

### 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

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

\*(measured at the power busbars and not the auxiliary terminals)

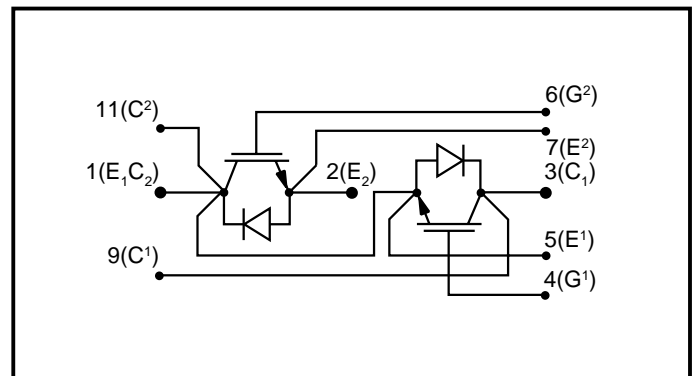


Fig. 1 Half bridge circuit diagram

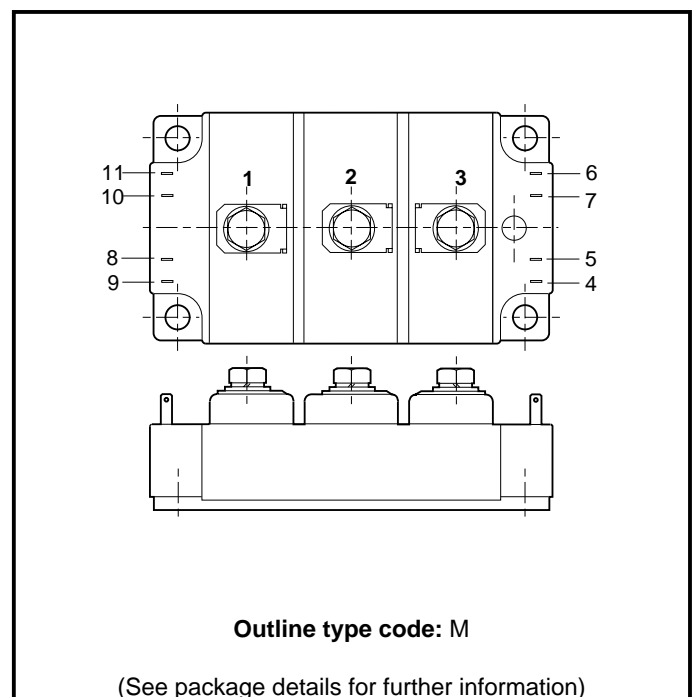


Fig. 2 Electrical connections - (not to scale)

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 <sub>CES</sub>	Collector-emitter voltage	V <sub>GE</sub> = 0V	600	V
V <sub>GES</sub>	Gate-emitter voltage	-	±20	V
I <sub>C</sub>	Collector current	DC, T <sub>case</sub> = 25°C	500	A
		DC, T <sub>case</sub> = 75°C	350	A
I <sub>C(PK)</sub>		1ms, T <sub>case</sub> = 25°C	1000	A
		1ms, T <sub>case</sub> = 75°C	700	A
P <sub>max</sub>	Maximum power dissipation	(Transistor)	1750	W
V <sub>isol</sub>	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	$^{\circ}\text{C/kW}$
$R_{th(j-c)}$	Thermal resistance - diode	DC junction to case -	-	160	$^{\circ}\text{C/kW}$
$R_{th(c-h)}$	Thermal resistance - Case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	15	$^{\circ}\text{C/kW}$
$T_j$	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	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	$\pm 1$	$\mu\text{A}$
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 10\text{mA}, V_{GE} = V_{CE}$	4	-	7.5	V
$V_{CE(SAT)}^\dagger$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 350A$	-	2.0	2.6	V
		$V_{GE} = 15V, I_C = 350A, T_j = 125^\circ\text{C}$	-	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
$V_F^\dagger$	Diode forward voltage	$I_F = 350A,$	-	1.51	2.31	V
		$I_F = 350A, T_j = 125^\circ\text{C}$	-	1.5	2.3	V
$C_{ies}$	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$	-	22500	-	pF

