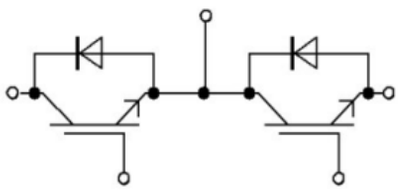
C2 series package: 1200V 200A IGBT module

Datasheet



Equivalent
Circuit Schematic

Features:

- IGBT 1200V/200A
- 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℃	V_{CES}	1200	V
Continuous DC Collector Current		I_{Cnom}	200	A
	T_C = 80℃, $T_{vj\ max}$ = 150℃	I_C	220	A
Repetitive Peak Collector Current	I_{CRM} = 2 x I_{cnom}	I_{CRM}	400	A
Total Power Dissipation	T_C = 25℃, $T_{vj\ max}$ = 150℃	P_{tot}	1135	W
Gate-emitter Peak Voltage		V_{GES}	±20	V

Characteristic Values

				min.	typ.	max.	
Collector-emitter Saturation Voltage[1)]	I_C = 200A, V_{GE} = 15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	V_{CEsat}		2.50 2.78 2.95	3.00	V
Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 2mA, 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	–	0.58	–	µC
Internal Gate Resistor	T_{vj} = 25℃		R_{Gint}	–	4	–	Ω
Input Capacitance	V_{CE} = 25V, V_{GE} = 0V f = 100kHz, T_{vj} = 25℃		C_{ies}	–	8.45	–	nF
Reverse Transfer Capacitance			C_{res}	–	0.38	–	nF
Collector-emitter Cutoff Current	V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25℃		I_{CES}	–	–	2	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 = 200A, V_{CE} = 600V V_{GE} = ±15V R_{gon} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	t_{don}	–	61 63 64	–	ns
Rise Time, Inductive Load	I_C = 200A, V_{CE} = 600V V_{GE} = ±15V R_{gon} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	t_r	–	53 58 63	–	ns
Turn-off Delay Time, Inductive Load	I_C = 200A, V_{CE} = 600V V_{GE} = ±15V R_{Goff} =3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	t_{doff}	–	233 270 273	–	ns
Fall Time, Inductive Load	I_C = 200A, V_{CE} = 600V V_{GE} = ±15V R_{Goff} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	t_f	–	33 34 36	–	ns
Turn-on Energy Loss per Pulse	I_C = 200A, V_{CE} = 600V, L_σ = 80nH, V_{GE} = ±15V, R_{Gon} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	E_{on}	–	20.0 28.4 31.0	–	mJ
Turn-off energy Loss per Pulse	I_C = 200A, V_{CE} = 600V, L_σ = 80nH, V_{GE} = ±15V R_{Goff} = 3.0Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	E_{off}	–	5.3 9.2 10.5	–	mJ

1) Terminal impedance is not included.

Thermal Resistance, Junction to Case	Per IGBT / IGBT	R_{thJC}	-	0.11	-	K/W
Temperature under Switching Conditions		$T_{vj\ op}$	-40		150	℃

Diode, Inverter
Maximum Rated Values

Repetitive Peak Reverse Voltage	T_{vj} = 25℃	V_{RRM}	1200	V
Continuous DC Forward Current		I_F	200	A
Repetitive Peak Forward Current	I_{CRM} = 2 x I_{fnom}	I_{FRM}	400	A

Characteristic Values

			min.	typ.	max.	
Forward Voltage	I_F = 200A, V_{GE} = 0V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	V_F		2.38 2.50 2.52	2.80	V
Peak Reverse Recovery Current	I_F = 200A, V_R = 600V -di_F/dt = 2800A/usn (T_{vj} = 150℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	I_{RM}	-	80 90 90	-	A
Recovery Charge	I_F = 200A, V_R = 600V -di_F/dt = 2800A/usn (T_{vj} = 150℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	Q_R	-	5.5 12.5 15.0	-	uC
Reverse Recovery Energy	I_F = 200A, V_R = 600V -di_F/dt = 2800A/usn (T_{vj} = 150℃) V_{GE} = −15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃	E_{rec}	-	1.90 5.50 7.00	-	mJ
Thermal Resistance, Junction to Case	Per Doide / Diode		R_{thJC}	-	0.25	-	K/W
Temperature under Switching Conditions			$T_{vj\ op}$	-40	-	150	℃

