

FEATURES

- High Thermal Cycling Capability
- 800A Per Switch
- Non Punch Through Silicon
- Isolated MMC Base with AlN Substrates

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Resonant Converters

The Powerline range of high power modules includes dual and single switch configurations covering voltages from 1200V to 3300V and currents up to 4800A.

The GP800DDM12 is a dual switch 1200V, n channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) ensuring reliability in demanding applications. This device is optimised for traction drives and other applications requiring high thermal cycling capability or very high reliability.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise earthed heat sinks for safety.

ORDERING INFORMATION

Order As:

GP800DDM12

Note: When ordering, please use the whole part number.

KEY PARAMETERS

V_{CES}		1200V
$V_{CE(sat)}$	(typ)	2.7V
I_C	(max)	800A
$I_{C(PK)}$	(max)	1600A

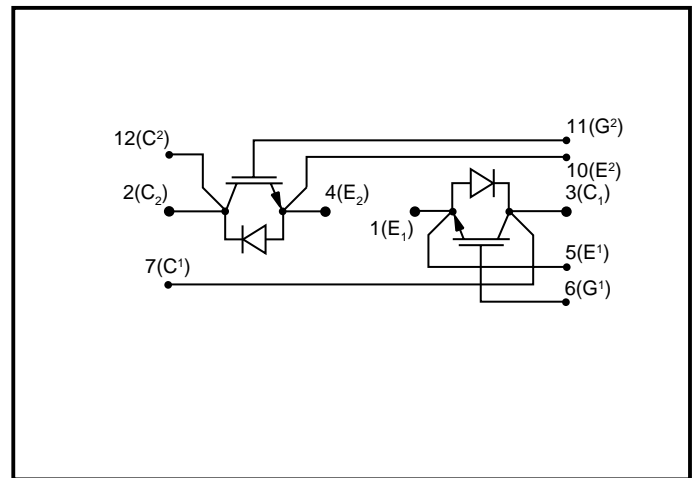
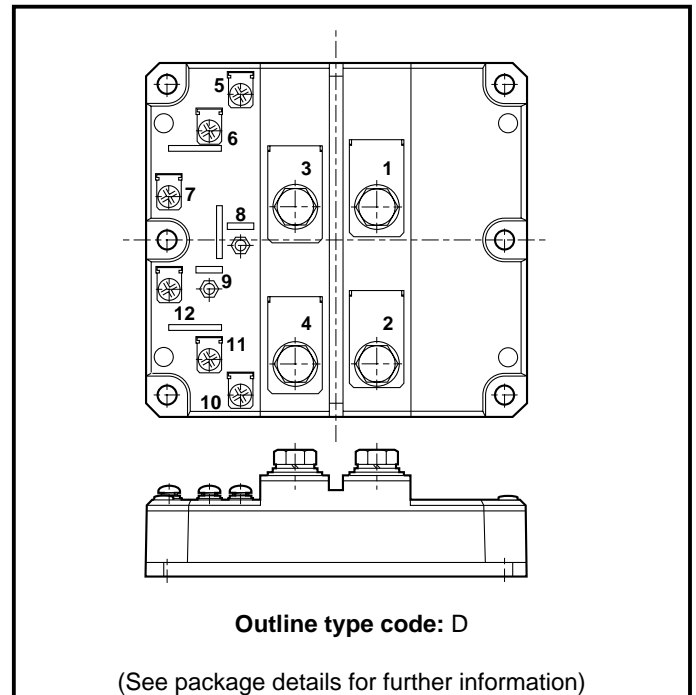


Fig. 1 Dual switch circuit diagram



Outline type code: D

(See package details for further information)

Fig. 2 Electrical connections - (not to scale)

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	$V_{GE} = 0\text{V}$	1200	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Continuous collector current	$T_{case} = 80^{\circ}\text{C}$	800	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 105^{\circ}\text{C}$	1600	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	6490	W
V_{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor (per arm)	Continuous dissipation - junction to case	-	18	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance - diode (per arm)	Continuous dissipation - junction to case	-	40	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	8	$^{\circ}\text{C}/\text{kW}$
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 - M4	-	2	Nm
		Electrical connections - M8	-	10	Nm

