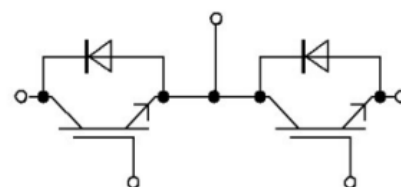


C2 series package: 1200V 150A IGBT module

Datasheet



Equivalent
Circuit Schematic

Features:

- IGBT 1200V/150A
- Planar Field Stop Fast IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High RBSOA capability
- Ultra Low dynamic losses

Options:

- pre-applied TIM
(option +M01)

Typical Applications:

- Inductive Heating
- Welding
- High Frequency Switching Application

**IGBT, Inverter / IGBT
Maximum Rated Values**

Collector-emitter Voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Continuous DC Collector Current		I_{Cnom}	150	A
	$T_C = 80^{\circ}\text{C}, T_{vj\ max} = 150^{\circ}\text{C}$	I_C	175	A
Repetitive Peak Collector Current	$I_{CRM} = 2 \times I_{Cnom}$	I_{CRM}	300	A
Total Power Dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\ max} = 150^{\circ}\text{C}$	P_{tot}	835	W
Gate-emitter Peak Voltage		V_{GES}	± 20	V

Characteristic Values

			min.	typ.	max.	
Collector-emitter Saturation Voltage ¹⁾	$I_C = 150\text{A}, V_{GE} = 15\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_{CEsat}		2.50 2.78 2.95	3.00	V
Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 2\text{mA}, T_{vj} = 25^{\circ}\text{C}$	V_{GEth}	5.0	6.0	7.0	V
Gate Charge	$V_{GE} = -8\text{V}/15\text{V}, V_{CE} = 600\text{V}, T_{vj} = 25^{\circ}\text{C}$	Q_G	—	0.45	—	μC
Internal Gate Resistor	$T_{vj} = 25^{\circ}\text{C}$	R_{Gint}	—	4	—	Ω
Input Capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$ $f = 100\text{kHz}, T_{vj} = 25^{\circ}\text{C}$	C_{ies}	—	6.60	—	nF
Reverse Transfer Capacitance		C_{res}	—	0.26	—	nF
Collector-emitter Cutoff Current	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$	I_{CES}	—	—	2	μA
Gate-emitter Leakage Current	$V_{CE} = 0\text{V}, V_{GE} = \pm 20\text{V}, T_{vj} = 25^{\circ}\text{C}$	I_{GES}	—	—	± 200	nA
Turn-on Delay Time, Inductive Load	$I_C = 150\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{gon} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	—	55 59 62	—	ns
Rise Time, Inductive Load	$I_C = 150\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{gon} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	—	39 46 53	—	ns
Turn-off Delay Time, Inductive Load	$I_C = 150\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	—	280 308 312	—	ns
Fall Time, Inductive Load	$I_C = 150\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	—	18 26 35	—	ns
Turn-on Energy Loss per Pulse	$I_C = 150\text{A}, V_{CE} = 600\text{V},$ $L_{\sigma} = 80\text{nH}, V_{GE} = \pm 15\text{V},$ $R_{Gon} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	—	15.4 23.6 26.0	—	mJ
Turn-off energy Loss per Pulse	$I_C = 150\text{A}, V_{CE} = 600\text{V},$ $L_{\sigma} = 80\text{nH}, V_{GE} = \pm 15\text{V}$ $R_{Goff} = 6.2\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	—	3.2 5.1 5.5	—	mJ

1) Terminal impedance is not included.

Thermal Resistance, Junction to Case	Per IGBT / IGBT	R _{thJC}	—	0.140	—	K/W
Temperature under Switching Conditions		T _{vj op}	-40		150	°C

Diode, Inverter Maximum Rated Values

Repetitive Peak Reverse Voltage	T _{vj} = 25°C	V _{RRM}	1200	V
Continuous DC Forward Current		I _F	150	A
Repetitive Peak Forward Current	I _{CRM} = 2 x I _{fnom}	I _{FRM}	300	A

