

### FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AISiC Base with AlN Substrates
- Lead Free Construction

### APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Choppers

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 1200V to 6500V and currents up to 2400A.

The DIM400NSM33-F000 is a single switch 3300V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

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

### ORDERING INFORMATION

Order As:

### DIM400NSM33-F000

Note: When ordering, please use the complete part number

### KEY PARAMETERS

$V_{CES}$	<b>3300V</b>
$V_{CE(sat)}$ * (typ)	<b>2.8V</b>
$I_C$ (max)	<b>400A</b>
$I_{C(PK)}$ (max)	<b>800A</b>

\* Measured at the auxiliary terminals

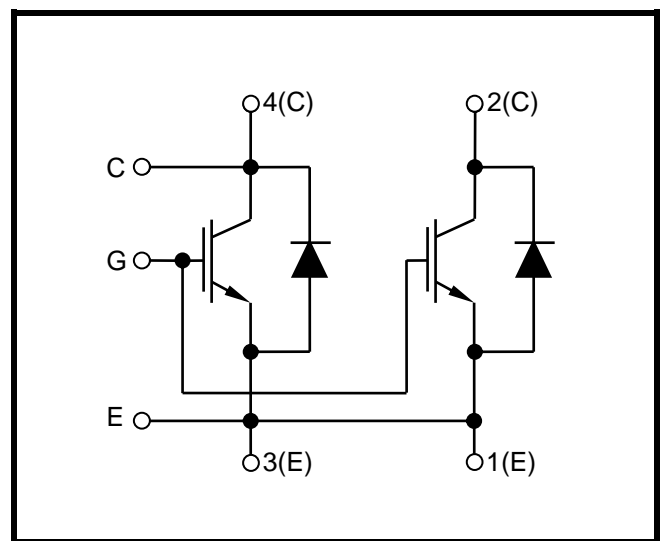
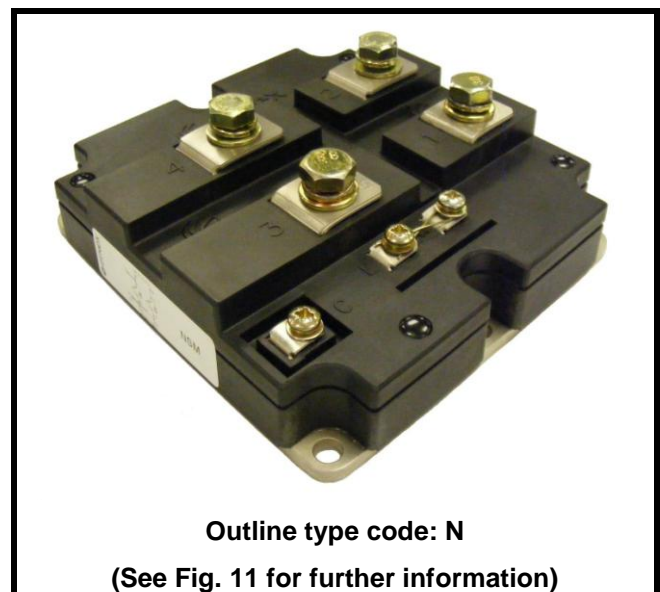


Fig. 1 Circuit configuration



Outline type code: N

(See Fig. 11 for further information)

Fig. 2 Package

## ABSOLUTE MAXIMUM RATINGS

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	$V_{GE} = 0\text{V}$	3300	V
$V_{GES}$	Gate-emitter voltage		$\pm 20$	V
$I_C$	Continuous collector current	$T_{case} = 90^{\circ}\text{C}$	400	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 115^{\circ}\text{C}$	800	A
$P_{max}$	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$ , $T_j = 150^{\circ}\text{C}$	5200	W
$I^2t$	Diode $I^2t$ value	$V_R = 0$ , $t_p = 10\text{ms}$ , $T_j = 125^{\circ}\text{C}$	24	$\text{kA}^2\text{s}$
$V_{isol}$	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	6000	V
$Q_{PD}$	Partial discharge – per module	IEC1287, $V_1 = 3500\text{V}$ , $V_2 = 2600\text{V}$ , 50Hz RMS	10	pC

## THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
Creepage distance:	33mm
Clearance:	20mm
CTI (Comparative Tracking Index):	350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per arm)	Continuous dissipation – junction to case	-	-	24	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance – diode (per arm)	Continuous dissipation – junction to case	-	-	48	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	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<sub>case</sub> = 25°C unless stated otherwise.**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I <sub>CES</sub>	Collector cut-off current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub>			2	mA
		V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub> , T <sub>case</sub> = 125°C			30	mA
I <sub>GES</sub>	Gate leakage current	V <sub>GE</sub> = ± 20V, V <sub>CE</sub> = 0V			1	μA
V <sub>GE(TH)</sub>	Gate threshold voltage	I <sub>C</sub> = 40mA, V <sub>GE</sub> = V <sub>CE</sub>	5.5	6.5	7.0	V
V <sub>CE(sat)</sub> †	Collector-emitter saturation voltage	V <sub>GE</sub> = 15V, I <sub>C</sub> = 400A		2.8		V
		V <sub>GE</sub> = 15V, I <sub>C</sub> = 400A, T <sub>j</sub> = 125°C		3.6		V
I <sub>F</sub>	Diode forward current	DC		400		A
I <sub>FM</sub>	Diode maximum forward current	t <sub>p</sub> = 1ms		800		A
V <sub>F</sub> †	Diode forward voltage (IGBT arm)	I <sub>F</sub> = 400A		2.9		V
		I <sub>F</sub> = 400A, T <sub>j</sub> = 125°C		3.0		V
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz		72		nF
Q <sub>g</sub>	Gate charge	±15V		10		μC
C <sub>res</sub>	Reverse transfer capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz		1.1		nF
L <sub>M</sub>	Module inductance			15		nH
R <sub>INT</sub>	Internal resistance			135		μΩ
SC <sub>Data</sub>	Short circuit current, I <sub>SC</sub>	T <sub>j</sub> = 125°C, V <sub>CC</sub> = 2500V t <sub>p</sub> ≤ 10μs, V <sub>GE</sub> ≤ 15V V <sub>CE(max)</sub> = V <sub>CES</sub> - L* x di/dt IEC 60747-9		1850		A

