Preliminary Datasheet

TIM1600FSM17-TS000

Single Switch IGBT Module

Replaces DS6179-1

DS6191-1 June 2016 (LN33579)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AlSiC Base with AlN Substrates
- Lead Free construction
- Low $V_{CE(sat)}$ Device
- High Current Density

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 TIM1600FSM17-TS000 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:

TIM1600FSM17-TS000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1700V**
$V_{CE(sat)}$ *	**(typ)**	**2.3 V**
I_C	**(max)**	**1600A**
$I_{C(PK)}$	**(max)**	**3200A**

* Measured at the power busbars, not the auxiliary terminals

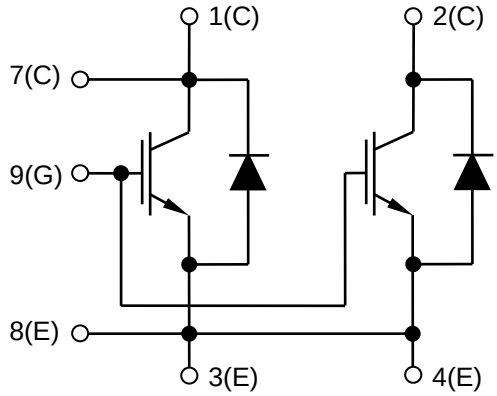
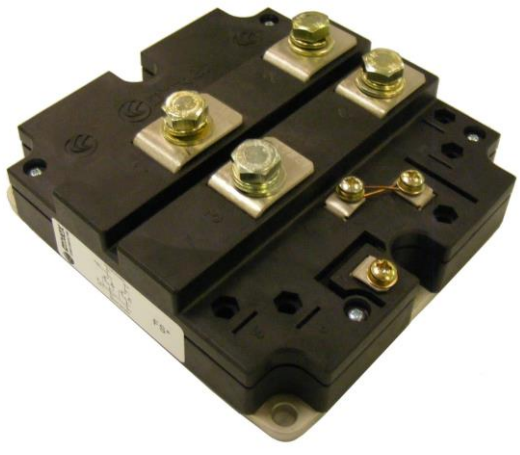


Fig. 1 Circuit configuration



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} = 80°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	13.8	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 125ºC	480	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: 20mm

Clearance: 10mm

CTI (Comparative Tracking Index): >350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per switch)	Continuous dissipation - junction to case		-	9	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (per switch)	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°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°C			50	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			8	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 80mA, V_{GE} = V_{CE}	5.6	5.9	6.2	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 1600A		2.3	2.6	V
		V_{GE} = 15V, I_C = 1600A, T_j = 125°C		2.8	3.1	V
I_F	Diode forward current	DC			1600	A
I_{FM}	Diode maximum forward current	t_p = 1ms			3200	A
V_F	Diode forward voltage	I_F = 1600A		1.7	2.0	V
		I_F = 1600A, T_j = 125°C		1.8	2.1	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		120		nF
Q_g	Gate charge	±15V		18		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-		nF
L_M	Module inductance – per switch	-		15		nH
R_{INT}	Internal transistor resistance – per switch	-		140		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		6400		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 = 1600A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 1.5Ω $R_{G(OFF)}$ = 1.5Ω L_S ~ 100nH		1360		ns
t_f	Fall time			275		ns
E_{OFF}	Turn-off energy loss			600		mJ
$t_{d(on)}$	Turn-on delay time			440		ns
t_r	Rise time			390		ns
E_{ON}	Turn-on energy loss			330		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1600A V_{CE} = 900V dI_F/dt = 7000A/µs		550		µC
I_{rr}	Diode reverse recovery current			980		A
E_{rec}	Diode reverse recovery energy			380		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		1450		ns
t_f	Fall time			330		ns
E_{OFF}	Turn-off energy loss			710		mJ
$t_{d(on)}$	Turn-on delay time			440		ns
t_r	Rise time			390		ns
E_{ON}	Turn-on energy loss			500		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1600A V_{CE} = 900V dI_F/dt = 7000A/µs		870		µC
I_{rr}	Diode reverse recovery current			1150		A
E_{rec}	Diode reverse recovery energy			590		mJ

