DIM600M1HS17-PA500

Half Bridge IGBT Module

Replaces DS6329-2

DS6329-3 September 2021 (LN41204)

FEATURES

- Trench Gate IGBT
- High Thermal Cycling
- Cu Base with Enhanced Al_2O_3 Substrates
- 10µs Short Circuit Withstand

APPLICATIONS

- Wind Turbines
- Power Charging Equipment
- 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 DIM600M1HS17-PA500 is a half bridge 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.

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:

DIM600M1HS17-PA500

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1700V**
$V_{CE(sat)}$ *	**(typ)**	**1.80V**
I_C	**(max)**	**600A**
$I_{C(RM)}$	**(max)**	**1200A**

* Measured at the auxiliary terminals

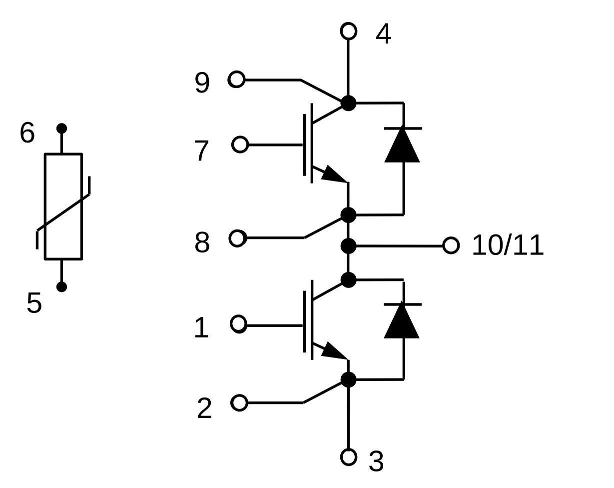


Fig. 1 Circuit configuration

Outline type code: M1

(See Fig. 15 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, T_C = 25°C	1700	V
V_{GES}	Gate-emitter voltage	T_C = 25°C	±20	V
I_C	Continuous collector current	T_C = 100°C, $T_{vj}max$ = 175°C	600	A
$I_{C(PK)}$	Peak collector current	t_P = 1ms	1200	A
P_{max}	Max. transistor power dissipation	T_C = 25°C, T_{vj} = 175°C	3.26	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_{vj} = 150°C	41.5	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	3400	V

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	Al_2O_3
Baseplate material:	Cu
Creepage distance – Terminal to heatsink:	14.5mm
Creepage distance – Terminal to terminal:	13.0mm
Clearance – Terminal to heatsink:	12.5mm
Clearance – Terminal to terminal:	10mm
CTI (Comparative Tracking Index):	>200

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – IGBT	Continuous dissipation – junction to case			46	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode				80	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm (with mounting grease 1W/m °C)		33		°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (Diode)			38		°C/kW
T_j	Junction temperature	IGBT	-40		150	°C
		Diode	-40		150	°C
T_{stg}	Storage temperature range	-	-40		125	°C
	Screw torque	Mounting – M5	3		6	Nm
		Electrical connections – M6	3		6	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_C = 125°C			15	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_C = 150°C			30	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			0.5	μA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 15mA, V_{GE} = V_{CE}	5.60	6.20	6.80	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 600A		1.80	2.20	V
		V_{GE} = 15V, I_C = 600A, T_j = 125°C		2.20		V
		V_{GE} = 15V, I_C = 600A, T_j = 150°C		2.30		V
I_F	Diode forward current	DC		600		A
I_{FM}	Diode maximum forward current	t_p = 1ms		1200		A
V_F	Diode forward voltage	I_F = 600A		1.85	2.25	V
		I_F = 600A, T_j = 125°C		2.10		V
		I_F = 600A, T_j = 150°C		2.10		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		96		nF
Q_g	Gate charge	±15V		6.1		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		0.7		nF
L_M	Module inductance			20		nH
R_{INT}	Internal transistor resistance			1		mΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 1000V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L^* x dI/dt IEC 60747-9		2400		A

Note:
* L is the circuit inductance + L_M

NTC-Thermistor Data

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R_{25}	Rated resistance	T_C = 25°C		5		kΩ
Δ*R*/R	Deviation of R100	T_C = 100°C, R_{100} = 493Ω	-5		5	%
P_{25}	Power dissipation	T_C = 25°C			20	m/W
$B_{25/50}$	B-value	R_2 = R_{25}exp [$B_{25/50}$(1/T2 – 1/(298.15K))]		3375		K
$B_{25/80}$		R_2 = R_{25}exp [$B_{25/80}$(1/T2 – 1/(298.15K))]		3411		K
$B_{25/100}$		R_2 = R_{25}exp [$B_{25/100}$(1/T2 – 1/(298.15K))]		3433		K