**Note:**

† Measured at the auxiliary terminals

\* L is the circuit inductance + L<sub>M</sub>

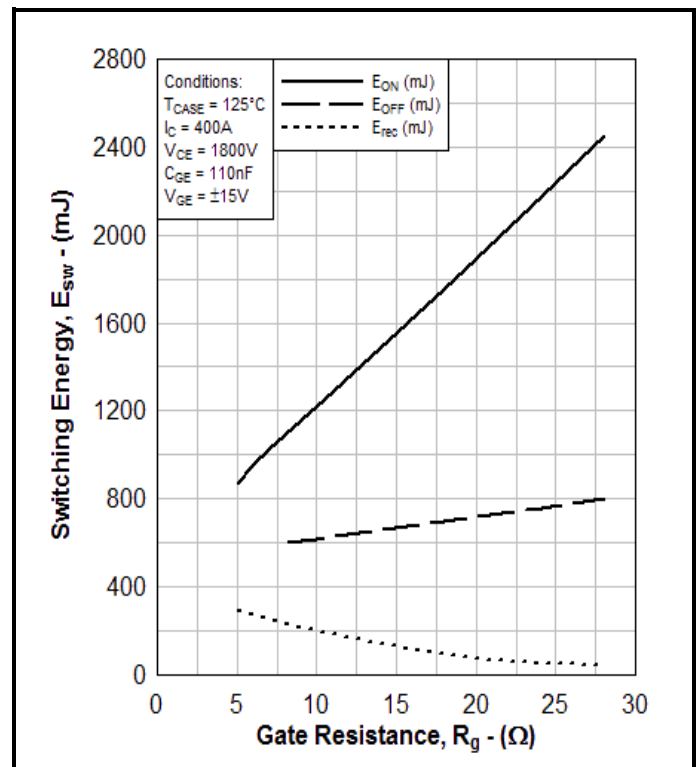
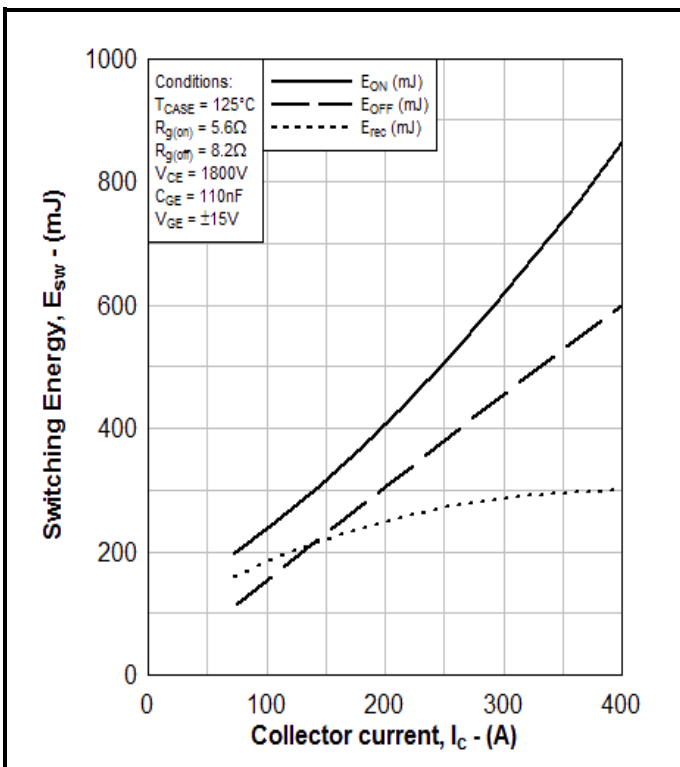
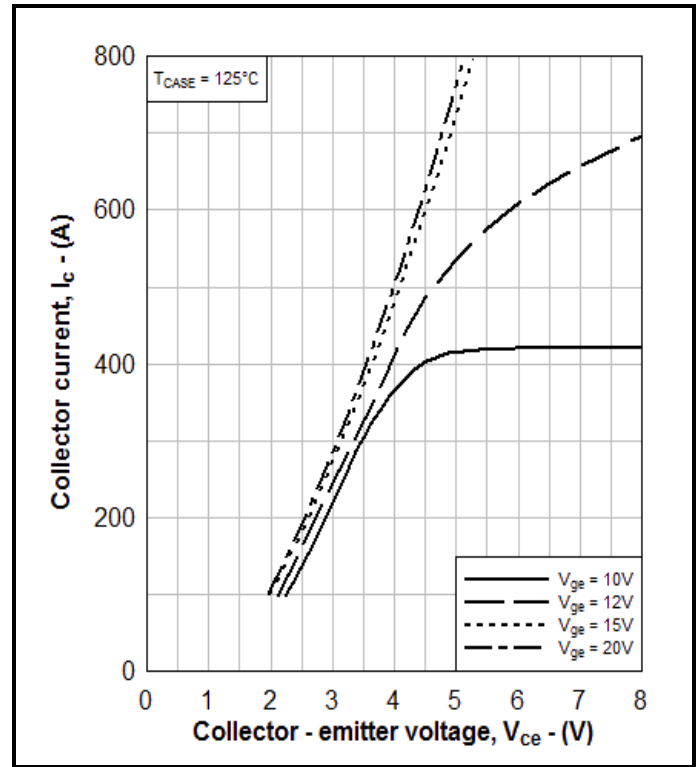
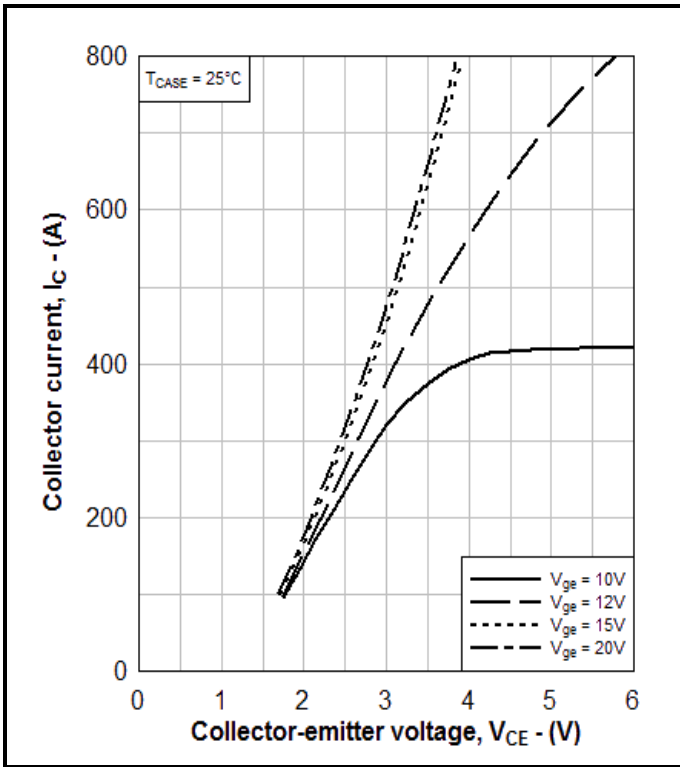
## ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions		Min	Typ.	Max	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 1800\text{V}$ $C_{ge} = 110\text{nF}$ $L_S \sim 100\text{nH}$	$R_{G(\text{ON})} = 8.2\Omega$ $R_{G(\text{OFF})} = 8.2\Omega$		2.1		$\mu\text{s}$
$t_f$	Fall time				210		ns
$E_{\text{OFF}}$	Turn-off energy loss				520		mJ
$t_{d(\text{on})}$	Turn-on delay time				1130		ns
$t_r$	Rise time				245		ns
$E_{\text{ON}}$	Turn-on energy loss				$R_{G(\text{ON})} = 5.6\Omega,$ $R_{G(\text{OFF})} = 8.2\Omega$	620	
$Q_{rr}$	Diode reverse recovery charge	$I_F = 400\text{A}$ $V_{CE} = 1800\text{V}$ $dI_F/dt = 2000\text{A}/\mu\text{s}$			160		$\mu\text{C}$
$I_{rr}$	Diode reverse recovery current				330		A
$E_{\text{rec}}$	Diode reverse recovery energy				150		mJ