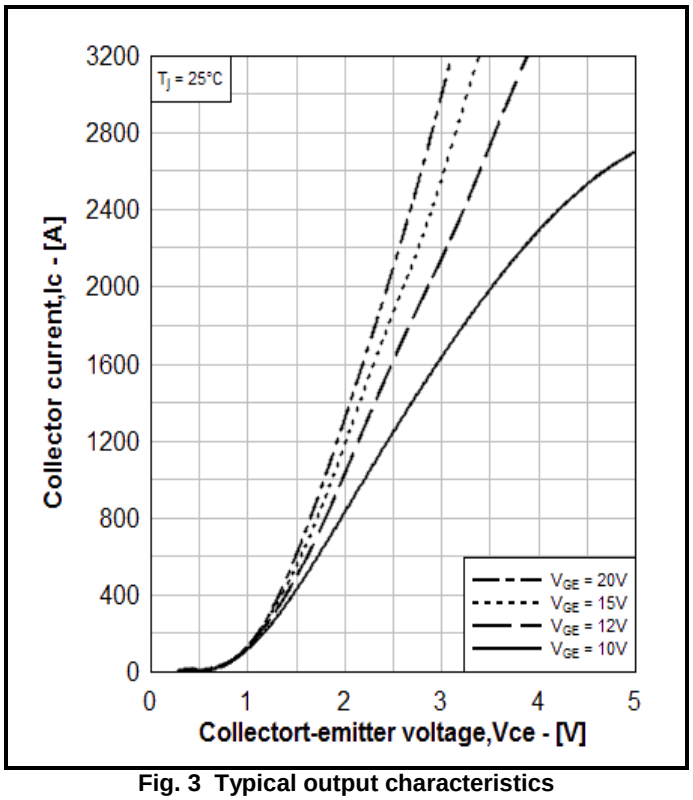


Fig. 3 Typical output characteristics

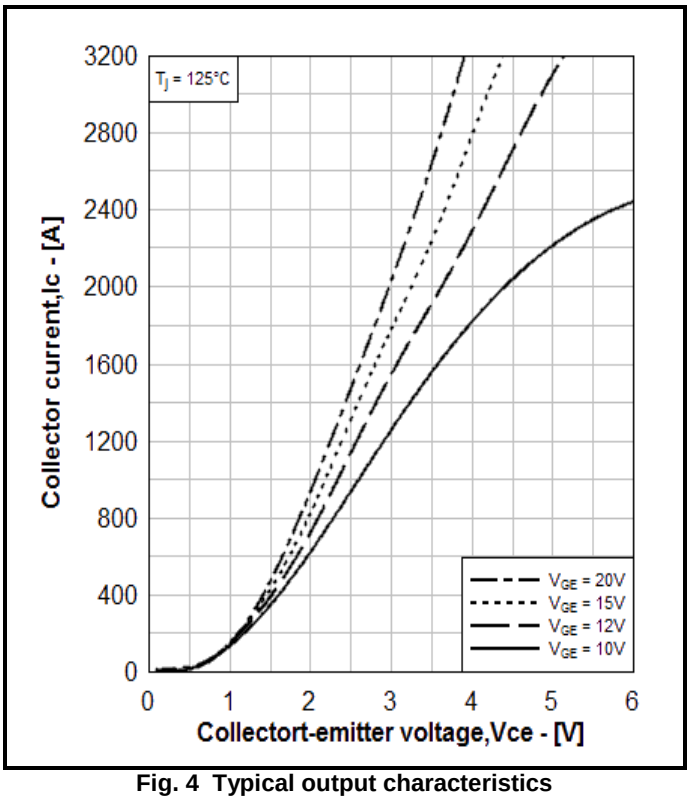


Fig. 4 Typical output characteristics

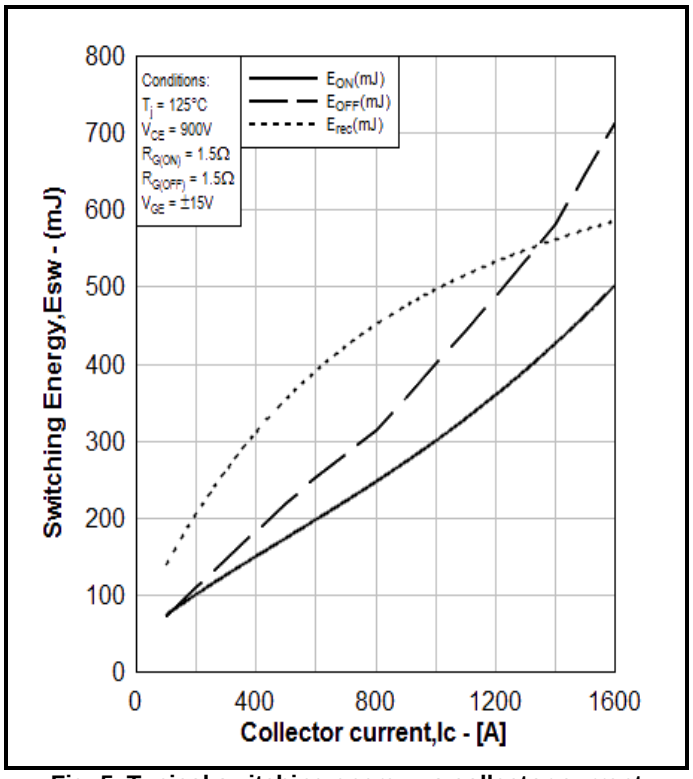


Fig. 5 Typical switching energy vs collector current