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 = 600A V_{CE} = 900V V_{GE} = ±15V $R_{G(OFF)}$ = 1.0Ω $R_{G(ON)}$ = 1.0Ω L_S ~ 60nH	*dv/dt* = 5000V/µs		760		ns
t_f	Fall time				360		ns
E_{OFF}	Turn-off energy loss				135		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 7700A/µs		285		ns
t_r	Rise time				81		ns
E_{ON}	Turn-on energy loss				45		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 600A V_{CE} = 900V *di/dt* = 7700A/µs			155		µC
I_{rr}	Diode reverse recovery current				720		A
E_{rec}	Diode reverse recovery energy				123		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 = 600A V_{CE} = 900V V_{GE} = ±15V $R_{G(OFF)}$ = 1.0Ω $R_{G(ON)}$ = 1.0Ω L_S ~ 60nH	*dv/dt* = 5000V/µs		860		ns
t_f	Fall time				500		ns
E_{OFF}	Turn-off energy loss				183		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 7700A/µs		295		ns
t_r	Rise time				85		ns
E_{ON}	Turn-on energy loss				61		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 600A V_{CE} = 900V *di/dt* = 7700A/µs			250		µC
I_{rr}	Diode reverse recovery current				810		A
E_{rec}	Diode reverse recovery energy				192		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 = 600A V_{CE} = 900V V_{GE} = ±15V $R_{G(OFF)}$ = 1.0Ω $R_{G(ON)}$ = 1.0Ω L_S ~ 60nH	*dv/dt* = 5000V/µs		870		ns
t_f	Fall time				535		ns
E_{OFF}	Turn-off energy loss				194		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 7700A/µs		300		ns
t_r	Rise time				86		ns
E_{ON}	Turn-on energy loss				67		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 600A V_{CE} = 900V *di/dt* = 7700A/µs			270		µC
I_{rr}	Diode reverse recovery current				830		A
E_{rec}	Diode reverse recovery energy				209		mJ

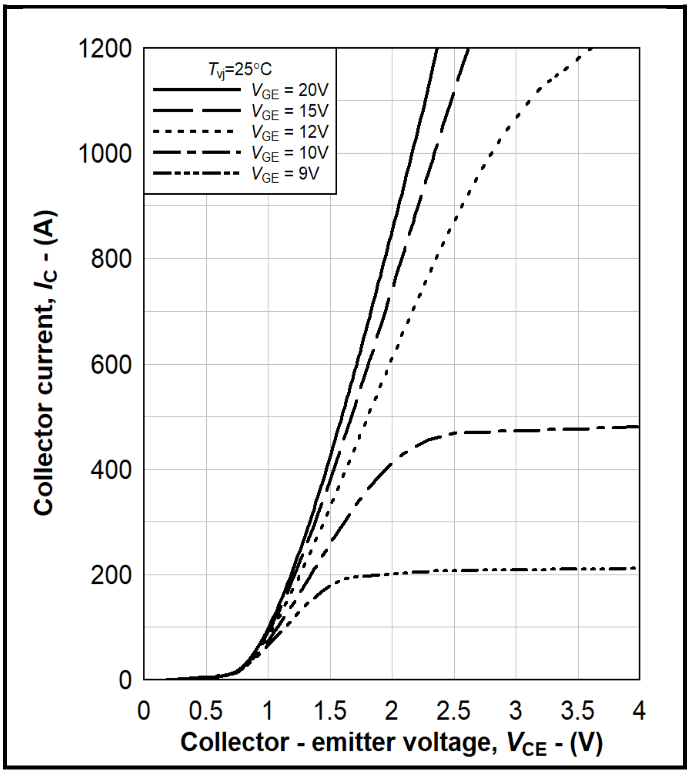


Fig. 3 Typical IGBT output characteristics, I_C = f(V_{CE})

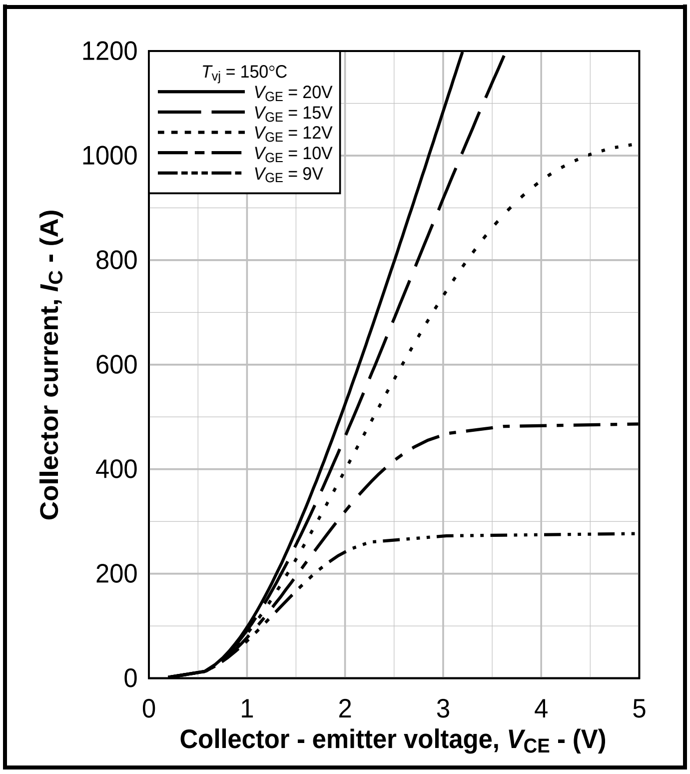


Fig. 4 Typical IGBT output characteristics, I_C = f(V_{CE})