Characteristic Values

			min.	typ.	max.	
Forward Voltage	I _F = 150A, V _{GE} = 0V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C	V _F		2.20 2.21 2.18	2.70	V
Peak Reverse Recovery Current	I _F = 150A, V _R = 600V -di _F /dt = 3000 A/us (T _{vj} = 150°C) V _{GE} = -15V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C	I _{RM}	—	90 90 90	—	A
Recovery Charge	I _F = 150A, V _R = 600V -di _F /dt = 3000A/us (T _{vj} = 150°C) V _{GE} = -15V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C	Q _R	—	7.5 12.5 17.5	—	µC
Reverse Recovery Energy	I _F = 150A, V _R = 600V -di _F /dt = 3000A/us (T _{vj} = 150°C) V _{GE} = -15V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C	E _{rec}	—	3.5 6.5 7.5	—	mJ
Thermal Resistance, Junction to Case	Per Doide / Diode	R _{thJC}	—	0.252	—	K/W
Temperature under Switching Conditions		T _{vj op}	-40	—	150	°C

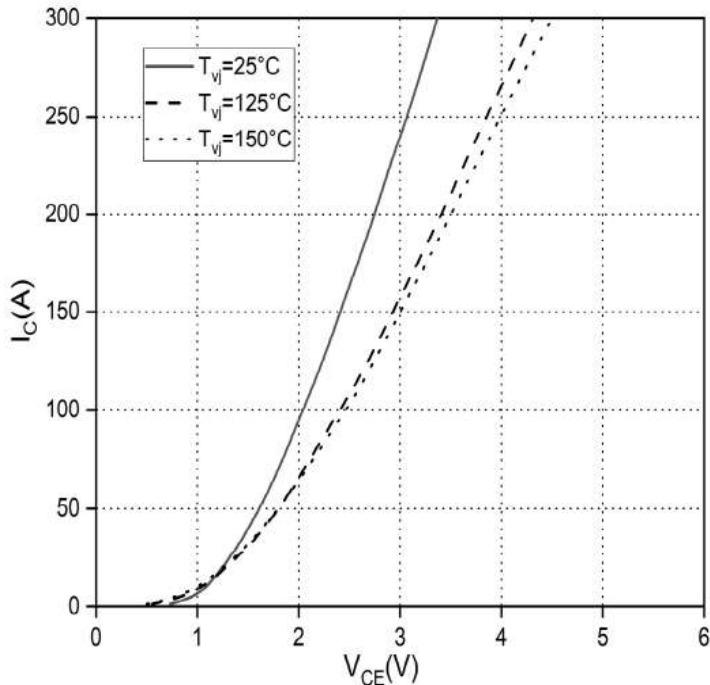
Module

Isolation Test Voltage	RMS, f = 50Hz, t = 1min	V _{ISOL}	3.0	kV
Material of Module Baseplate			Cu	
Internal Isolation	(class 1, IEC 61140) Basic insulation (class 1, IEC 61140)		AL ₂ O ₃	
Creepage Distance	Terminal to heatsink Terminal to terminal		29.0 23.0	mm
Clearance	Terminal to heatsink Terminal to terminal		23.0 11.0	mm
Comparative Tracking Index		CTI	>200	

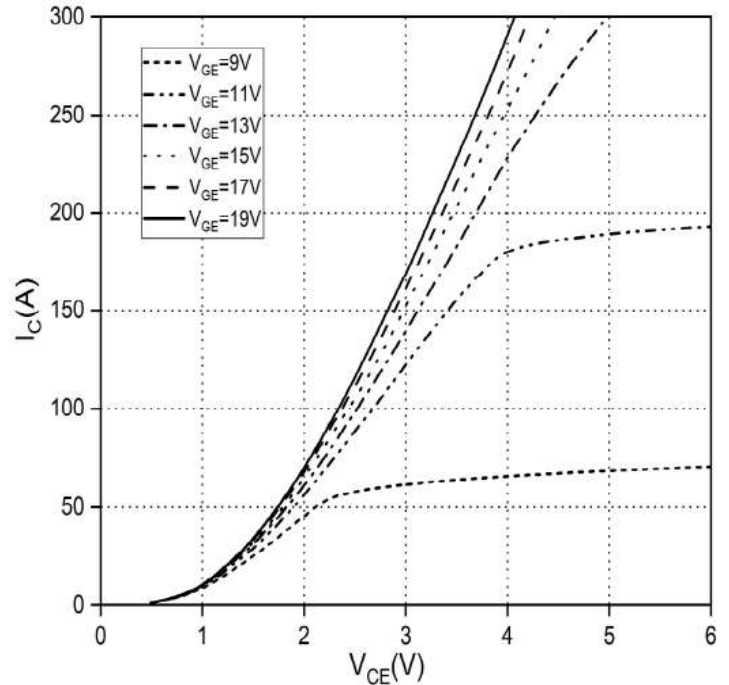
				min.	typ.	max.
Thermal resistance, case to heatsink	per module $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K})/\lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$	R_{thCH}		0.01		K/W
Stray Inductance Module		L_{sCE}	—	20	—	nH
Module Lead Resistance, Terminals-Chip	$T_C = 25^\circ\text{C}$, Per Switch	$R_{\text{CC}'+\text{EE}'}$	—	0.70	—	mΩ
Storage Temperature		T_{stg}	-40	—	125	°C
Modul MountingTorque	M6	M	4.0	—	6.0	Nm
Terminal MountingTorque	M6	M	4.0	—	6.0	Nm
Weight		G	—	320	—	g

