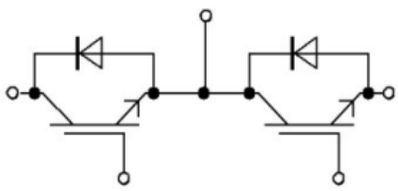
C1 series package: 1200V 150A IGBT module

Datasheet



Equivalent
Circuit Schematic

Features:

- Trenchgate Gen.7 IGBT technology
- VCE(sat) with positive temperature coefficient
- High RBSOA capability
- Low static losses: VCE(sat) = 1,5V@25C
- Low dynamic losses

Options:

- Pre-applied TIM (option +M01)

Typical Applications:

- Motor Drives
- Uninterrupted Power Suppl
- Photovoltaic

IGBT, Inverter / IGBT
Maximum Rated Values

Collector-emitter Voltage	T_{vj} = 25℃	V_{CES}	1200	V
Continuous DC Collector Current		I_{Cnom}	150	A
	T_C = 100℃, $T_{vj\ max}$ = 175℃	I_C	170	A
Repetitive Peak Collector Current	I_{CRM} = 2 x I_{cnom}	I_{CRM}	300	A
Gate-emitter Peak Voltage		V_{GES}	±20	V

Characteristic Values

			min.	typ.	max.	
Collector-emitter Saturation Voltage[1)]	I_C = 150A, V_{GE} = 15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	V_{CEsat}		1.50 1.70 1.84	1.70	V
Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 3mA, T_{vj} = 25℃		V_{GEth}	5.0	6.0	7.0	V
Gate Charge	V_{GE} = -8V/15V, V_{CE} = 600V, T_{vj} = 25℃		Q_G	-	1.42	-	µC
Internal Gate Resistor	T_{vj} = 25℃		R_{Gint}	-	3.50	-	Ω
Input Capacitance	V_{CE} = 25V, V_{GE} = 0V f = 100kHz, T_{vj} = 25℃		C_{ies}	-	36	-	nF
Reverse Transfer Capacitance			C_{res}	-	0.09	-	nF
Collector-emitter Cutoff Current	V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25℃		I_{CES}	-	-	200	µA
Gate-emitter Leakage Current	V_{CE} = 0V, V_{GE} =20V, T_{vj} = 25℃		I_{GES}	-	-	200	nA
Turn-on Delay Time, Inductive Load	I_C = 150A, V_{CE} = 600V V_{GE} = ±15V R_{gon} = 3Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	t_{don}	-	140 150 160	-	ns
Rise Time, Inductive Load	I_C = 150A, V_{CE} = 600V V_{GE} = ±15V R_{gon} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	t_r	-	50 60 65	-	ns
Turn-off Delay Time, Inductive Load	I_C = 150A, V_{CE} = 600V V_{GE} = ±15V R_{Goff} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	t_{doff}	-	290 330 345	-	ns
Fall Time, Inductive Load	I_C = 150A, V_{CE} = 600V V_{GE} = ±15V R_{Goff} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	t_f	-	120 190 230	-	ns
Turn-on Energy Loss per Pulse	I_C = 150A, V_{CE} = 600V, V_{GE} = ±15V, R_{Gon} = 3.0Ω di/dt = 1800 A/µs (T_{vj} = 175℃)	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	E_{on}	-	9.10 13.0 15.4	-	mJ
Turn-off energy Loss per Pulse	I_C = 150A, V_{CE} = 600V, V_{GE} = ±15V, R_{Goff} = 3.0Ω dv/dt = 6300 V/µs (T_{vj} = 175℃)	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	E_{off}	-	11.1 15.7 17.7	-	mJ

1) Terminal impedance is not included.

SC Data	V_{CE} = 800 V V_{GE} = ±15 V	$t_p \le 6us$, T_{vj} = 150℃	I_{SC}		760		A
		$t_p \le 6us$, T_{vj} = 175℃			730		
Thermal Resistance, Junction to Case	Per IGBT		R_{thJC}	-	0.180	-	K/W
Temperature under Switching Conditions 2)			$T_{vj\ op}$	-40		150	℃

Diode, Inverter
Maximum Rated Values

Repetitive Peak Reverse Voltage	T_{vj} = 25℃	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 1)	I_F = 150A, V_{GE} = 0V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	V_F		1.95 2.13 2.12	2.40	V
Peak Reverse Recovery Current	I_F = 150A, V_R = 600V -di_F/dt = 2800A/us (T_{vj} = 175℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	I_{RM}	-	115 120 130	-	A
Recovery Charge	I_F = 150A, V_R = 600V -di_F/dt = 2800A/us (T_{vj} = 175℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	Q_R	-	8.50 15.5 20.0	-	uC
Reverse Recovery Energy	I_F = 150A, V_R = 600V -di_F/dt = 2800A/us (T_{vj} = 175℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 175℃	E_{rec}	-	3.70 7.30 9.90	-	mJ
Thermal Resistance, Junction to Case	Per Doide		R_{thJC}	-	0.246	-	K/W
Temperature under Switching Conditions 2)			$T_{vj\ op}$	-40	-	175	℃