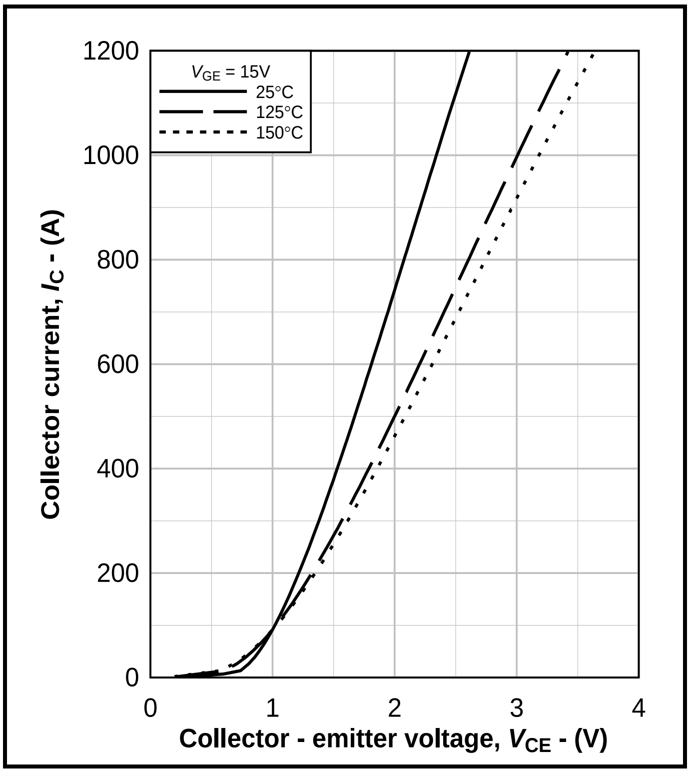


Fig. 5 Typical IGBT output characteristics, I_C = f(V_{CE})

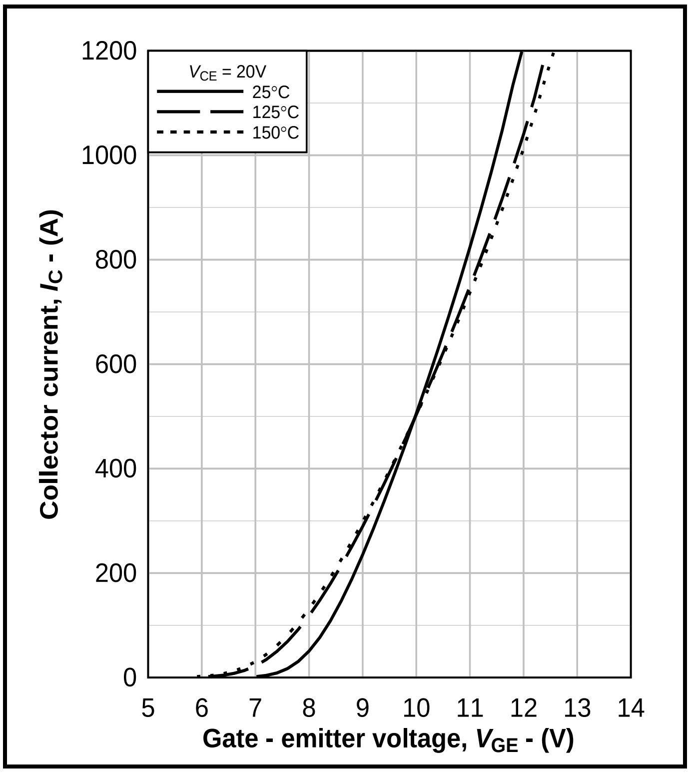


Fig. 6 Typical IGBT transfer characteristics, I_C = f(V_{GE})

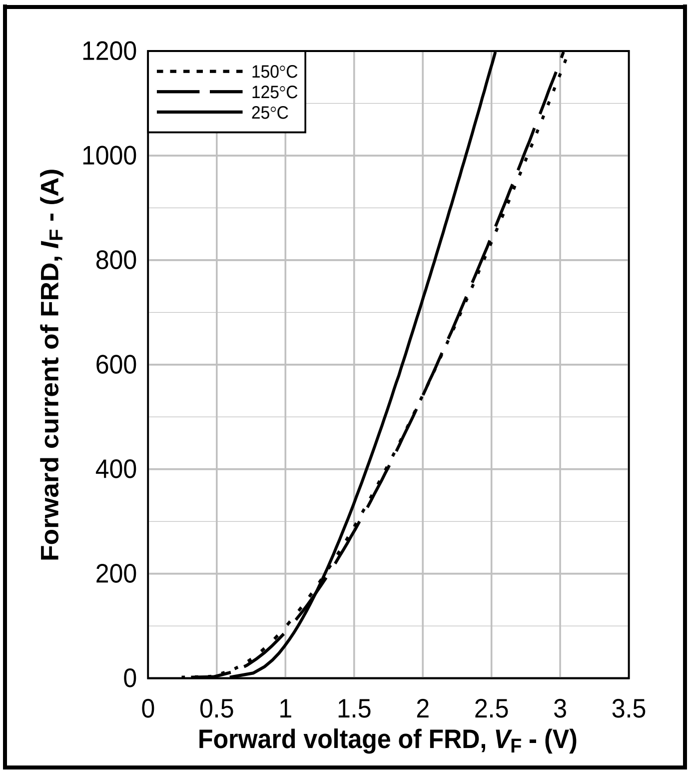


Fig. 7 Typical FRD E_{rec}, E_{rec} = f(R_G)