Circuit Diagram

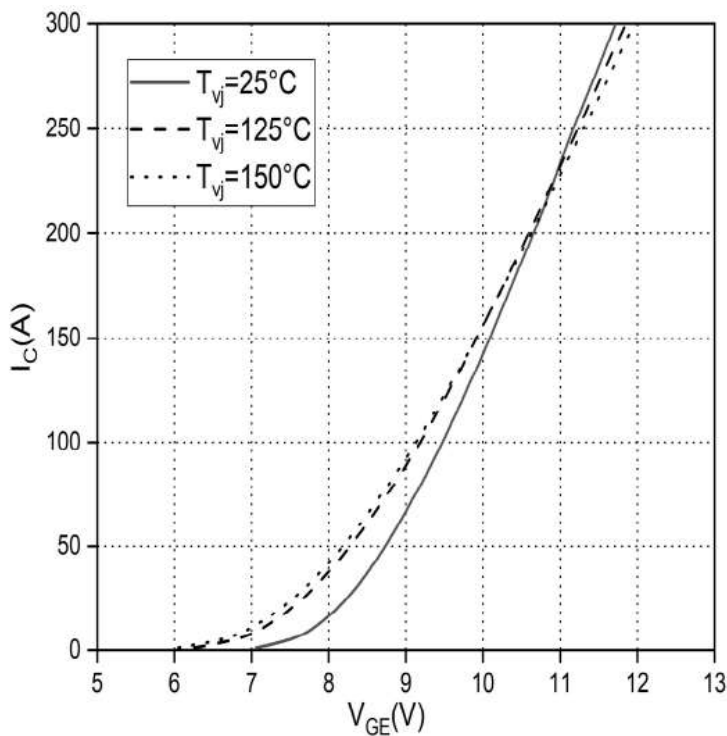
Output characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{CE})$, $V_{GE} = 15V$



Output characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{CE})$, $T_{vj} = 150^\circ C$



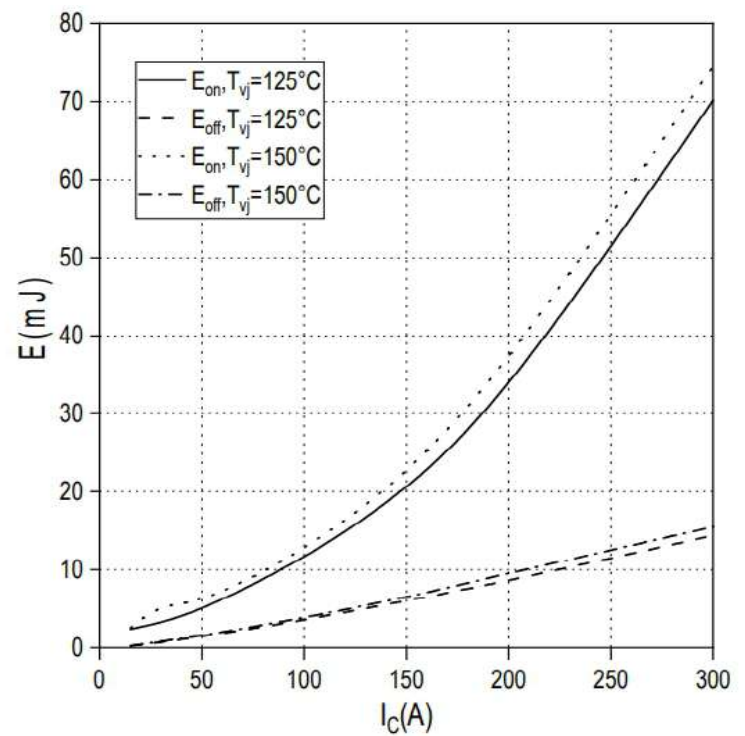
Transfer characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{GE})$, $V_{CE} = 20V$



