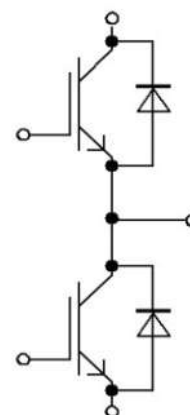


C2 series package: 1200V 800A IGBT module

[Datasheet](#)



Equivalent
Circuit Schematic

Features:

- Trenchgate Gen.7 IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High RBSOA capability
- Low static losses: $V_{CE(sat)} = 1,5V@25^{\circ}C$
- Low dynamic losses

Options:

- Pre-applied TIM (option +M01)
- Adoption for parallel connection (Vf selection)

Typical Applications:

- High Power Converters
- Motor Drives
- Uninterrupted Power Supply
- Photovoltaic

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}	800	A
	$T_C = 80^{\circ}\text{C}, T_{vj\ max} = 175^{\circ}\text{C}$	I_C	875	A
Repetitive Peak Collector Current	$I_{CRM} = 2 \times I_{Cnom}$	I_{CRM}	1600	A
Total Power Dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\ max} = 175^{\circ}\text{C}$	P_{tot}	3060	W
Gate-emitter Peak Voltage		V_{GES}	± 20	V

Characteristic Values

		min. typ. max.				
Collector-emitter Saturation Voltage ¹⁾	$I_C = 800\text{A}, V_{GE} = 15\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	V_{CEsat}		1.50 1.73 1.78 1.82	1.70	V
Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 16\text{mA}, T_{vj} = 25^{\circ}\text{C}$	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	—	6.9	—	μC
Internal Gate Resistor	$T_{vj} = 25^{\circ}\text{C}$	R_{Gint}	—	0.9	—	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}	—	170	—	nF
Reverse Transfer Capacitance		C_{res}	—	0.42	—	nF
Collector-emitter Cutoff Current	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$	I_{CES}	—	—	200	μA
Gate-emitter Leakage Current	$V_{CE} = 0\text{V}, V_{GE} = \pm 20\text{V}, T_{vj} = 25^{\circ}\text{C}$	I_{GES}	—	—	± 100	nA
Turn-on Delay Time, Inductive Load	$I_C = 800\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = 15\text{V}/-8\text{V}$ $R_{GON} = 1.0\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	—	281 289 291 296	—	ns
Rise Time, Inductive Load	$I_C = 800\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = 15\text{V}/-8\text{V}$ $R_{gon} = 1.0\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	—	104 112 115 120	—	ns
Turn-off Delay Time, Inductive Load	$I_C = 800\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = 15\text{V}/-8\text{V}$ $R_{goff} = 1.0\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	—	639 671 680 693	—	ns
Fall Time, Inductive Load	$I_C = 800\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = 15\text{V}/-8\text{V}$ $R_{Goff} = 1.0\Omega$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	—	112 117 131 140	—	ns
Turn-on energy Loss per Pulse	$I_C = 800\text{A}, V_{CE} = 600\text{V},$ $L_{\sigma} = 28\text{nH}, V_{GE} = 15\text{V}/-8\text{V},$ $R_{Gon} = 1.0\Omega, di/dt =$ $5600\text{A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	—	79.1 115.1 128.5 140.0	—	mJ
Turn-off energy Loss per Pulse	$I_C = 800\text{A}, V_{CE} = 600\text{V},$ $L_{\sigma} = 45\text{nH}, R_{Goff} = 1.0\Omega$ $V_{GE} = 15\text{V}/-8\text{V}, dv/dt =$ $4000\text{V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	—	84.1 99.2 102.1 110.0	—	mJ

SC Data	VCE = 600V, VGE = 15V/-8V, T _{vj} = 150°C	t _{psc}	8	—	—	μs
Thermal Resistance, Junction to Case	Per IGBT / IGBT	R _{thJC}	—	0.067	—	K/W
Thermal Resistance, Case to Sink	Per IGBT (λ _{grease} = 0.81W/(m·K))	R _{thcs}	—	0.049	—	K/W
Temperature under Switching Conditions ²⁾		T _{vj op}	-40	—	175	°C