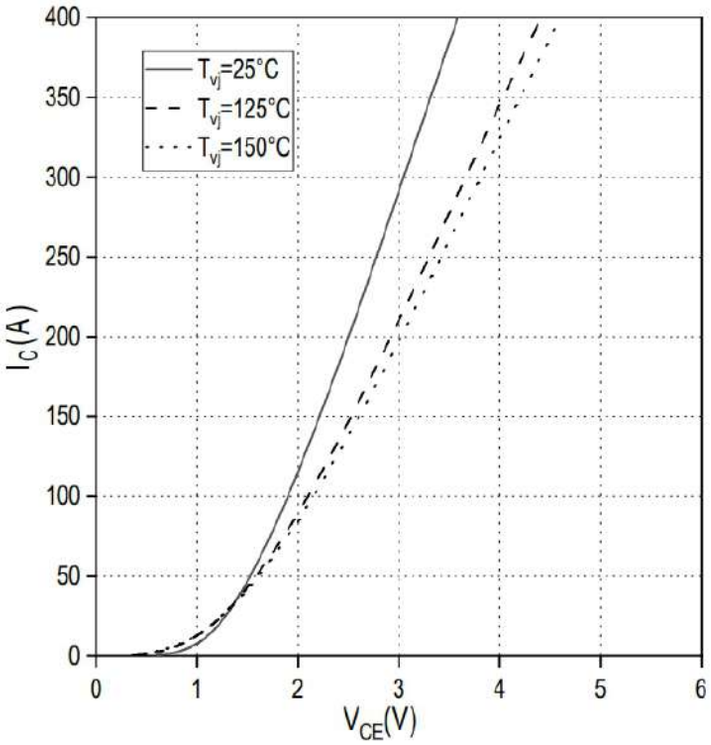
Module

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		29.0 23.0	mm
Clearance	Terminal to heatsink Terminal to terminal		23.0 11.0	mm
Comparative Tracking Index		CTI	＞200	

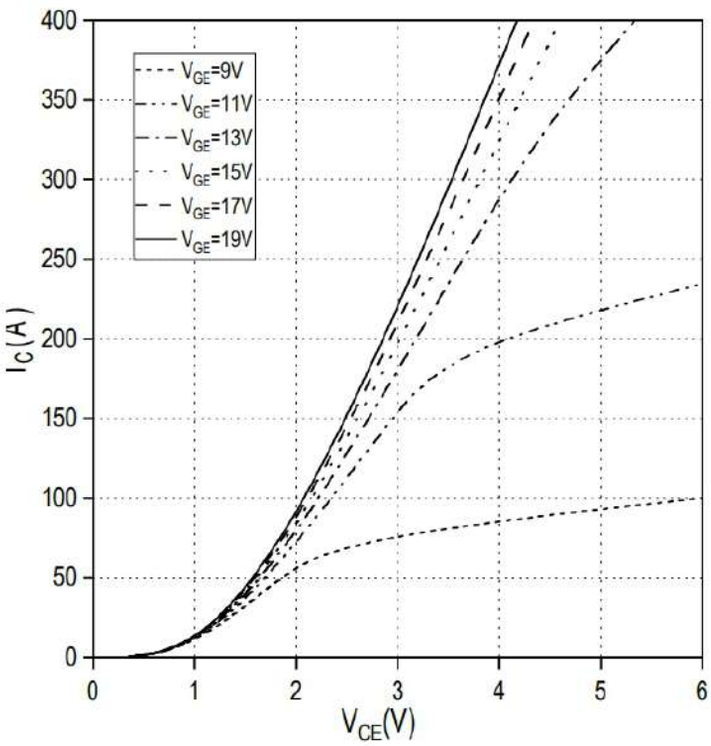
			min.	typ.	max.	
Thermal resistance, case to heatsink	per module λ_{Paste} = 1W/(m·K)/λ_{grease} = 1W/(m·K)	R_{thCH}		0.01		K/W
Stray Inductance Module		L_{sCE}	-	20	-	nH
Module Lead Resistance, Terminals-Chip	T_C = 25℃, Per Switch	$R_{CC'+EE'}$	-	0.70	-	mΩ
Storage Temperature		T_{stg}	-40	-	125	℃
Modul MountingTorque	M5	M	4.0	-	6.0	Nm
Terminal MountingTorque	M6	M	4.0	-	6.0	Nm
Weight		G	-	320	-	g