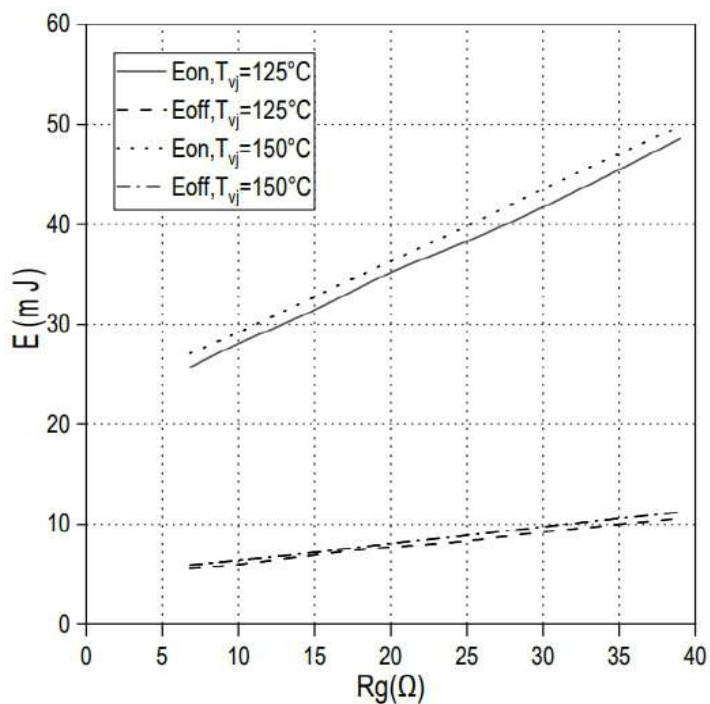
Switching losses IGBT, Inverter (Typical), IGBT

$E_{on} = f(I_c)$, $E_{off} = f(I_c)$

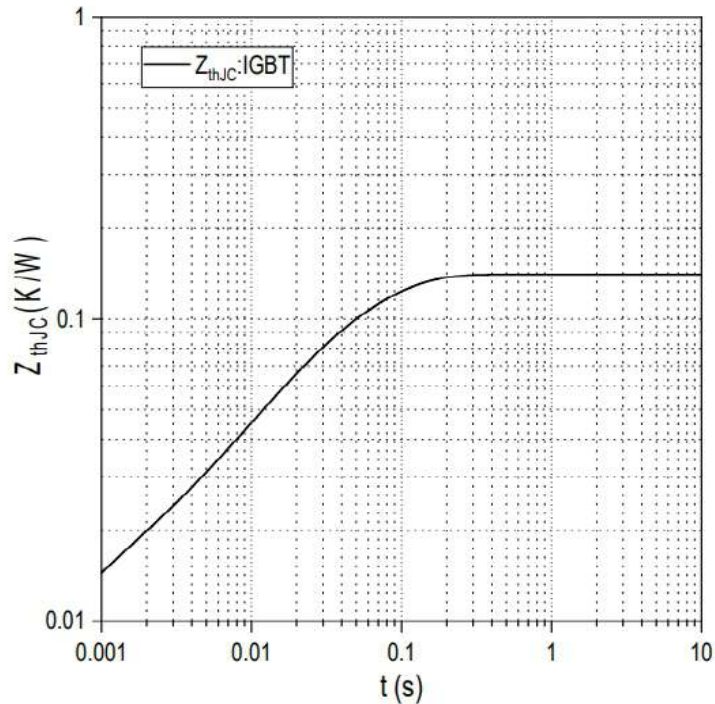
$V_{GE} = \pm 15V$, $R_{Gon} = 6.2\Omega$, $R_{Goff} = 6.2\Omega$, $V_{CE} = 600V$