**Note:**

$^\dagger$  Measured at the power busbars and not the auxiliary terminals

\* L is the circuit inductance +  $L_M$

## INDUCTIVE SWITCHING CHARACTERISTICS

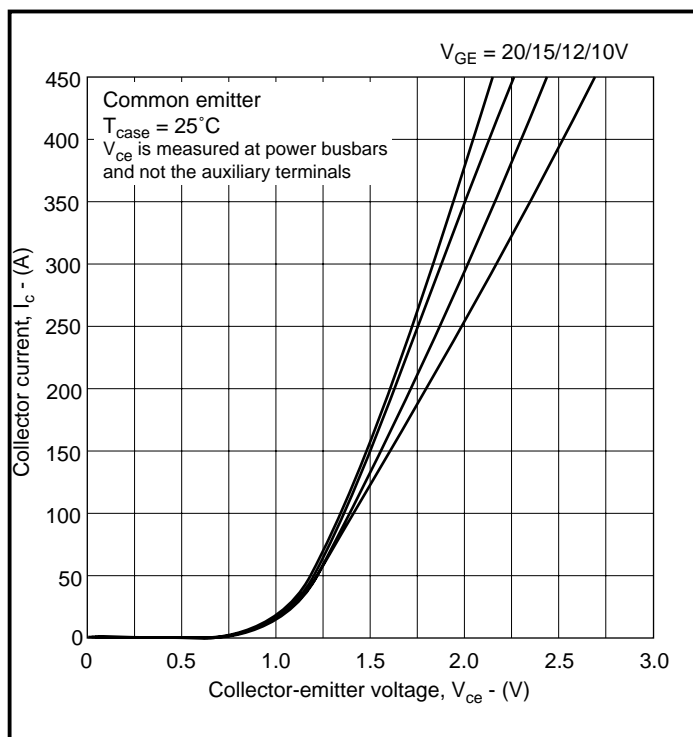
 $T_j = 25^\circ\text{C}$  unless stated otherwise

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
$E_{\text{OFF}}$	Turn-off energy loss		-	26	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	320	-	ns
$t_r$	Rise time		-	150	-	ns
$E_{\text{ON}}$	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	-	$\mu\text{C}$

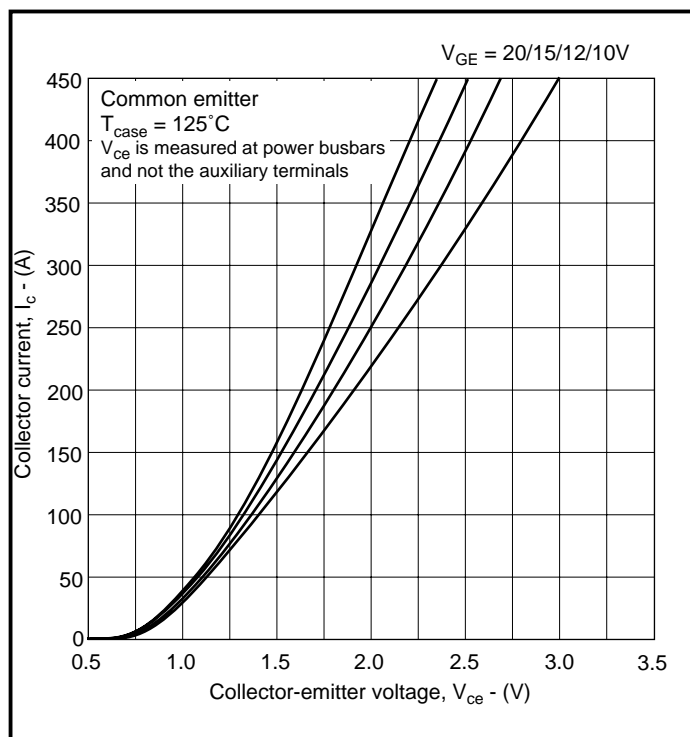
 $T_j = 125^\circ\text{C}$  unless stated otherwise.