Module

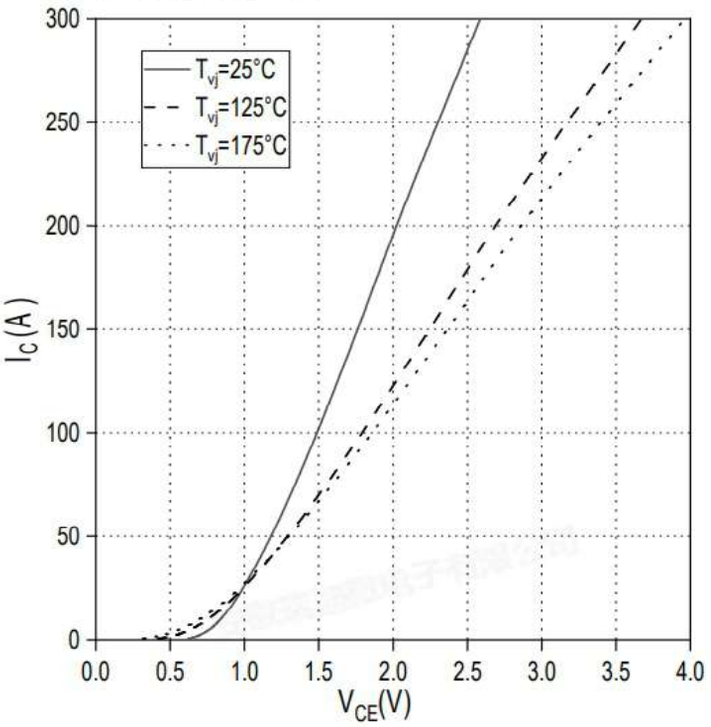
Isolation Test Voltage	RMS, f = 50Hz, t = 1min	V_{ISOL}	3.0	kV
Material of Module Baseplate			Cu	
Internal Isolation	(class 1, IEC 61140) Basic insulation (class 1, IEC 61140)		AL_2O_3	
Creepage Distance	Terminal to heatsink Terminal to terminal		17.0 20.0	mm
Clearance	Terminal to heatsink Terminal to terminal		17.0 9.5	mm
Comparative Tracking Index		CTI	＞200	

			min.	typ.	max.	
Thermal resistance, case to heatsink	per module λ_{Paste} = 1W/(m·K)/λ_{grease} = 1W/(m·K)	R_{thCH}		0.05		K/W
Stray Inductance Module		L_{sCE}	-	30	-	nH
Module Lead Resistance, Terminals-Chip	T_C = 25℃, Per Switch	$R_{CC'+EE'}$	-	0.65	-	mΩ
Storage Temperature		T_{stg}	-40	-	125	℃
Modul MountingTorque	M6	M	4.0	-	6.0	Nm
Terminal MountingTorque	M5	M	3.0	-	6.0	Nm
Weight		G	-	145	-	g

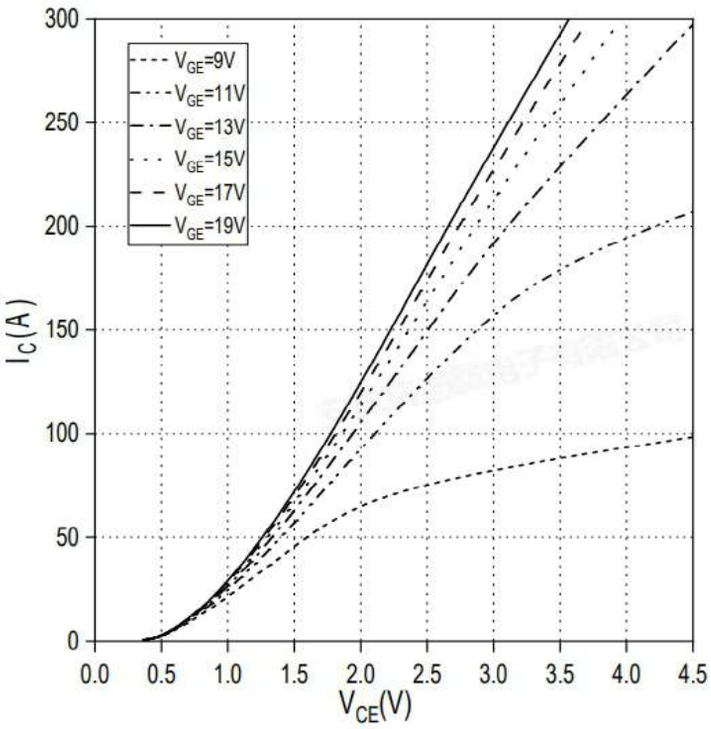
1）Terminal impedance is not included.
2) $T_{vj\ op}$ > 150°C is only allowed for operation at overload conditions.

