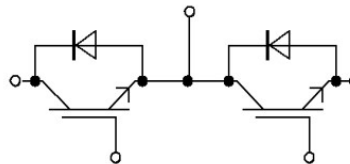


K package: 1200V 150A IGBT module



Equivalent Circuit Schematic

Features:

- 1200V 150A, $V_{CE(sat)} = 2.50V$
- planar field-stop technology
- High RBSOA capability
- Low turn-off losses

产品特性:

- 1200V 150A, $V_{CE(sat)} = 2.50V$
- 平面栅场终止技术
- 高 RBSOA 性能
- 低关断损耗

Typical Applications:

- Inductive Heating
- Welding
- High Frequency Switching Application

典型应用:

- 感应加热
- 电焊机
- 高频开关应用

IGBT, Inverter / IGBT , 逆变部分

Maximum Rated Values / 最大标称参数

Collector-emitter Voltage 集电极-发射极电压	$T_{vj}=25^{\circ}\text{C}$	V_{CES}	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{C\text{ nom}}$	150	A
	$T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$	I_C	175	A
Repetitive Peak collector current 集电极可重复峰值电流	$I_{CRM}=2 \times I_{C\text{ nom}}$	I_{CRM}	300	A
Total power dissipation 总功率损耗	$T_C=25^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$	P_{tot}	835	W
Gate-emitter peak voltage 门极-发射极峰值电压		V_{GES}	± 20	V

Characteristic Values / 性能参数

				min.	typ.	max.	
Collector-emitter saturation Voltage ¹⁾ 集电极-发射极饱和压降	$I_C=150\text{A}, V_{GE}=15\text{V}$ $I_C=150\text{A}, V_{GE}=15\text{V}$ $I_C=150\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$V_{CE\text{ sat}}$		2.50 2.90 3.00	3.00	V
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=2\text{mA},$	$T_{vj}=25^{\circ}\text{C}$	$V_{GE\text{ th}}$	5.0	6.0	7.0	V
Gate Charge 门极电荷	$V_{GE}=-8\text{V}/15\text{V}, V_{CE}=600\text{V}$	$T_{vj}=25^{\circ}\text{C}$	Q_G		0.45		nC
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$		$R_{G\text{ int}}$		4		Ω
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=100\text{KHz}, T_{vj}=25^{\circ}\text{C}$		C_{ies}		6.60		nF
Reverse Transfer Capacitance 反向传输电容			C_{res}		0.26		nF
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	$V_{CE}=1200\text{V}, V_{GE}=0\text{V},$	$T_{vj}=25^{\circ}\text{C}$	I_{CES}			2	mA
Gate-emitter Leakage Current 门极-发射极漏电流	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V},$	$T_{vj}=25^{\circ}\text{C}$	I_{GES}			± 200	nA
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{G\text{ on}}=1.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{don}		45 45 45		ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{G\text{ on}}=1.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_r		30 35 40		ns
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{G\text{ off}}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{doff}		350 385 390		ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{G\text{ off}}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_f		20 30 40		ns
Turn-on energy loss per pulse 开通损耗	$I_C=150\text{A}, V_{CE}=600\text{V},$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}=\pm 15\text{V}, R_{G\text{ on}}=1.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{on}		13.0 20.0 22.0		mJ
Turn-off energy loss per pulse 关断损耗	$I_C=150\text{A}, V_{CE}=600\text{V},$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}=\pm 15\text{V}, R_{G\text{ off}}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{off}		3.8 6.0 6.5		mJ

Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.140		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	°C

Diode, Inverter / 二极管，逆变部分

Maximum Rated Values / 最大标称参数

Repetitive peak reverse voltage 可重复反向峰值电压	$T_{vj}=25^{\circ}\text{C}$	V_{RRM}	1200	V
Continuous DC Forward Current 可连续正向直流电流		I_F	150	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{CRM}=2\times I_{C_{nom}}$	I_{FRM}	300	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F=150\text{A}, V_{GE}=0\text{V}$ $I_F=150\text{A}, V_{GE}=0\text{V}$ $I_F=150\text{A}, V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$		2.20 2.20 2.15	2.70	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=150\text{A}, V_R=600\text{V}$ $-di_F/dt=3000\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$		90 90 90		A
Recovery Charge 反向恢复电荷	$I_F=150\text{A}, V_R=600\text{V}$ $-di_F/dt=3000\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$		7.5 12.5 17.5		uC
Reverse Recovery Energy 反向恢复损耗	$I_F=150\text{A}, V_R=600\text{V}$ $-di_F/dt=3000\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$		3.5 6.5 7.5		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode / 单个 Diode	R_{thJC}		0.252		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	°C

注：1) Terminal impedance is not included.

