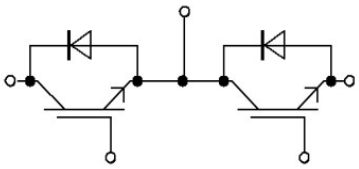
K package: 1200V 200A IGBT module



Equivalent Circuit Schematic

Features:

- 1200V 200A,$V_{CE(sat)}$ = 2.40V
- planar field-stop technology
- High RBSOA capability
- Low turn-off losses

产品特性:

- 1200V 200A,$V_{CE(sat)}$ = 2.40V
- 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℃	V_{CES}	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{C\ nom}$	200	A
	T_C=80℃, T_{vjmax}=150℃	I_C	220	A
Repetitive Peak collector current 集电极可重复峰值电流	I_{CRM}=2×I_{Cnom}	I_{CRM}	400	A
Total power dissipation 总功率损耗	T_C=25℃, T_{vjmax}=150℃	P_{tot}	1135	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=200A, V_{GE}=15V T_{vj}=25℃ I_C=200A, V_{GE}=15V T_{vj}=125℃ I_C=200A, V_{GE}=15V T_{vj}=150℃	V_{CEsat}		2.40 2.90 3.00	3.00	V
Gate Threshold Voltage 门极阈值电压	V_{CE}= V_{GE}, I_C=2mA, T_{vj}=25℃	V_{GEth}	5.0	6.0	7.0	V
Gate Charge 门极电荷	V_{GE} =-8V/15V, V_{CE}=600V T_{vj}=25℃	Q_G		0.58		nC
Internal Gate Resistor 内置门极电阻	T_{vj}=25℃	R_{Gint}		4		Ω
Input Capacitance 输入电容	V_{CE} = 25V, V_{GE} = 0V f = 100KHz, T_{vj}= 25℃	C_{ies}		8.45		nF
Reverse Transfer Capacitance 反向传输电容		C_{res}		0.38		nF
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	V_{CE}=1200V, V_{GE}=0V, T_{vj}=25℃	I_{CES}			2	mA
Gate-emitter Leakage Current 门极-发射极漏电流	V_{CE}=0V, V_{GE}=±20V, T_{vj}=25℃	I_{GES}			±200	nA
Turn-on Delay Time, Inductive Load 开通延迟时间，感性负载	I_C=200A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=2.4Ω T_{vj}=150℃	t_{don}		58.5 60 60		ns
Rise Time, Inductive Load 上升时间，感性负载	I_C=200A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=2.4Ω T_{vj}=150℃	t_r		50 55 60		ns
Turn-off Delay Time, Inductive Load 关断延迟时间，感性负载	I_C=200A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=10 Ω T_{vj}=150℃	t_{doff}		415 480 485		ns
Fall Time, Inductive Load 下降时间，感性负载	I_C=200A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=10Ω T_{vj}=150℃	t_f		32 40 45		ns
Turn-on energy loss per pulse 开通损耗	I_C=200A, V_{CE}=600V, T_{vj}=25℃ L_σ=80nH, V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V, R_{Gon}=2.4Ω T_{vj}=150℃	E_{on}		19.0 27.0 29.5		mJ
Turn-off energy loss per pulse 关断损耗	I_C=200A, V_{CE}=600V, T_{vj}=25℃ L_σ=80nH, V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V, R_{Goff}=10Ω T_{vj}=150℃	E_{off}		6.0 10.5 12.0		mJ

Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.11		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

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	Tvj=25℃	V_{RRM}	1200	V
Continuous DC Forward Current 可连续正向直流电流		I_F	200	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{CRM}=2\times IC_{nom}$	I_{FRM}	400	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	I_F=200A, V_{GE}=0V I_F=200A, V_{GE}=0V I_F=200A, V_{GE}=0V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃	V_F		2.40 2.45 2.50	2.80	V
Peak Reverse Recovery Current 反向恢复峰值电流	I_F=200A, V_R=600V -di$_F$/dt=2800A/us（T_{vj}=150℃） V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃	I_{RM}		80 90 90		A
Recovery Charge 反向恢复电荷	I_F=200A, V_R=600V -di$_F$/dt=2800A/us（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 反向恢复损耗	I_F=200A, V_R=600V -di$_F$/dt=2800A/us（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 结-壳热阻	Per Diode /单个 Diode		R_{thJC}		0.25		K/W
Temperature under switching conditions 工作温度			$T_{vj\ op}$	-40		150	℃

注： 1）Terminal impedance is not included.