Circuit Diagram

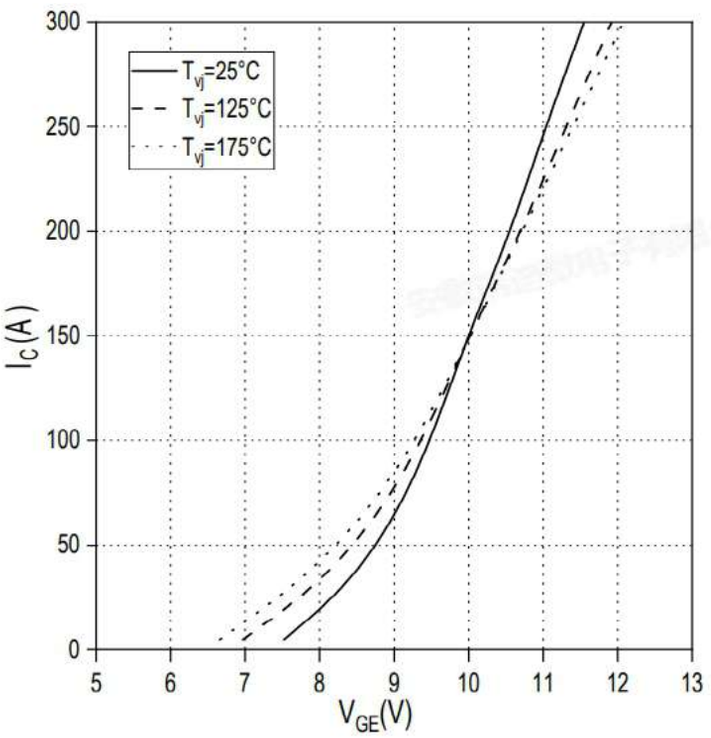
Output characteristic IGBT, Inverter (typical), IGBT
$I_C = f(V_{CE})$, V_{GE} = 15V



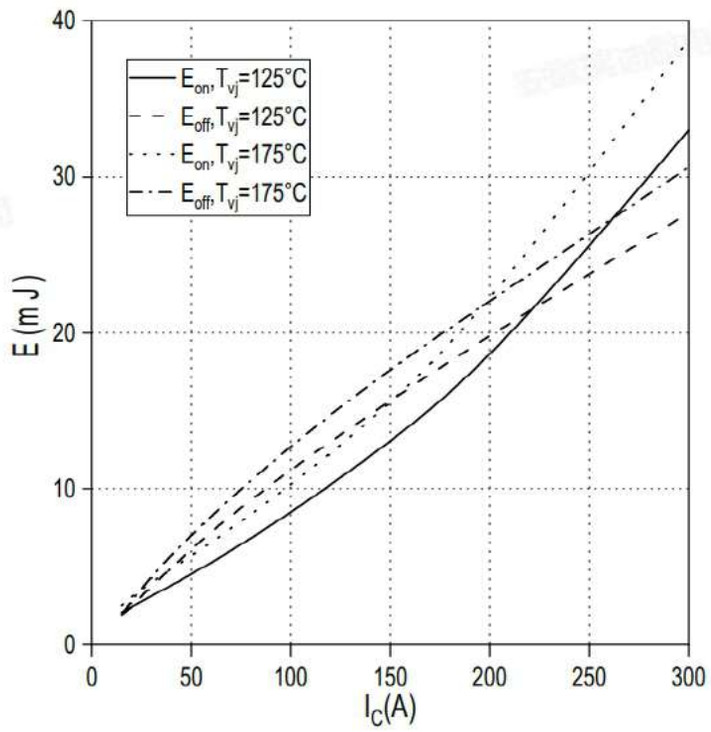
Output characteristic IGBT, Inverter (typical), IGBT
$I_C = f(V_{CE})$, T_{vj} = 175°C



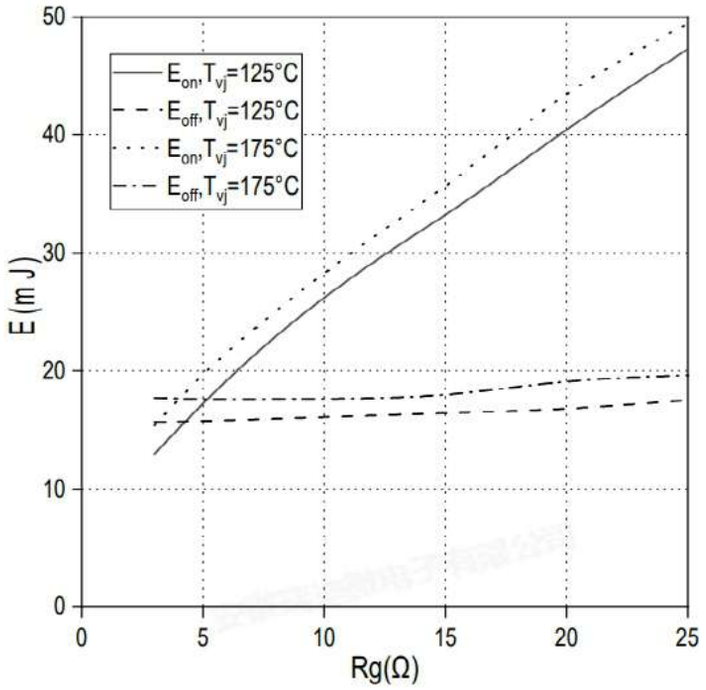
Transfer characteristic IGBT,Inverter(typical), IGBT
$I_C = f(V_{GE})$, V_{CE} = 20V