不包含端子阻抗。

Module / 模块

Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	V_{ISOL}	3.0	KV
Material of Module Baseplate 模块底板材料			Cu	
Internal Isolation 内部绝缘	基本绝缘 (class 1, IEC 61140) Basic insulation (class1, IEC 61140)		Al_2O_3	
Creepage Distance 爬电距离	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		29.0 23.0	mm
Clearance 电气间隙	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		23.0 11.0	mm
Comparative Tracking Index 相对漏电起痕指数		CTI	>200	

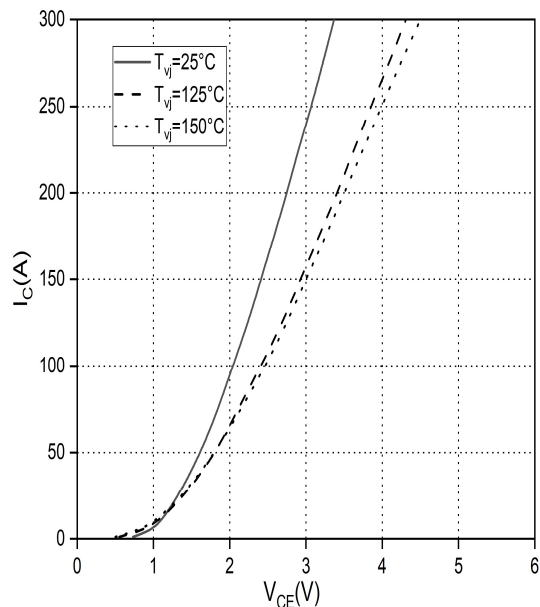
			min.	typ.	max.	
Thermal resistance, case to heatsink 外壳-散热器热阻	每个模块/per module $\lambda_{Paste} = 1W/(m \cdot K) / \lambda_{grease} = 1W/(m \cdot K)$	R_{thCH}		0.01		K/W
Stray Inductance Module 模块杂散电感		L_{sCE}		20		nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片	$T_C = 25^\circ C$, 每个开关 per switch	$R_{CC'+EE'}$		0.70		mΩ
Storage Temperature 贮存温度		T_{stg}	-40		125	°C
Modul Mounting torque 模块安装扭距	M6	M	4.0		6.0	Nm
Terminal Mounting torque 端子安装扭距	M6	M	4.0		6.0	Nm
Weight 重量		G		320		g

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

$$I_C = f(V_{CE}),$$

$$V_{GE} = 15V$$

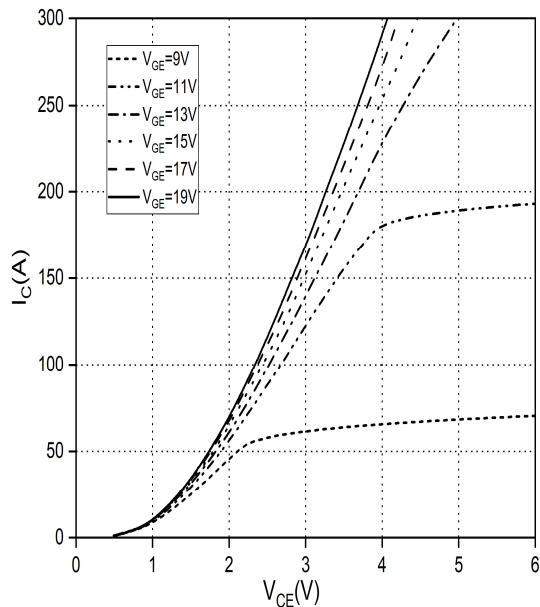


输出特性 IGBT, 逆变器(典型值)

output characteristic IGBT Inverter (typical)