Diode, Inverter Maximum Rated Values

Repetitive Peak Reverse Voltage	T _{vj} = 25°C	V _{RRM}	1200	V
Continuous DC Forward Current		I _F	800	A
Repetitive Peak Forward Current	I _{CRM} = 2 x I _{fnom}	I _{FRM}	1600	A

Characteristic Values

			min.	typ.	max.	
Forward Voltage ¹⁾	I _F = 800A, V _{GE} = 0V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C T _{vj} = 175°C	V _F		1.90 1.87 1.80 1.72	2.60	V
Peak Reverse Recovery Current	I _F = 800A, V _R = 600V -di _F /dt = 4800A/μs (T _{vj} = 175°C) V _{GE} = -8V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C T _{vj} = 175°C	I _{RM}	—	340 415 445 465	—	A
Recovery Charge	I _F = 800A, V _R = 600V -di _F /dt = 4800A/μs (T _{vj} = 175°C) V _{GE} = -8V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C T _{vj} = 175°C	Q _R	—	30.5 57.0 65.0 75.0	—	μC
Reverse Recovery Energy	I _F = 800A, V _R = 600V -di _F /dt = 4800A/μs (T _{vj} = 175°C) V _{GE} = -8V T _{vj} = 25°C T _{vj} = 125°C T _{vj} = 150°C T _{vj} = 175°C	E _{rec}	—	14.0 28.0 33.0 40.0	—	mJ
Thermal Resistance, Junction to Case	Per Doide / Diode	R _{thJC}	—	0.082	—	K/W
Temperature under Switching Conditions ²⁾		T _{vj op}	-40	—	175	°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	>400	

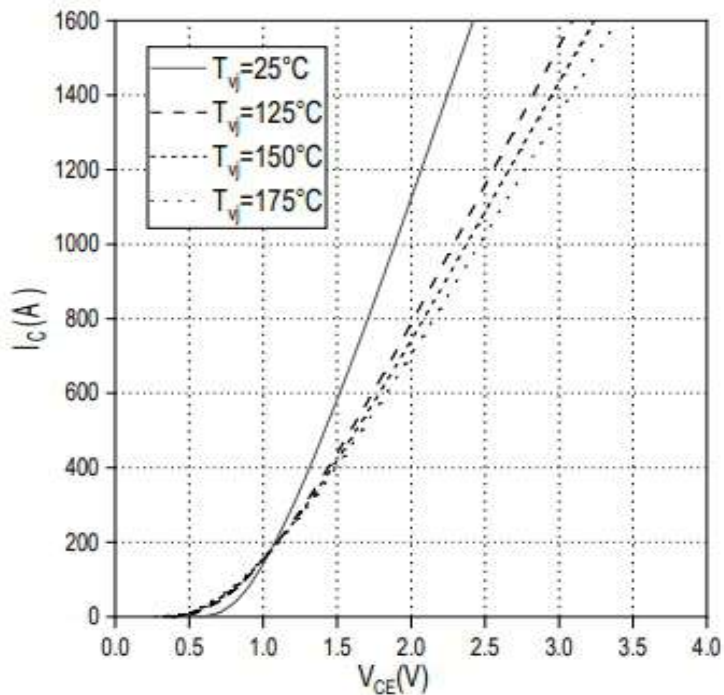
			min.	typ.	max.	
Stray Inductance Module		L _{sCE}	—	20	—	nH
Module Lead Resistance, Terminals-Chip	T _C = 25°C, Per Switch	R _{CC'+EE'}	—	0.70	—	mΩ
Storage Temperature		T _{stg}	-40	—	125	°C
Modul MountingTorque	M6	M	3.0	—	6.0	Nm
Terminal MountingTorque	M6	M	2.5	—	5.0	Nm
Weight		G	—	320	—	g

1) Terminal impedance is not included.