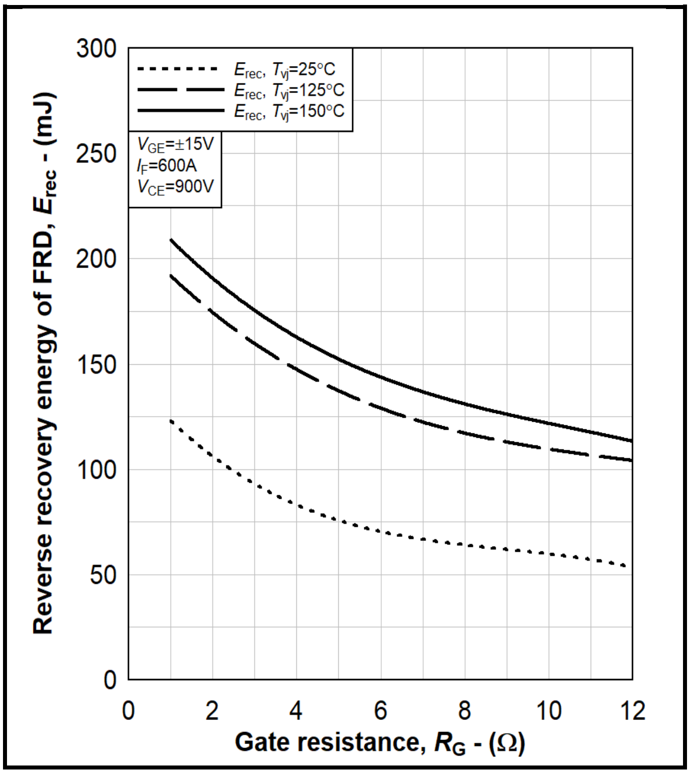


Fig. 8 Typical FRD E_{rec}, E_{rec} = f(R_G)

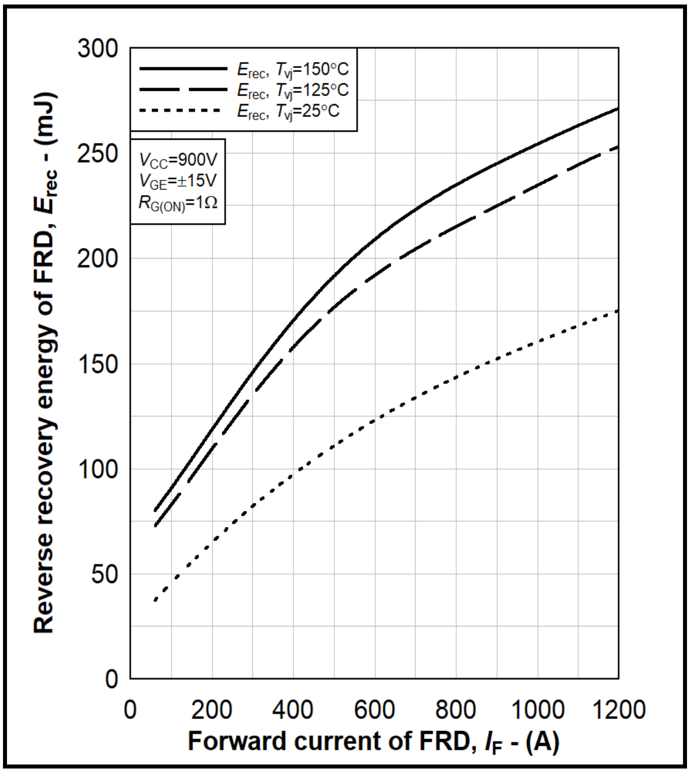


Fig. 9 Typical FRD E_{rec}, E_{rec} = f(I_F)

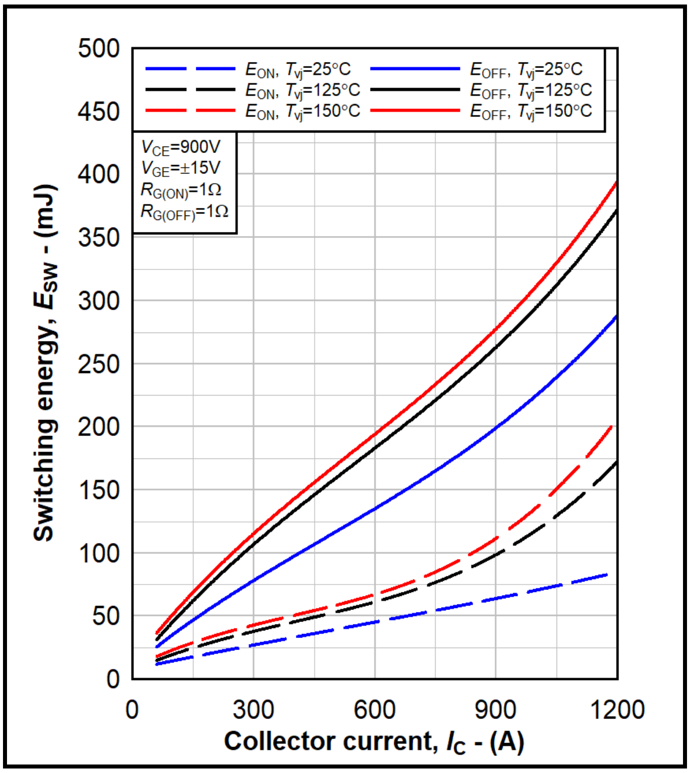


Fig. 10 Typical IGBT switching energy,
E_{ON} = f(I_C), E_{OFF} = f(I_C)