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$	-	-	1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}\text{C}$	-	-	50	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 4	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 120\text{mA}, V_{GE} = V_{CE}$	4	-	7.5	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 800\text{A}$	-	2.7	3.5	V
		$V_{GE} = 15V, I_C = 800\text{A}, T_{case} = 125^{\circ}\text{C}$	-	3.2	4	V
I_F	Diode forward current	DC, $T_{case} = 50^{\circ}\text{C}$	-	-	800	A
I_{FM}	Diode maximum forward current	$t_p = 1\text{ms}$	-	-	1600	A
V_F	Diode forward voltage	$I_F = 800\text{A}$	-	2.2	2.4	V
		$I_F = 800\text{A}, T_{case} = 125^{\circ}\text{C}$	-	2.3	2.5	V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$	-	90	-	nF
L_M	Module inductance	-	-	20	-	nH

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 800\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 600\text{V}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 3.3\Omega$ $L \sim 100\text{nH}$	-	1100	1300	ns
t_{f}	Fall time		-	150	200	ns
E_{OFF}	Turn-off energy loss		-	130	170	mJ
$t_{\text{d(on)}}$	Turn-on delay time		-	800	900	ns
t_{r}	Rise time		-	320	400	ns
E_{ON}	Turn-on energy loss		-	90	130	mJ
Q_{rr}	Diode reverse recovery charge	$I_{\text{F}} = 800\text{A}, V_{\text{R}} = 50\% V_{\text{CES}}$ $di_{\text{F}}/dt = 2000\text{A}/\mu\text{s}^{-1}$	-	150	200	μC

 $T_{\text{case}} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 800\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 600\text{V}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 3.3\Omega$ $L \sim 100\text{nH}$	-	1300	1500	ns
t_{f}	Fall time		-	200	250	ns
E_{OFF}	Turn-off energy loss		-	170	250	mJ
$t_{\text{d(on)}}$	Turn-on delay time		-	950	1200	ns
t_{r}	Rise time		-	350	450	ns
E_{ON}	Turn-on energy loss		-	150	200	mJ
Q_{rr}	Diode reverse recovery charge	$I_{\text{F}} = 800\text{A}, V_{\text{R}} = 50\% V_{\text{CES}}$ $di_{\text{F}}/dt = 2000\text{A}/\mu\text{s}^{-1}$	-	200	260	μC

