

FEATURES

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

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives

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 DIM1600FSM17-A000 is a single switch 1700V, 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:

DIM1600FSM17-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	1700V
$V_{CE(sat)}$ * (typ)	2.7V
I_C (max)	1600A
$I_{C(PK)}$ (max)	3200A

* Measured at the power busbars, not the auxiliary terminals

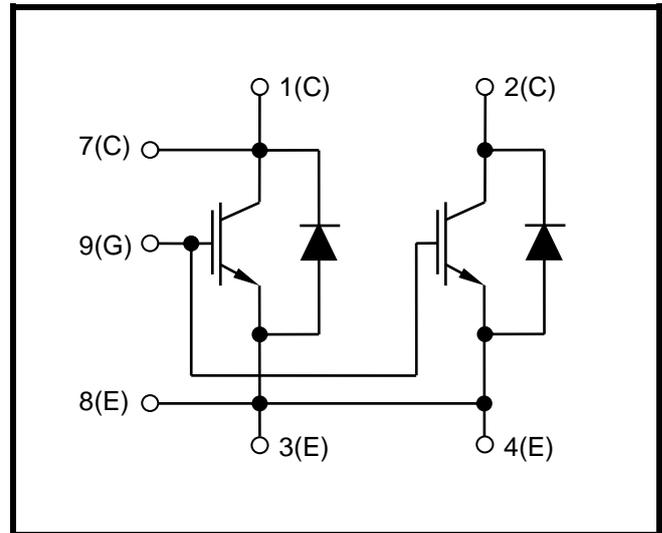


Fig. 1 Circuit configuration



Outline type code: F
(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} = 75°C	1600	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 110°C	3200	A
P _{max}	Max. transistor power dissipation	T _{case} = 25°C, T _j = 150°C	13890	W
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _j = 125°C	480	kA ² s
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: AIN
 Baseplate material: AISiC
 Creepage distance: 20mm
 Clearance: 10mm
 CTI (Comparative Tracking Index): 350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
R _{th(j-c)}	Thermal resistance – transistor	Continuous dissipation - junction to case	-	-	9	°C/kW
R _{th(j-c)}	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	20	°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	-	-	125	°C
T _{stg}	Storage temperature range	-	-40	-	125	°C
	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M4	-	-	2	Nm
		Electrical connections – M8	-	-	10	Nm

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			2	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}C$			50	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			8	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 80mA, V_{GE} = V_{CE}$	4.5	5.5	6.5	V
$V_{CE(sat)}^{\dagger}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 1600A$		2.7	3.2	V
		$V_{GE} = 15V, I_C = 1600A, T_j = 125^{\circ}C$		3.4	4.0	V
I_F	Diode forward current	DC			1600	A
I_{FM}	Diode maximum forward current	$t_p = 1ms$			3200	A
V_F^{\dagger}	Diode forward voltage	$I_F = 1600A$		2.2	2.5	V
		$I_F = 1600A, T_j = 125^{\circ}C$		2.3	2.6	V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		120		nF
Q_g	Gate charge	$\pm 15V$		18		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$				nF
L_M	Module inductance			15		nH
R_{INT}	Internal transistor resistance			140		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 125^{\circ}C, V_{CC} = 1000V$ $t_p \leq 10\mu s, V_{GE} \leq 15V$ $V_{CE(max)} = V_{CES} - L^* \times dl/dt$ IEC 60747-9		6400		A

Note:

\dagger Measured at the power busbars, not the auxiliary terminals

* 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 = 1600A V _{GE} = ±15V V _{CE} = 900V R _{G(ON)} = 1.5Ω R _{G(OFF)} = 1.5Ω L _S ~ 100nH		1400		ns	
t _f	Fall time			200		ns	
E _{OFF}	Turn-off energy loss				550		mJ
t _{d(on)}	Turn-on delay time				300		ns
t _r	Rise time				200		ns
E _{ON}	Turn-on energy loss				300		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1600A V _{CE} = 900V di _F /dt = 8000A/μs		400		μC	
I _{rr}	Diode reverse recovery current			1000		A	
E _{rec}	Diode reverse recovery energy				265		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 = 1600A V _{GE} = ±15V V _{CE} = 900V R _{G(ON)} = 1.5Ω R _{G(OFF)} = 1.5Ω L _S ~ 100nH		1600		ns	
t _f	Fall time			250		ns	
E _{OFF}	Turn-off energy loss				720		mJ
t _{d(on)}	Turn-on delay time				400		ns
t _r	Rise time				250		ns
E _{ON}	Turn-on energy loss				600		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1600A V _{CE} = 900V di _F /dt = 7000A/μs		600		μC	
I _{rr}	Diode reverse recovery current			1050		A	
E _{rec}	Diode reverse recovery energy				530		mJ