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

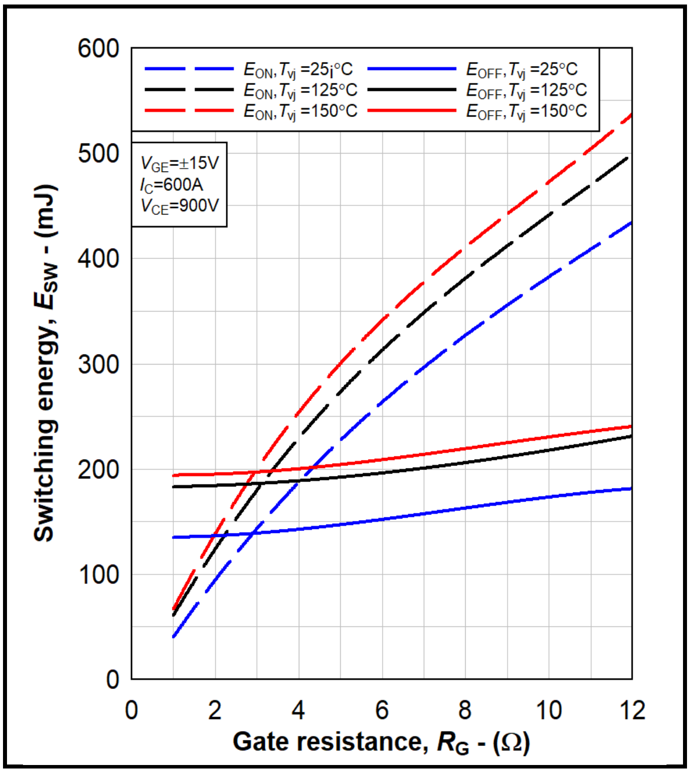


Fig. 11 Typical IGBT switching energy
$E_{ON} = f(R_G)$, $E_{OFF} = fR_G$)