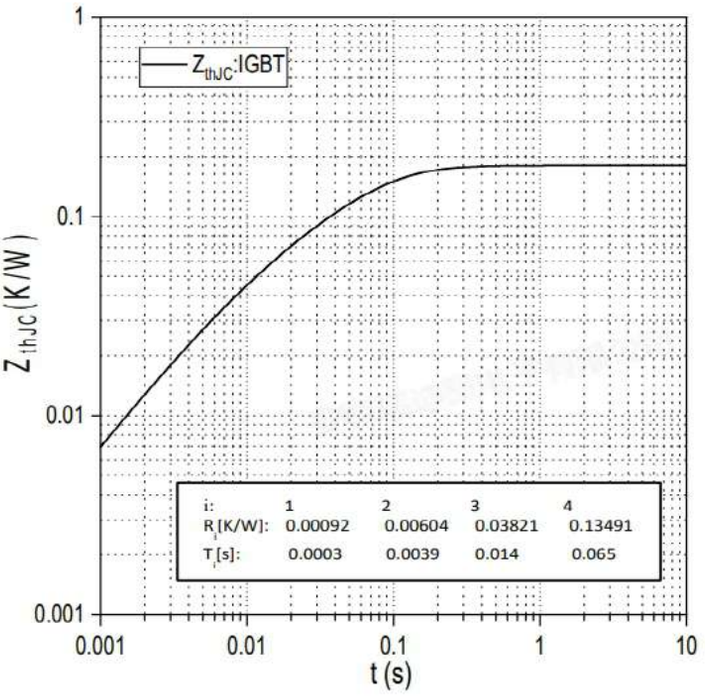
Switching losses IGBT, Inverter (Typical), IGBT
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15V, R_{Gon} = 3Ω, R_{Goff} = 3Ω, V_{CE} = 600V



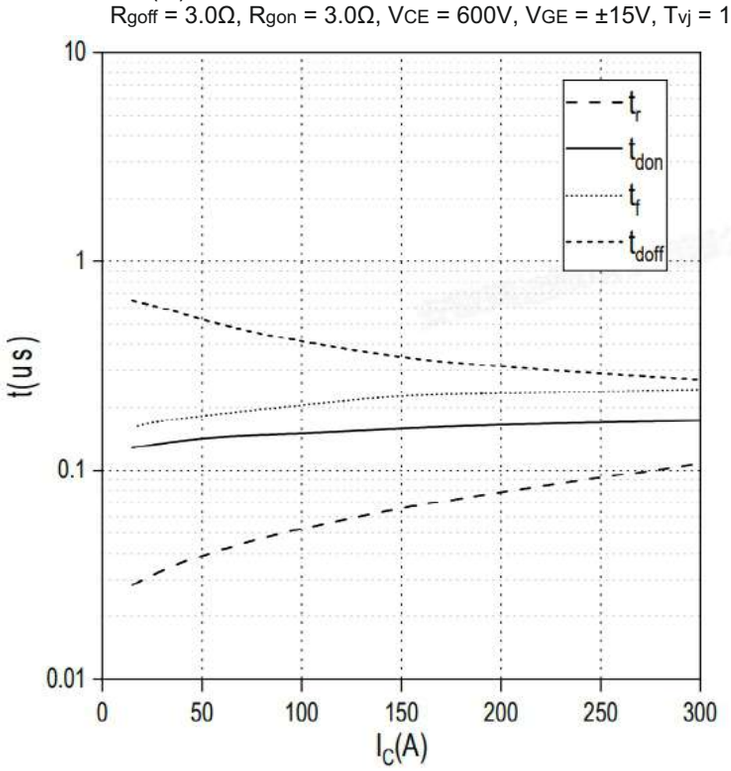
Switching losses IGBT, Inverter (typical), IGBT
V_{GE} = ±15V, I_C = 150A, V_{CE} = 600V