Circuit Diagram

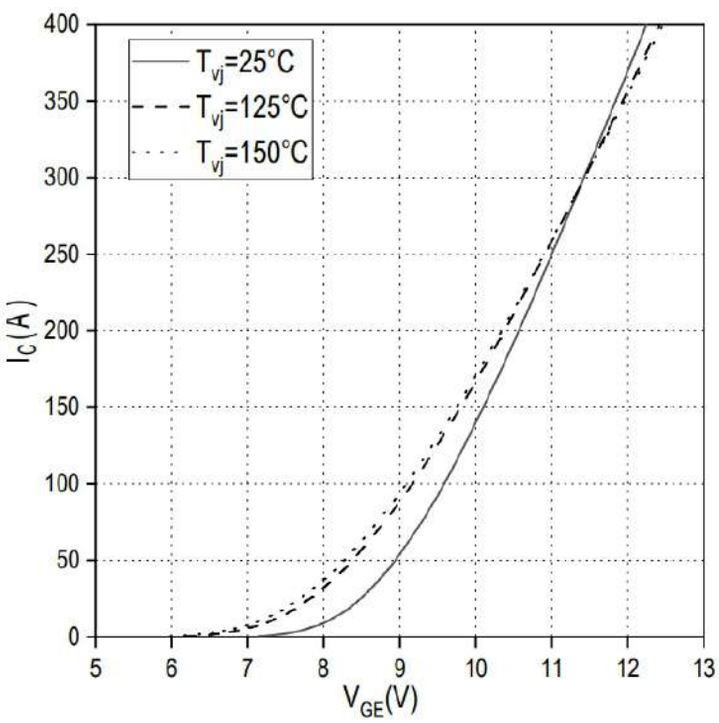
Output characteristic IGBT, Inverter (typical), IGBT
$I_C = f(V_{CE})$, V_{GE} = 15V



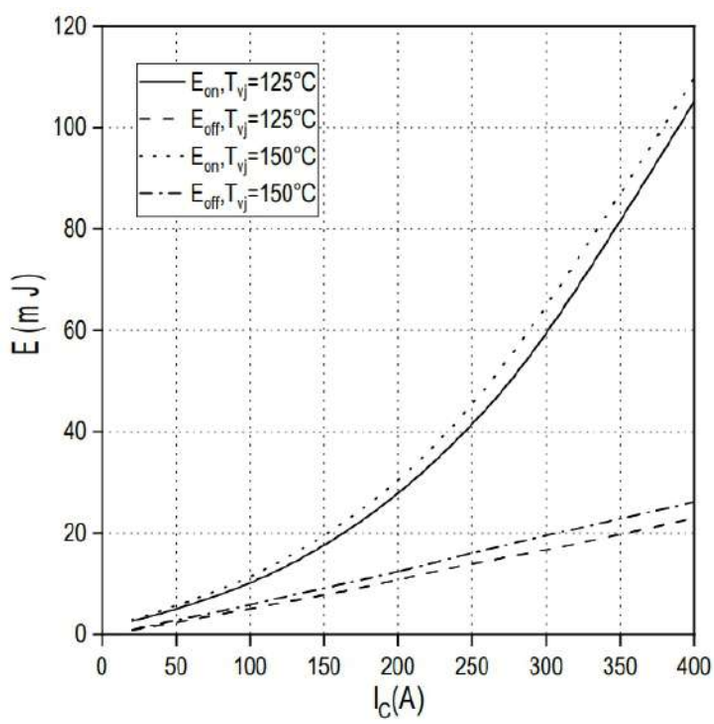
Output characteristic IGBT, Inverter (typical), IGBT
$I_C = f(V_{CE})$, T_{vj} = 150°C