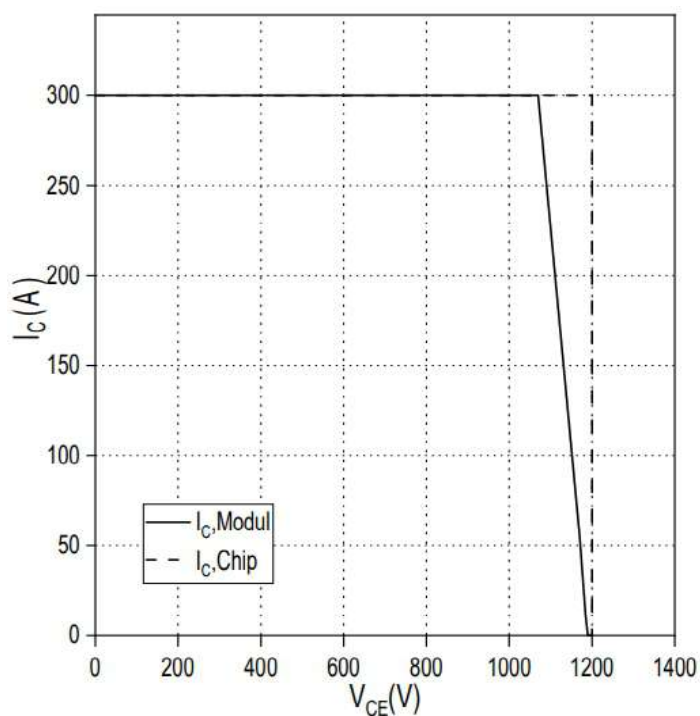
Switching losses IGBT, Inverter (typical), IGBT
 $V_{GE} = \pm 15V$, $I_C = 150A$, $V_{CE} = 600V$



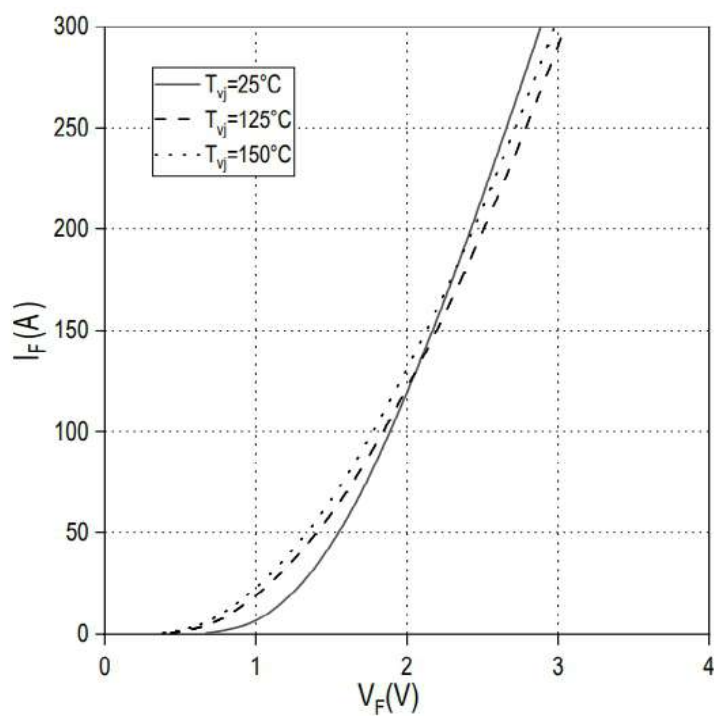
Transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



Reverse bias safe operating area IGBT, Inverter
(RBSOA) $I_C = f(V_{CE})$,
 $V_{GE} = \pm 15V$, $R_{Goff} = 10\Omega$, $T_{vj} = 150^\circ C$



