GP200MHB12S

Powerline N-Channel IGBT Module

Advance Information

Supersedes July 1996 version, DS4339 - 4.2

DS4339 - 5.2 May 1998

The GP200MHB12S is a single switch 1200V, robust n channel enhancement mode insulated gate bipolar transistor (IGBT) module. Designed for low power loss, the module is suitable for a variety of medium voltage applications in motor drives and power conversion. The high impedance gate simplifies gate drive considerations enabling operation directly from low power control circuitry.

Fast switching times allow high frequency operation making the device suitable for the latest drive designs employing pwm and high frequency switching. the igbt is fully short circuit rated and has a wide reverse bias safe operating area (RBSOA) for ultimate reliability in demanding applications.

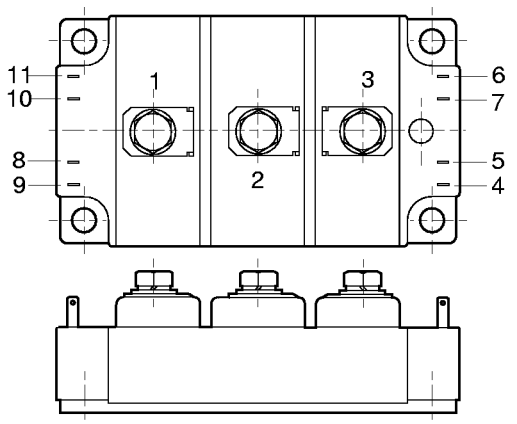
These modules incorporate electrically isolated base plates and low inductance construction enabling circuit designers to optimise circuit layouts and utilise earthed heat sinks for safety.

The powerline range of high power modules includes dual and single switch configurations with a range of current and voltage capabilities to match customer system demands.

Typical applications include dc motor drives, ac pwm drives, traction auxiliaries, ups systems and resonant inverters.

KEY PARAMETERS

V_{CES}		1200V
$V_{CE(sat)}$	(typ)	3.2V
$I_{C(CONT)}$	(max)	220A
$I_{C(PK)}$	(max)	440A
t_{sc}	(max)	10µs



Outline type code: M

(See package outline for further information)

Fig. 1 Electrical connections - (not to scale)

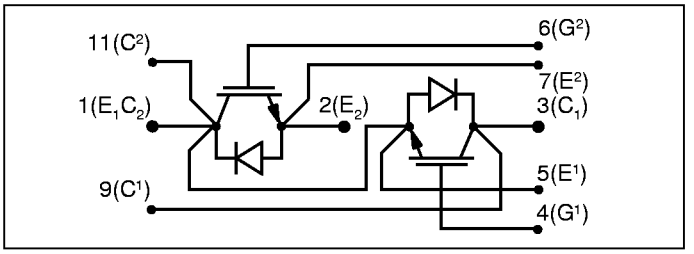


Fig.2 Half bridge circuit diagram

FEATURES

- n - Channel.
- High Input Impedance.
- High Switching Speed.
- Low Forward Voltage Drop.
- Isolated Base.
- Short Circuit Capability (10µs).

APPLICATIONS

- High Power Switching.
- Motor Control.
- UPS.
- AC And DC Servo Drive Amplifiers.

ORDERING INFORMATION

GP200MHB12S

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to Absolute Maximum Ratings for extended periods may affect device reliability.

T_{case} = 25˚C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	V_{GE} = 0V	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Collector current	DC, T_{case} = 25˚C	220	A
		DC, T_{case} = 75˚C	150	A
$I_{C(PK)}$		1ms, T_{case} = 25˚C	440	A
		1ms, T_{case} = 75˚C	300	A
P_{max}	Maximum power dissipation	(Transistor)	1250	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	-	100	°C/kW
$R_{th(j-c)}$	Thermal resistance - diode	DC junction to case -	-	240	°C/kW
$R_{th(c-h)}$	Thermal resistance - Case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	15	°C/kW
T_j	Junction temperature	Transistor	-	150	°C
		Diode	-	125	°C
T_{stg}	Storage temperature range	-	- 40	125	°C
-	Screw torque	Mounting - M6	-	5	Nm
		Electrical connections - M6	-	5	Nm

ELECTRICAL CHARACTERISTICS

T_j = 25˚C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	V_{GE} = 0V, V_{CE} = V_{CES}	-	-	10	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_j = 125˚C	-	-	45	mA
I_{GES}	Gate leakage current	V_{GE} = ±20V, V_{CE} = 0V	-	-	1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 10mA, V_{GE} = V_{CE}	4	-	7.5	V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 200A	-	3.2	3.8	V
		V_{GE} = 15V, I_C = 200A, T_{case} = 125˚C	-	3.4	4.0	V
I_F	Diode forward current	DC	-	-	200	A
I_{FM}	Diode maximum forward current	t_p = 1ms	-	-	400	A
V_F	Diode forward voltage	I_F = 200A,	-	1.6	2.2	V
		I_F = 200A, T_j = 125˚C	-	1.5	2.1	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	27000	-	pF

INDUCTIVE SWITCHING CHARACTERISTICS

For definition of switching waveforms, refer to figure 3 and 4.