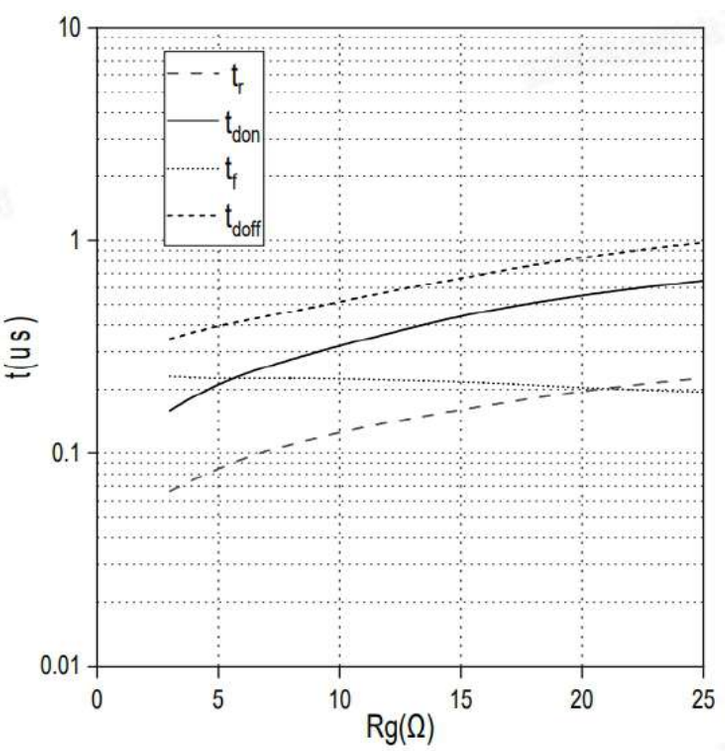
Transient thermal impedance IGBT, Inverter
Z_{thJC} = f(t)



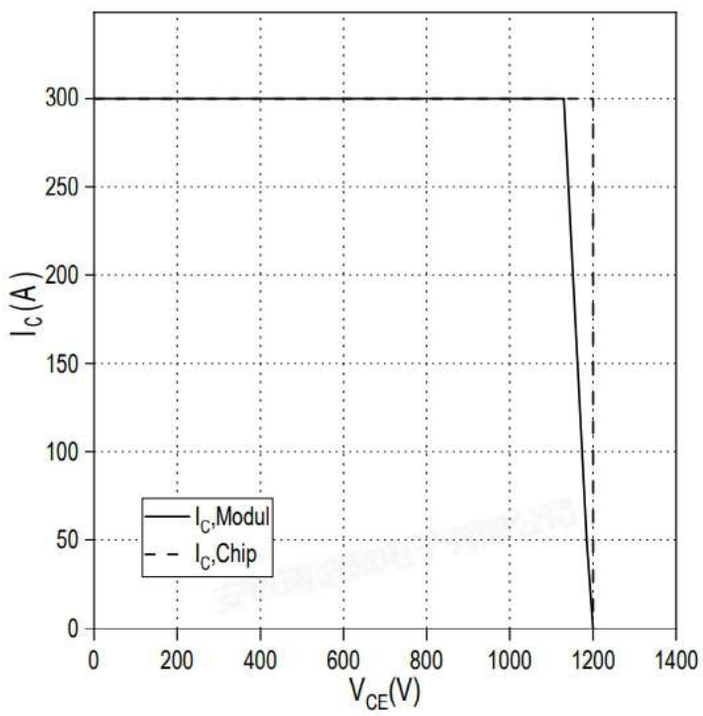
Switching time IGBT, Inverter (typical)
t = f(I_C)
R_{goff} = 3.0Ω, R_{gon} = 3.0Ω, V_{CE} = 600V, V_{GE} = ±15V, T_{vj} = 175℃



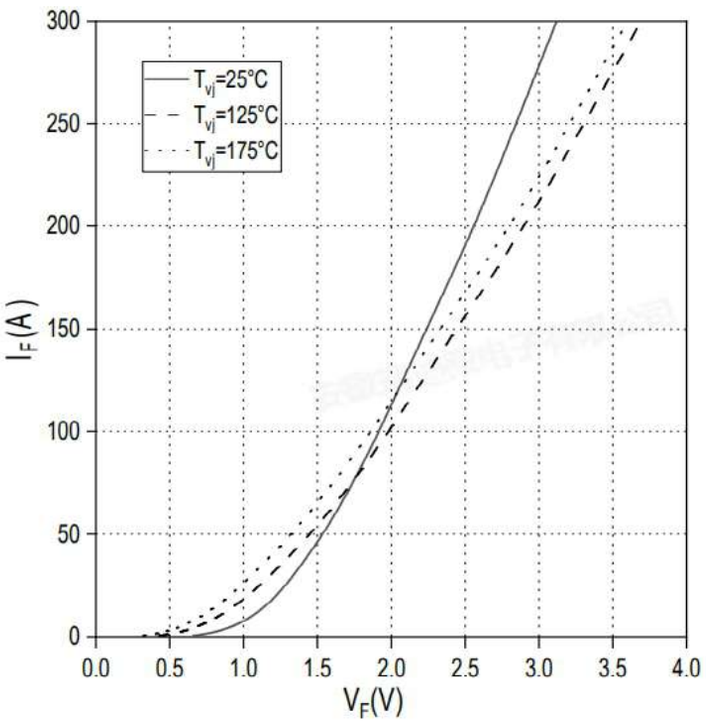
Switching time IGBT, Inverter (typical)
t = f(R_G)
I_C = 150A,V_{CE} = 600V, V_{GE} = ±15V, T_{vj} = 175℃