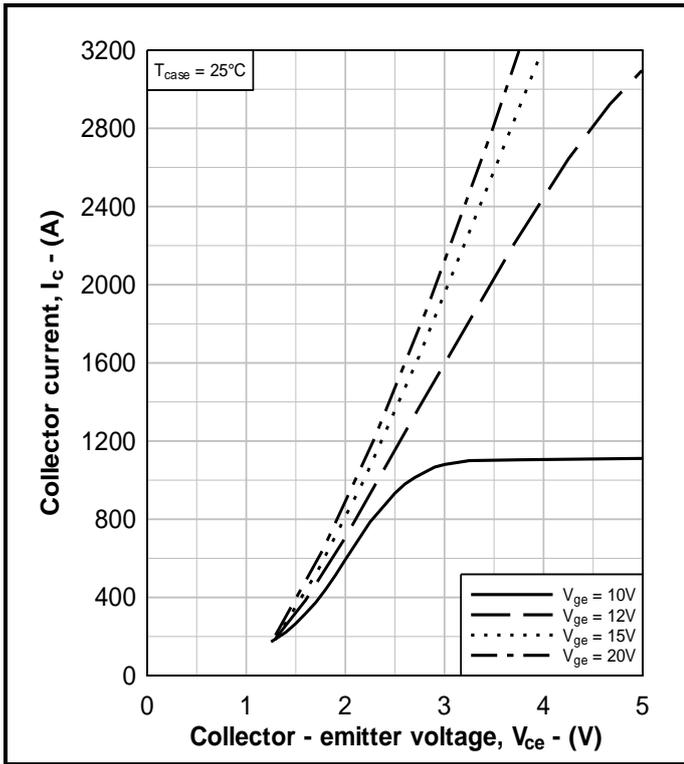


Fig. 3 Typical output characteristics

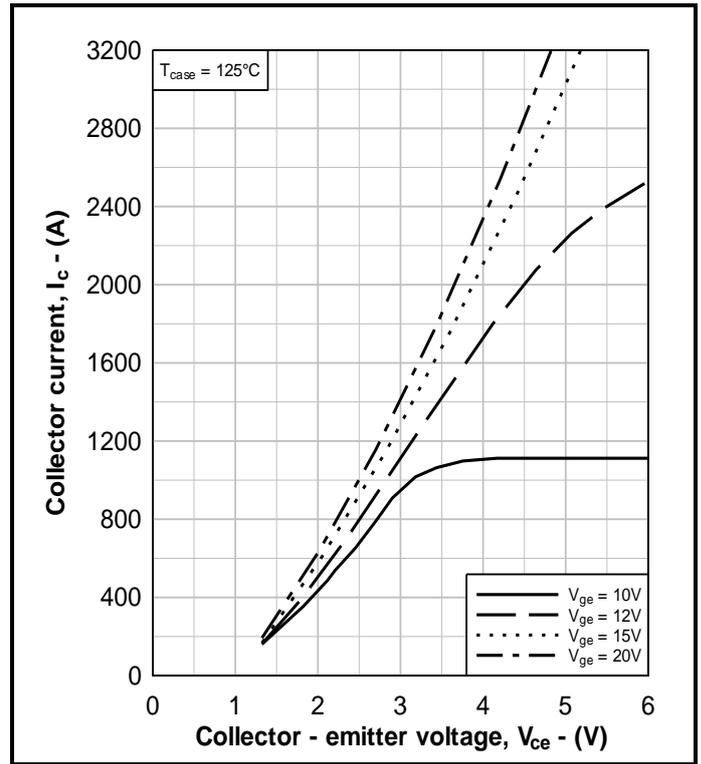


Fig. 4 Typical output characteristics

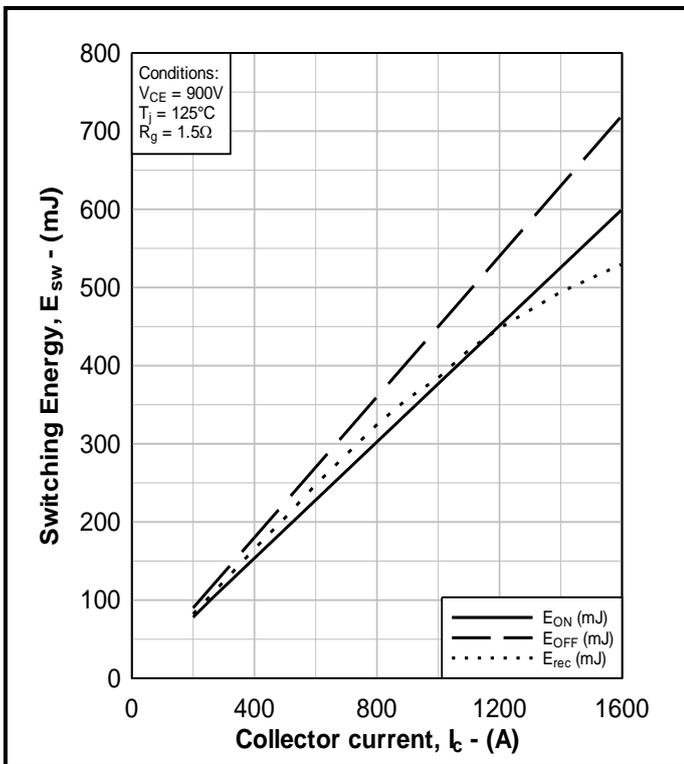