$t_{d(\text{off})}$	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
$E_{\text{OFF}}$	Turn-off energy loss		-	40	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	380	-	ns
$t_r$	Rise time		-	250	-	ns
$E_{\text{ON}}$	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	-	$\mu\text{C}$

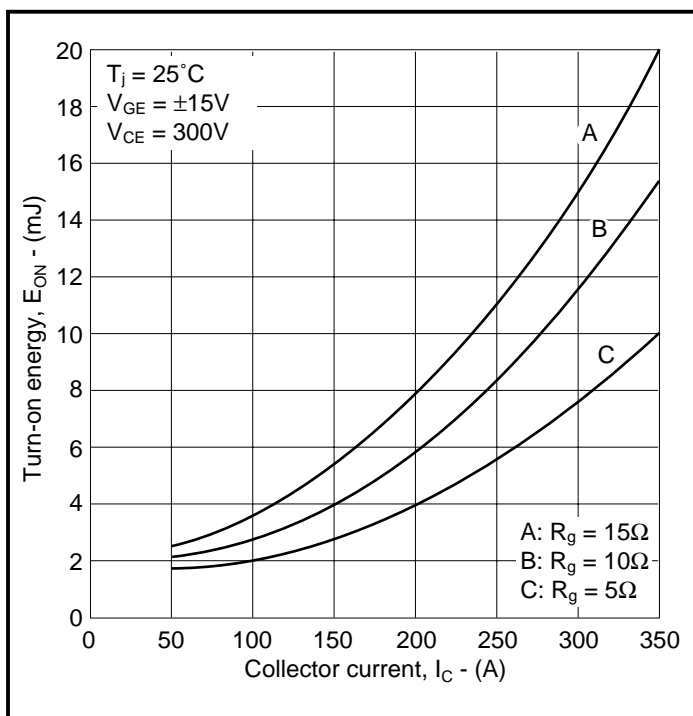
## TYPICAL CHARACTERISTICS



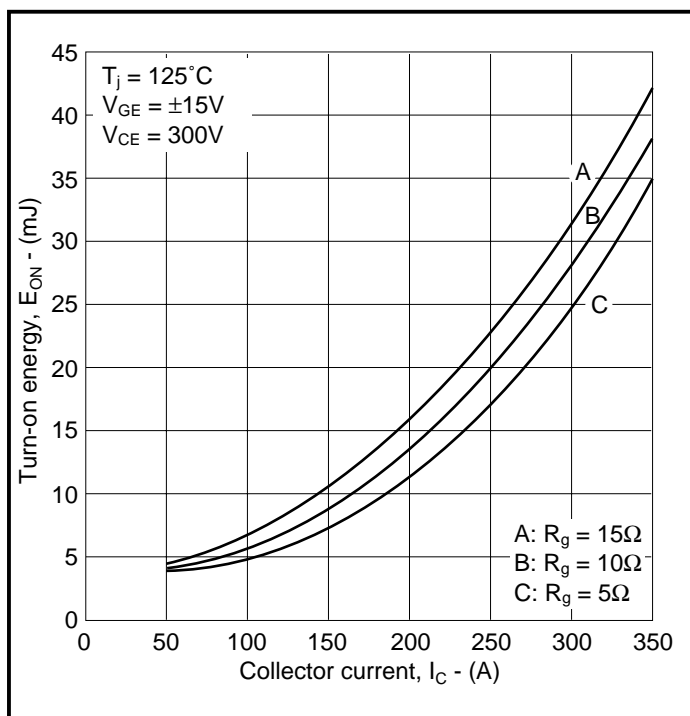
**Fig.3 Typical output characteristics**