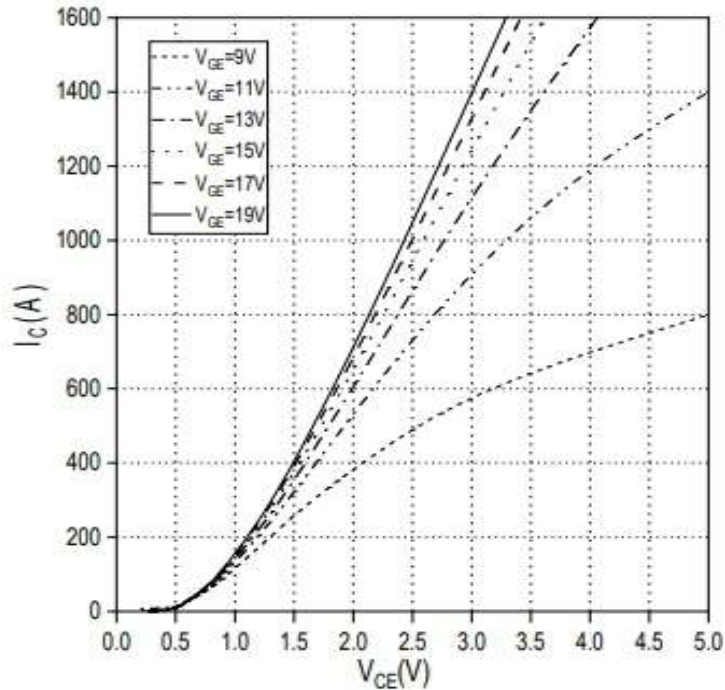
2) T_{vj op} > 150°C is allowed for operation at overload conditions.

Circuit Diagram

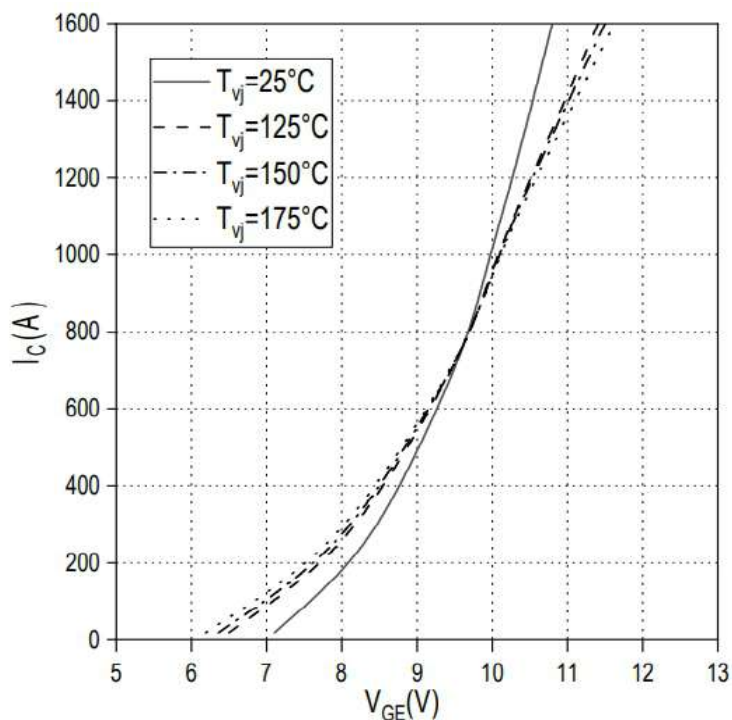
Output characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{CE})$, $V_{GE} = 15V$



Output characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{CE})$, $T_{vj} = 175^\circ C$



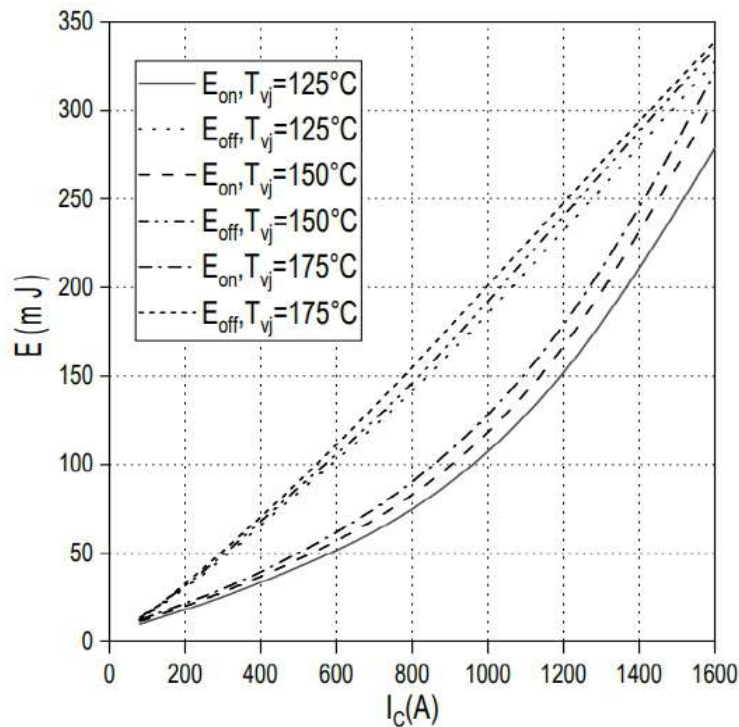
Transfer characteristic IGBT, Inverter (typical), IGBT
 $I_c = f(V_{GE})$, $V_{CE} = 20V$