T_j = 25˚C unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{d(off)}$	Turn-off delay time	I_C = 200A V_{GE} = ±15V V_{CE} = 50% V_{CES} $R_{G(ON)}$ = $R_{G(OFF)}$ = 5Ω L ~ 100nH	-	600	-	ns
t_f	Fall time		-	750	-	ns
E_{OFF}	Turn-off energy loss		-	30	-	mJ
$t_{d(on)}$	Turn-on delay time		-	280	-	ns
t_r	Rise time		-	120	-	ns
E_{ON}	Turn-on energy loss		-	30	-	mJ
t_{rr}	Diode reverse recovery time	I_F = 200A V_R = 50%V_{CES}, dI_F/dt = 1500A/µs	-	185	-	ns
Q_{rr}	Diode reverse recovery charge		-	25	-	µC

T_j = 125˚C unless stated otherwise.

$t_{d(off)}$	Turn-off delay time	I_C = 200A V_{GE} = ±15V V_{CE} = 50% V_{CES} $R_{G(ON)}$ = $R_{G(OFF)}$ = 5Ω L ~ 100nH	-	700	-	ns
t_f	Fall time		-	1350	-	ns
E_{OFF}	Turn-off energy loss		-	60	-	mJ
$t_{d(on)}$	Turn-on delay time		-	350	-	ns
t_r	Rise time		-	160	-	ns
E_{ON}	Turn-on energy loss		-	60	-	mJ
t_{rr}	Diode reverse recovery time	I_F = 200A V_R = 50%V_{CES}, dI_F/dt = 1500A/µs	-	300	-	ns
Q_{rr}	Diode reverse recovery charge		-	40	-	µC

SHORT CIRCUIT RATING

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_{sc}	Short circuit withstand time	T_c = 125˚C, V_{GE} = 15V, V_{CE} = 50% V_{CES}	-	-	10	µs