**Fig.4 Typical output characteristics**



**Fig.5 Typical turn-on energy vs collector current**



**Fig.6 Typical turn-on energy vs collector current**

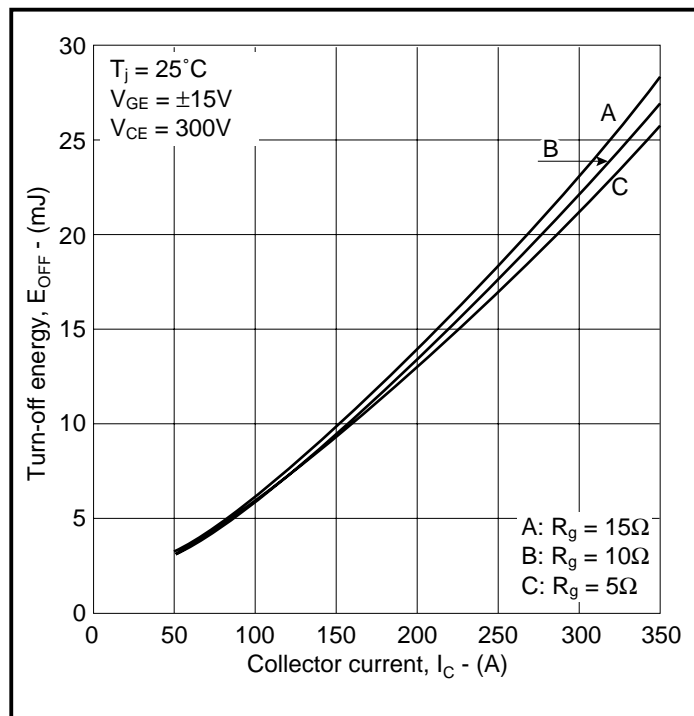