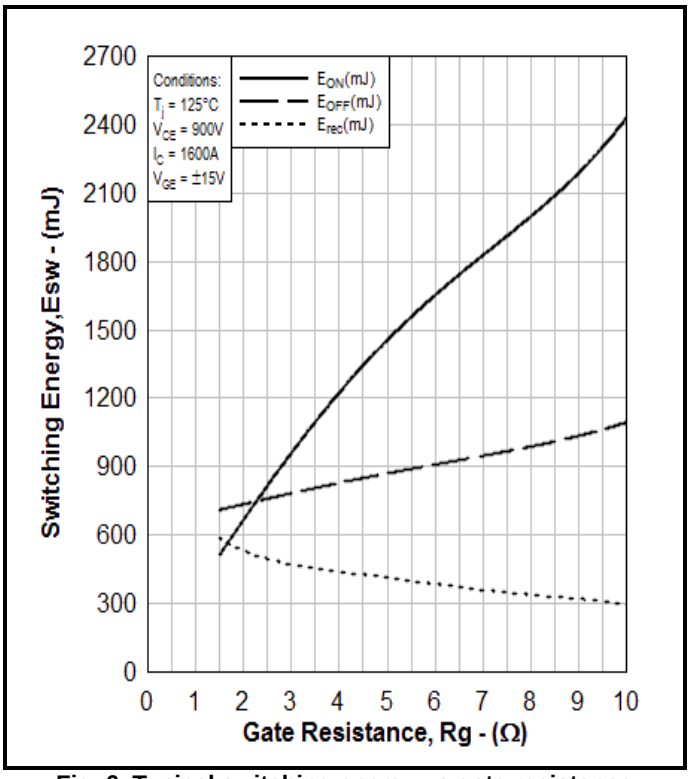


Fig. 6 Typical switching energy vs gate resistance

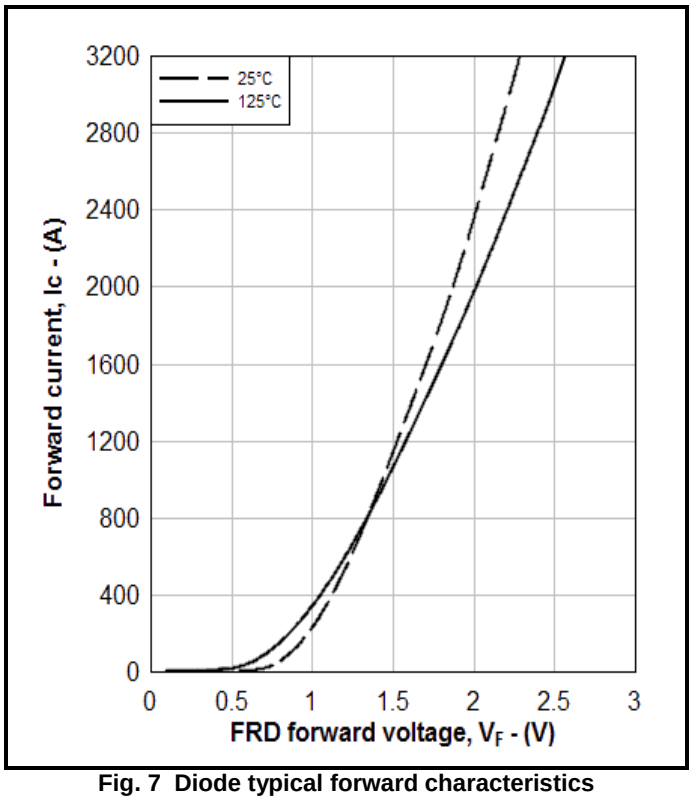


Fig. 7 Diode typical forward characteristics

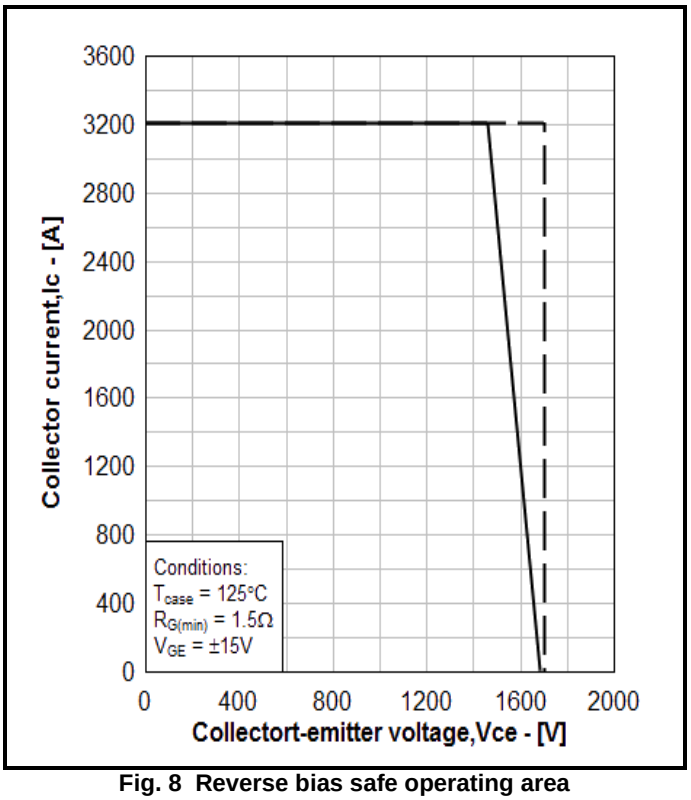