Fig. 5 Typical switching energy vs collector current

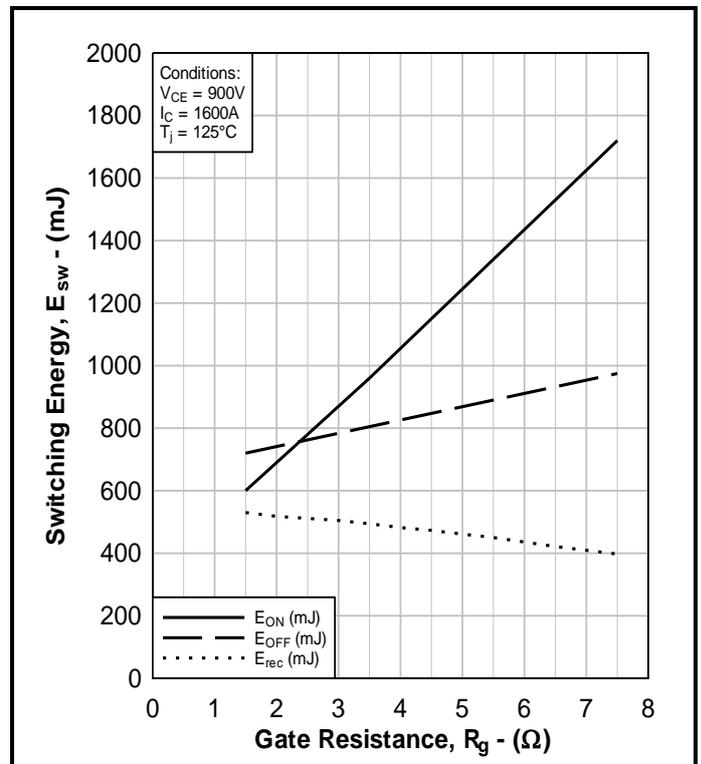


Fig. 6 Typical switching energy vs gate resistance

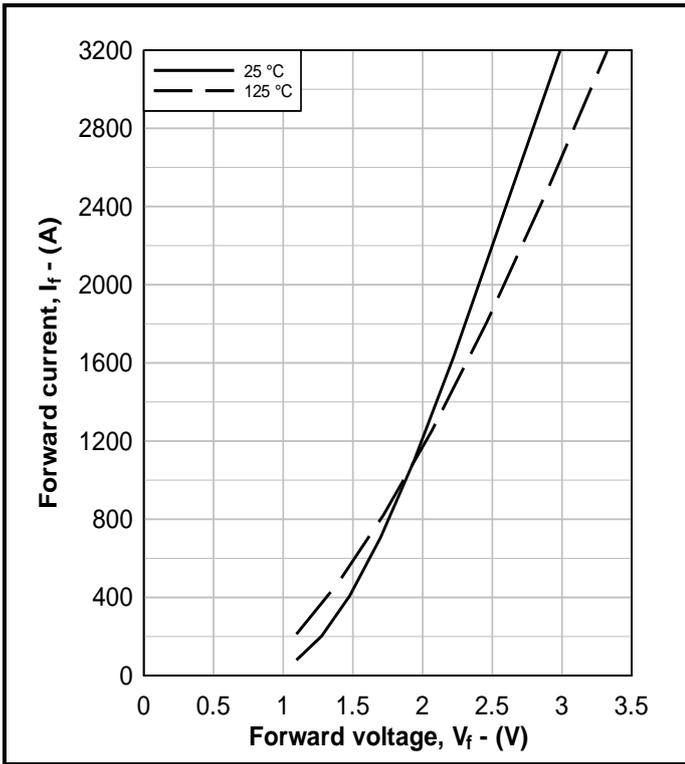


Fig. 7 Diode typical forward characteristics