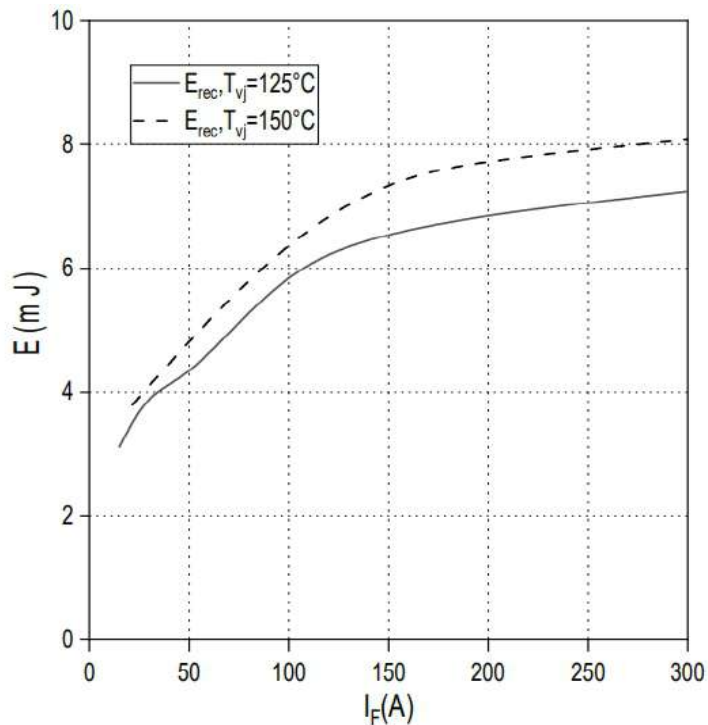
Forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



Switching losses Diode, Inverter (typical)

$$E_{rec} = f(I_F)$$

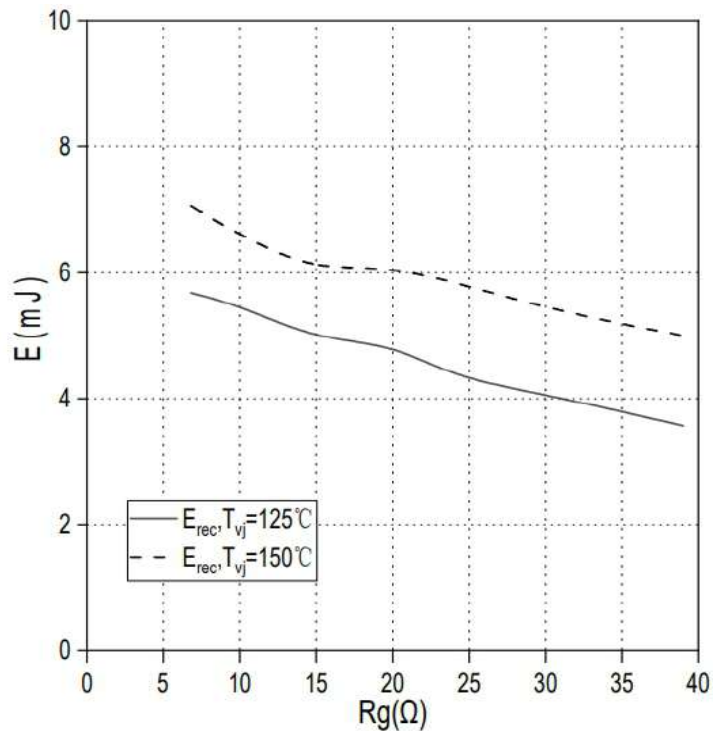
$$R_{Gon} = 6.2\Omega, V_{CE} = 600V$$



Switching losses Diode, Inverter (typical)

