DIM2400NSM17-PT500

Single Switch IGBT Module

TRENCH
Gen5 TMOS

Replaces DS6327-1

DS6327-2 April 2020 (LN39869)

FEATURES

- Trench Gate IGBT
- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Low $V_{ce(sat)}$ Device
- High Current Density
- Isolated AlSiC Base with AlN Substrates

APPLICATIONS

- Traction Drives
- Motor Controllers
- Smart Grid
- High Reliability Inverters

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 DIM2400NSM17-PT500 is a single switch 1700V, trench gate, insulated gate bipolar transistor (IGBT) module with enhanced field stop and implantation technology. 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:

DIM2400NSM17-PT500

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1700V**
$V_{CE(sat)}$ *	**(typ)**	**2.1V**
I_C	**(max)**	**2400A**
$I_{C(PK)}$	**(max)**	**4800A**

* Measured at the power busbars, not the auxiliary terminals

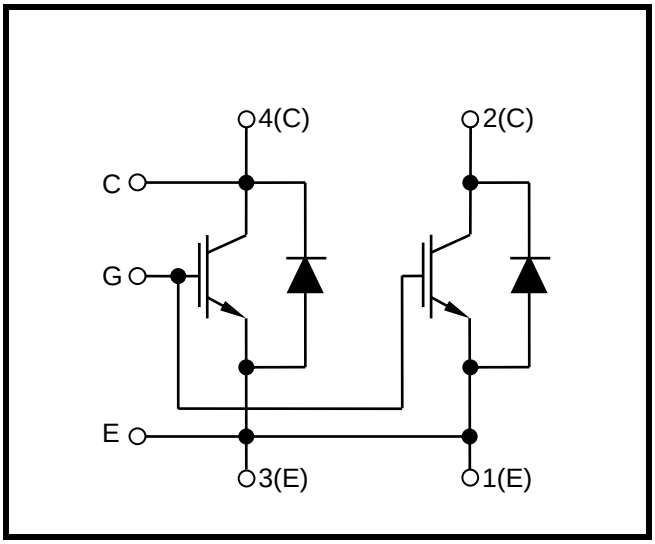


Fig. 1 Circuit configuration

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°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	V_{GE} = 0V	1700	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 85°C	2400	A
$I_{C(PK)}$	Peak collector current	T_p = 1ms	4800	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	12.5	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 150ºC	840	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 1800V, V_2 = 1300V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN

Baseplate material: AlSiC

Creepage distance: 33mm

Clearance: 20mm

CTI (Comparative Tracking Index): >600

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor	Continuous dissipation - junction to case	-	-	10	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	18	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	8	°C/kW
T_j	Junction temperature	Transistor	-	-	150	°C
		Diode	-	-	150	°C
T_{stg}	Storage temperature range	-	-40	-	150	°C
M	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M4	-	-	2	Nm
		Electrical connections – M8	-	-	10	Nm

ELECTRICAL CHARACTERISTICS

T_{case} = 25°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°C			40	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			60	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 80mA, V_{GE} = V_{CE}	5.00	6.00	7.00	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 2400A		2.10		V
		V_{GE} = 15V, I_C = 2400A, T_j = 125°C		2.40		V
		V_{GE} = 15V, I_C = 2400A, T_j = 150°C		2.50		
I_F	Diode forward current	DC		2400		A
I_{FM}	Diode maximum forward current	t_p = 1ms		4800		A
V_F	Diode forward voltage	I_F = 2400A		1.90		V
		I_F = 2400A, T_j = 125°C		2.10		V
		I_F = 2400A, T_j = 150°C		2.10		
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		270		nF
Q_g	Gate charge	±15V		13		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		2		nF
L_M	Module inductance			15		nH
R_{INT}	Internal transistor resistance			145		µΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 125°C, V_{CC} = 1000V t_p ≤ 10µs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L* x dI/dt IEC 60747-9		9600		A

Note:

* L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	I_C = 2400A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 50nH		1480		ns
t_f	Fall time			550		ns
E_{OFF}	Turn-off energy loss			1050		mJ
$t_{d(on)}$	Turn-on delay time			510		ns
t_r	Rise time			210		ns
E_{ON}	Turn-on energy loss			410		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 2400A V_{CE} = 900V dI_F/dt = 10000A/µs		480		µC
I_{rr}	Diode reverse recovery current			1000		A
E_{rec}	Diode reverse recovery energy			320		mJ