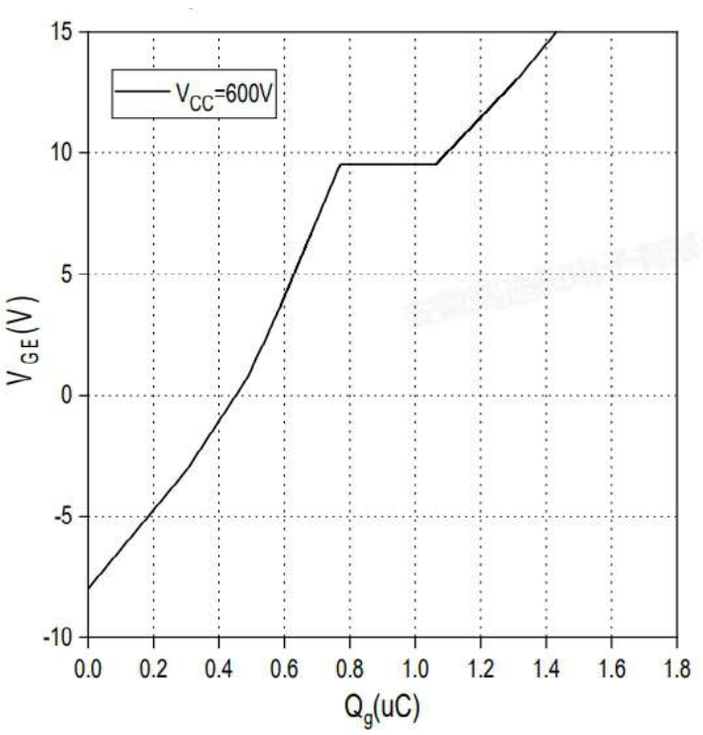
Reverse bias safe operating area IGBT, Inverter
(RBSOA) $I_C = f(V_{CE})$,
$V_{GE} = \pm 15V$, $R_{Goff} = 3\Omega$, $T_{vj} = 175°C$



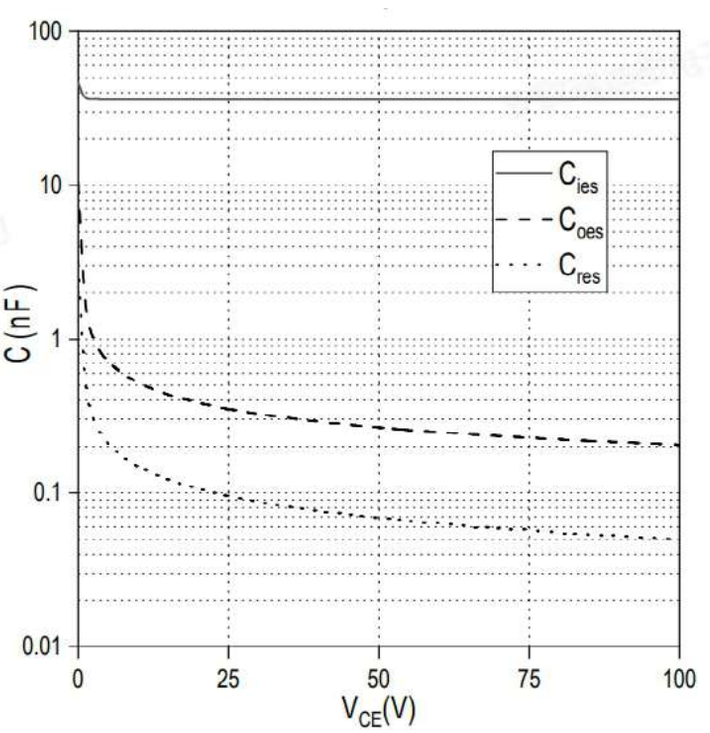
Forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