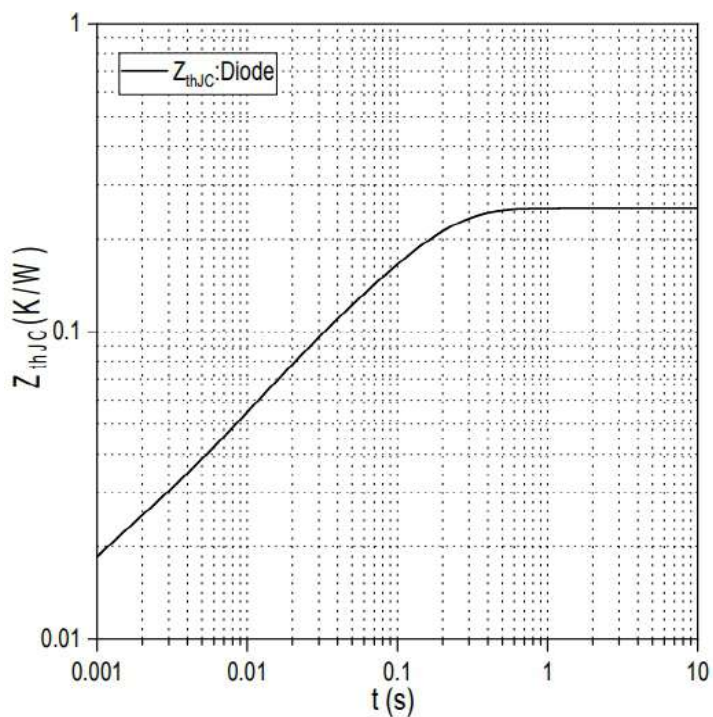
$$E_{rec} = f(R_G)$$

$$I_F = 150A, V_{CE} = 600V$$



Transient thermal impedance Diode , Inverter

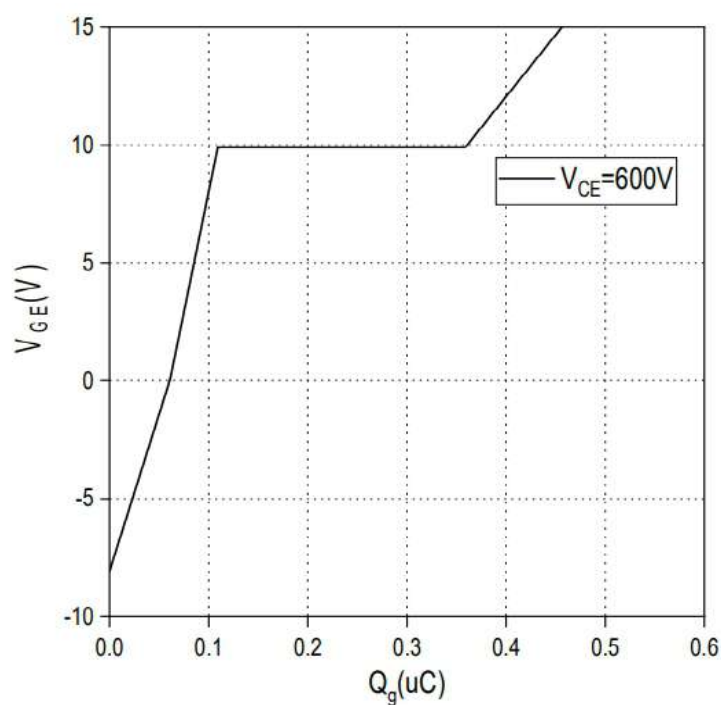
$$Z_{thJC} = f(t)$$



Gate charge characteristic, IGBT, Inverter (typical)