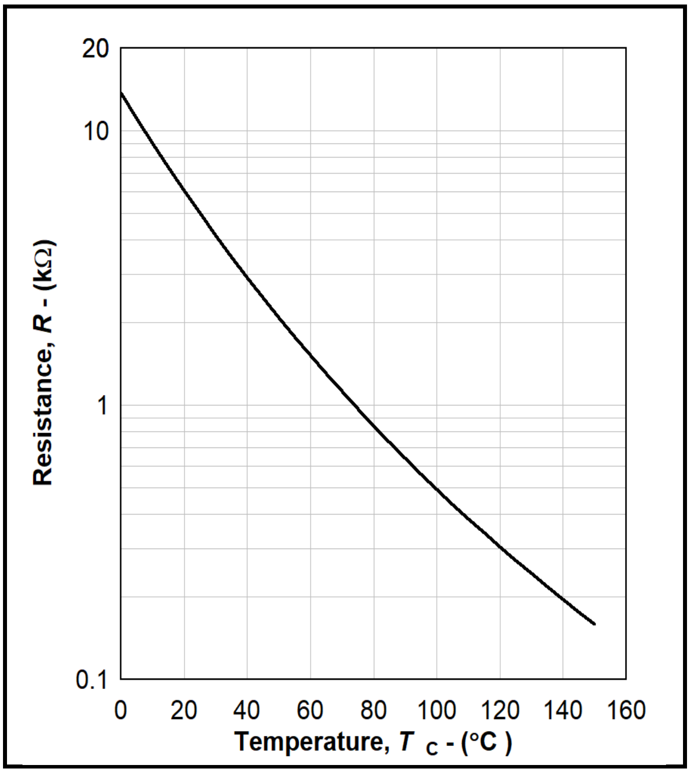


Fig. 12 Typical NTC thermistor characteristic, $R = f(T_C)$

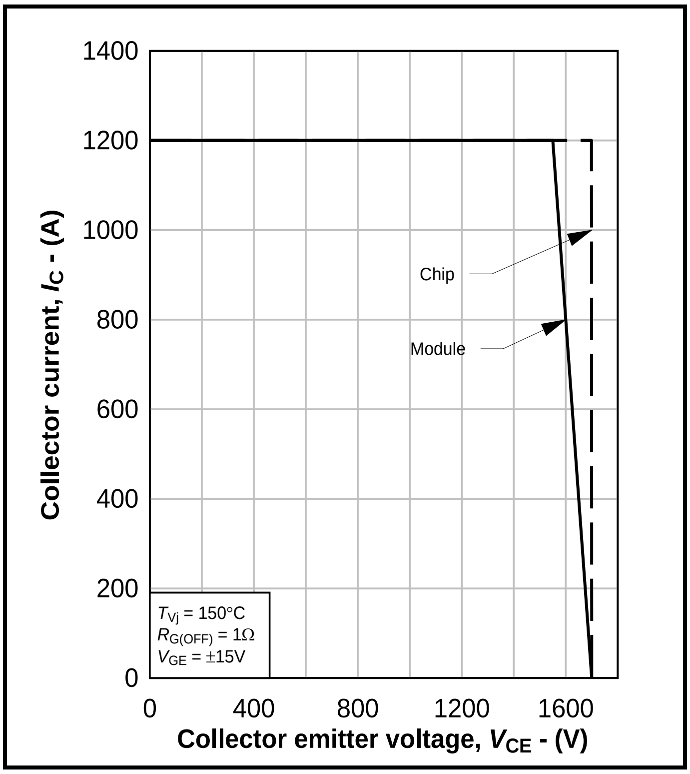


Fig. 13 Reverse bias safe operating area of IGBT,
$I_C = f(V_{CE})$

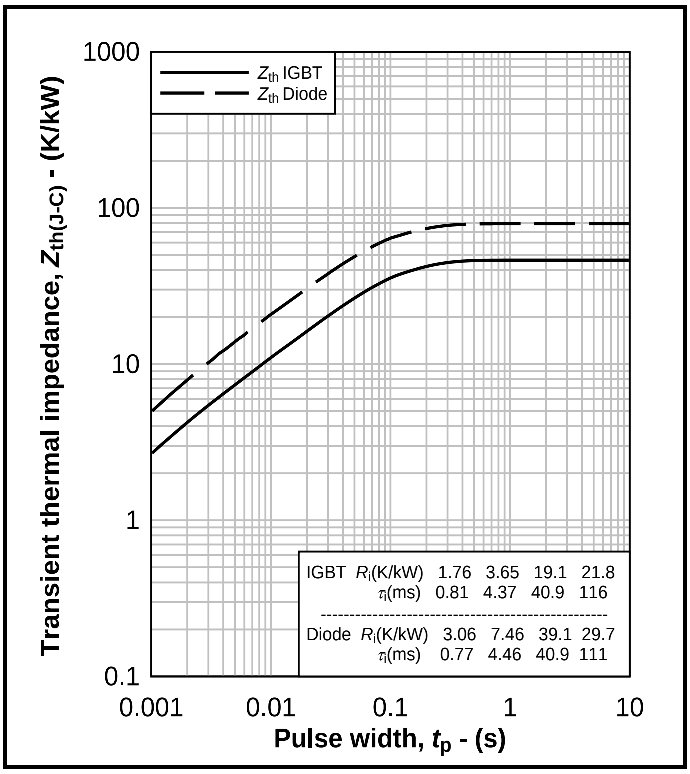


Fig. 14 Transient thermal impedance, $Z_{th(J-C)} = f(t)$

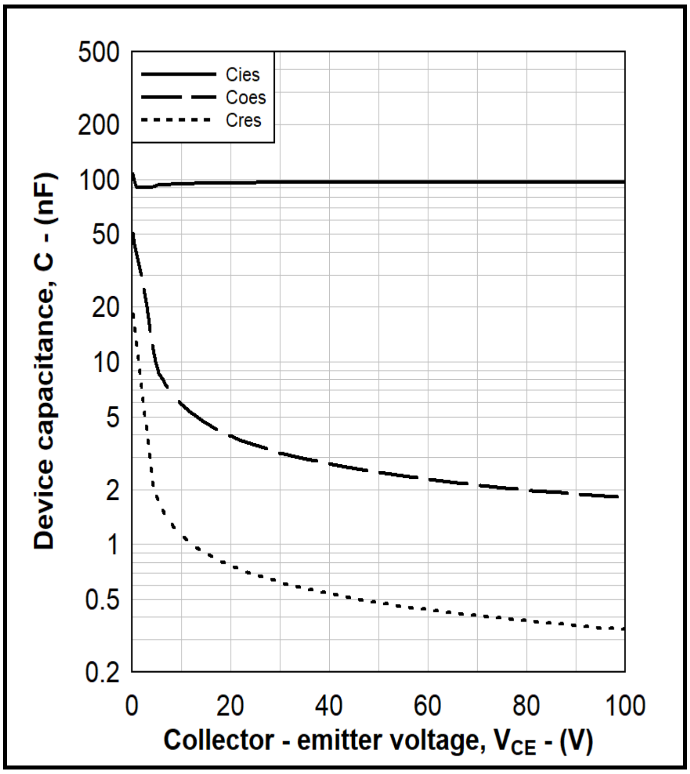


Fig. 15 Device capacitance