T_{case} = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	I_C = 2400A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 50nH		1550		ns
t_f	Fall time			560		ns
E_{OFF}	Turn-off energy loss			1320		mJ
$t_{d(on)}$	Turn-on delay time			510		ns
t_r	Rise time			220		ns
E_{ON}	Turn-on energy loss			660		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 2400A V_{CE} = 900V dI_F/dt = 10000A/µs		750		µC
I_{rr}	Diode reverse recovery current			1200		A
E_{rec}	Diode reverse recovery energy			550		mJ

T_{case} = 150°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	I_C = 2400A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 50nH		1550		ns
t_f	Fall time			560		ns
E_{OFF}	Turn-off energy loss			1400		mJ
$t_{d(on)}$	Turn-on delay time			510		ns
t_r	Rise time			220		ns
E_{ON}	Turn-on energy loss			820		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 2400A V_{CE} = 900V dI_F/dt = 10000A/µs		820		µC
I_{rr}	Diode reverse recovery current			1250		A
E_{rec}	Diode reverse recovery energy			620		mJ

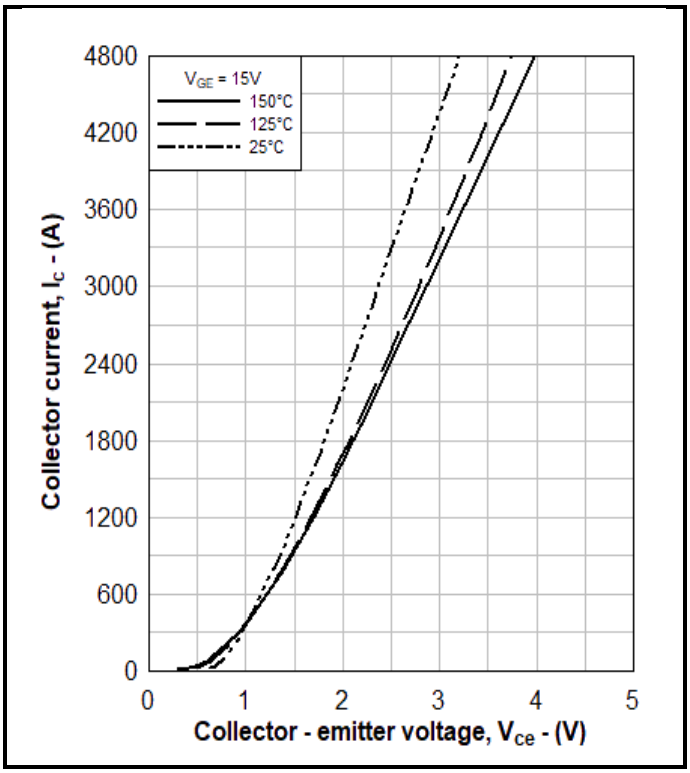


Fig. 3 Typical output characteristics