Fig.7 Typical turn-off energy vs collector current

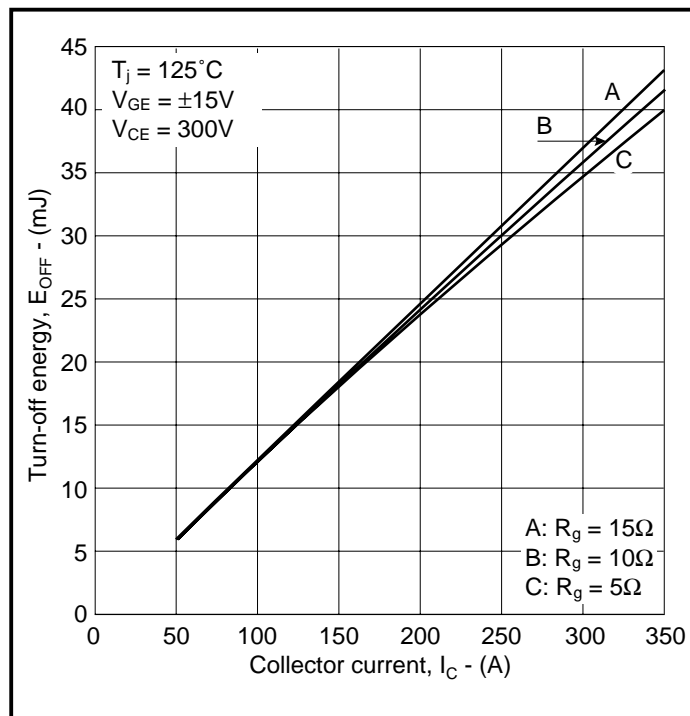


Fig.8 Typical turn-off energy vs collector current

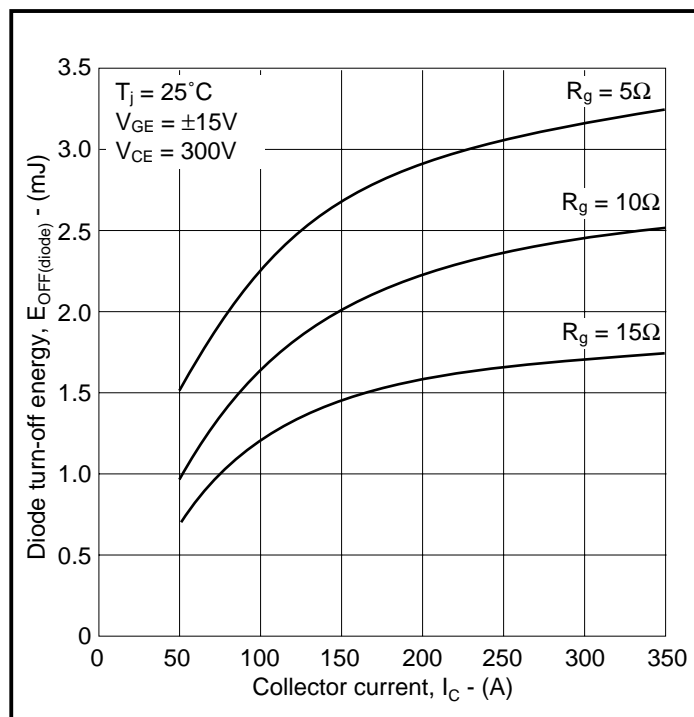


Fig.9 Typical diode turn-off energy vs collector current