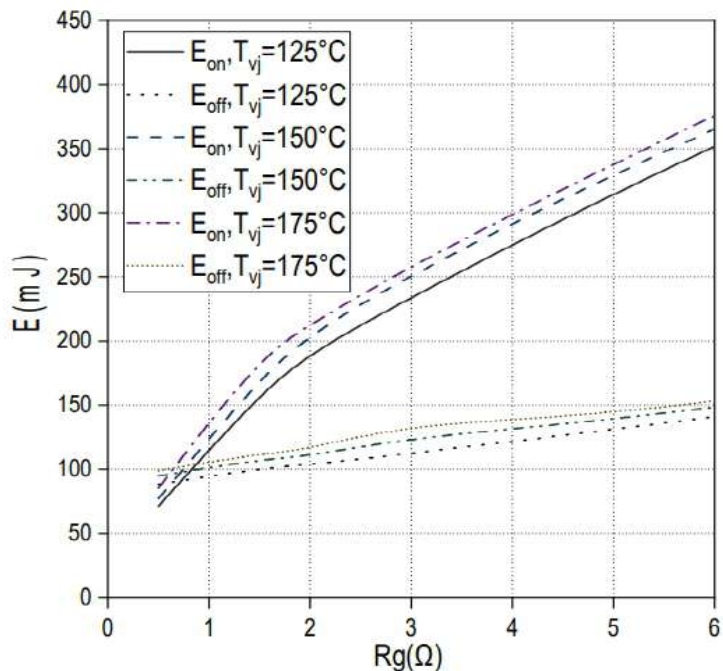
Switching losses IGBT, Inverter (Typical), IGBT

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

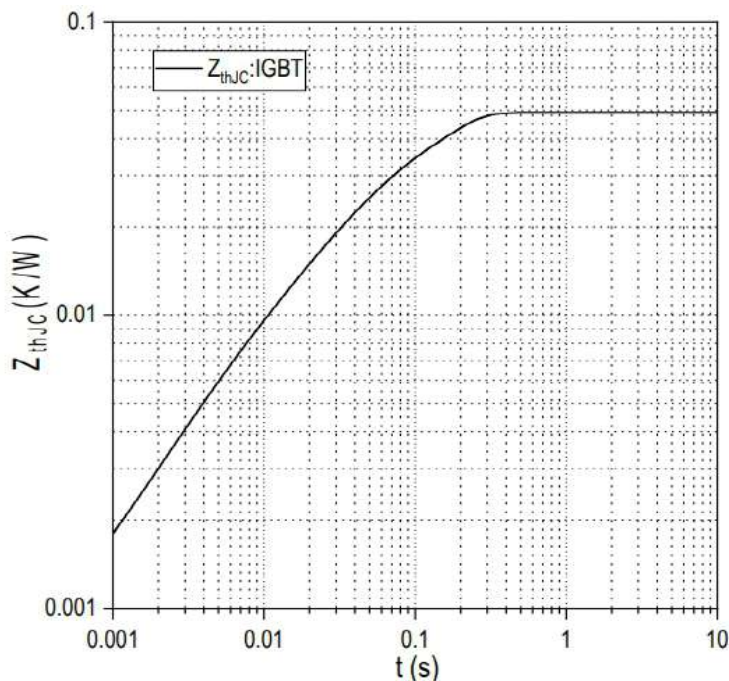
$V_{GE} = 15V/-8V$, $R_{Gon} = 1\Omega$, $R_{Goff} = 6\Omega$, $V_{CE} = 600V$