SWITCHING DEFINITIONS

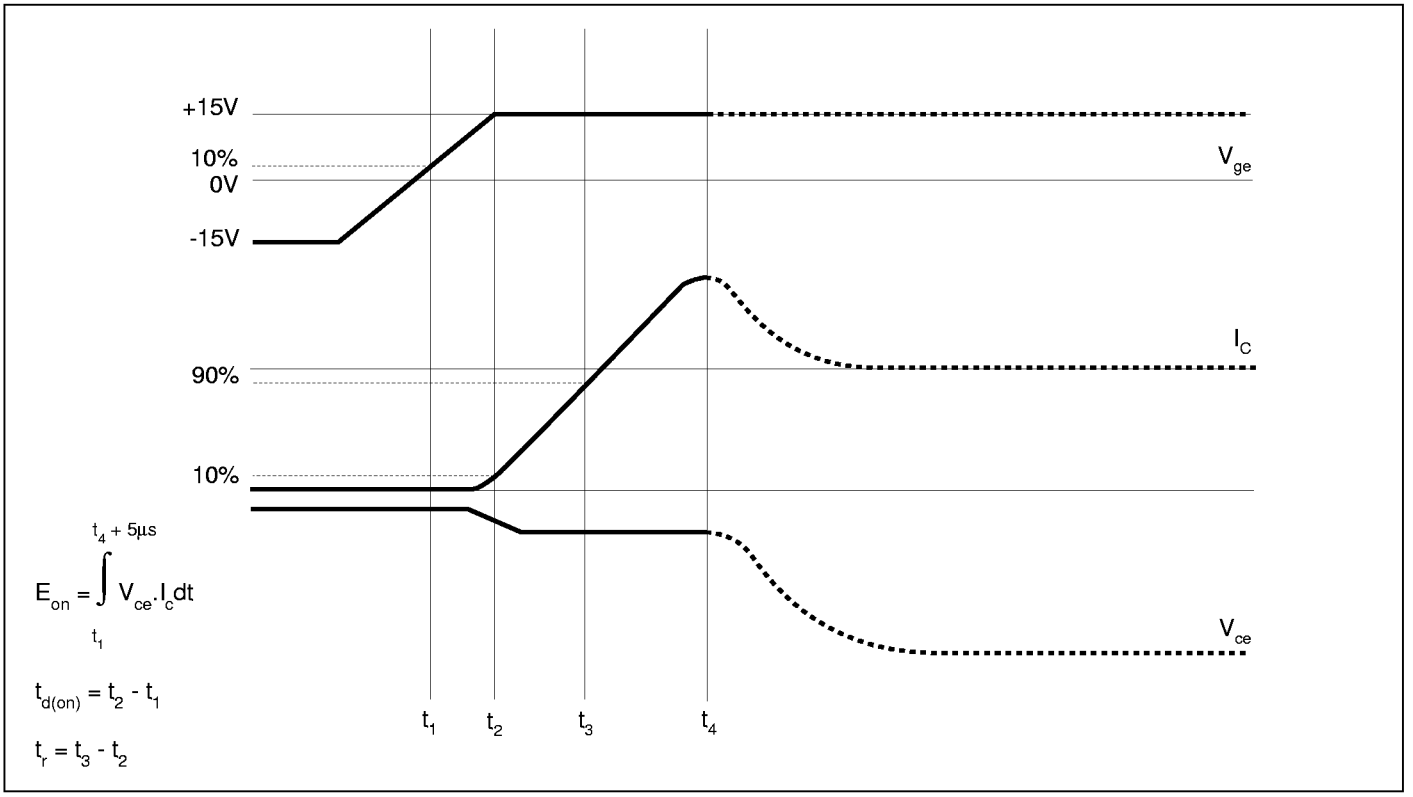


Fig.3 Definition of turn-on switching times

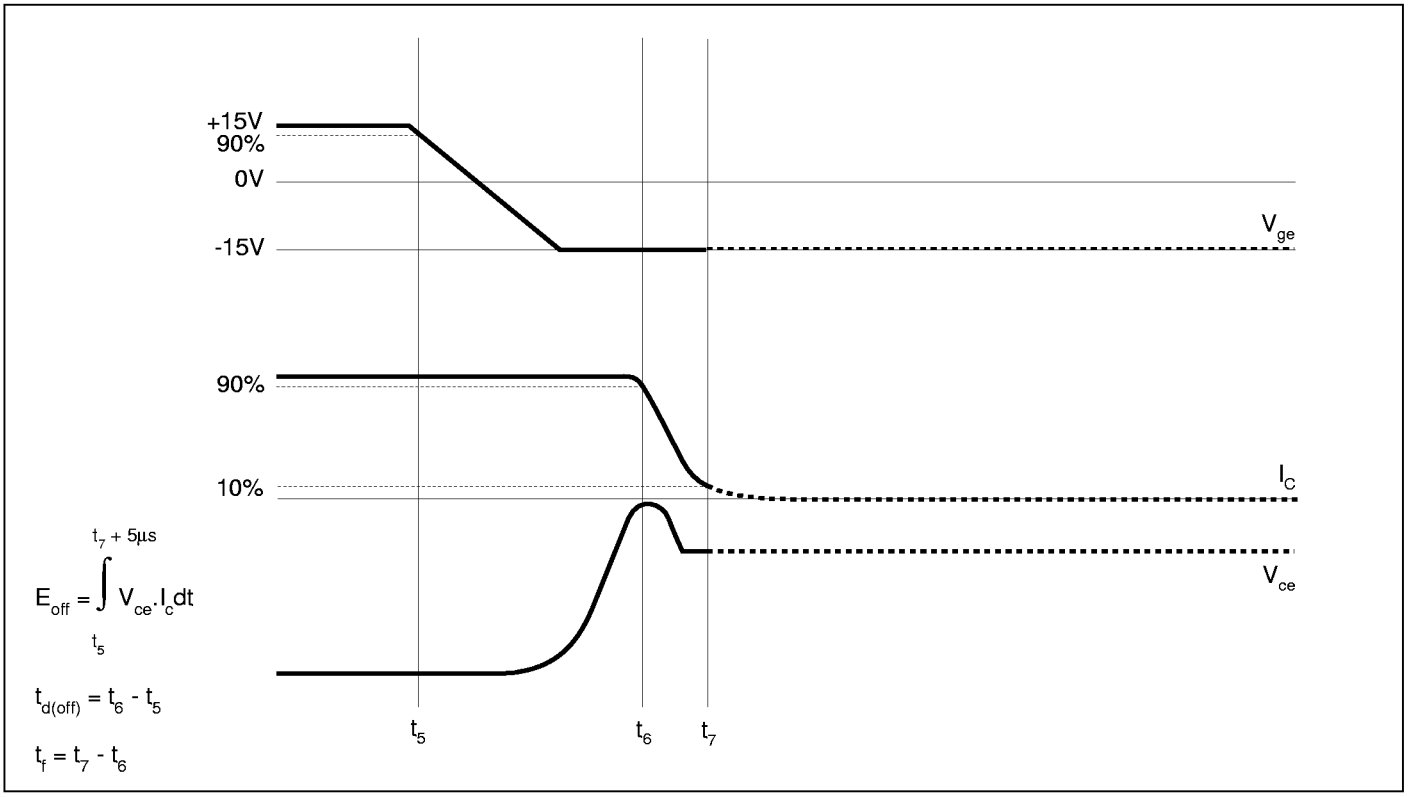


Fig.4 Definition of turn-off switching times

TYPICAL CHARACTERISTICS

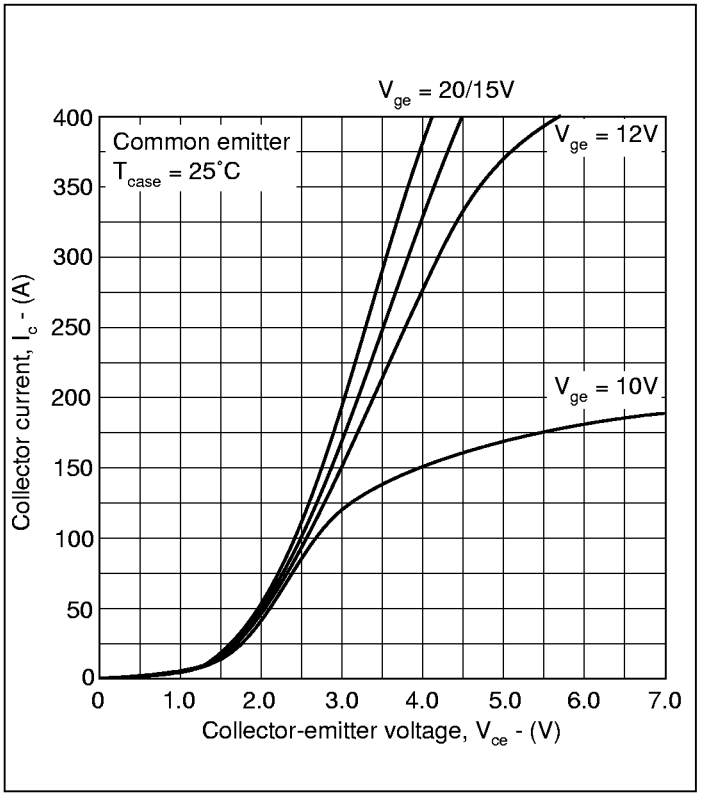


Fig.5 Typical output characteristics