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

Symbol	Parameter	Test Conditions		Min	Typ.	Max	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 1800\text{V}$ $C_{ge} = 110\text{nF}$ $L_S \sim 100\text{nH}$	$R_{G(\text{ON})} = 8.2\Omega$ $R_{G(\text{OFF})} = 8.2\Omega$		2.15		$\mu\text{s}$
$t_f$	Fall time				220		ns
$E_{\text{OFF}}$	Turn-off energy loss				600		mJ
$t_{d(\text{on})}$	Turn-on delay time				1160		ns
$t_r$	Rise time				285		ns
$E_{\text{ON}}$	Turn-on energy loss				$R_{G(\text{ON})} = 5.6\Omega,$ $R_{G(\text{OFF})} = 8.2\Omega$	870	
$Q_{rr}$	Diode reverse recovery charge	$I_F = 400\text{A}$ $V_{CE} = 1800\text{V}$ $dI_F/dt = 2000\text{A}/\mu\text{s}$			300		$\mu\text{C}$
$I_{rr}$	Diode reverse recovery current				400		A
$E_{\text{rec}}$	Diode reverse recovery energy				300		mJ



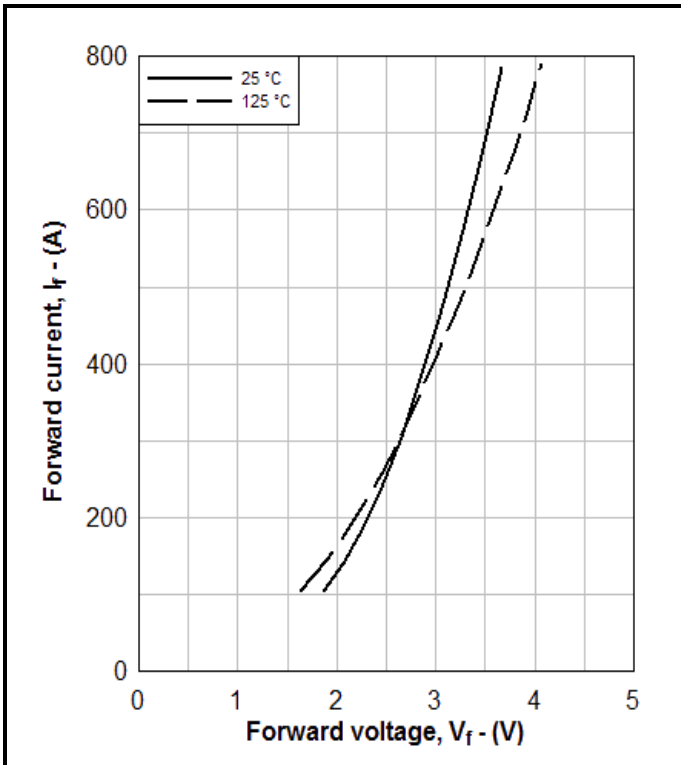


Fig. 7 Diode typical forward characteristics

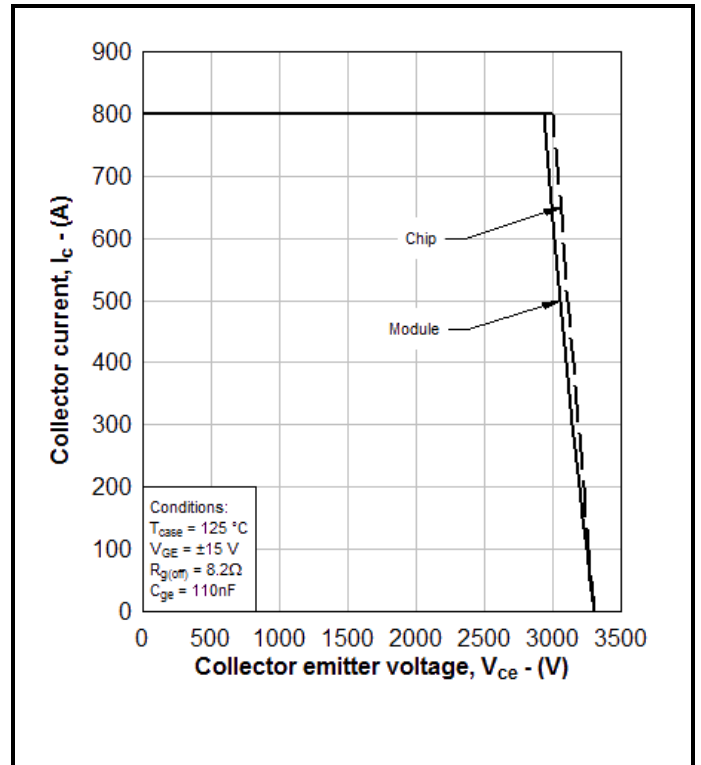


Fig. 8 Reverse bias safe operating area