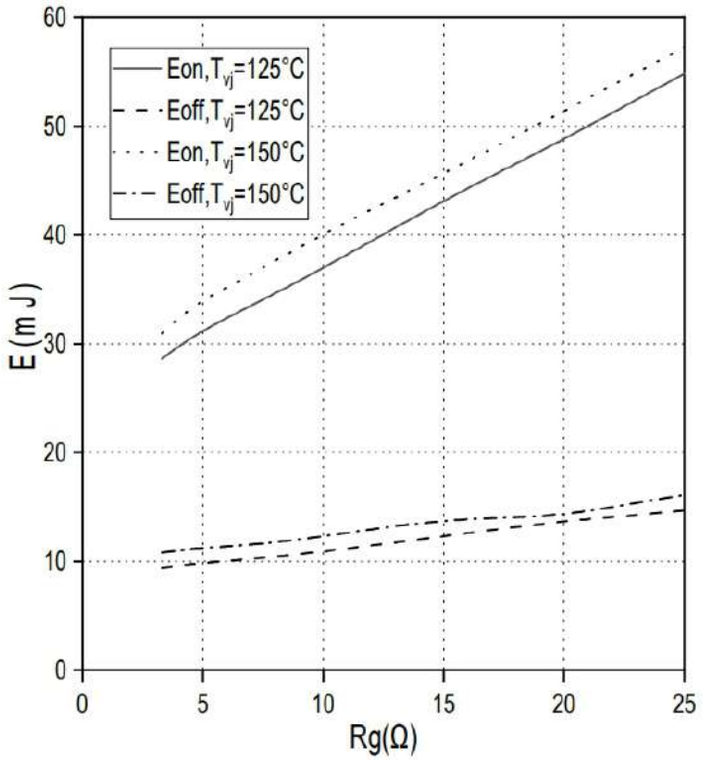
Transfer characteristic IGBT,Inverter(typical), IGBT
$I_C = f(V_{GE})$, V_{CE} = 20V



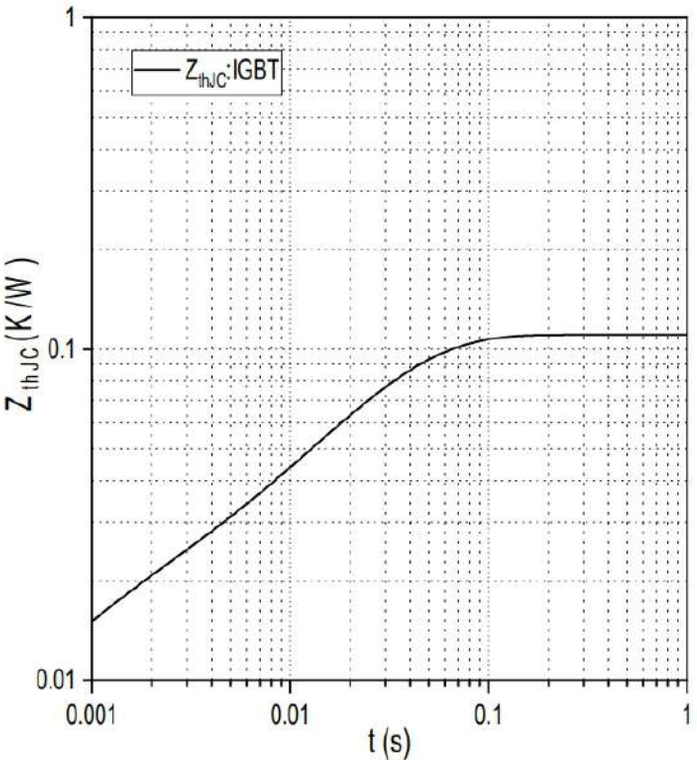
Switching losses IGBT, Inverter (Typical), IGBT
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15V, R_{Gon} = 3Ω, R_{Goff} = 3Ω, V_{CE} = 600V