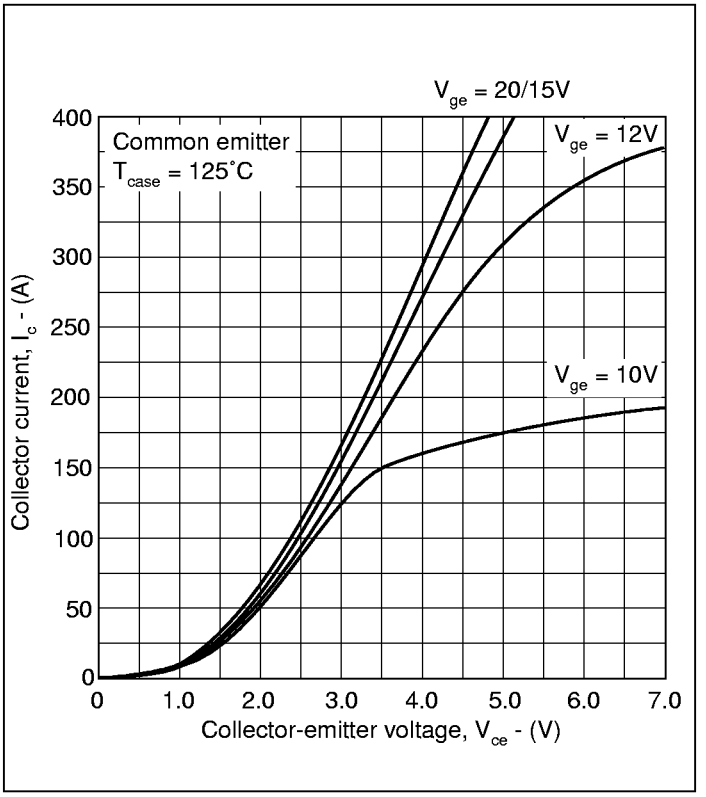


Fig.6 Typical output characteristics

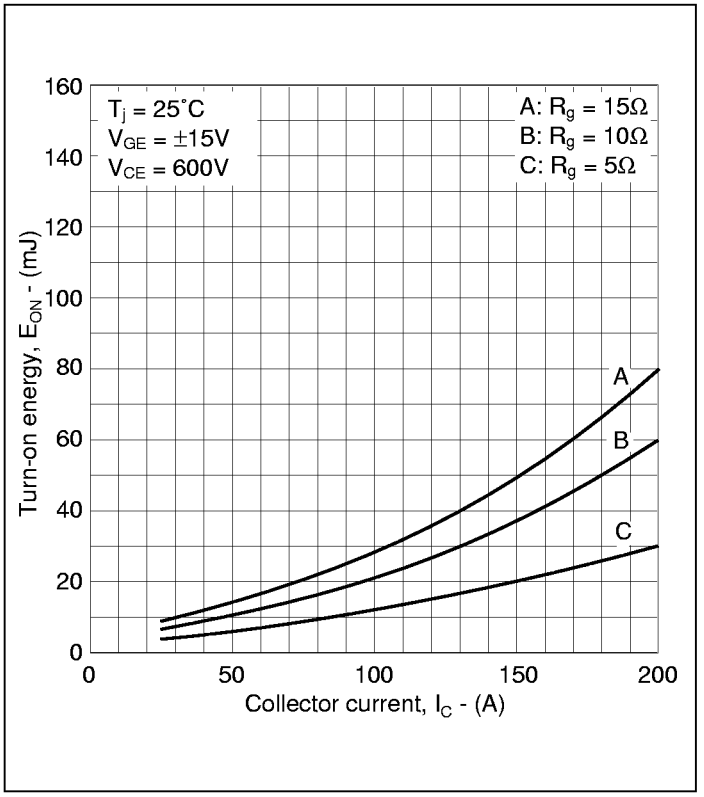


Fig.7 Typical turn-on energy vs collector current

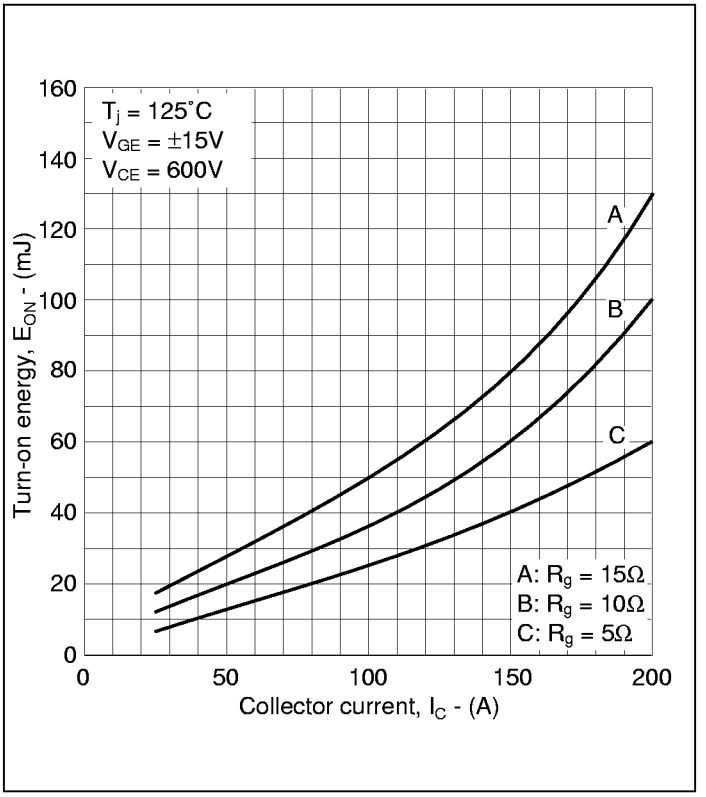


Fig.8 Typical turn-on energy vs collector current

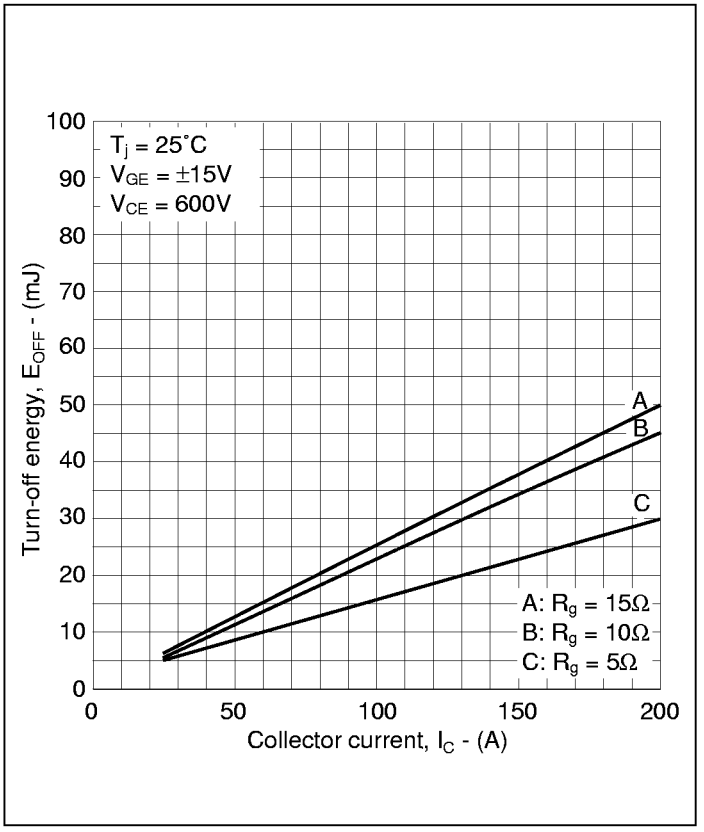