TYPICAL CHARACTERISTICS

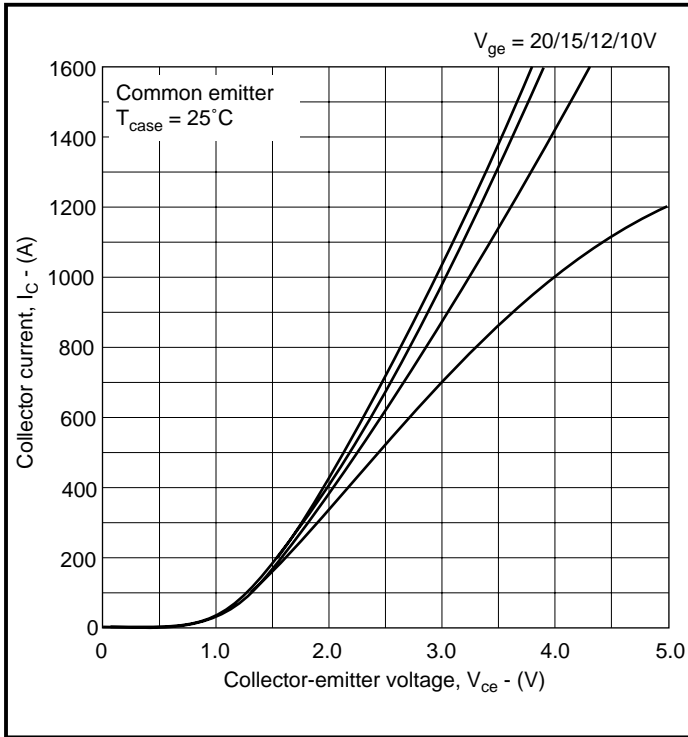


Fig. 3 Typical output characteristics

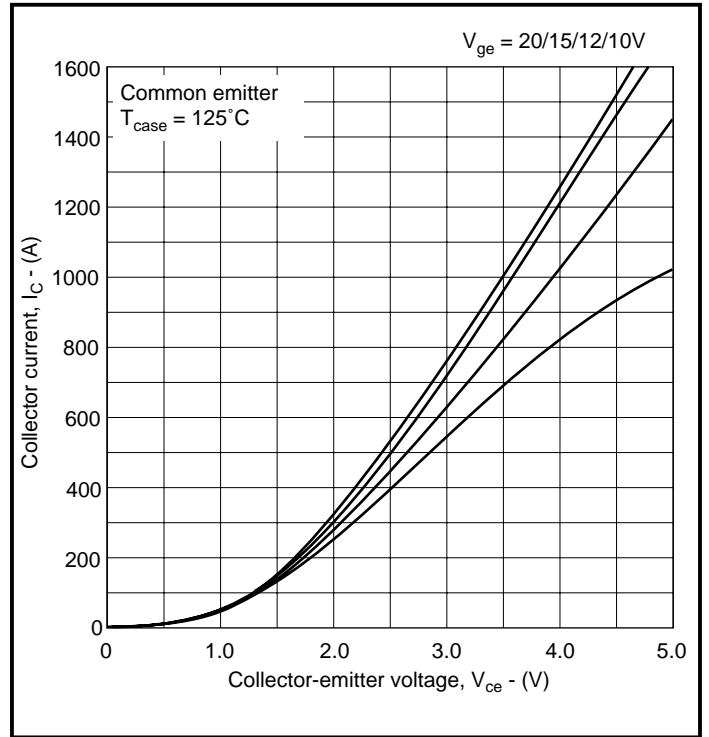


Fig. 4 Typical output characteristics

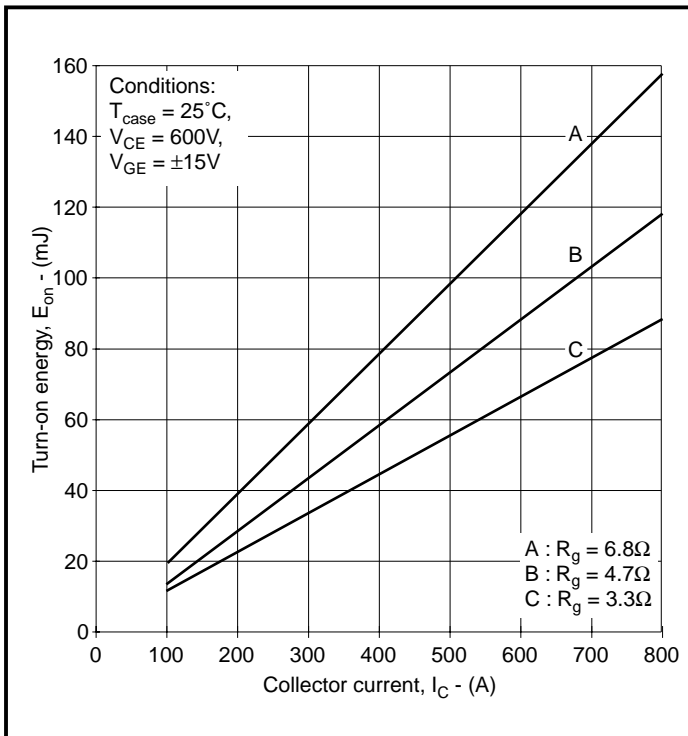


Fig. 5 Typical turn-on energy vs collector current

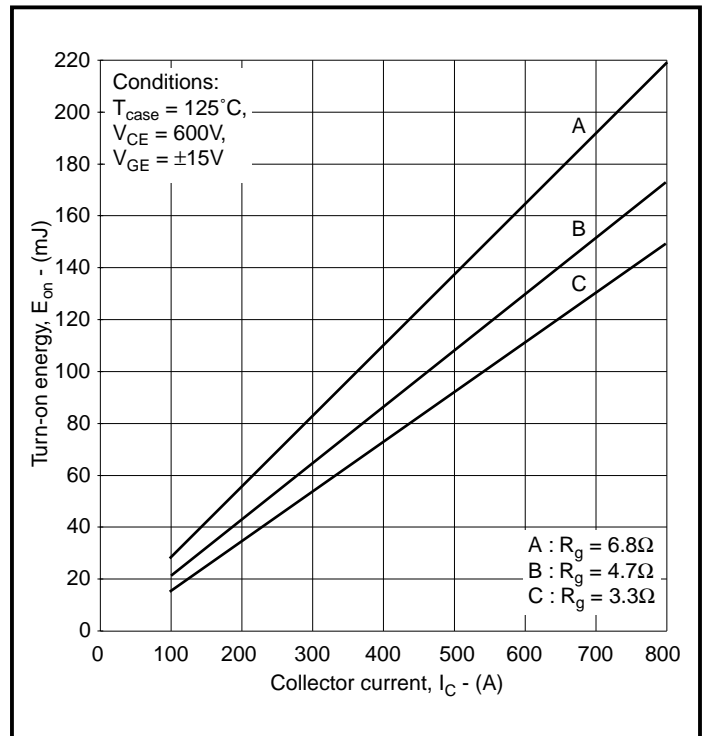


Fig. 6 Typical turn-off energy vs collector current