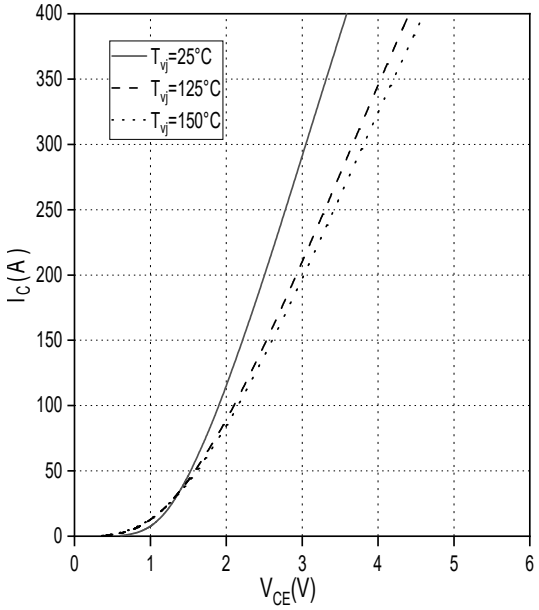
不包含端子阻抗。

Module / 模块

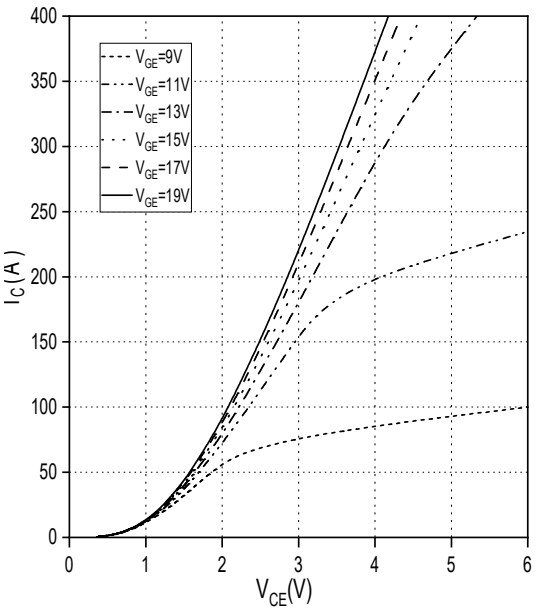
Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	V_{ISOL}	3.0	KV
Material of Module Baseplate 模块底板材料			Cu	
Internal Isolation 内部绝缘	基本绝缘（class 1, IEC 61140） Basic insulation (class1,IEC 61140		Al_2O_3	
Creepage Distance 爬电距离	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		29.0 23.0	mm
Clearance 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 λ_{Paste} =1W/(m·K)/λ grease =1W/(m·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°C,每个开关 per switch	$R_{CC'+EE'}$		0.70		mΩ
Storage Temperature 贮存温度		T_{stg}	-40		125	℃
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

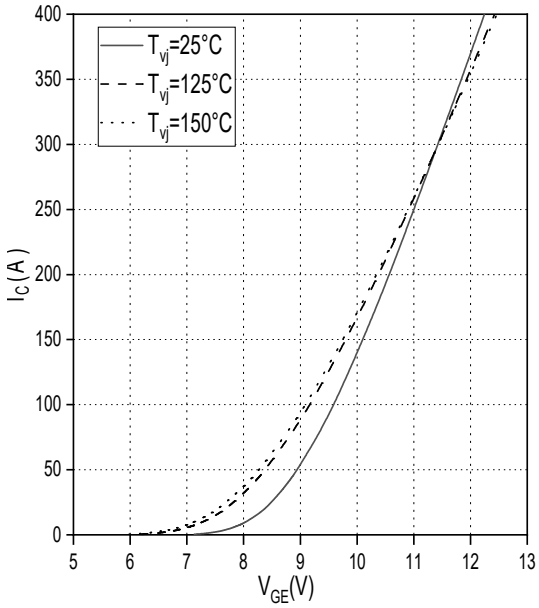
输出特性 IGBT,逆变器(典型值)
Output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$V_{GE} = 15V$