$$I_C = f(V_{CE}),$$

$$T_{vj} = 150^\circ C$$

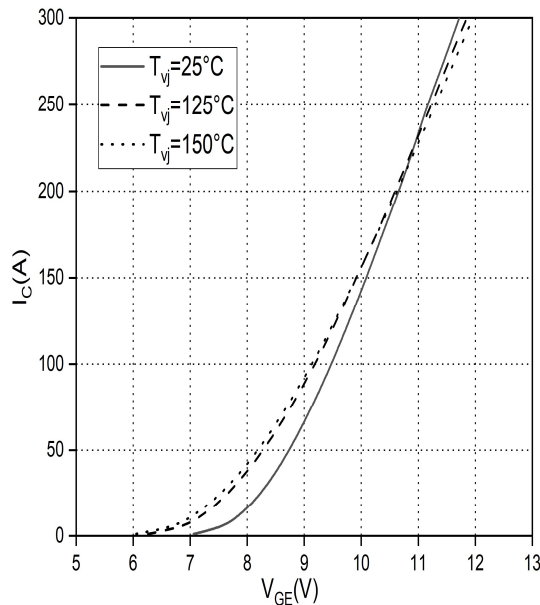


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

$$I_C = f(V_{GE}),$$

$$V_{CE} = 20V$$

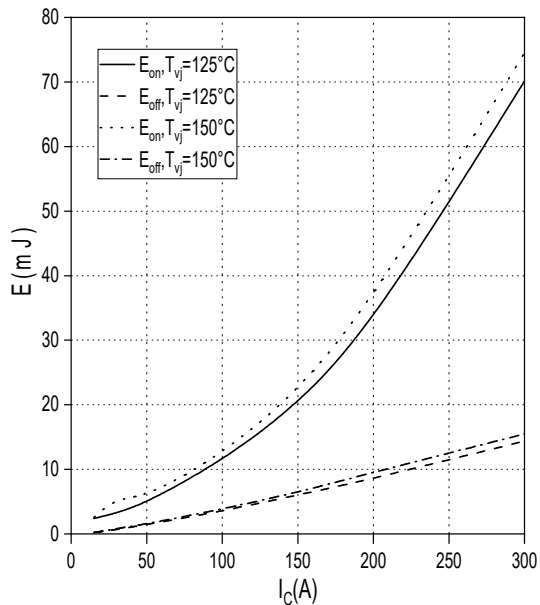


开关损耗 IGBT, 逆变器 (典型值)

switching losses IGBT, Inverter (typical)

$$E_{on} = f(I_C), E_{off} = f(I_C), V_{GE} = \pm 15V,$$

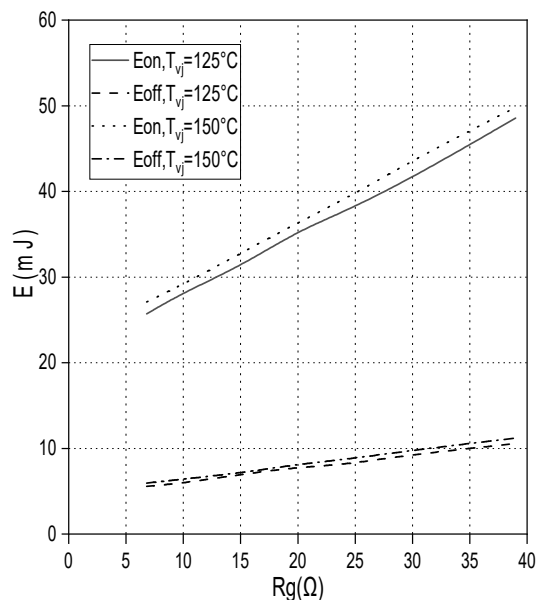
$$R_{Gon} = 1.0\Omega, R_{Goff} = 10\Omega, V_{CE} = 600V$$



开关损耗 IGBT, 逆变器 (典型值)

Switching losses IGBT, Inverter (typical)

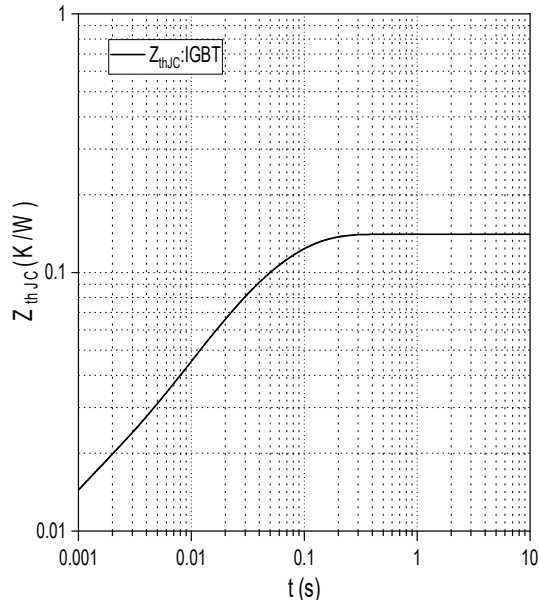
$V_{GE} = \pm 15V, I_C = 150A, V_{CE} = 600V$