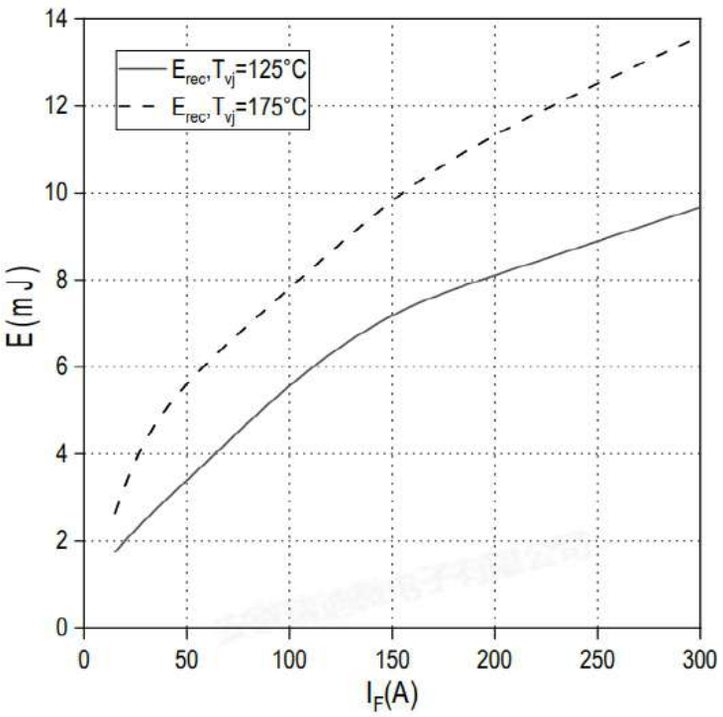
Gate charge characteristic, IGBT, Inverter (typical)
$V_{GE} = f(Q_g)$
$I_C = 150A$, $T_{vj} = 25°C$



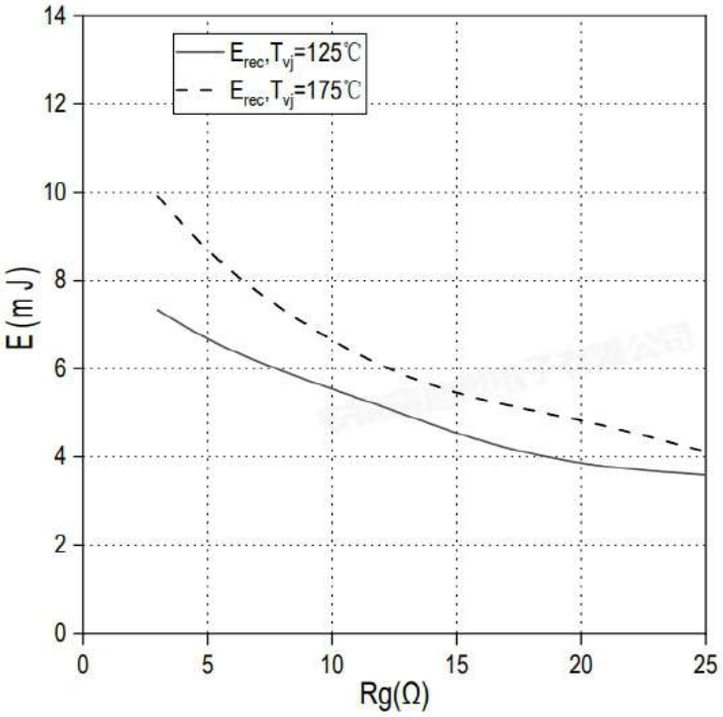
Capacity characteristic, IGBT, Inverter (typical)
$C = f(V_{CE})$
$f = 100kHz$, $V_{GE} = 0$ V, $T_{vj} = 25°C$



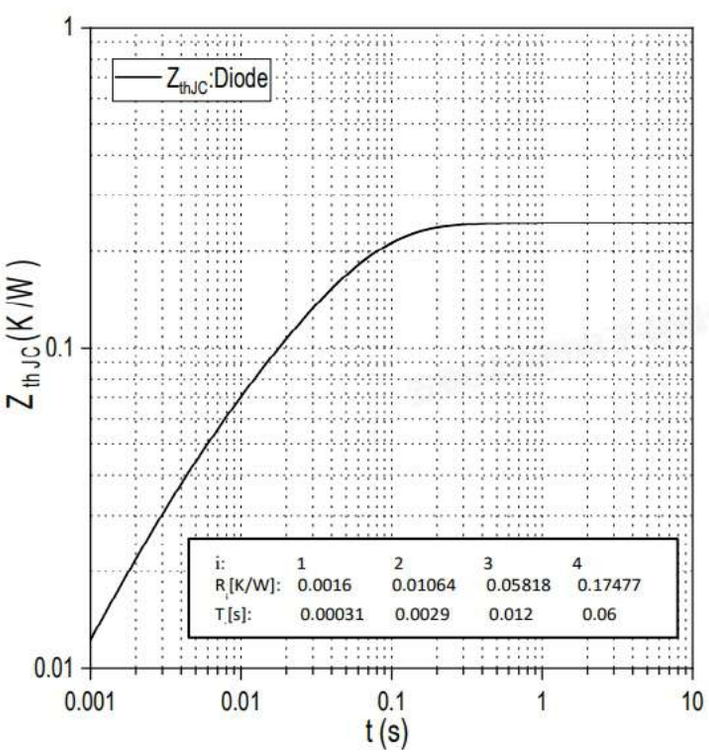
Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$