Fig. 8 Reverse bias safe operating area

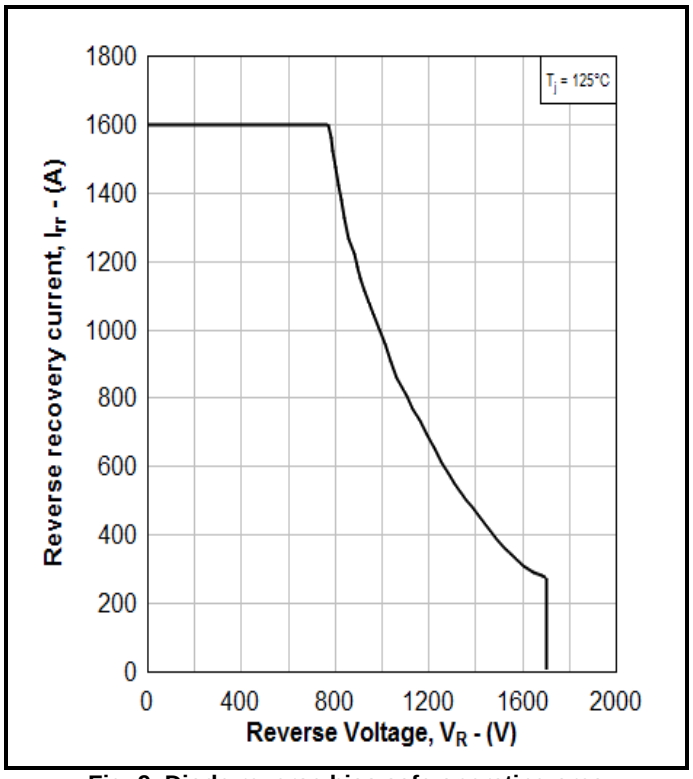


Fig. 9 Diode reverse bias safe operating area

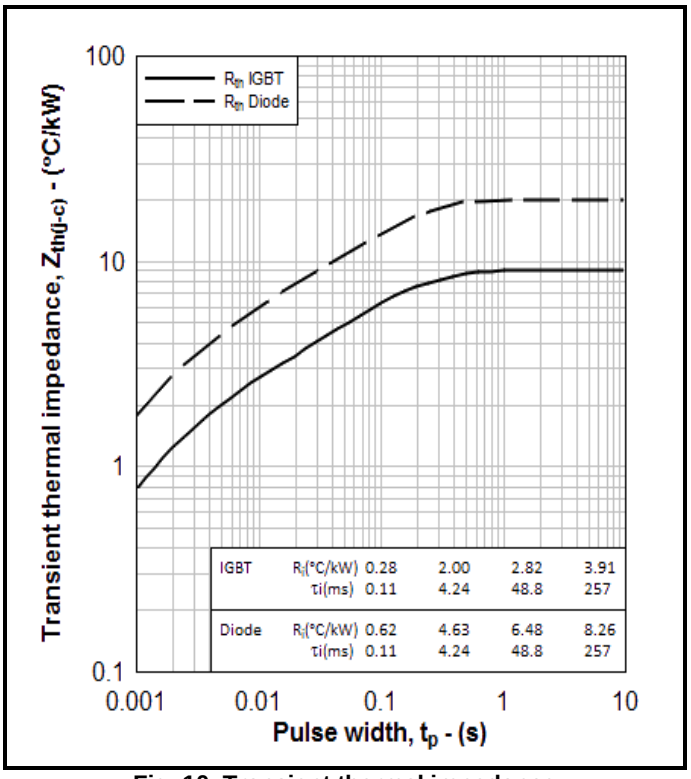
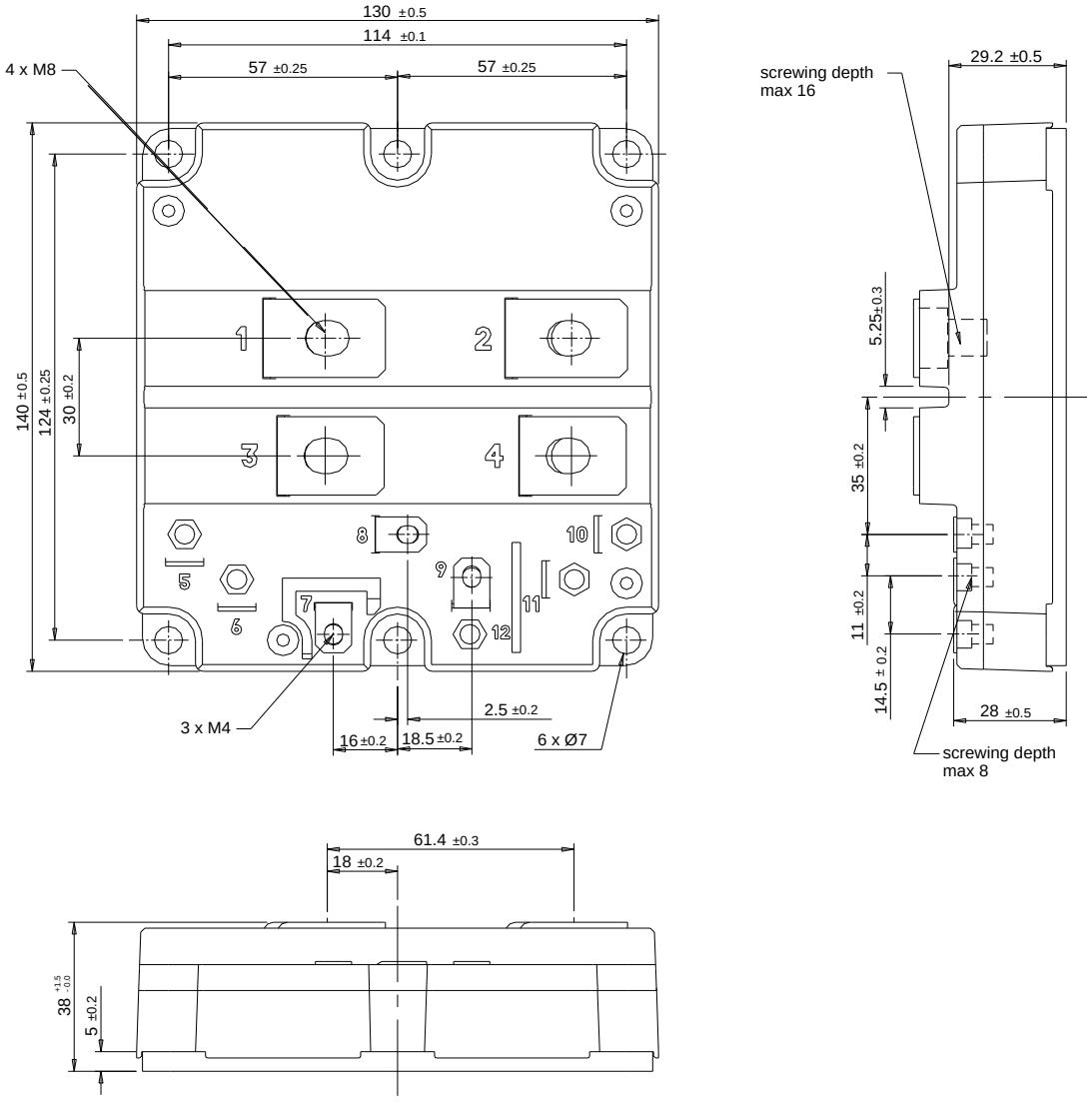


Fig. 10 Transient thermal impedance

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
Fax: +44(0)1522 500020
Tel: +44(0)1522 502753 / 502901
Email: Power_solutions@dynexsemi.com

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.