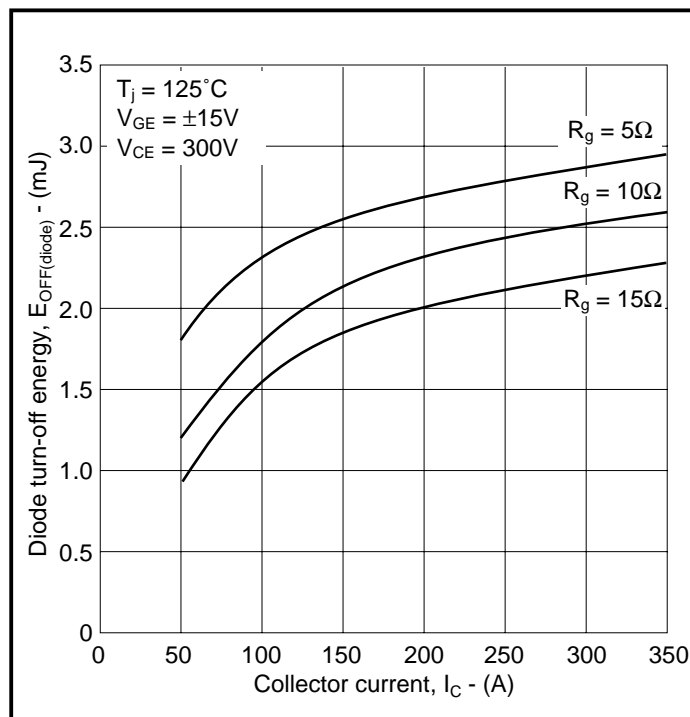
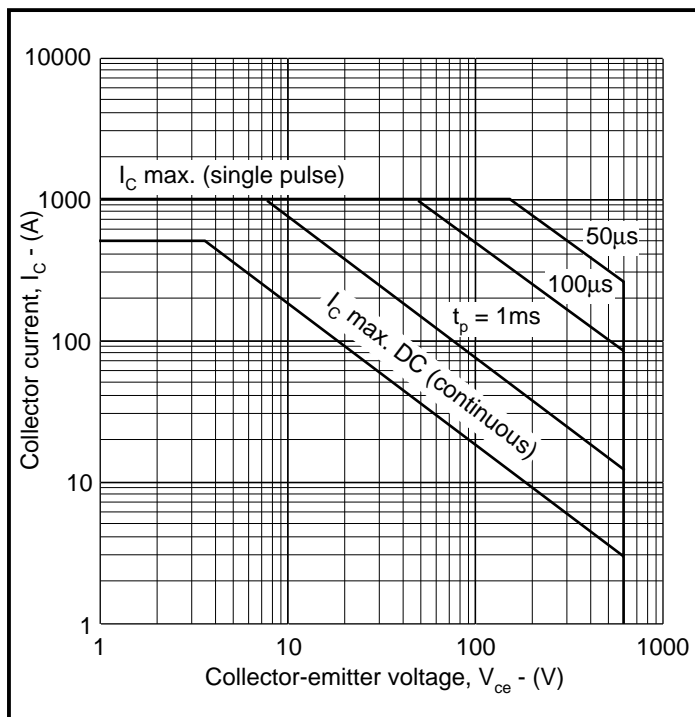
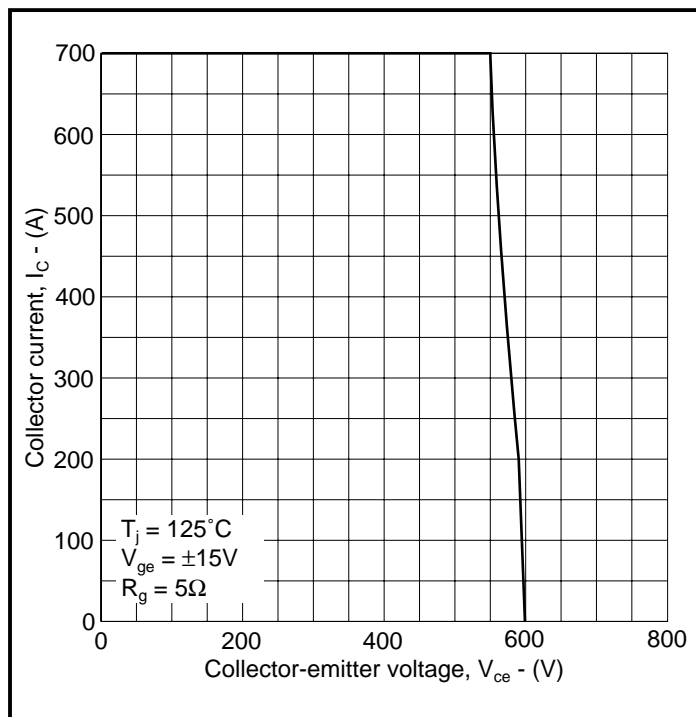
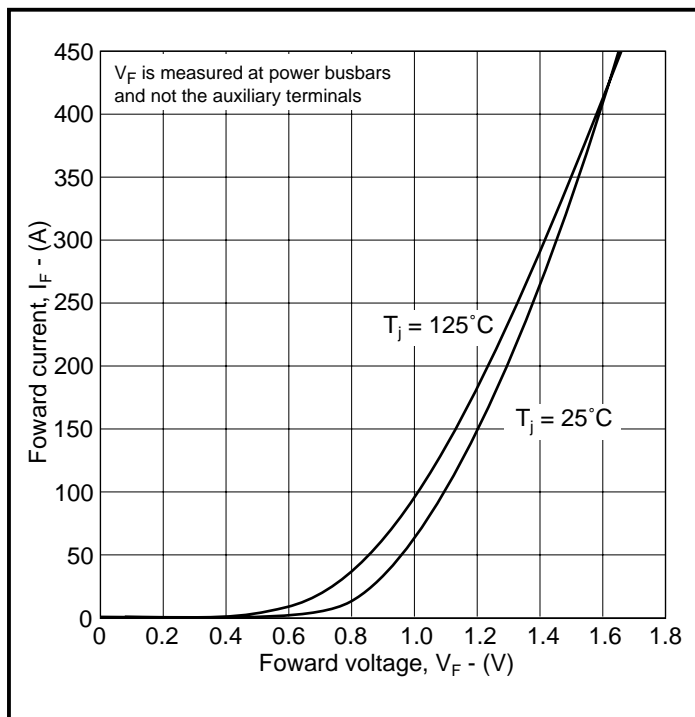
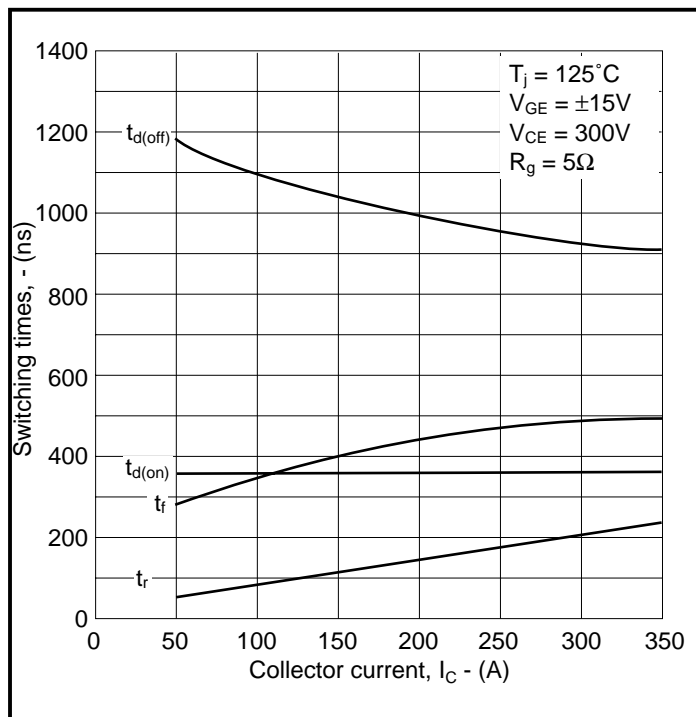