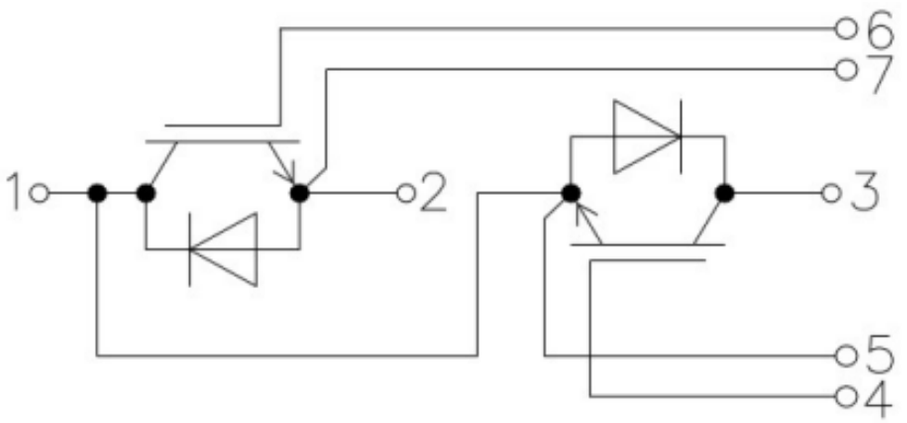
Switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$



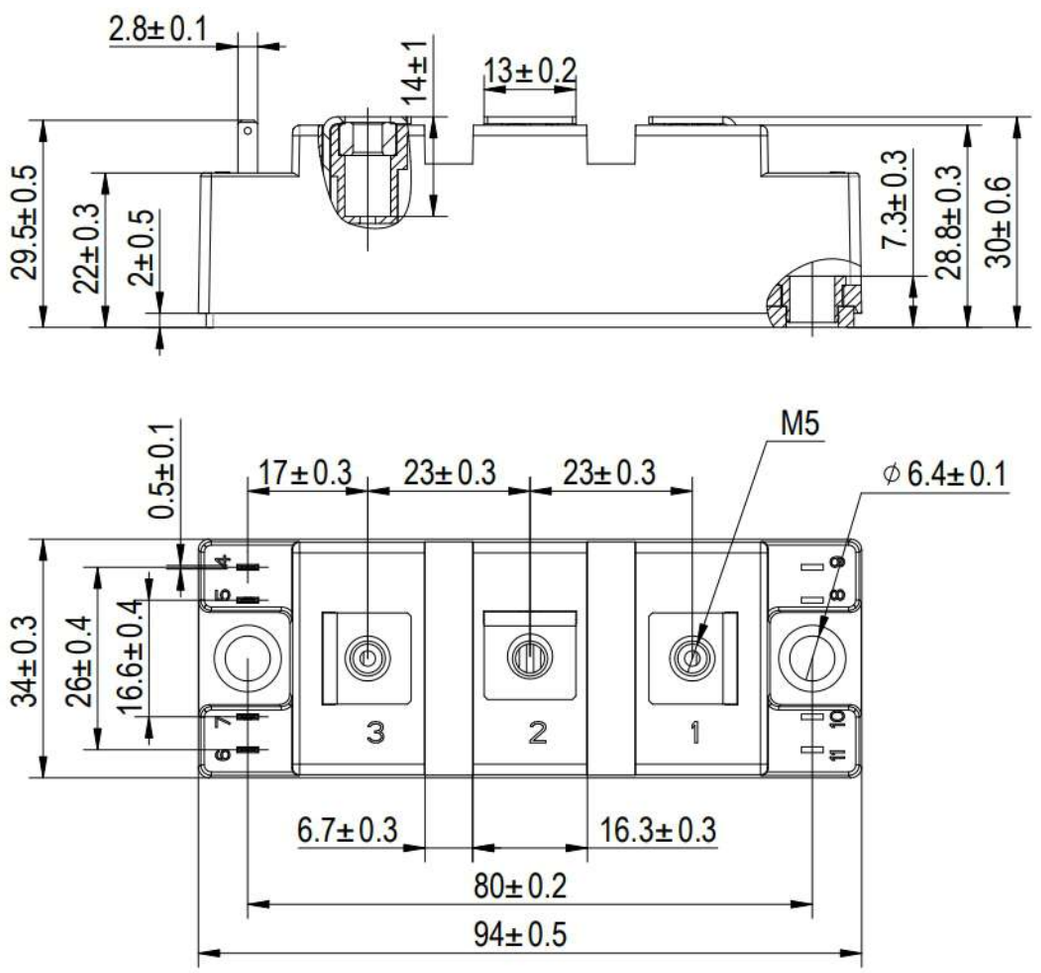
Transient thermal impedance Diode , Inverter
$Z_{thJC} = f(t)$



Internal Circuit



Package Dimension
Dimensions in Millimeters



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