$$V_{GE} = f(Q_g)$$

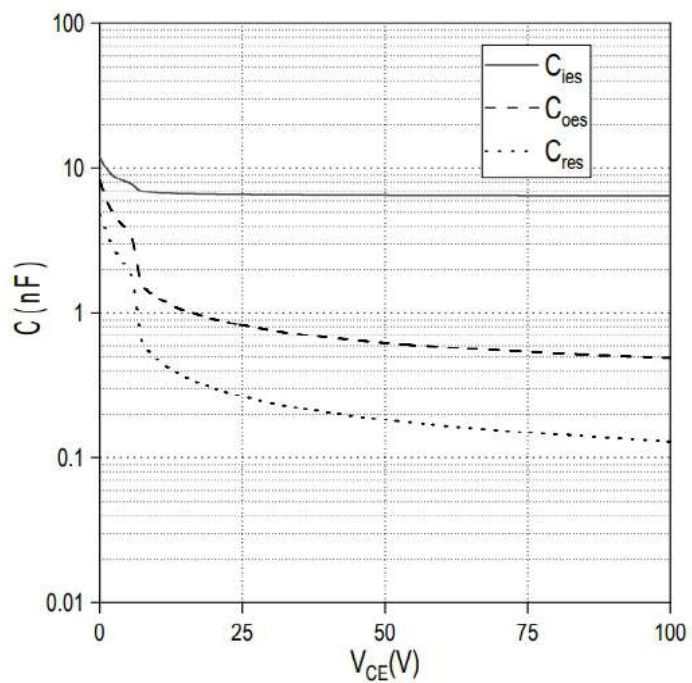
$$I_C = 150A, T_{vj} = 25^\circ C$$



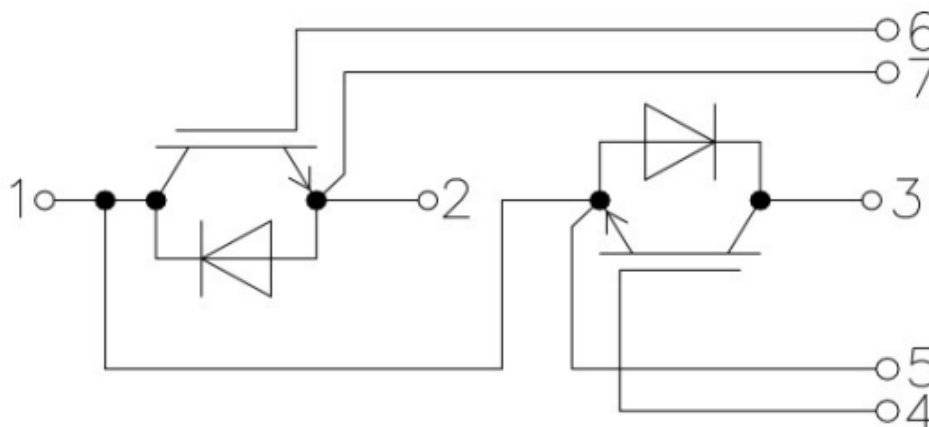
Capacity characteristic, IGBT, Inverter (typical)

$C = f(V_{CE})$

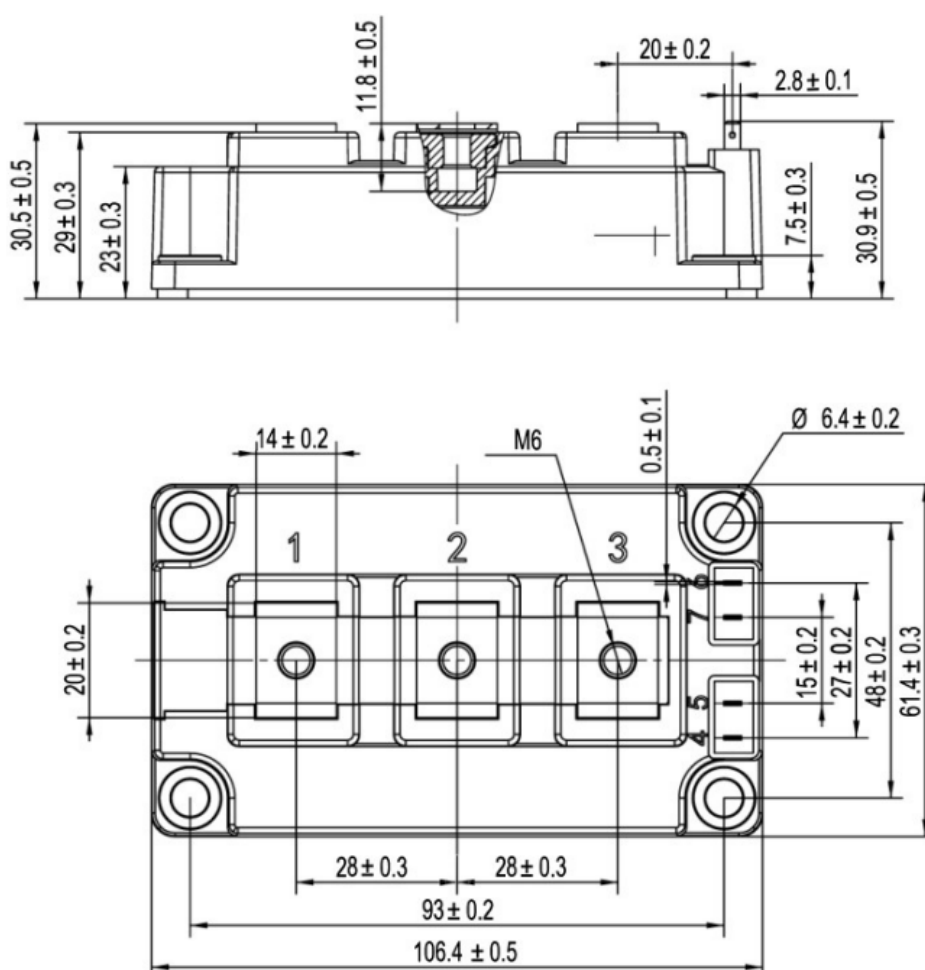
$f = 100\text{kHz}$, $V_{GE} = 0\text{ V}$, $T_{vj} = 25^\circ\text{C}$



Internal Circuit



Package Dimension Dimensions in Millimeters



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