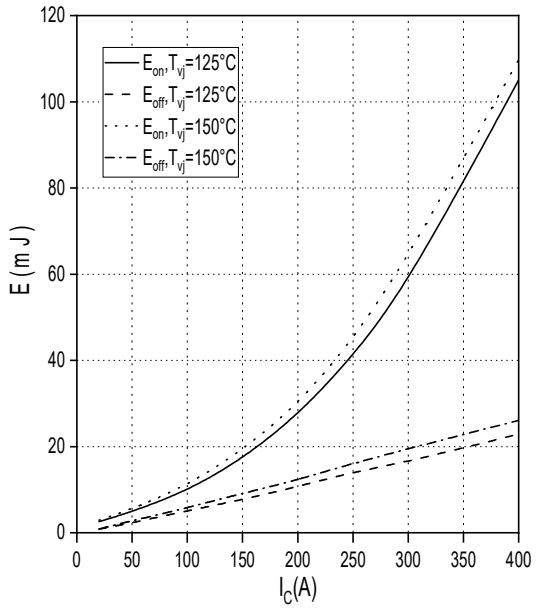
输出特性 IGBT, 逆变器(典型值)
output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$T_{vj} = 150℃$



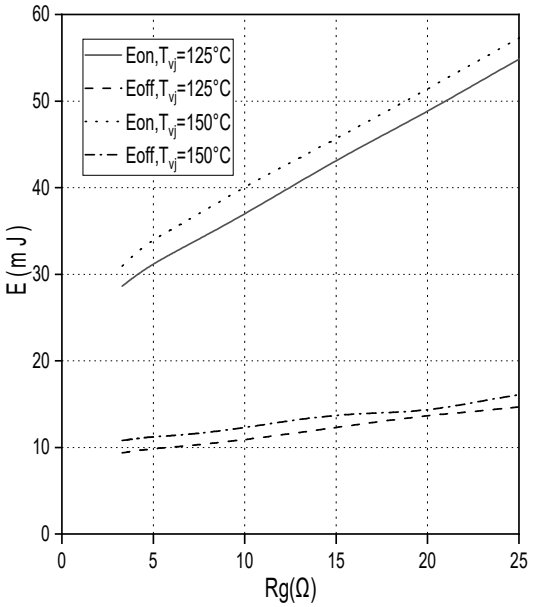
传输特性 IGBT, 逆变器 (典型值)
Transfer characteristic IGBT, Inverter (typical)
$I_C = f(V_{GE})$,
$V_{CE} = 20V$



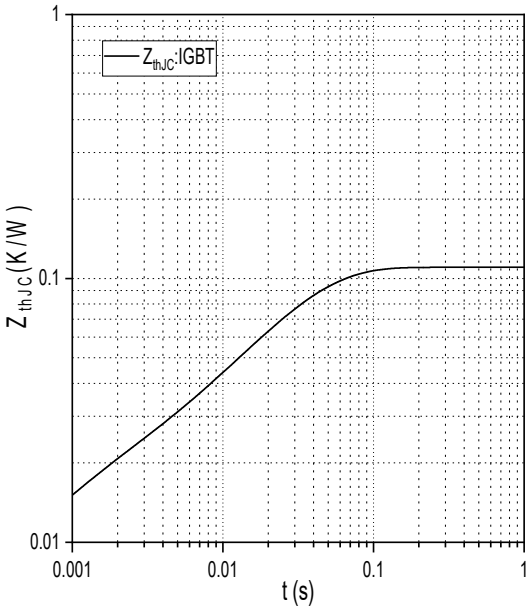
开关损耗 IGBT ,逆变器（典型值)
switching losses IGBT , Inverter (typical)
$E_{on} = f(I_C), E_{off} = f(I_C)$, $V_{GE} = \pm 15V$,
$R_{Gon} = 2.4\Omega, R_{Goff} = 10\Omega, V_{CE} = 600V$



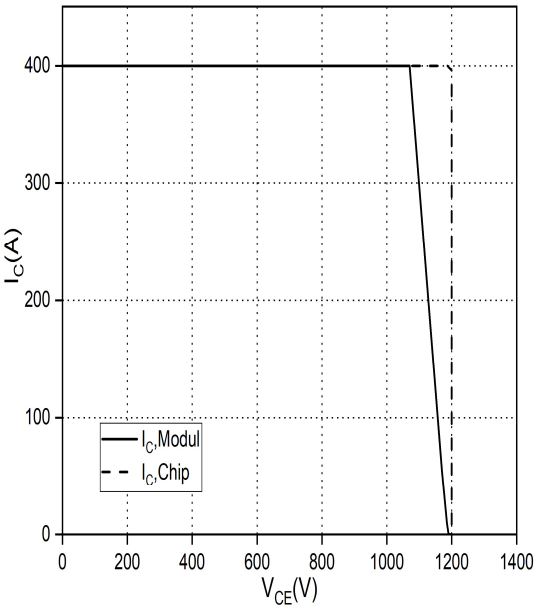
开关损耗 IGBT, 逆变器（典型值）
Switching losses IGBT, Inverter (typical)
V_{GE} = ±15V,I_C = 200A,V_{CE} = 600V