Fig.10 Typical diode turn-off energy vs collector current



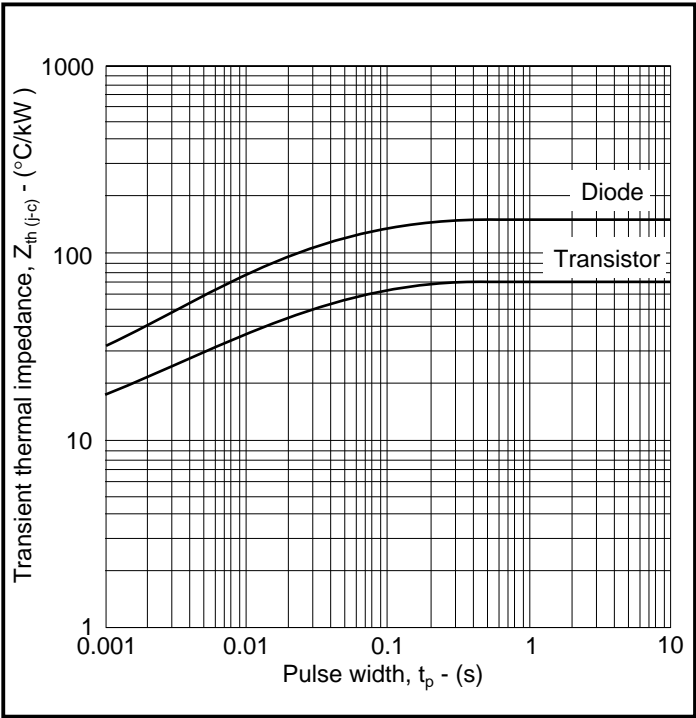
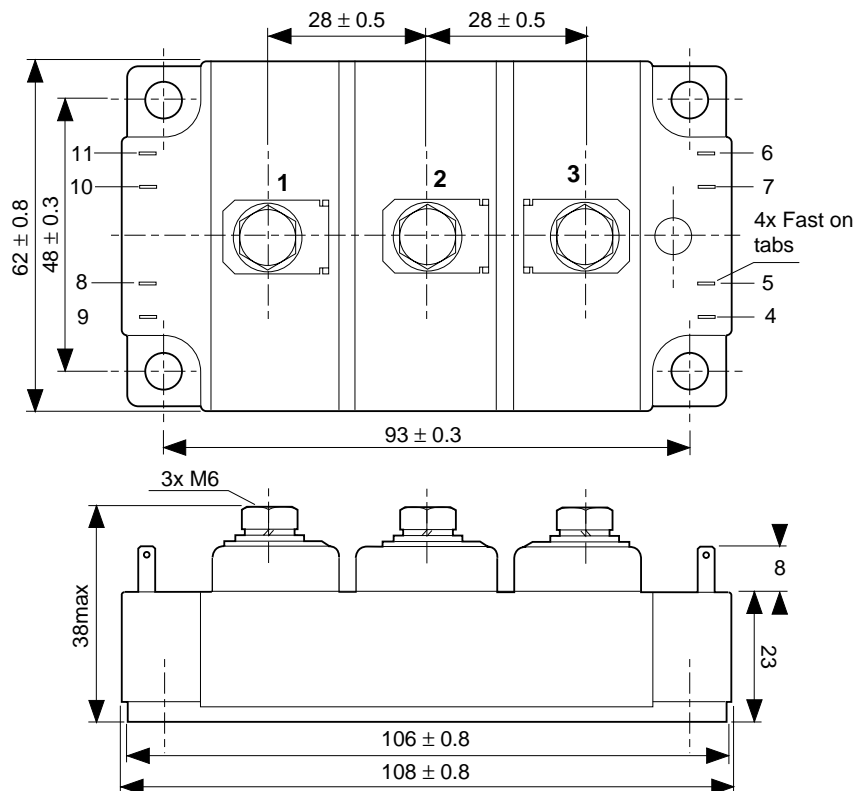


Fig.15 Transient thermal impedance



## 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**

## POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

## HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or customer service office.



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**Preliminary Information:** The product is in design and development. The datasheet represents the product as it is understood but details may change.

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

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