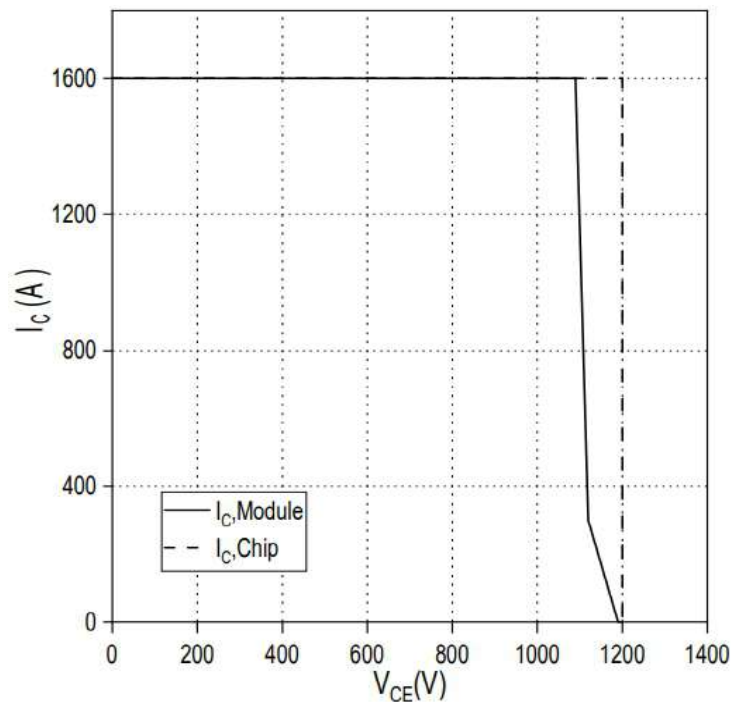


Switching losses IGBT, Inverter (typical), IGBT

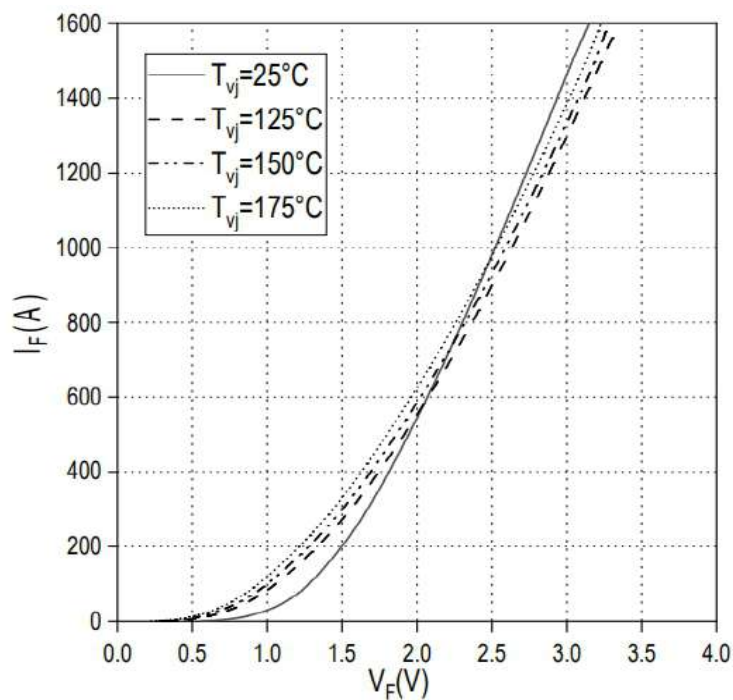
 $V_{GE} = 15V/-8V$, $I_C = 800A$, $V_{CE} = 600V$