Fig.10 Typical turn-off energy vs collector current

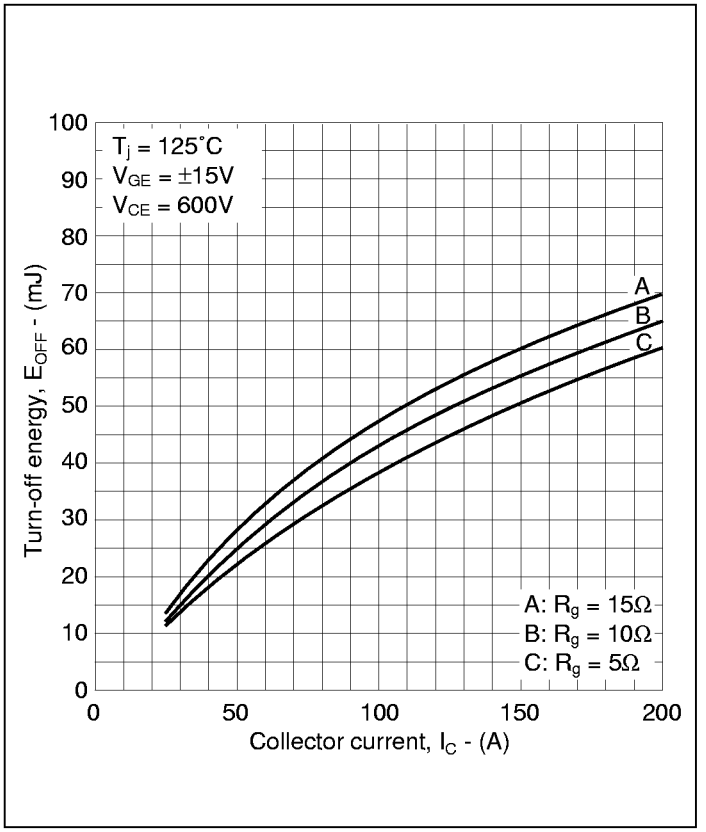


Fig.11 Typical turn-off energy vs collector current

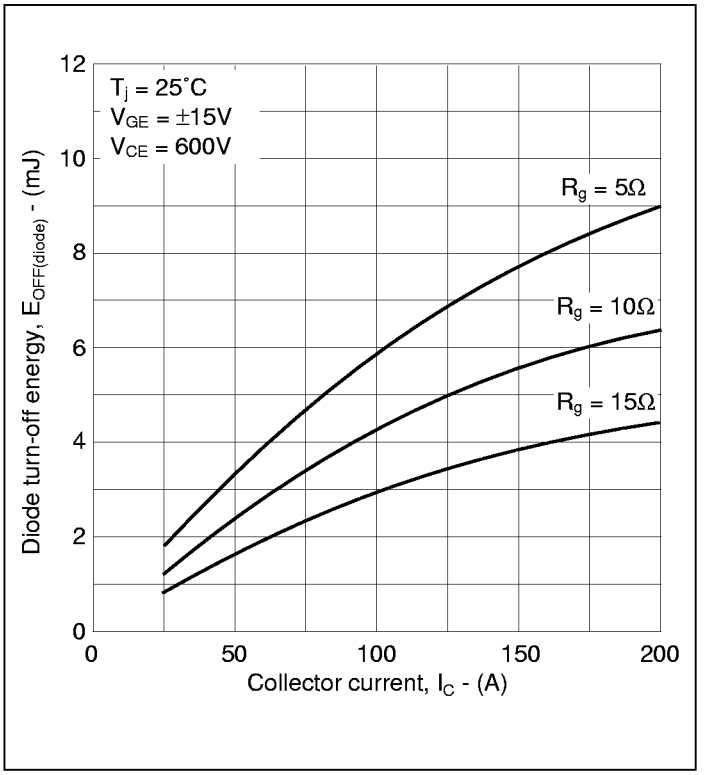


Fig.12 Typical diode turn-off energy vs collector current

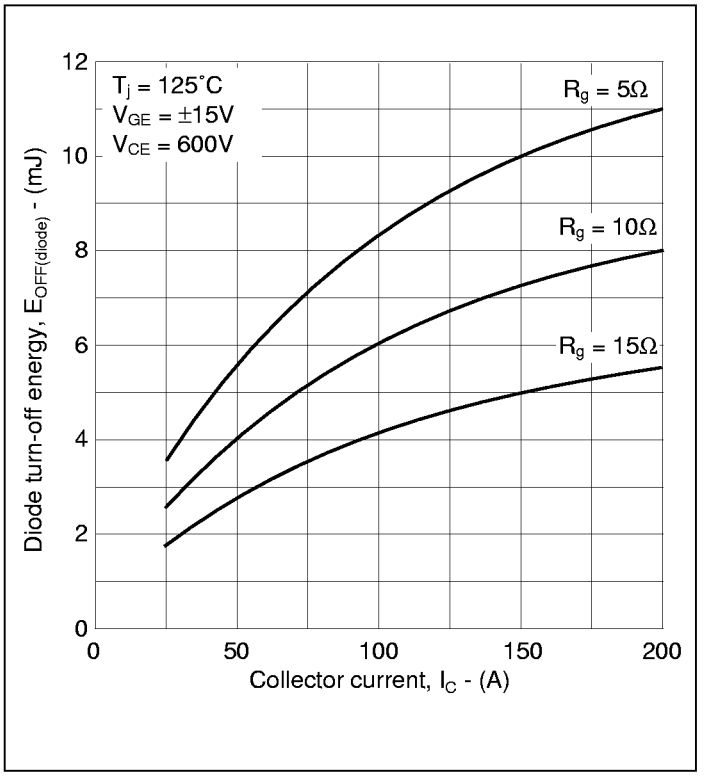