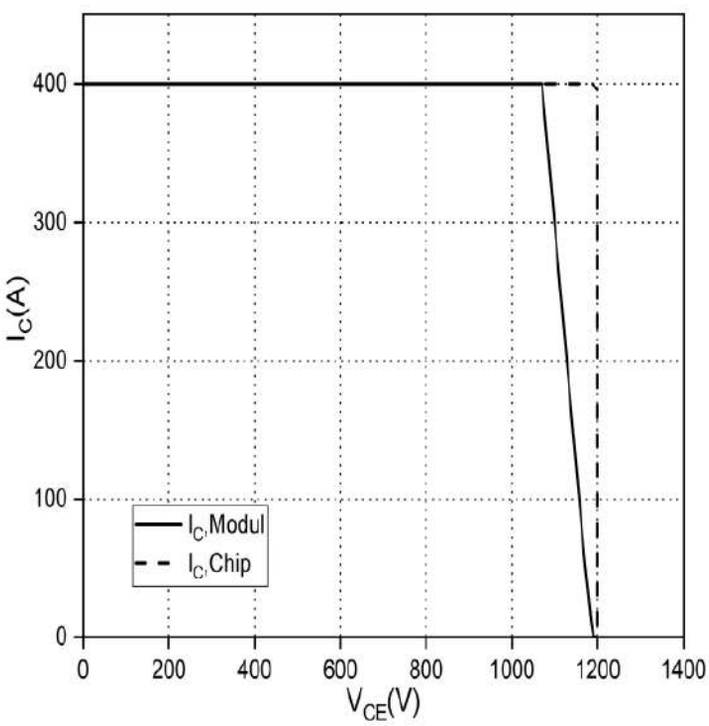
Switching losses IGBT, Inverter (typical), IGBT
V_{GE} = ±15V, I_C = 200A, V_{CE} = 600V



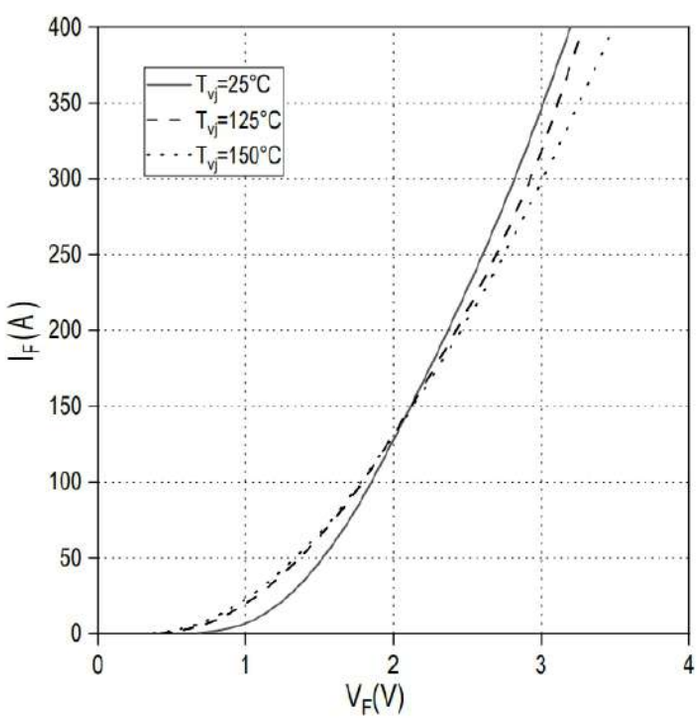
Transient thermal impedance IGBT, Inverter
Z_{thJC} = f(t)