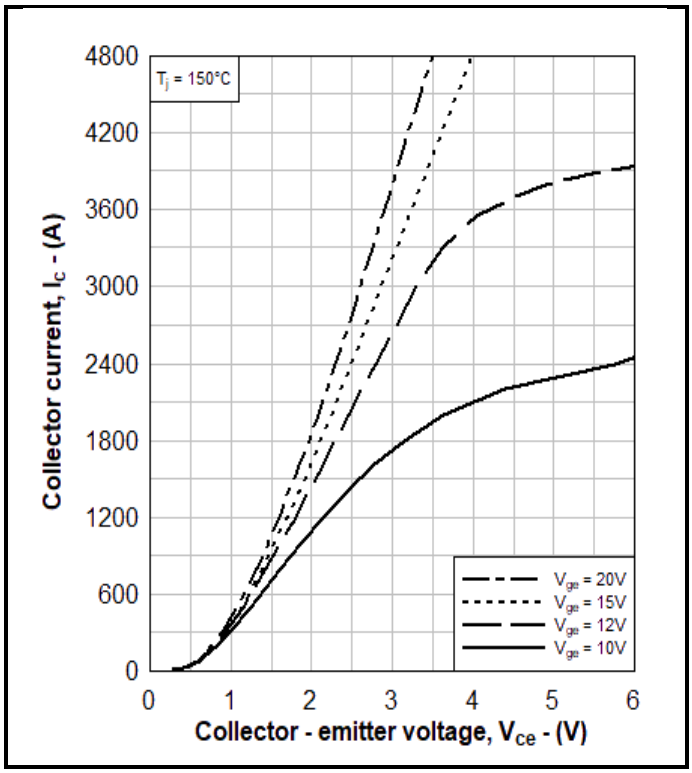


Fig. 4 Typical output characteristics

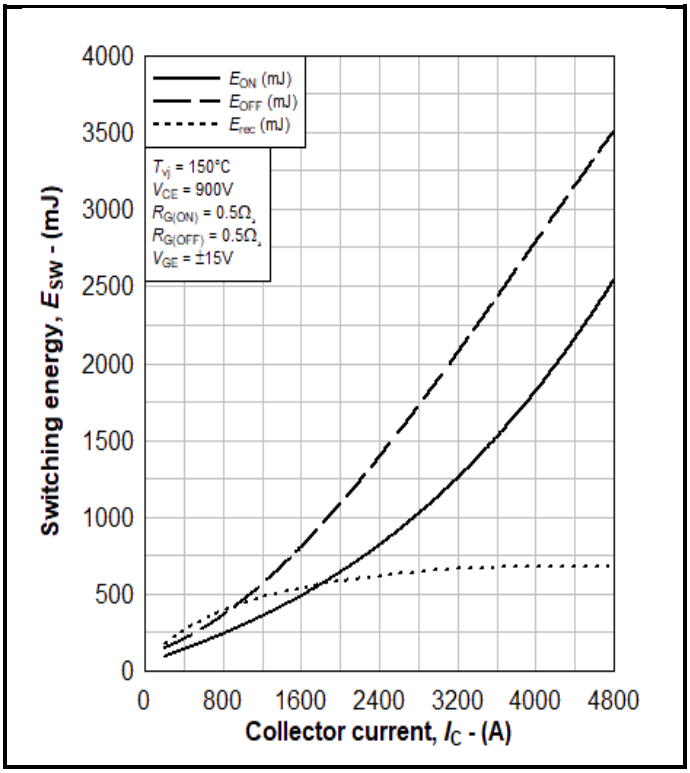


Fig. 5 Typical switching energy vs collector current

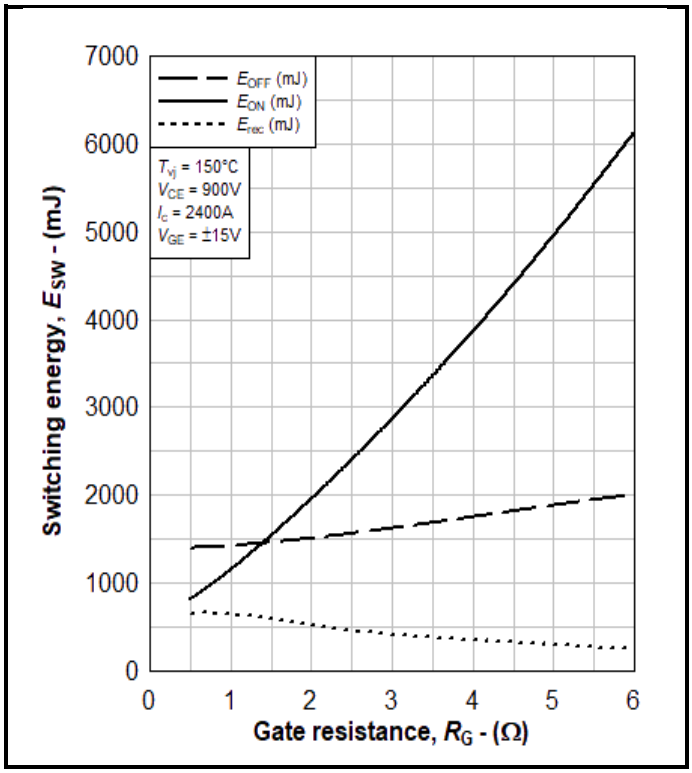


Fig. 6 Typical switching energy vs gate resistance

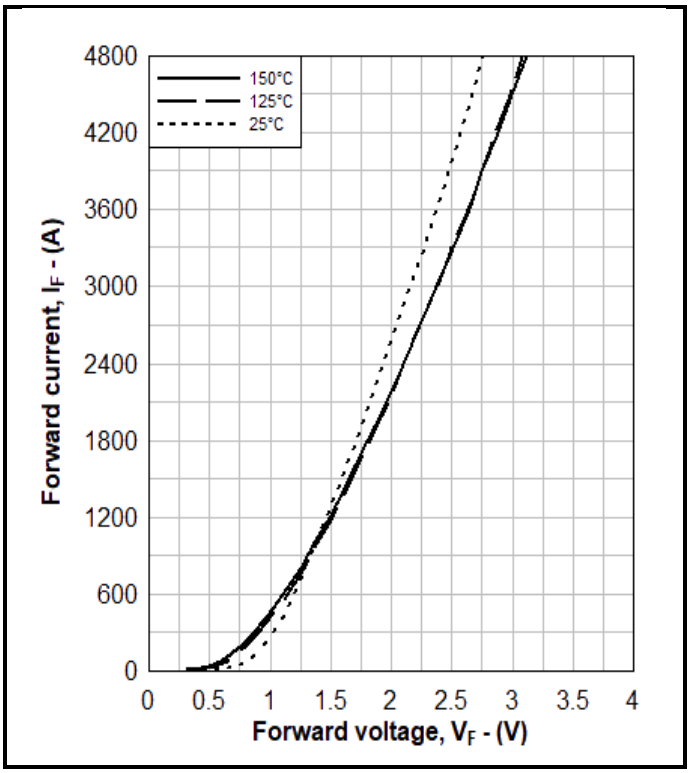


Fig. 7 Diode typical forward characteristics

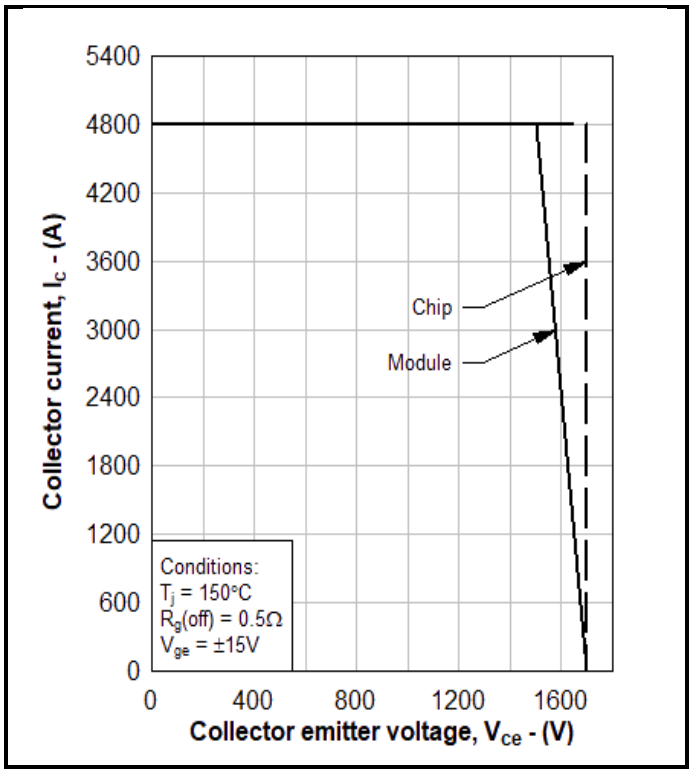


Fig. 8 Reverse bias safe operating area

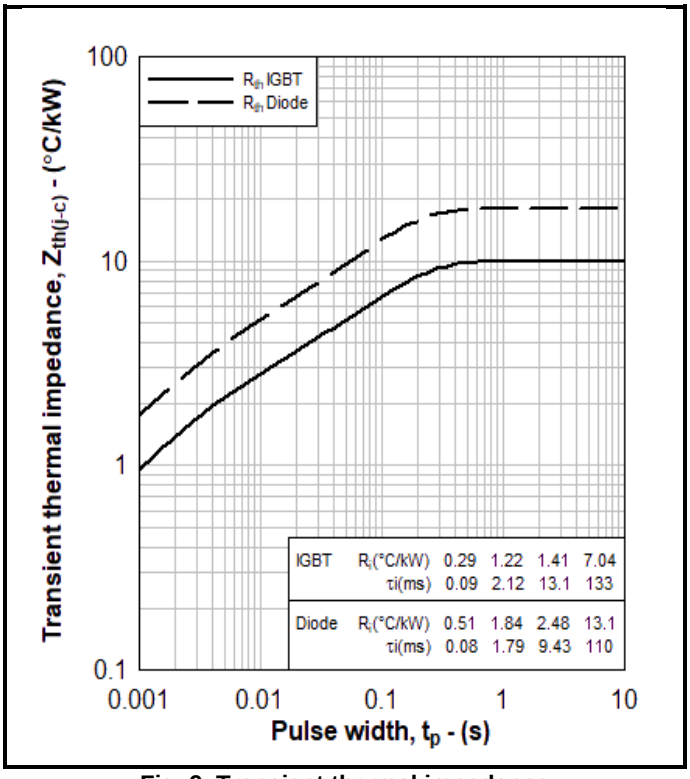
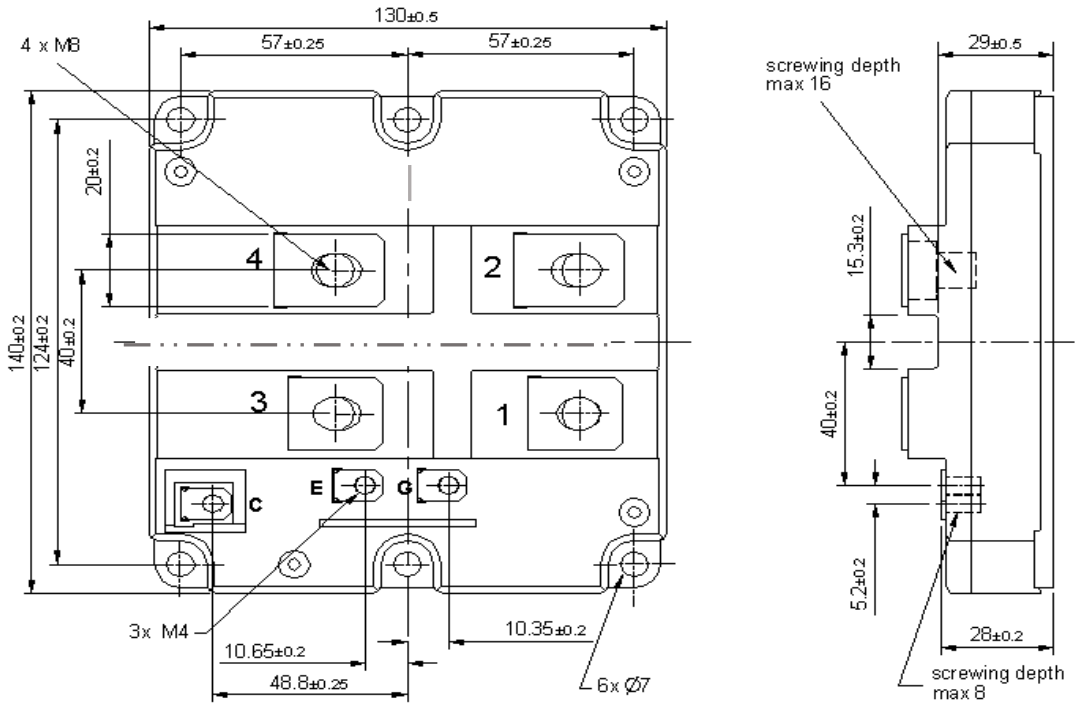
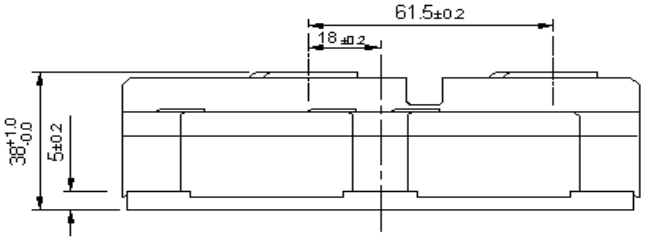


Fig. 9 Transient thermal impedance

PACKAGE DETAILS

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





Nominal Weight: 900g

Module Outline Type Code: N

Fig. 10 Module outline drawing

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HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom
Fax: +44(0)1522 500550
Tel: +44(0)1522 500500
Web: http://www.dynexsemi.com

CUSTOMER SERVICE

DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Tel: +44(0)1522 502753 / 502901
Email: powersolutions@dynexsemi.com