Transient thermal impedance IGBT, Inverter

 $Z_{thJC} = f(t)$

 Reverse bias safe operating area IGBT, Inverter (RBSOA) $I_C = f(V_{CE})$,

 $V_{GE} = 15V/-8V$, $R_{Goff} = 6\Omega$, $T_{vj} = 175^\circ C$


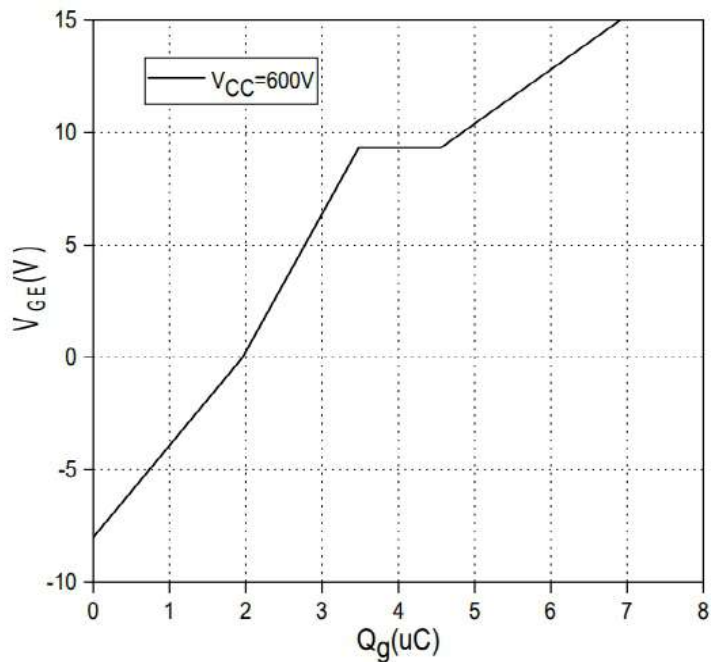
Forward characteristic of Diode, Inverter (typical)

 $I_F = f(V_F)$


Gate charge characteristic, IGBT, Inverter (typical)

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

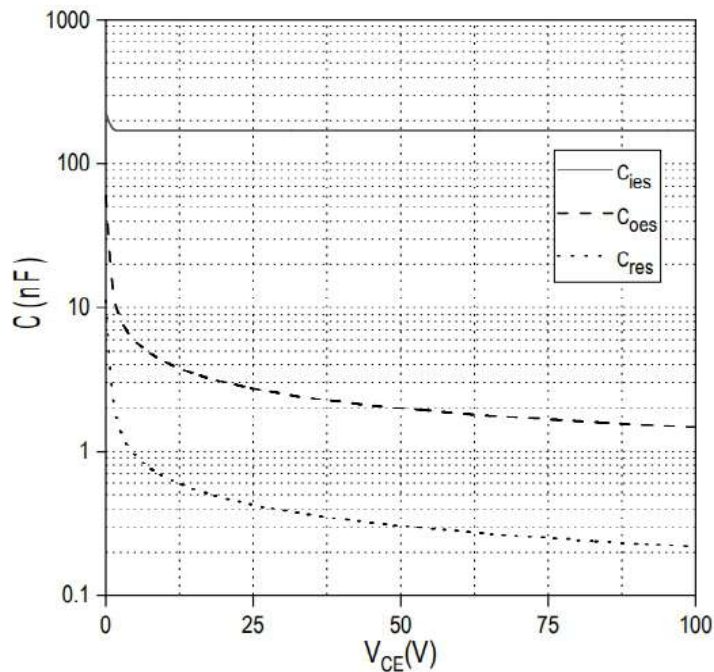
$I_C = 800A$, $T_{vj} = 25^\circ C$



Capacity characteristic, IGBT, Inverter (typical)