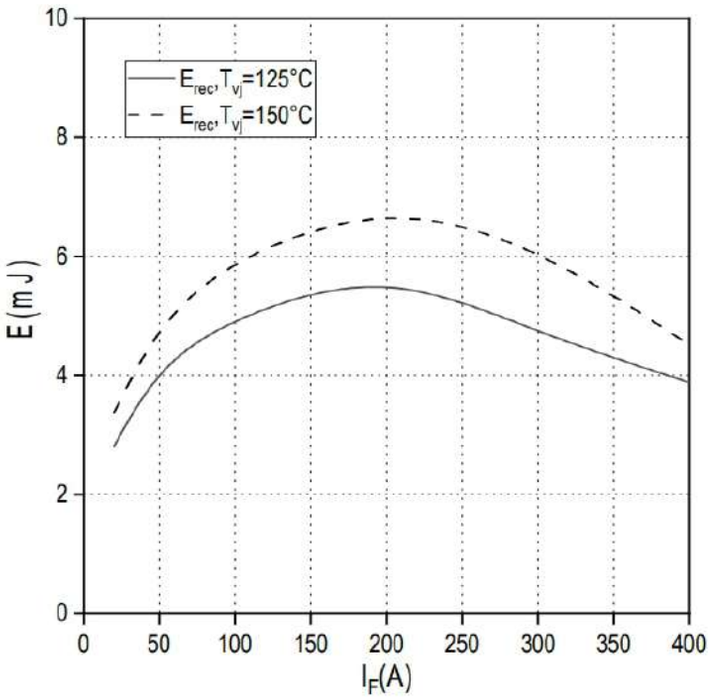
Reverse bias safe operating area IGBT, Inverter
(RBSOA) I_C = f(V_{CE}),
V_{GE} = ±15V, R_{Goff} = 10Ω,Tvj = 150°C



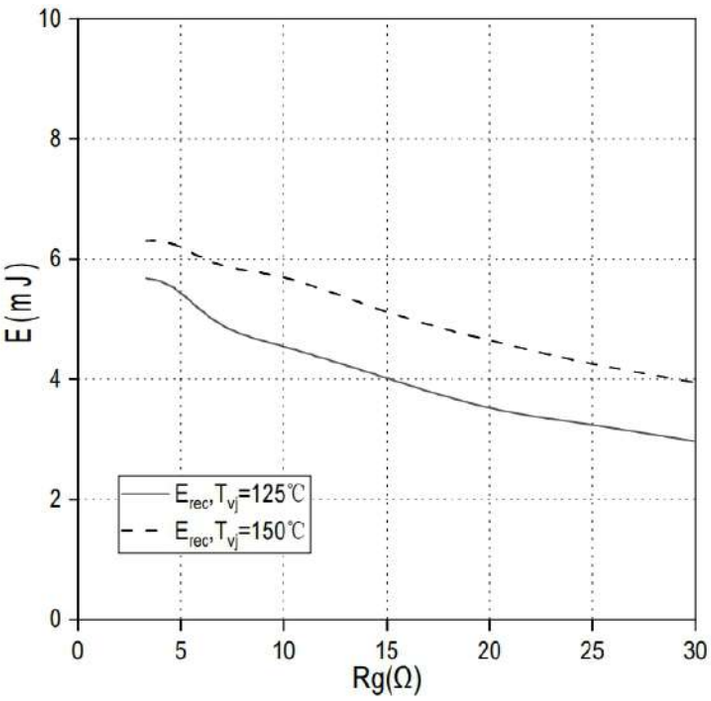
Forward characteristic of Diode, Inverter (typical)
IF = f(VF)