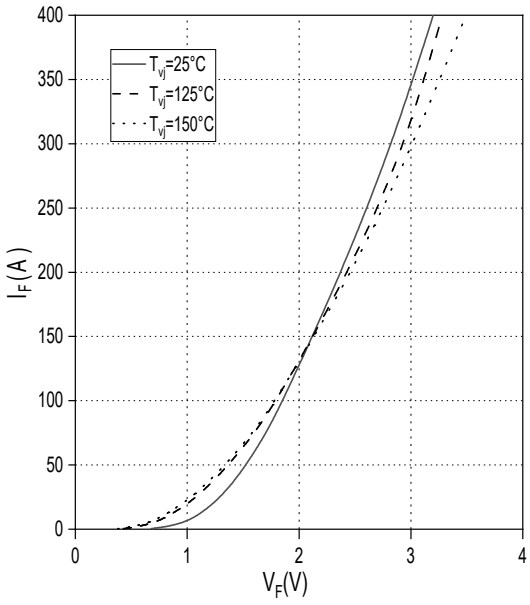
瞬态热阻抗 IGBT,逆变器
transient thermal impedance IGBT , Inverter
Z_{thJC} = f(t)



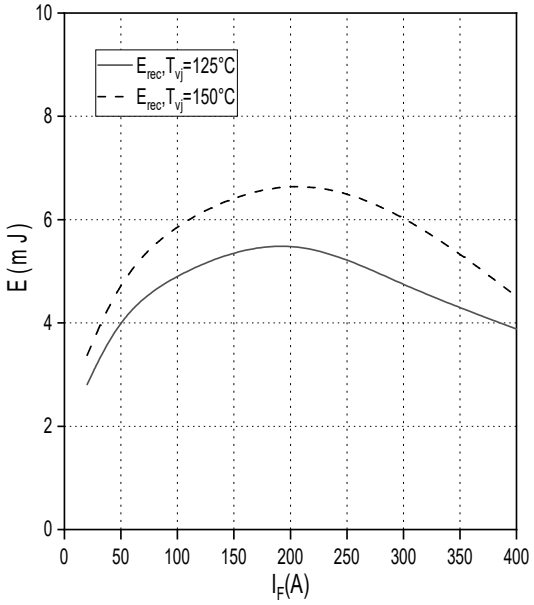
反偏安全工作区 IGBT,逆变器(RBSOA）
Reverse bias safe operating area IGBT, Inverter (RBSOA) I_C = f(V_{CE}),
V_{GE} = ±15V,R_{Goff} = 10Ω,T_{vj} = 150°C



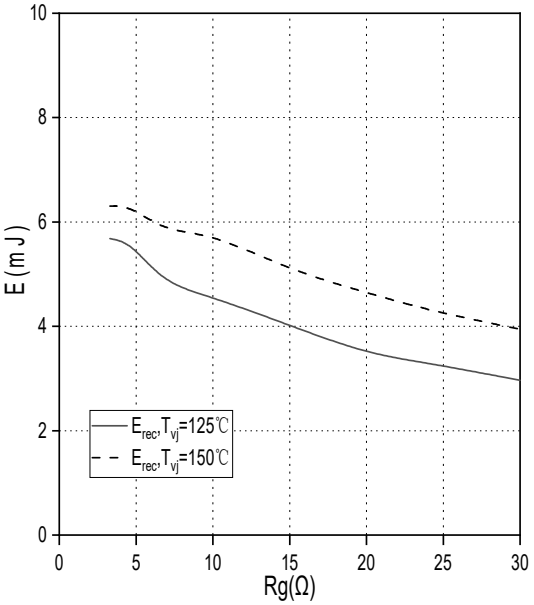
正向偏压特性二极管,逆变器（典型值)
forward characteristic of Diode, Inverter (typical)
I_F = f(V_F)