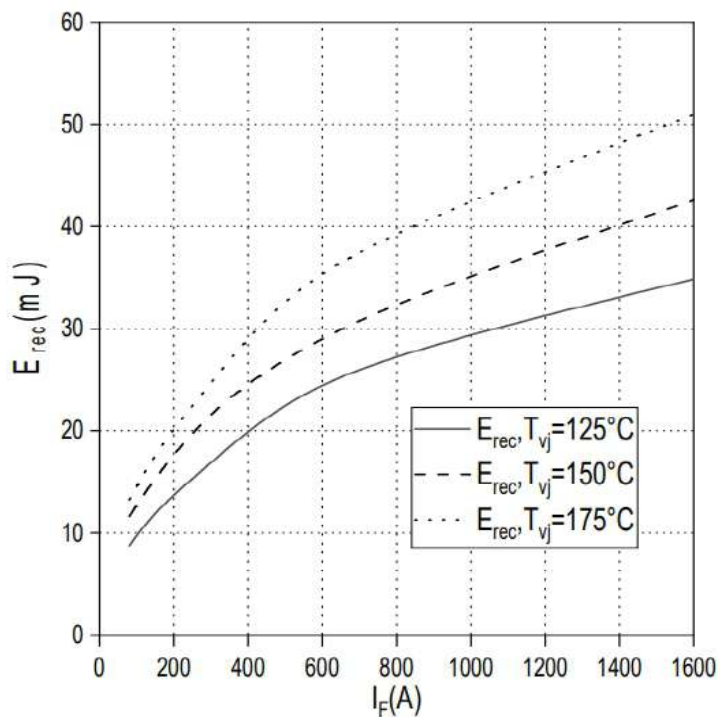
$$C = f(V_{CE})$$

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



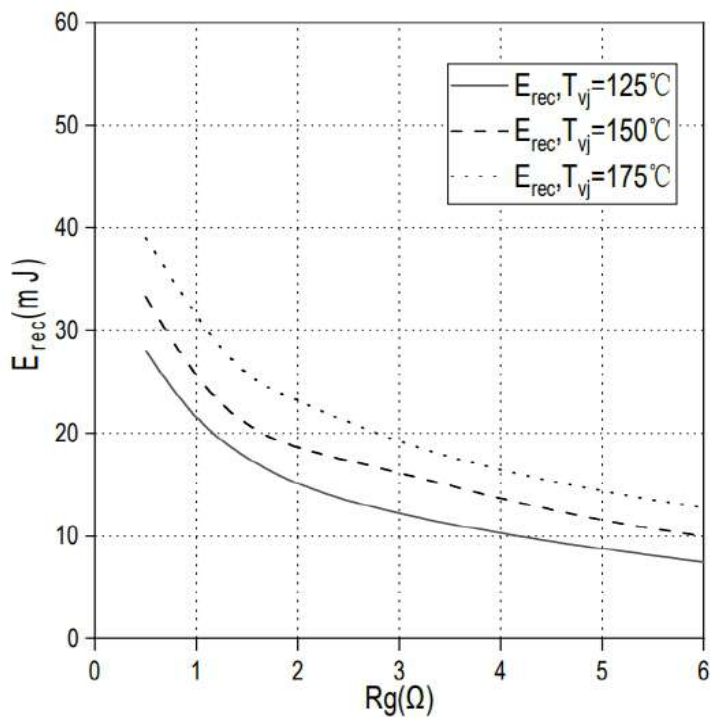
Switching losses Diode, Inverter (typical)

$$E_{rec} = f(I_F), R_{gon} = 1.0\Omega, V_{CE} = 600V$$

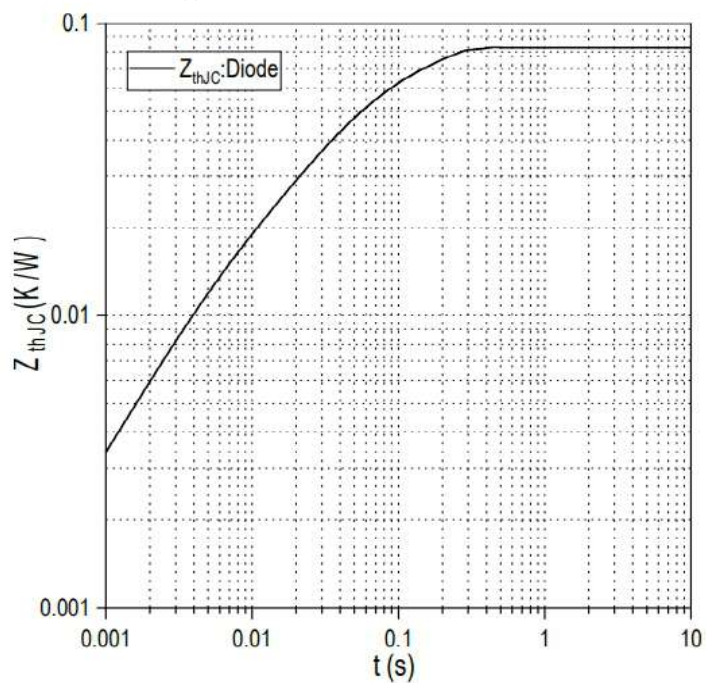


Switching losses Diode, Inverter (typical)