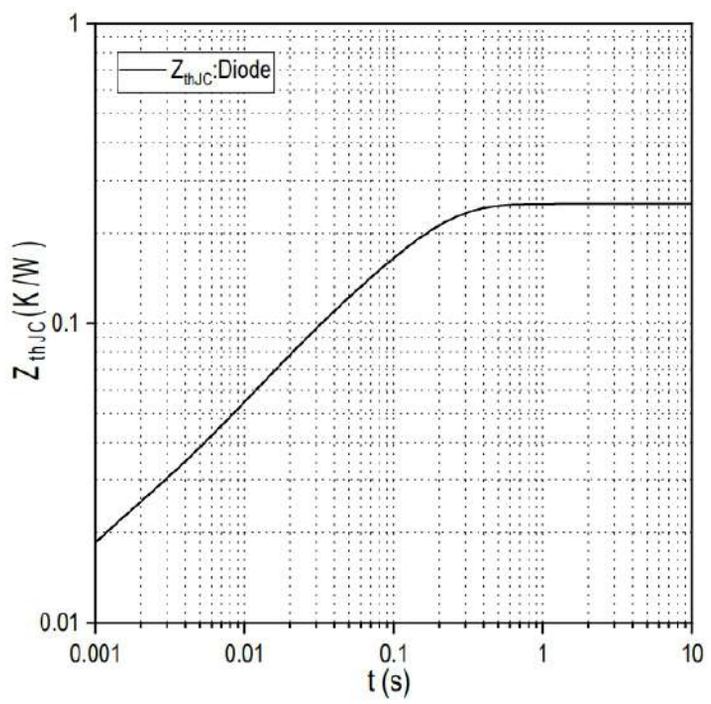
Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 3\Omega, V_{CE} = 600V$



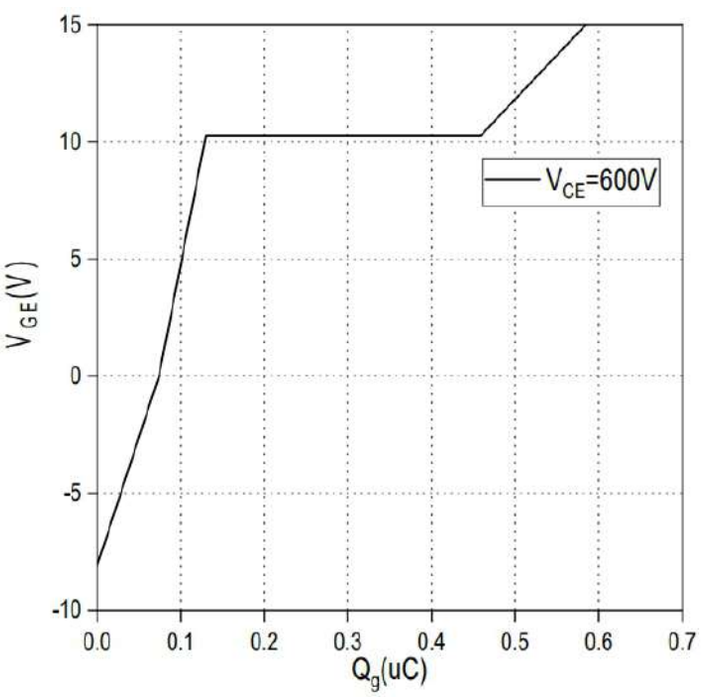
Switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 200A, V_{CE} = 600V$



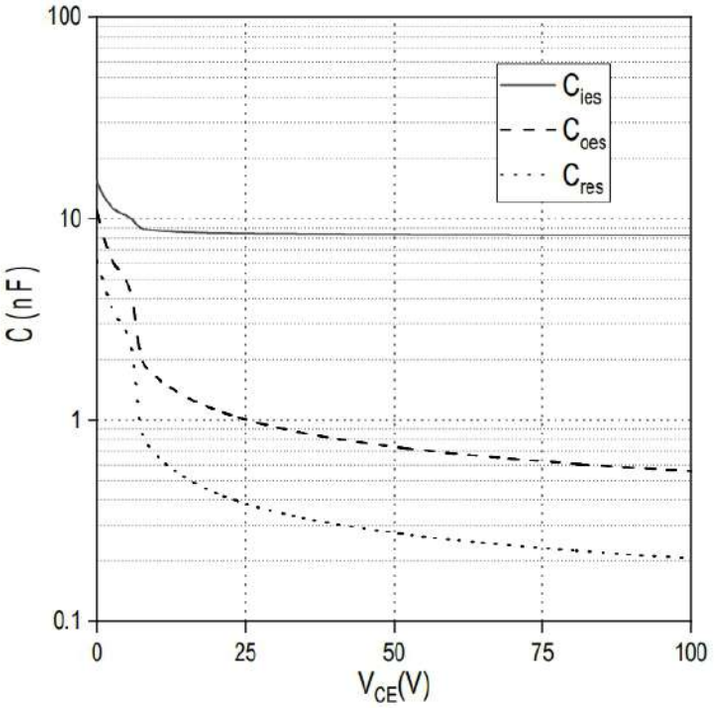
Transient thermal impedance Diode , Inverter
$Z_{thJC} = f(t)$