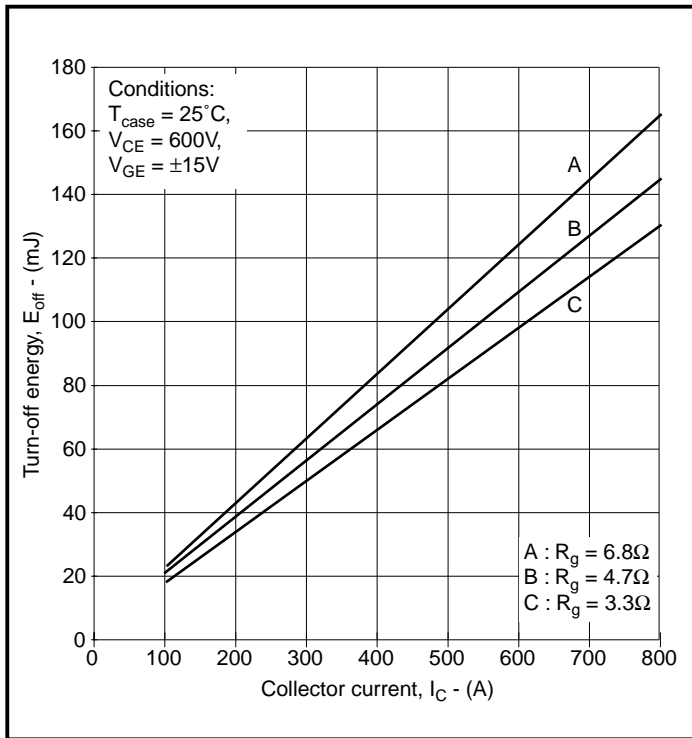


Fig.7 Typical turn-off energy vs collector current

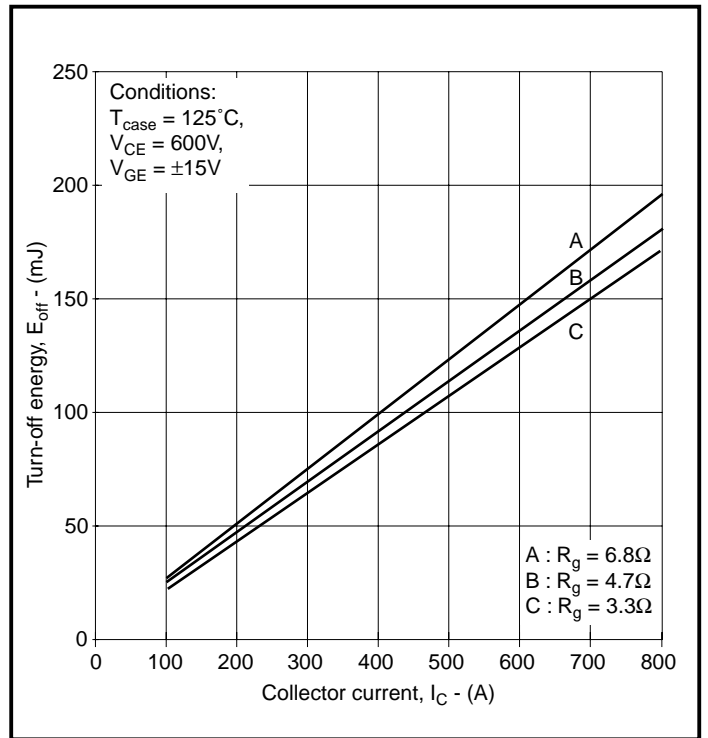


Fig.8 Typical turn-off energy vs collector current

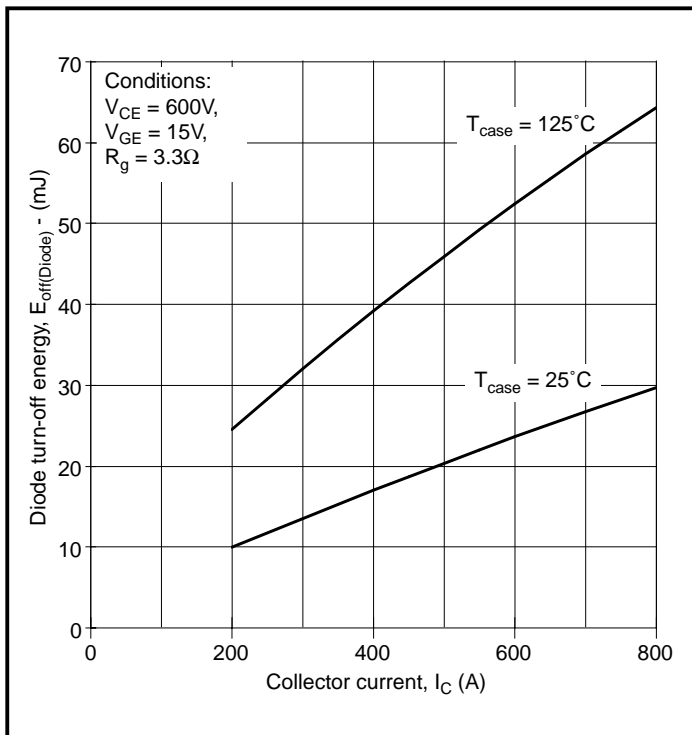


Fig.9 Typical diode reverse recovery charge vs collector current

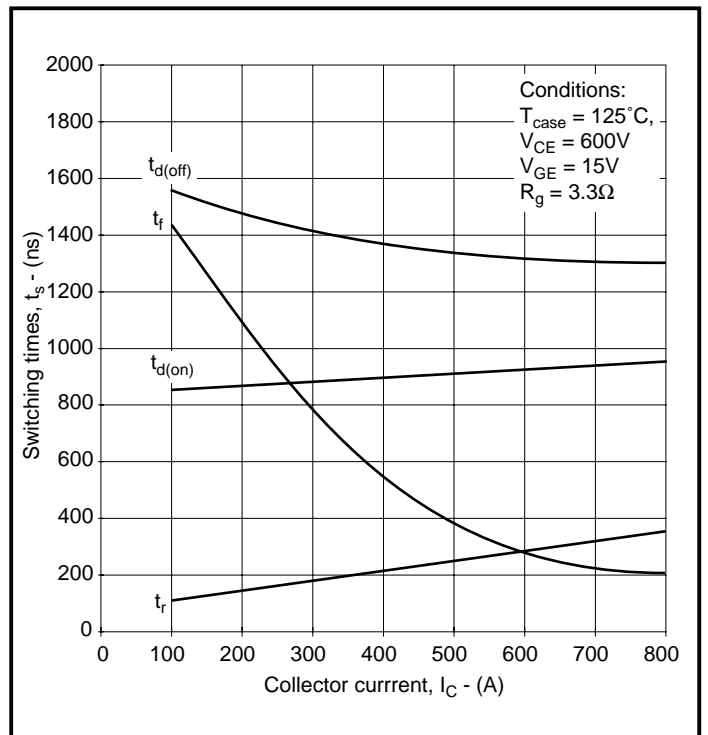


Fig.10 Typical switching characteristics