瞬态热阻抗 IGBT, 逆变器

transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$

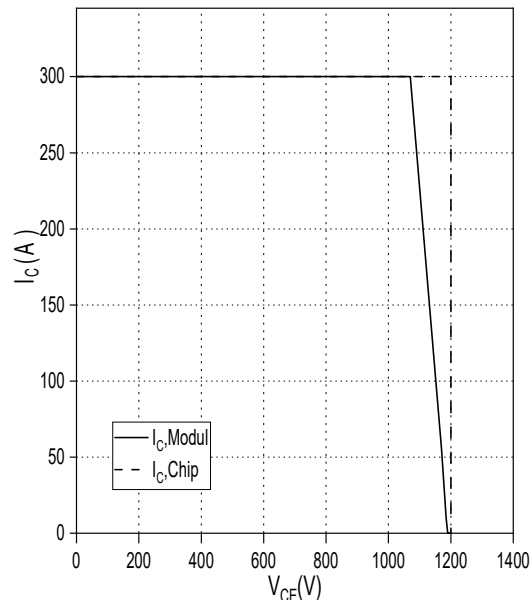


反偏安全工作区 IGBT, 逆变器(RBSOA)

Reverse bias safe operating area IGBT, Inverter

(RBSOA) $I_C = f(V_{CE})$,

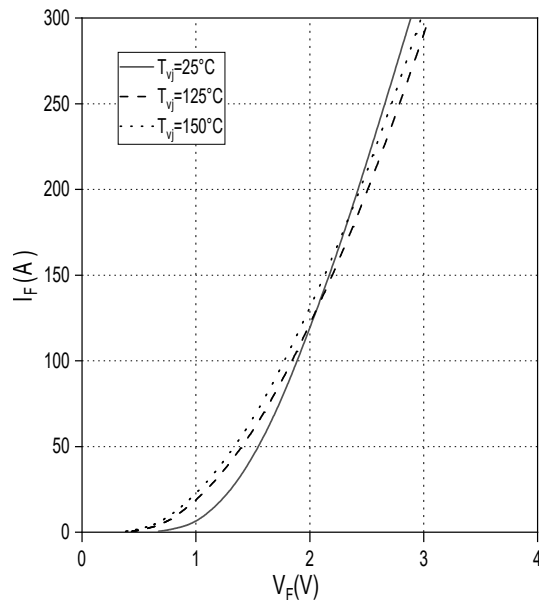
$V_{GE} = \pm 15V, R_{Goff} = 10\Omega, T_{vj} = 150^\circ C$



正向偏压特性二极管, 逆变器 (典型值)

forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$

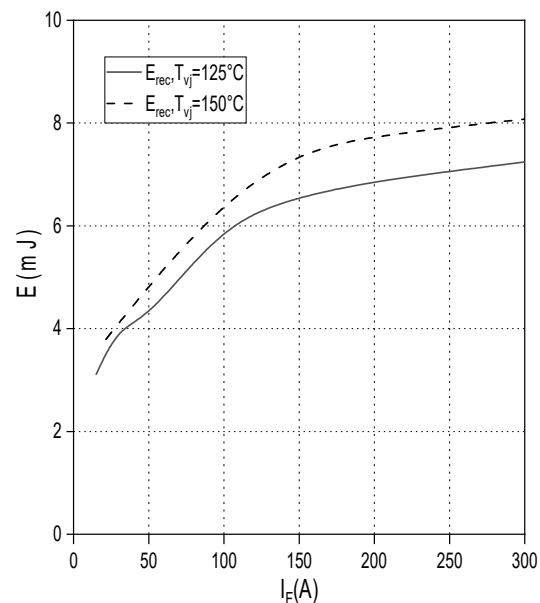


开关损耗二极管,逆变器 开关损耗 (典型值)

Switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

$R_{Gon} = 1.0\Omega, V_{CE} = 600V$

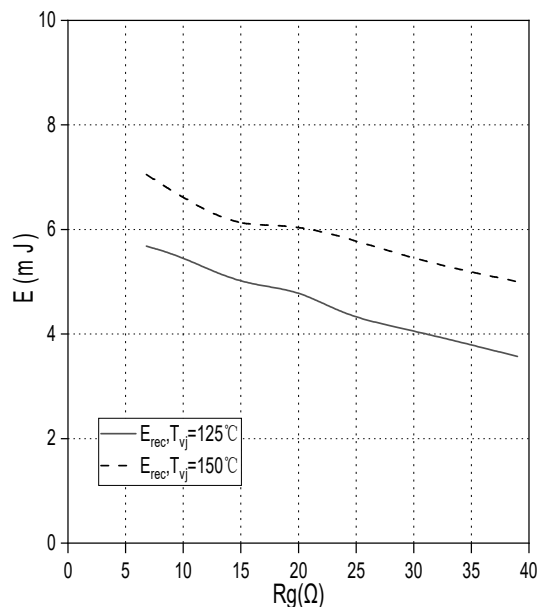


二极管,逆变器 (典型值)

switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

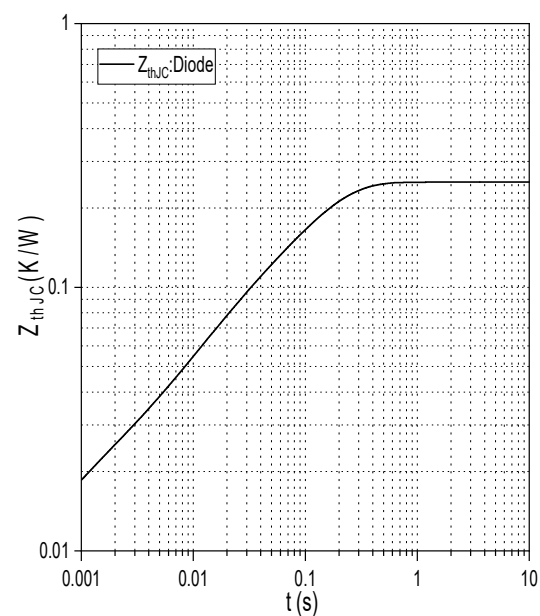
$I_F = 150A, V_{CE} = 600V$



瞬态热阻抗二极管,逆变器

transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

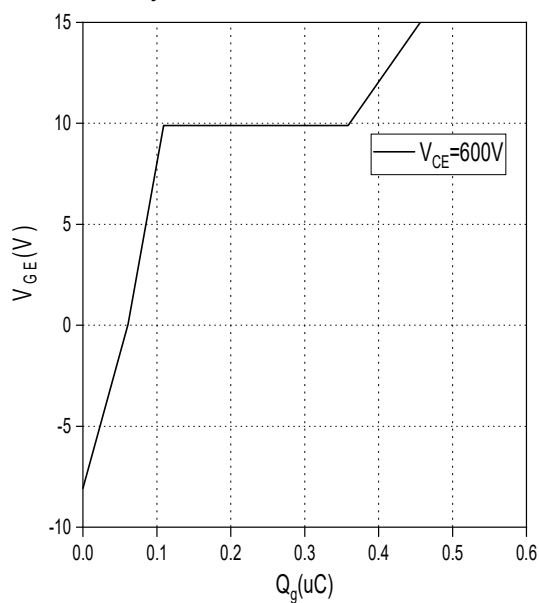


栅极电荷特性, IGBT, 逆变器 (典型)

Gate charge characteristic, IGBT, Inverter (typical)

$V_{GE} = f(Q_g)$

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

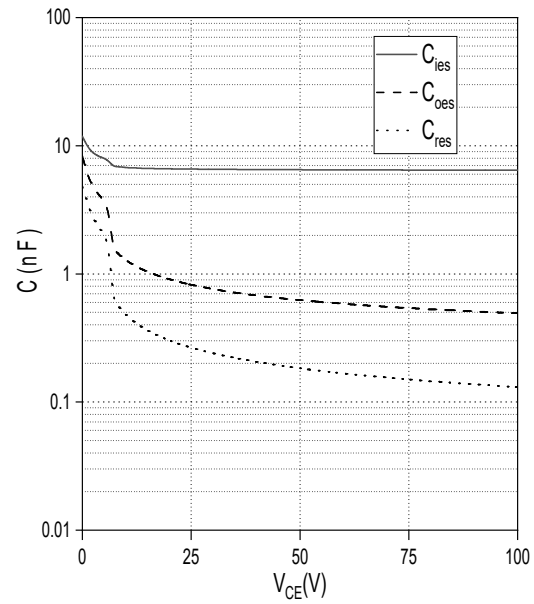


电容特性, IGBT, 逆变器 (典型)

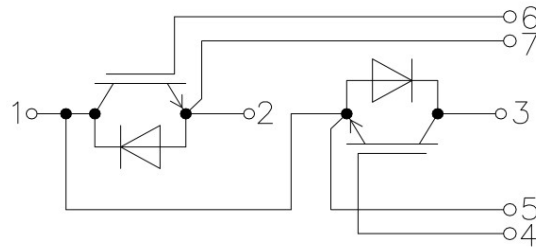
Capacity characteristic, IGBT, Inverter (typical)

$C = f(V_{CE})$

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



Internal Circuit:



Package Dimension

Dimensions in Millimeters