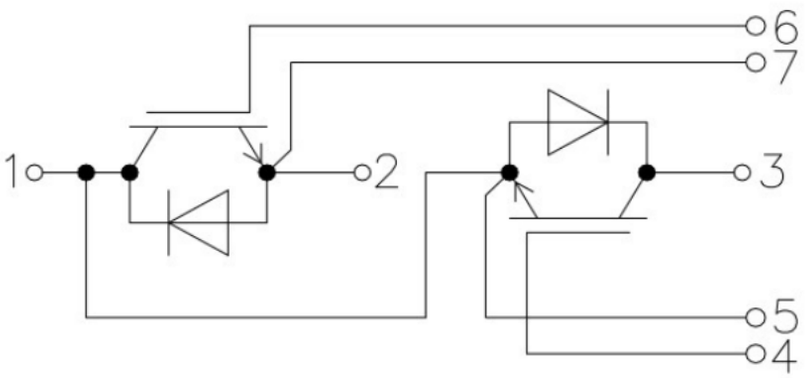
Gate charge characteristic, IGBT, Inverter (typical)
$V_{GE} = f(Q_g)$
$I_C = 200A, T_{vj} = 25°C$



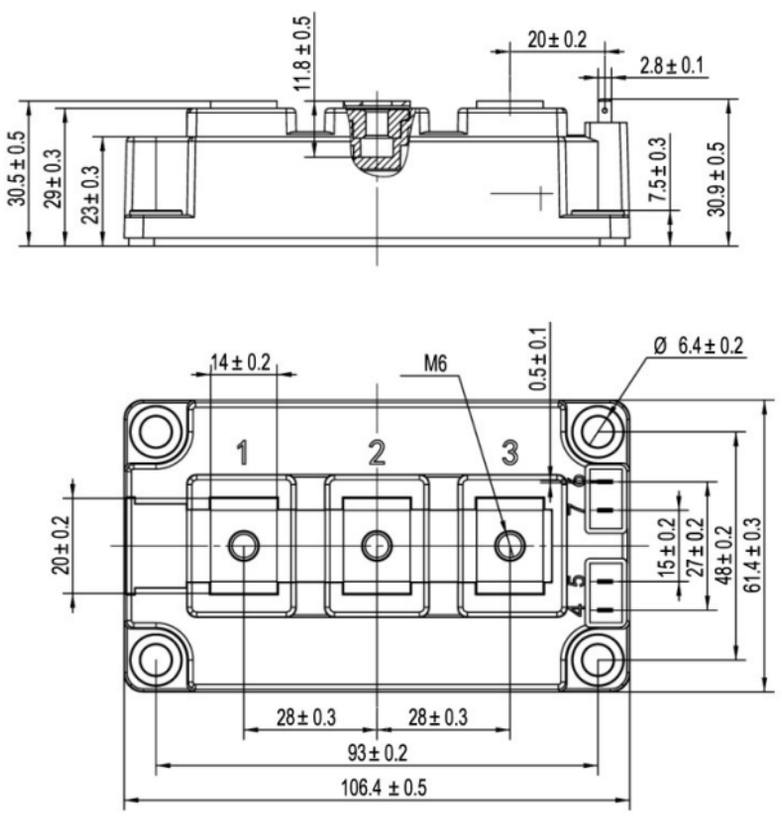
Capacity characteristic, IGBT, Inverter (typical)
C = f(V_{CE})
f = 100kHz, V_{GE} = 0 V, T_{vj} = 25°C



Internal Circuit



Package Dimension
Dimensions in Millimeters



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