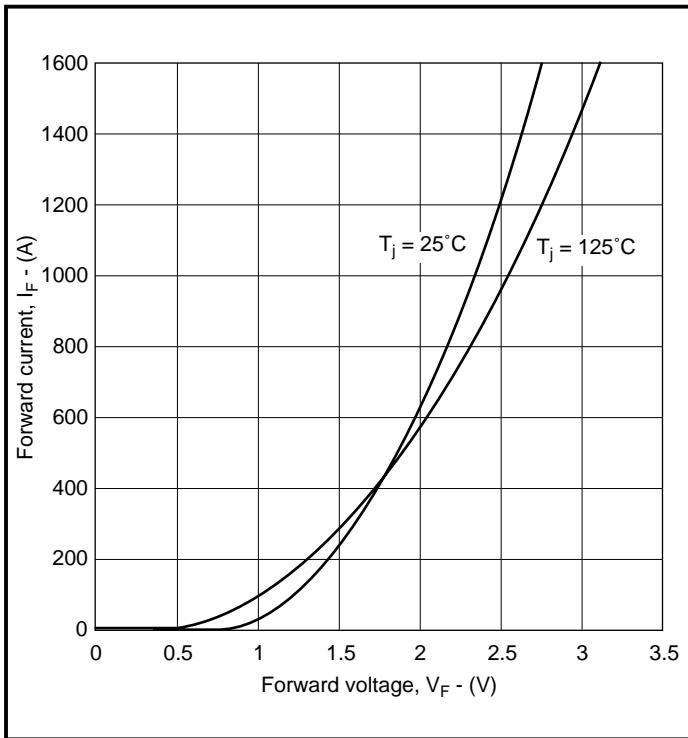


Fig.11 Diode typical forward characteristics

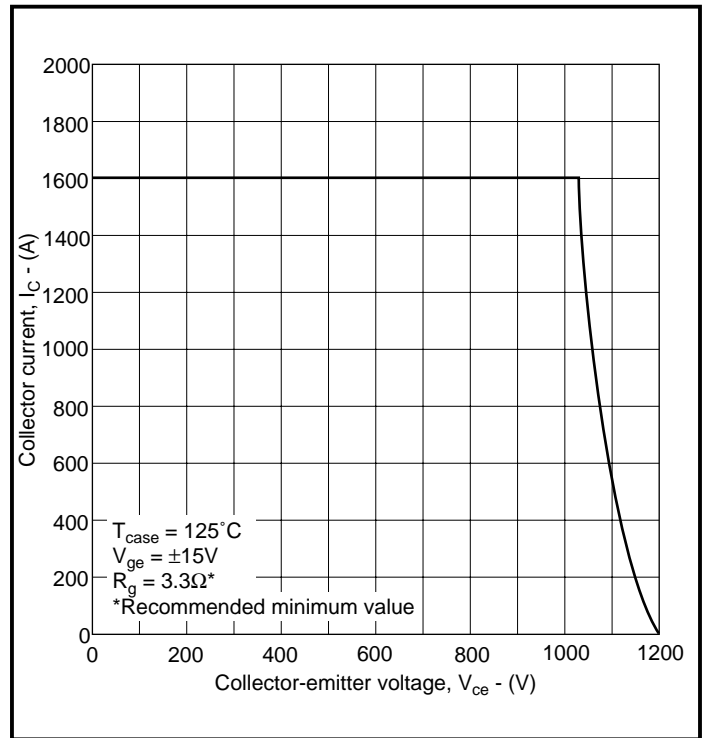


Fig.12 Reverse bias safe operating area

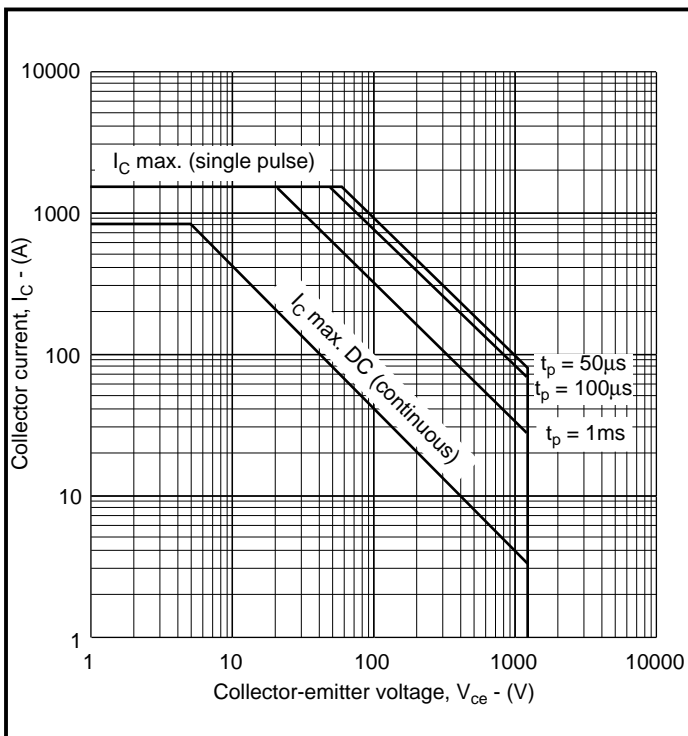


Fig.13 Forward bias safe operating area

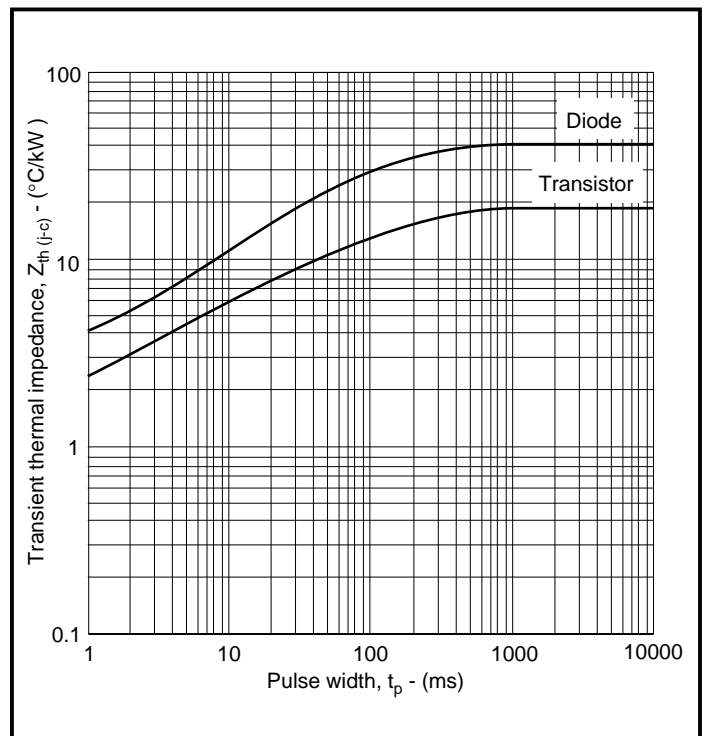


Fig.14 Transient thermal impedance

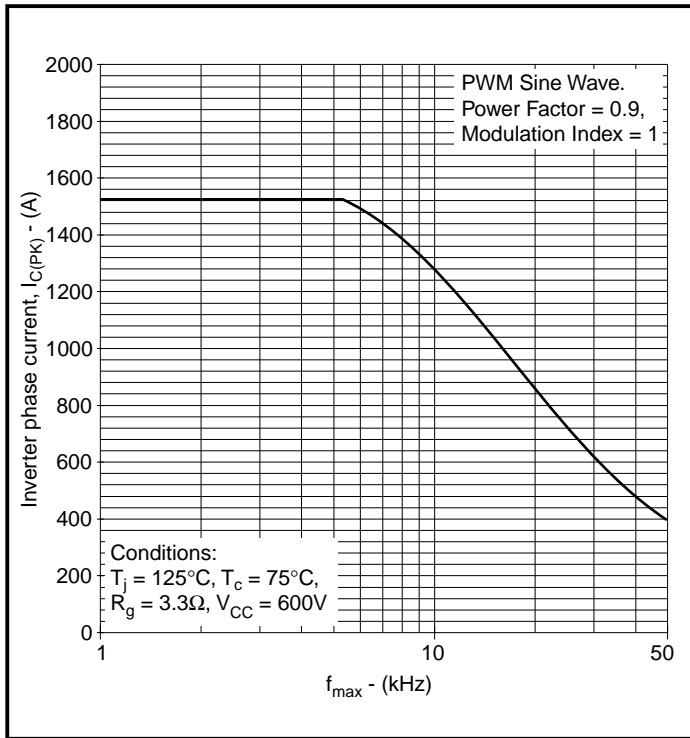