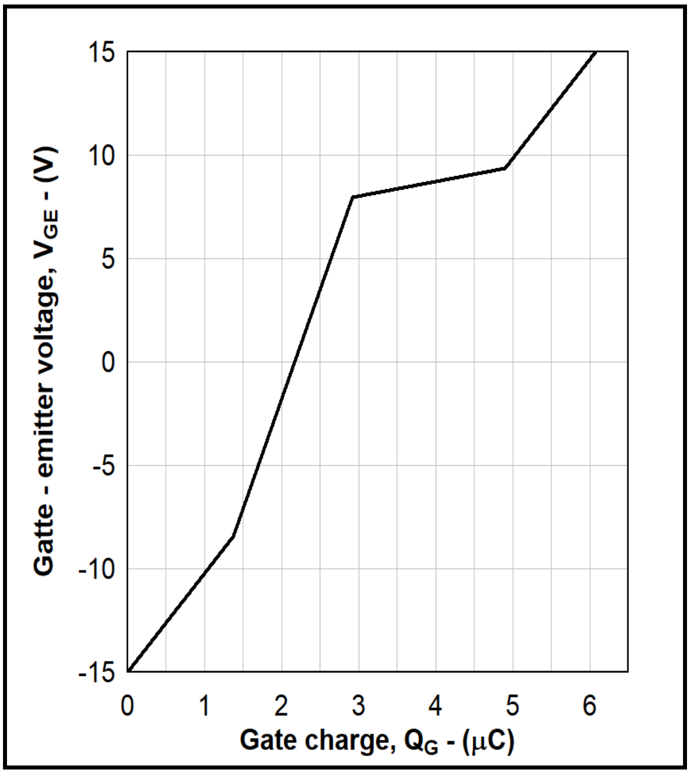


Fig. 16 Typical gate charge characteristics

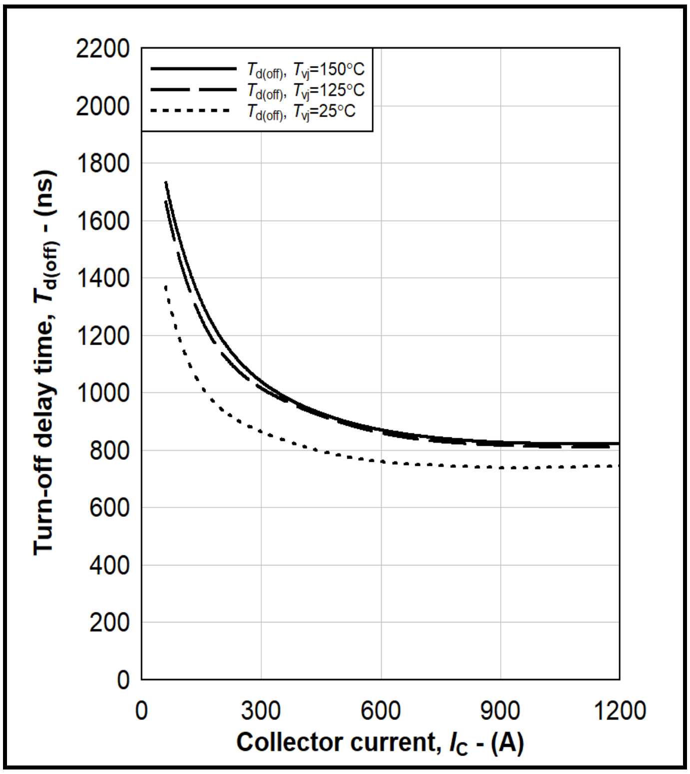


Fig. 17 Turn off delay time vs collector current

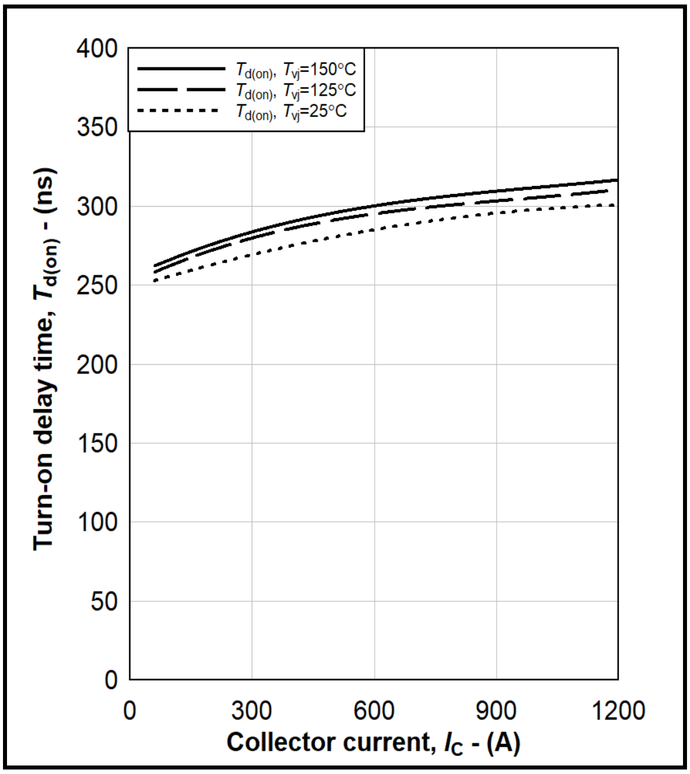


Fig. 18 Turn on delay time vs collector current

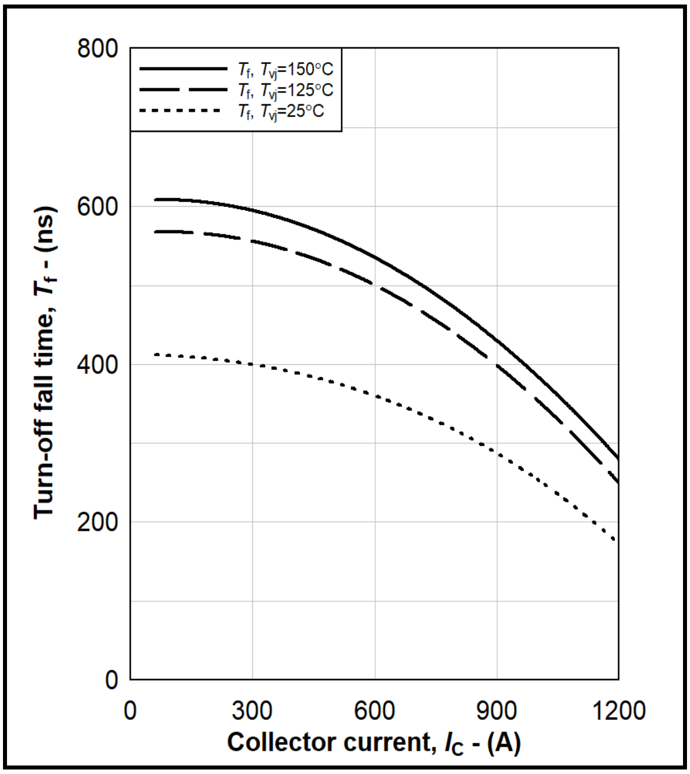


Fig. 19 Turn-off time vs collector current

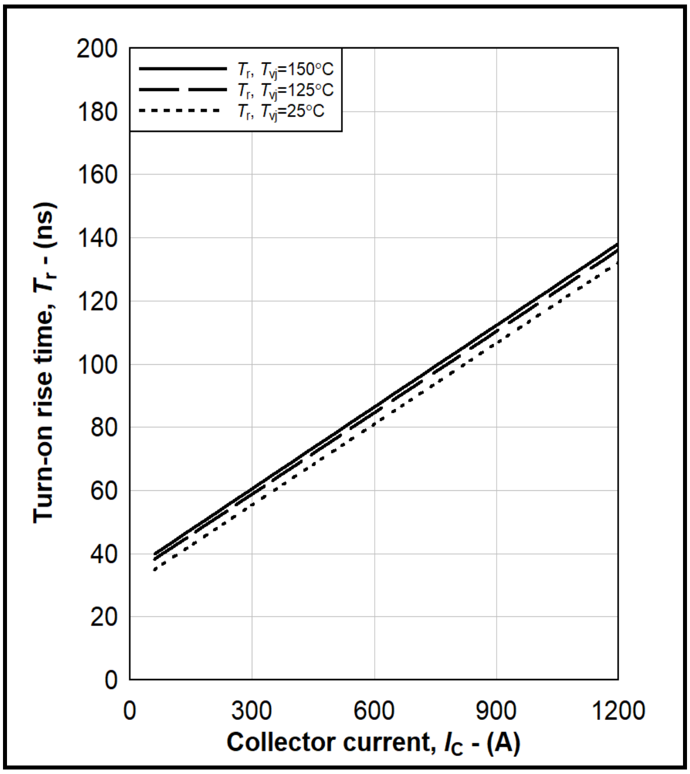
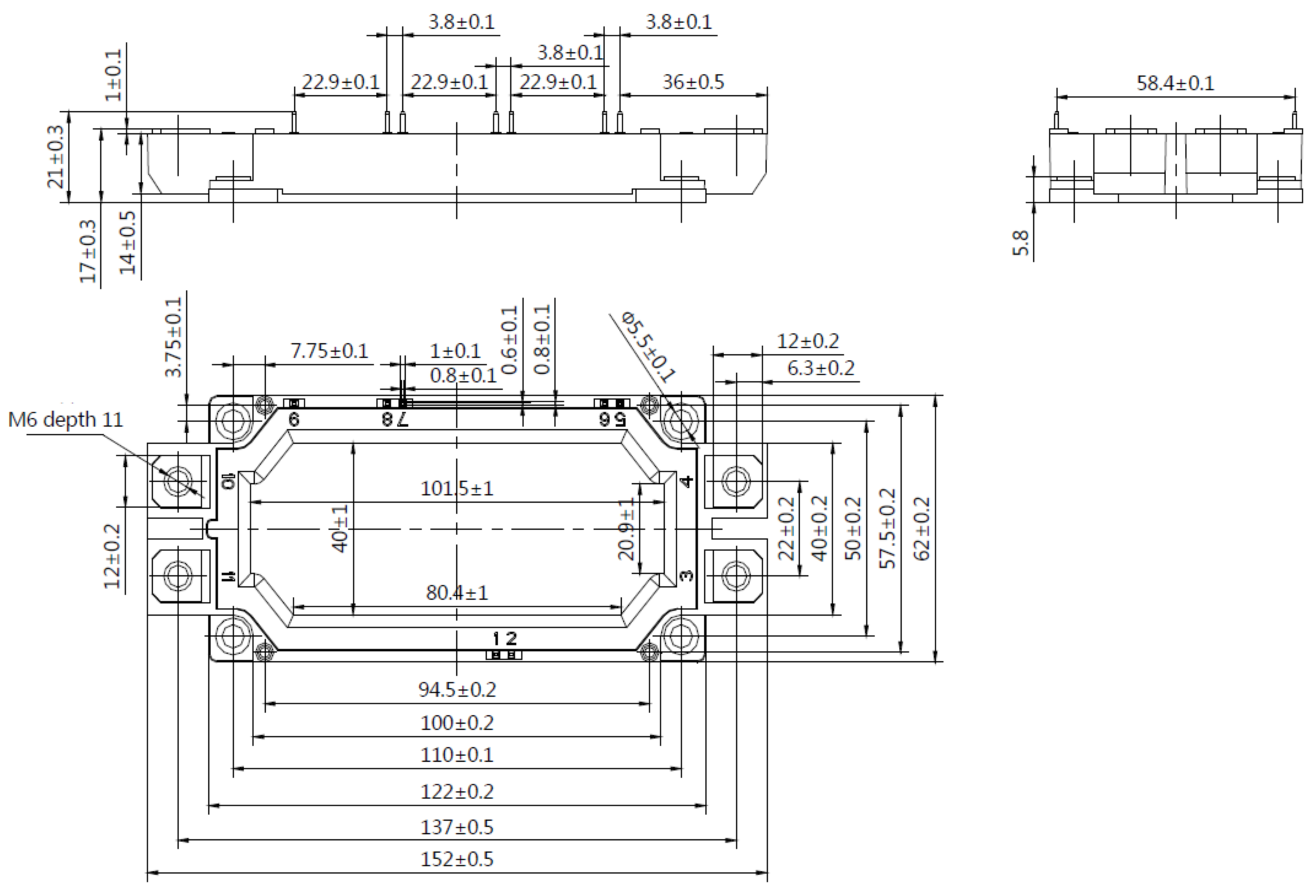


Fig. 20 Turn-on rise time vs collector current

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: 345g

Module Outline Type Code: M1

Fig. 15 Module outline drawing

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

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The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

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