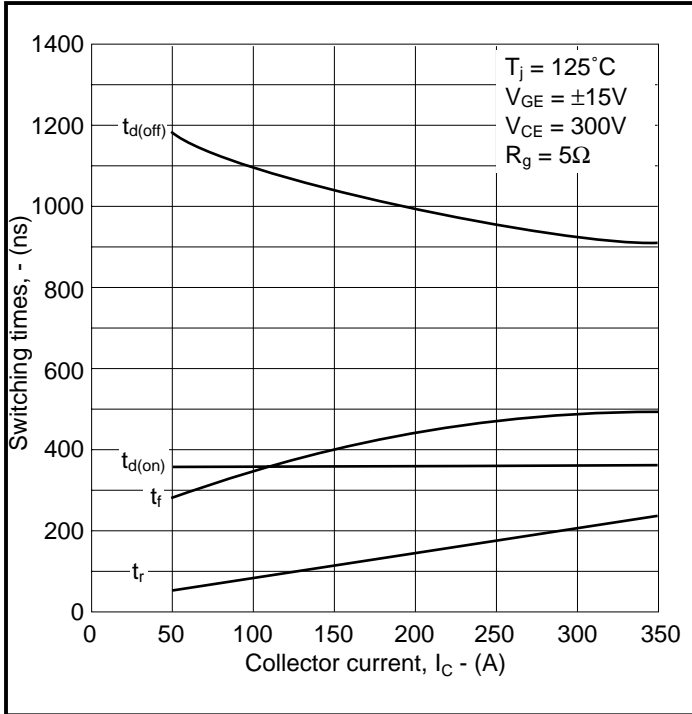


Fig.11 Typical switching characteristics

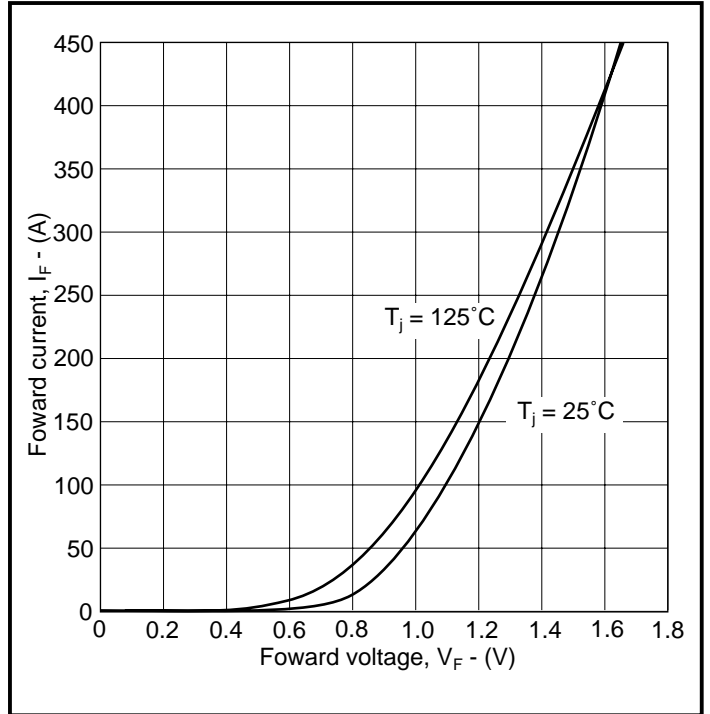


Fig.12 Diode typical forward characteristics

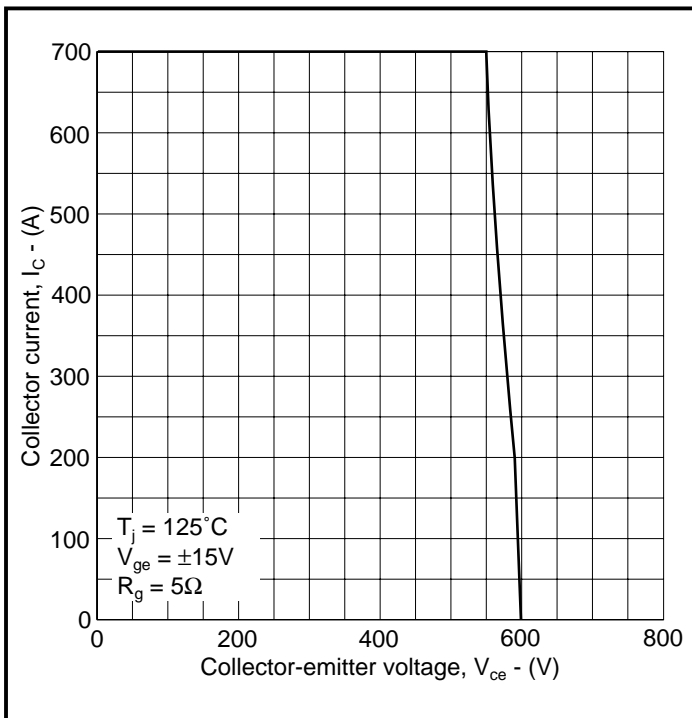


Fig.13 Reverse bias safe operating area

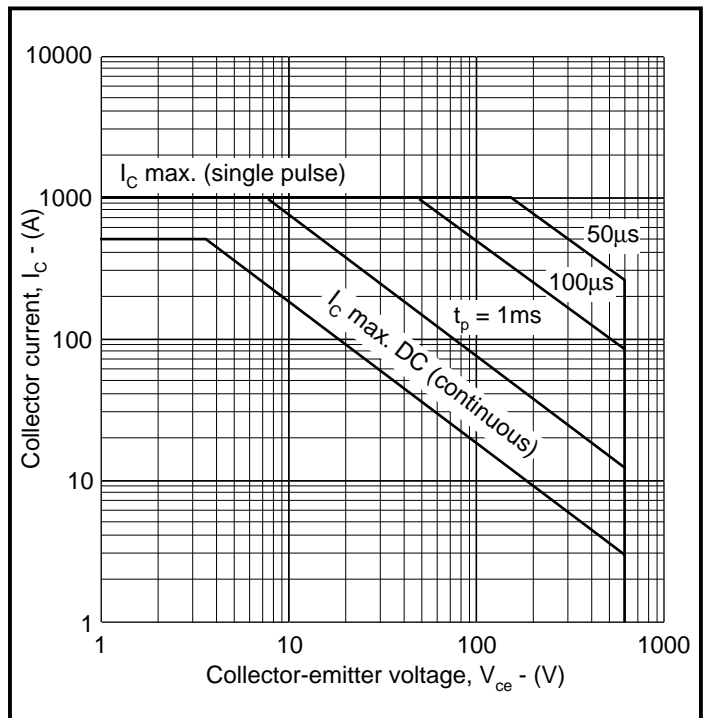


Fig.14 Forward bias safe operating area

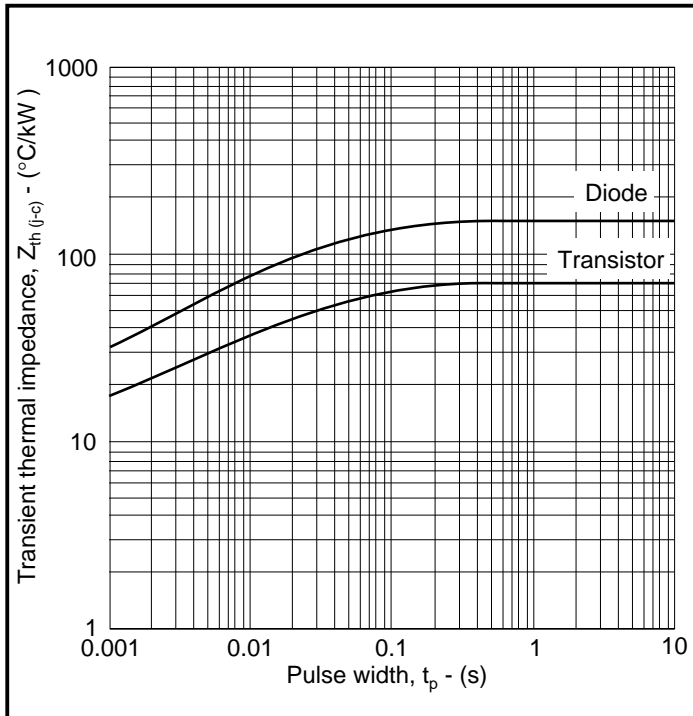
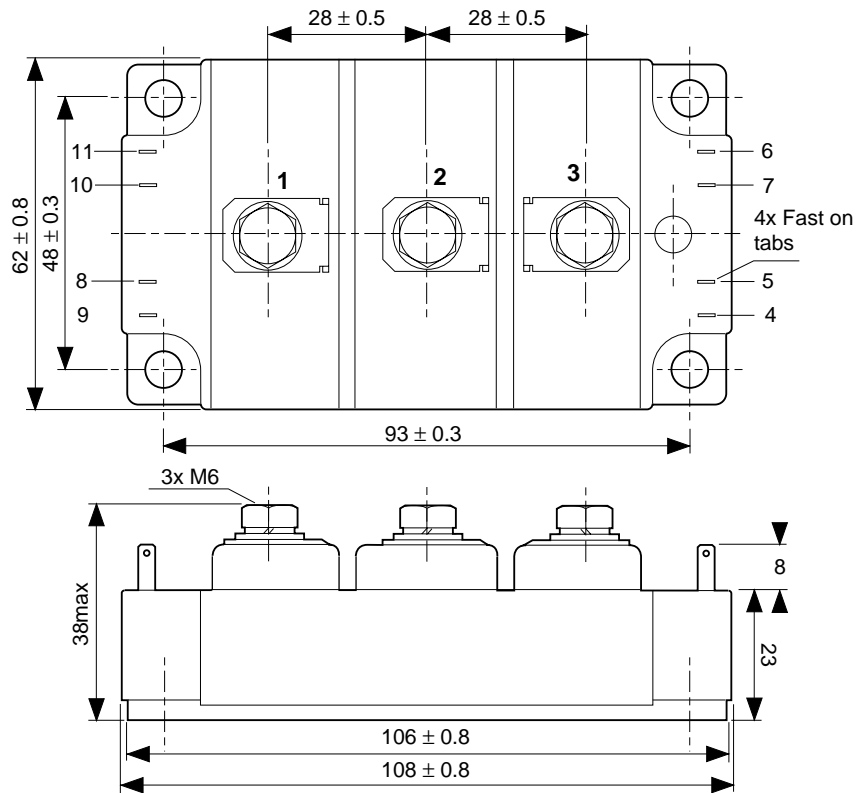


Fig.15 Transient thermal impedance

PACKAGE DETAILS

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



Nominal weight: 270g
 Recommended fixings for mounting: M6
 Recommended mounting torque: 5Nm (44lbs.ins)
 Recommended torque for electrical connections (M6): 5Nm (44lbs.ins)

Module outline type code: M



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Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.

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