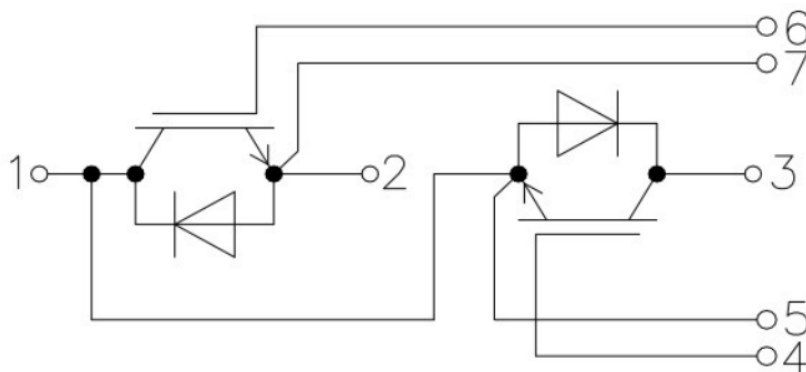
$$E_{rec} = f(R_g), I_F = 800A, V_{CE} = 600V$$



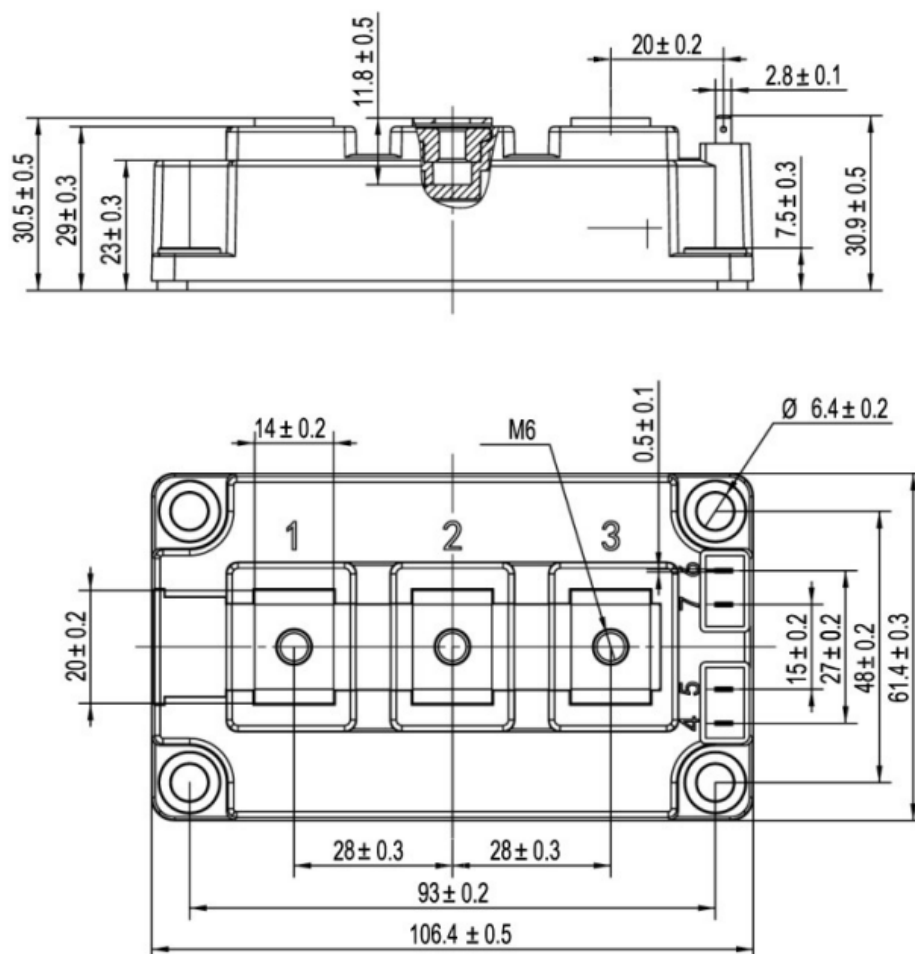
Transient thermal impedance Diode , Inverter

 $Z_{thJC} = f(t)$ 

Internal Circuit



Package Dimension Dimensions in Millimeters



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