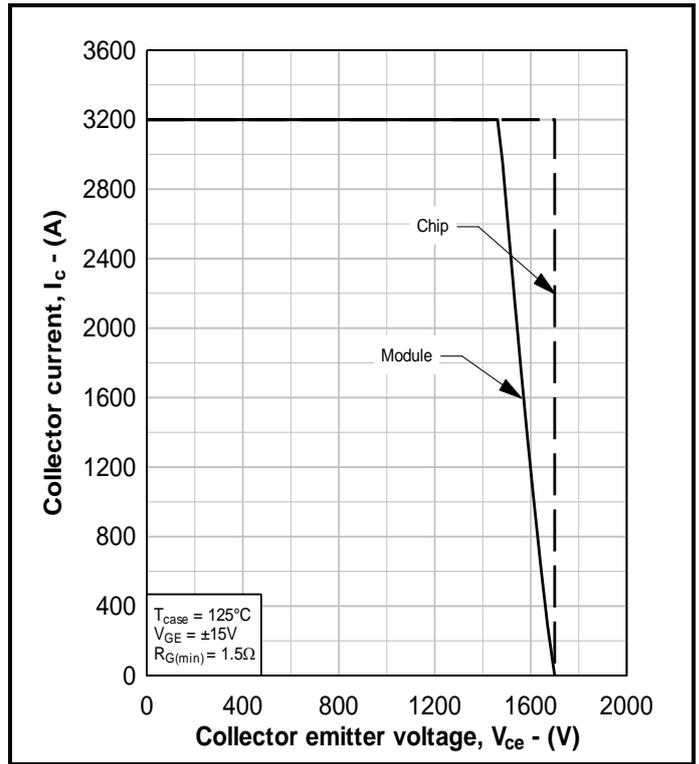


Fig. 8 Reverse bias safe operating area

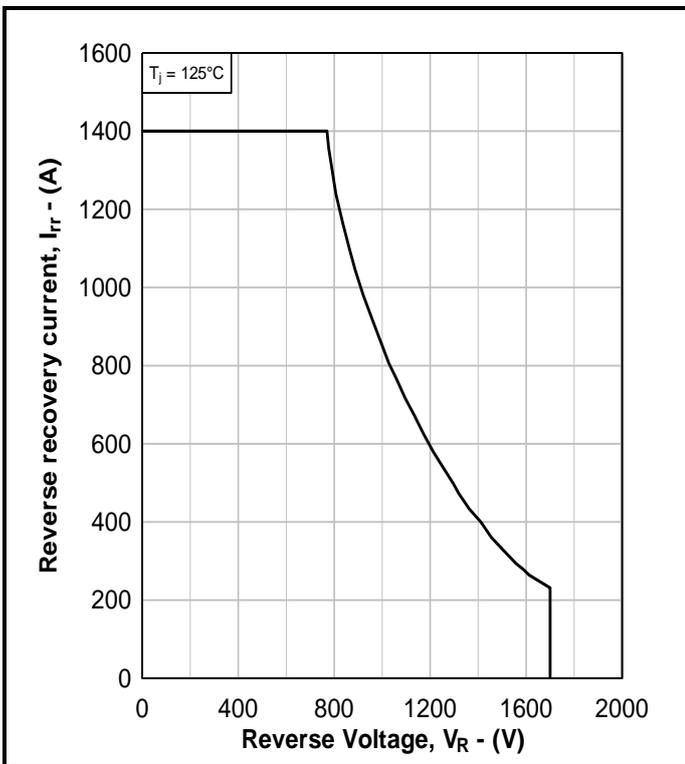


Fig. 9 Diode reverse bias safe operating area

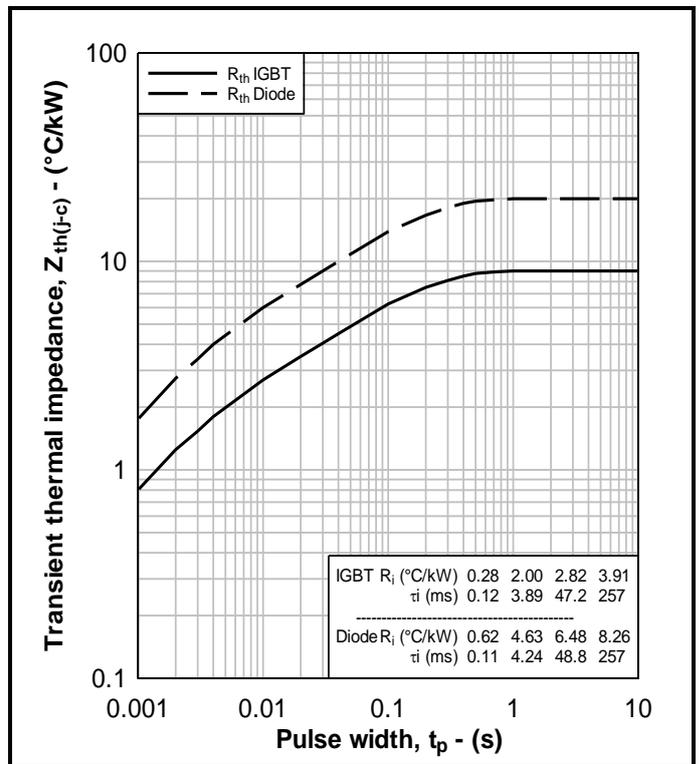
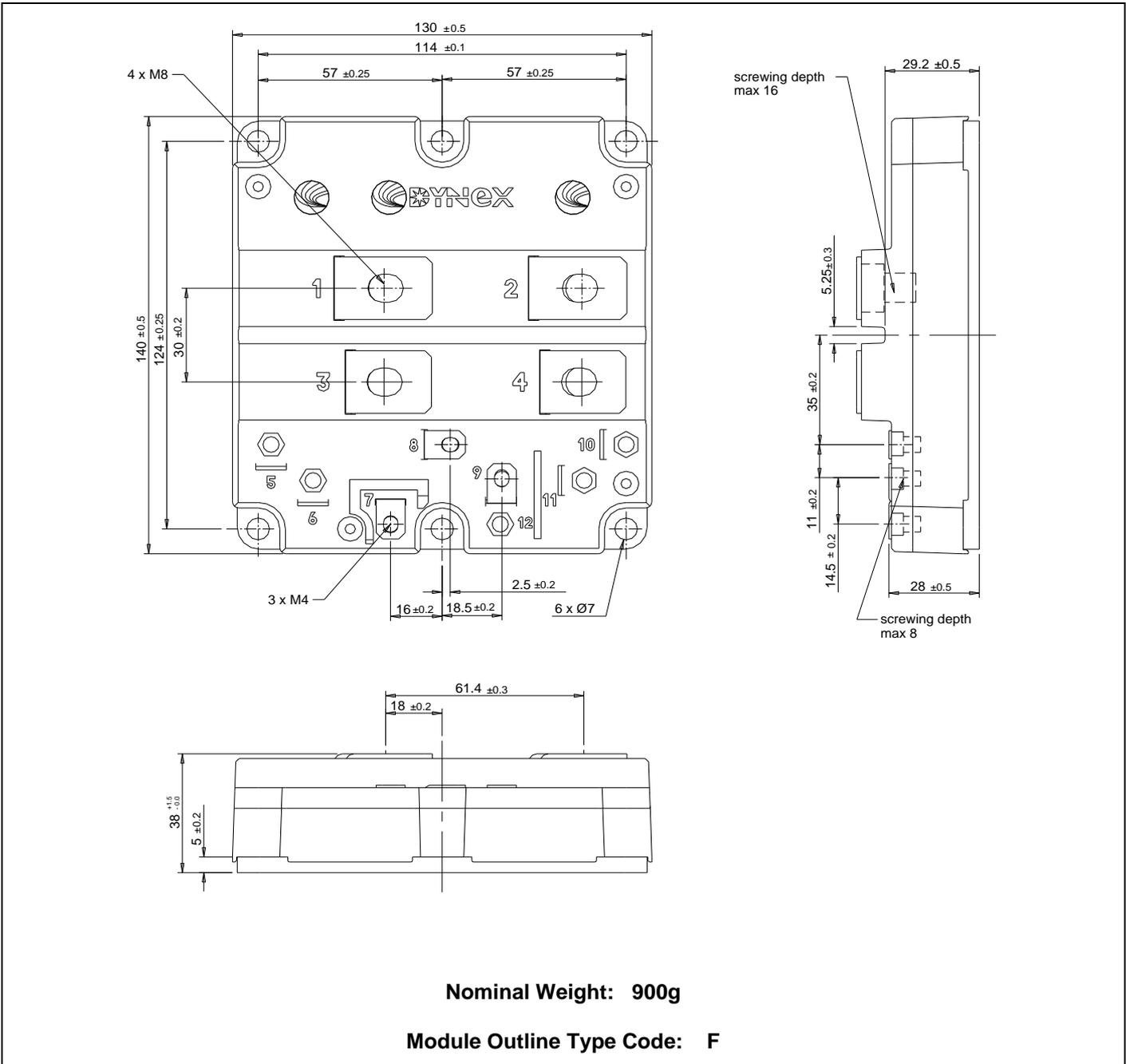


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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



Nominal Weight: 900g

Module Outline Type Code: F

Fig. 11 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