Fig.15 3-Phase inverter operating frequency

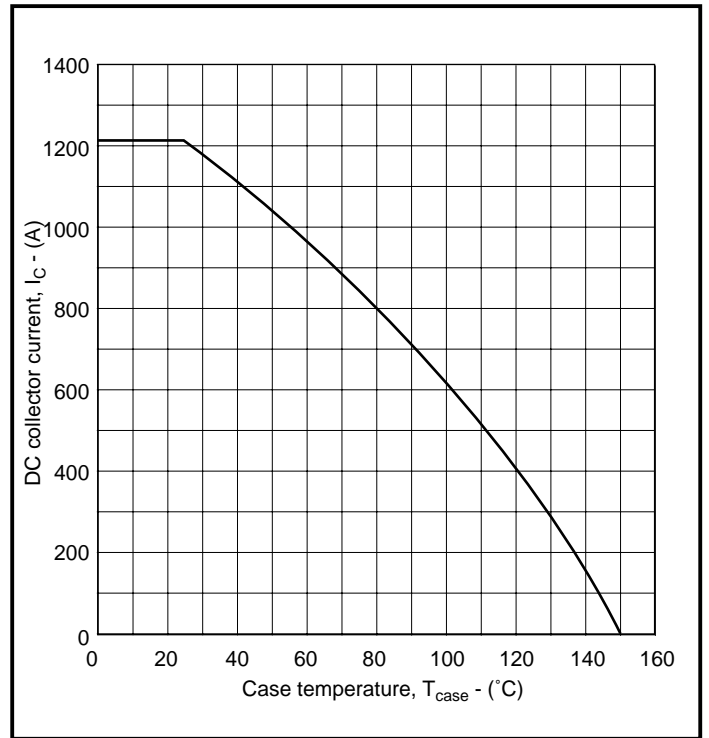
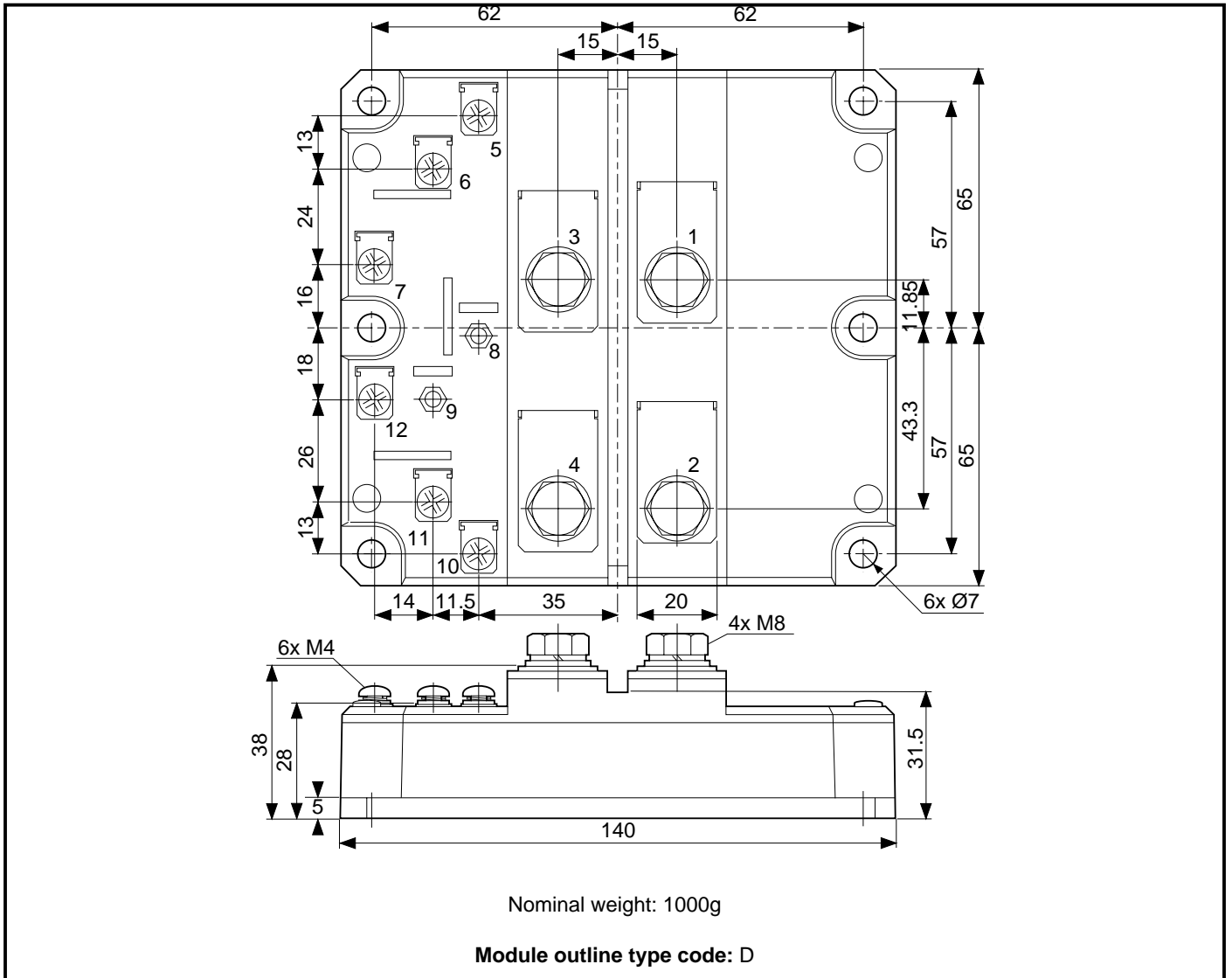


Fig.16 DC current rating vs case temperature

PACKAGE DETAILS

For further package information, please visit our website or contact your nearest Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



ASSOCIATED PUBLICATIONS

Title	Application Note Number
Electrostatic handling precautions	AN4502
An introduction to IGBTs	AN4503
IGBT ratings and characteristics	AN4504
Heatsink requirements for IGBT modules	AN4505
Calculating the junction temperature of power semiconductors	AN4506
Gate drive considerations to maximise IGBT efficiency	AN4507
Parallel operation of IGBTs – punch through vs non-punch through characteristics	AN4508
Guidance notes for formulating technical enquiries	AN4869
Principle of rating parallel connected IGBT modules	AN5000
Short circuit withstand capability in IGBTs	AN5167
Driving Dynex Semiconductor IGBT modules with Concept gate drivers	AN5384

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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