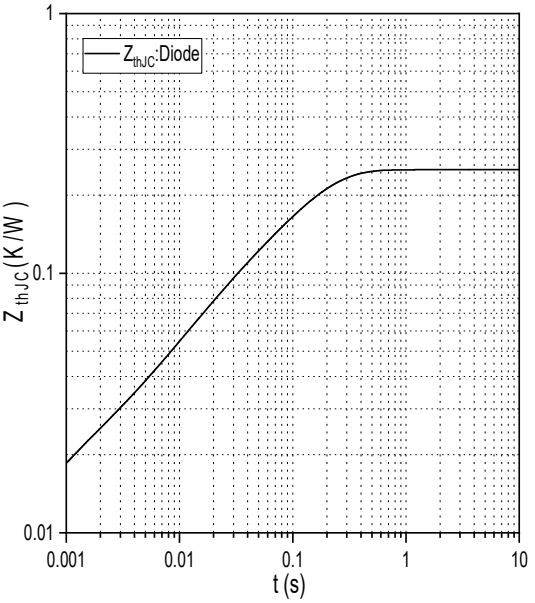
开关损耗二极管,逆变器 开关损耗（典型值)
Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 2.4\Omega, V_{CE} = 600V$



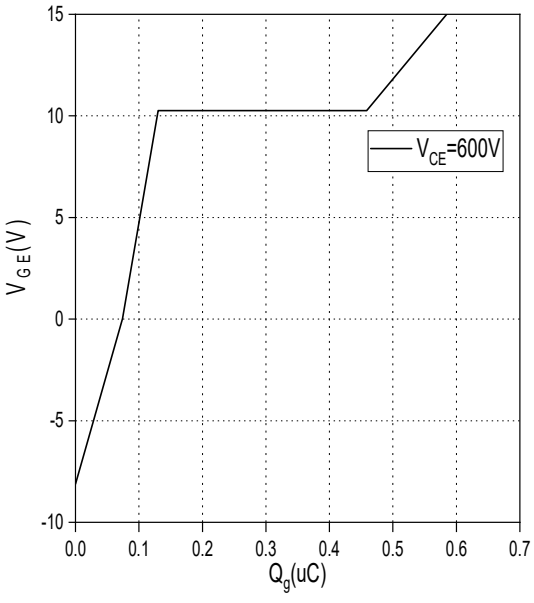
二极管,逆变器（典型值)
Switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 200A, V_{CE} = 600V$



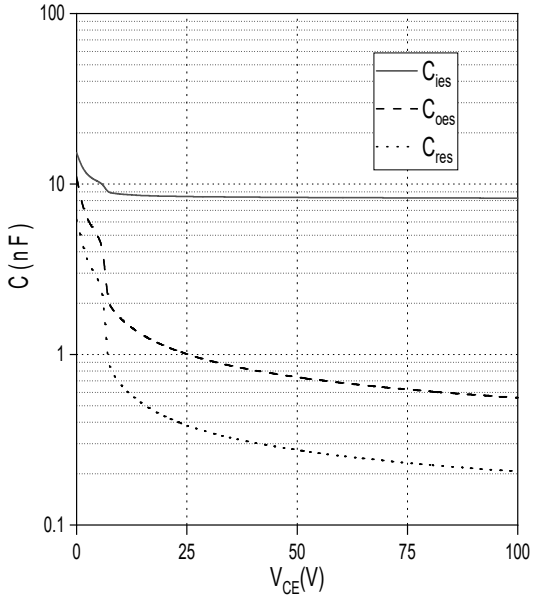
瞬态热阻抗二极管,逆变器
transient thermal impedance Diode , Inverter
$Z_{thJC} = f(t)$



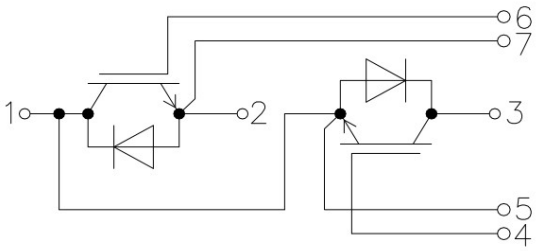
栅极电荷特性, IGBT, 逆变器（典型)
Gate charge characteristic, IGBT, Inverter (typical)
$V_{GE} = f(Qg)$
$I_C = 200A, Tvj = 25\ °C$



电容特性, IGBT, 逆变器 (典型)
Capacity characteristic, IGBT, Inverter (typical)
C = f(VCE)
f = 100kHz, V_{GE} = 0 V, Tvj = 25 °C



Internal Circuit:



Package Dimension
Dimensions in Millimeters