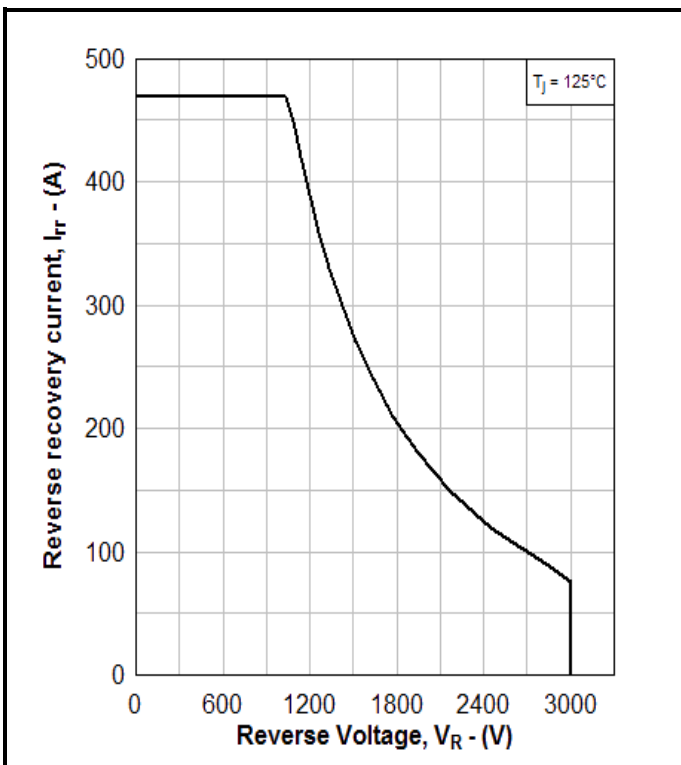


Fig. 9 Diode reverse bias safe operating area

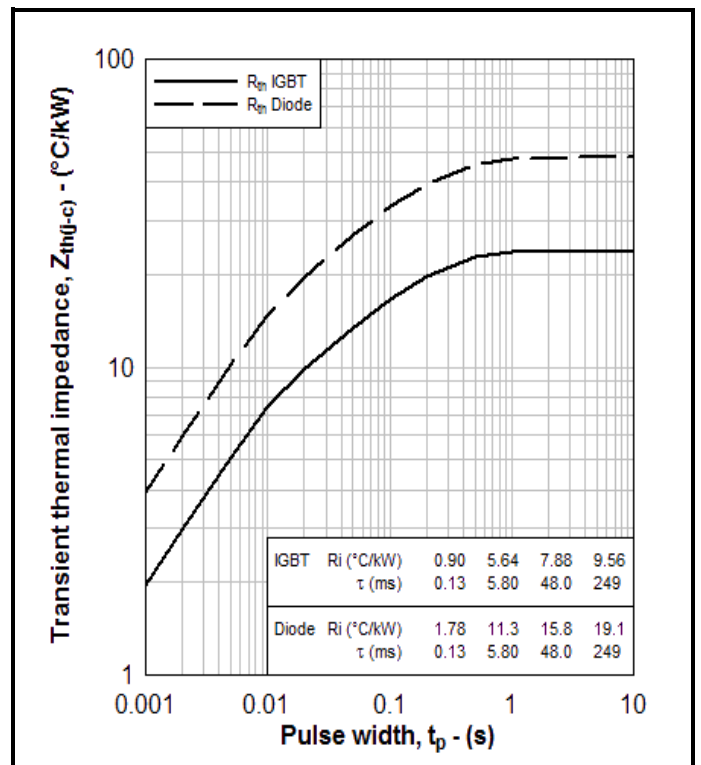
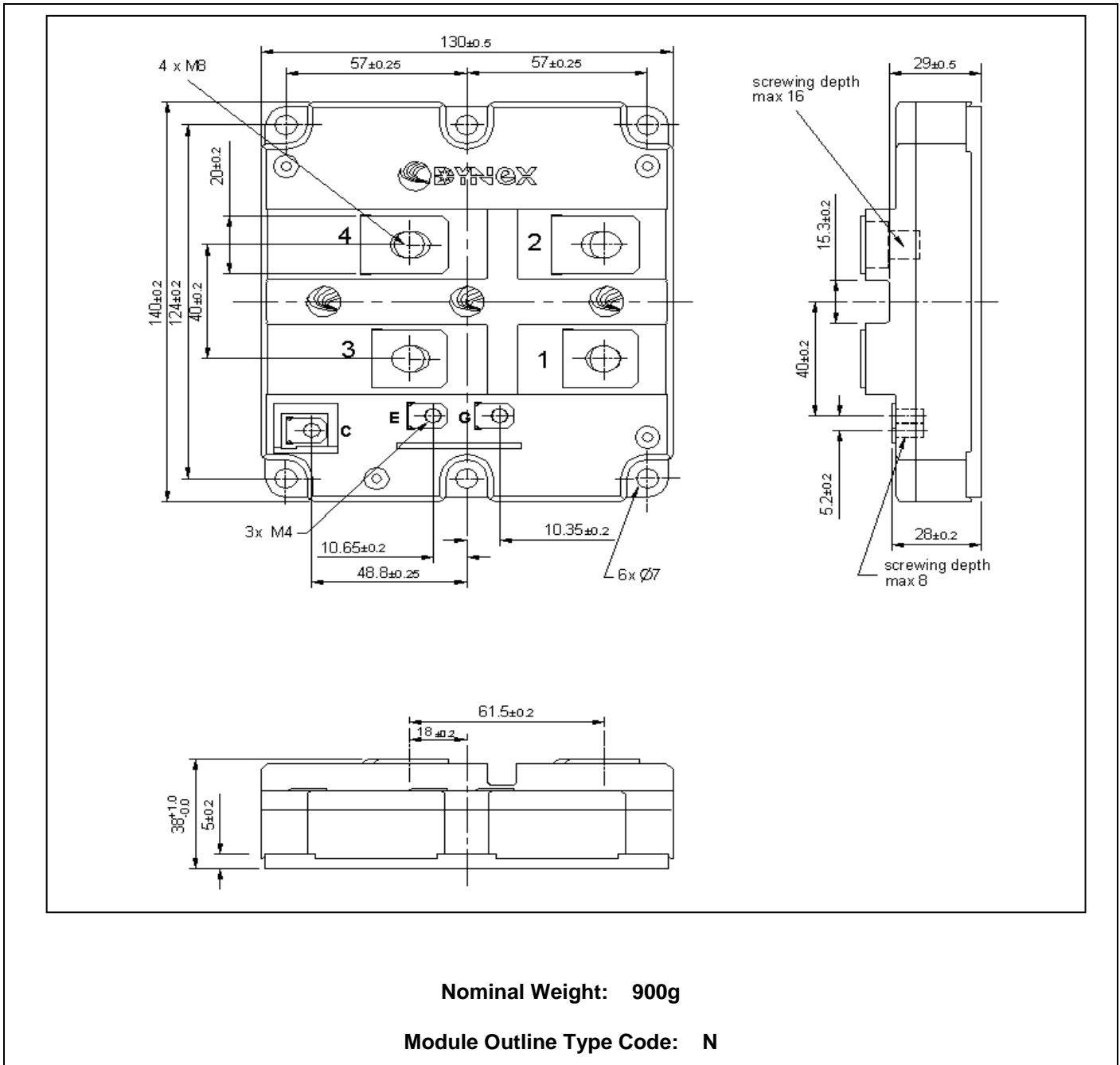


Fig. 10 Transient thermal impedance

**PACKAGE DETAILS**

For further package information, please visit our website or contact Customer Services.  
 All dimensions in mm, unless stated otherwise.

**DO NOT SCALE.**



**Fig. 11 Module outline drawing**

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