Fig.13 Typical diode turn-off energy vs collector current

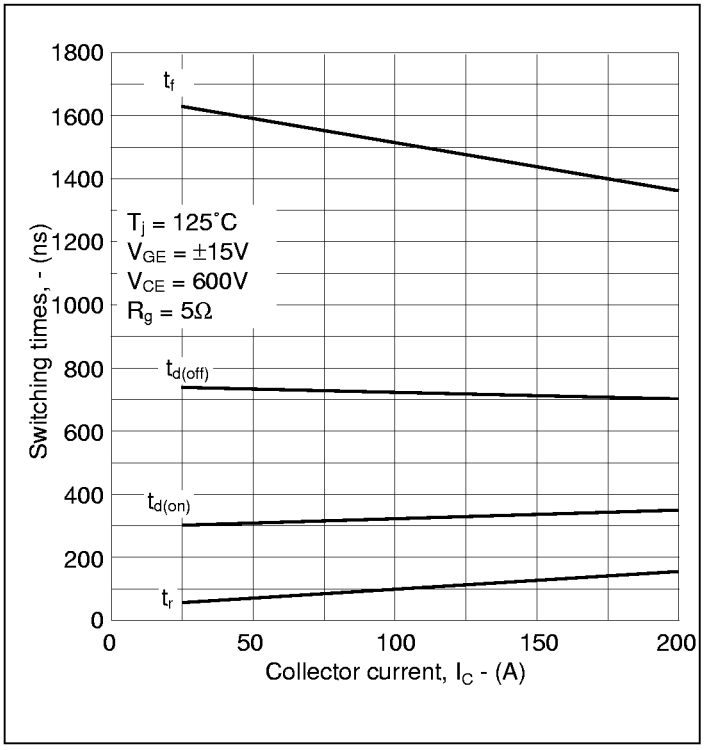


Fig.14 Typical switching characteristics

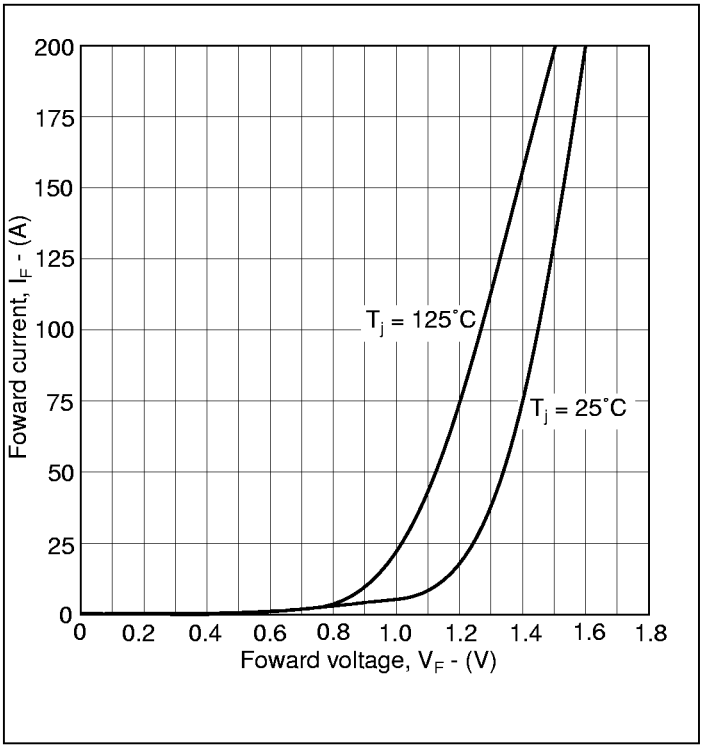


Fig.15 Diode typical forward characteristics

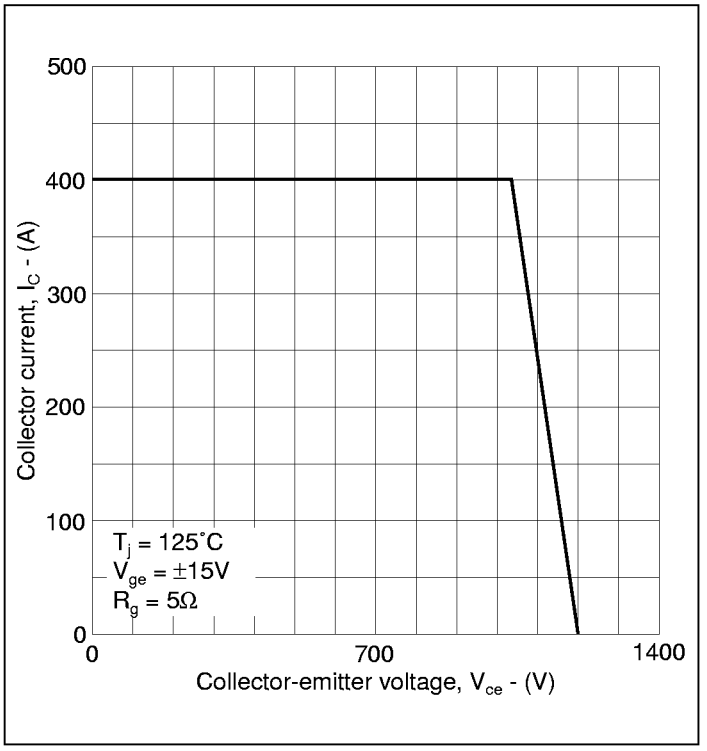


Fig.16 Reverse bias safe operating area

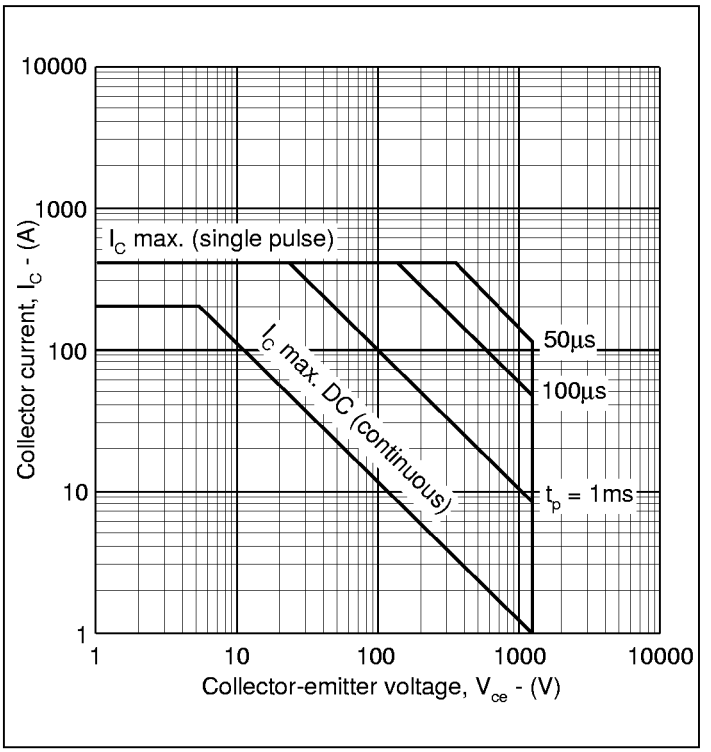


Fig.17 Forward bias safe operating area (DC and single pulse)

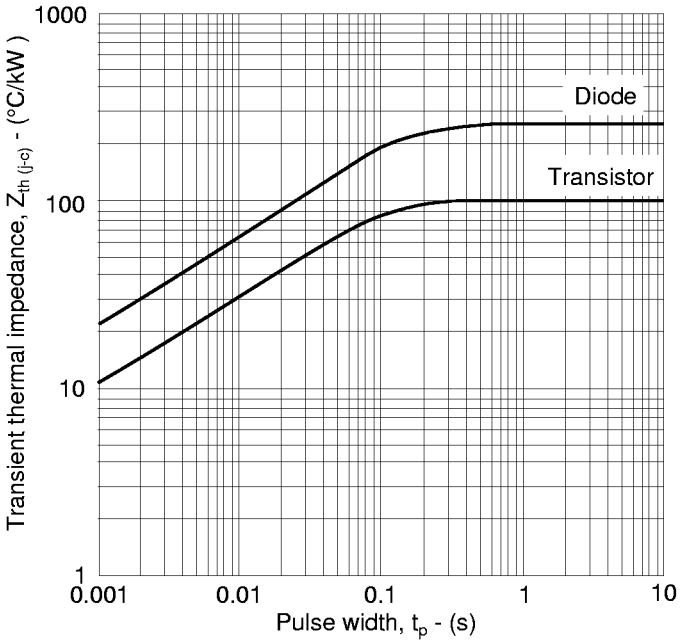
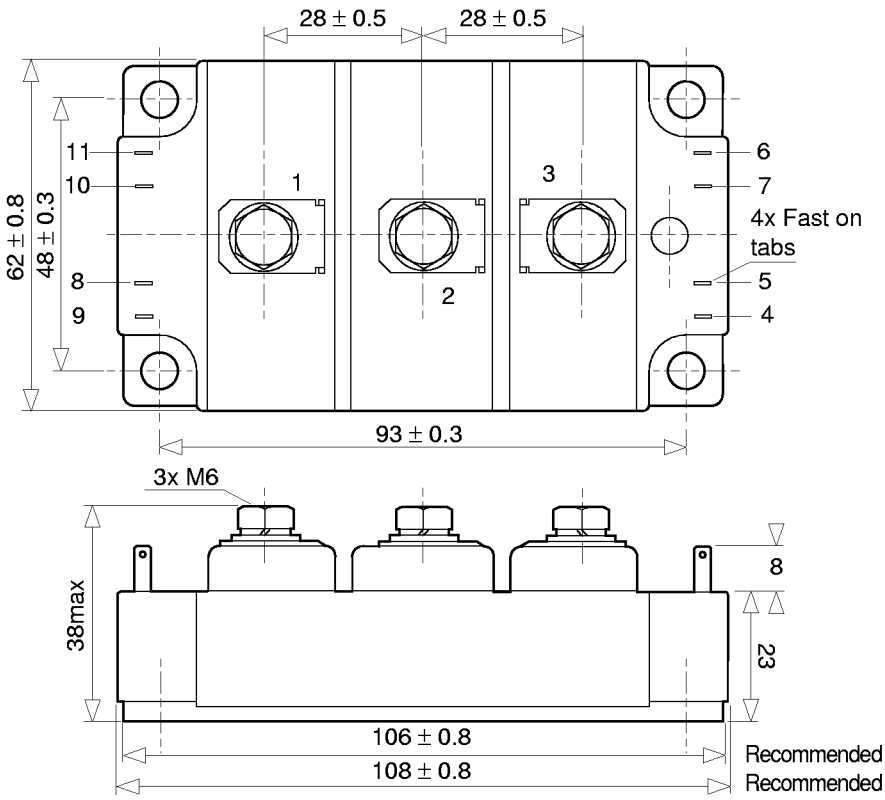


Fig.18 Transient thermal impedance

PACKAGE DETAILS - M

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



Recommended fixings for mounting:	M6
Recommended mounting torque:	5Nm (44lbs.ins)
Recommended torque for electrical connections (M6):	5Nm (44lbs.ins)
Nominal weight:	265g

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ADVANCE INFORMATION - The product design is complete and final characterisation for volume production is well in hand.