

## IGBT Module/IGBT 模块

### Features/特性

- 1200V, 150A
  - 采用SPT+技术的低 $V_{CE(sat)}$
- Low  $V_{CE(sat)}$  with SPT+ technology
- 具有正温度系数的 $V_{CE(sat)}$
- $V_{CE(sat)}$  with positive temperature coefficient
- 包括快速软恢复反并联前馈
- Including fast & soft recovery anti-parallel FWD
- 高短路能力 (10us)
- High short circuit capability(10us)
- 低电感模块结构
- Low inductance module structure



IGBT Power Module

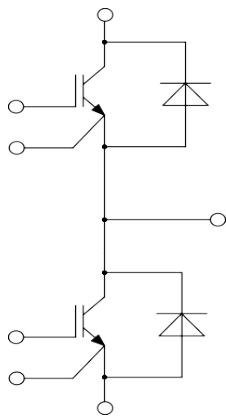
### Mechanical Features/机械特性

绝缘的基板  
Isolated Base Plate  
标准封装  
Standard Housing

### Applications/应用

- 高频开关应用  
High Frequency Switching Application
- 电机驱动逆变器  
Inverter for motor drive
- 交流和直流伺服驱动放大器  
AC and DC servo drive amplifier
- 不间断电源  
UPS (Uninterruptible Power Supplies)
- 软开关焊接机  
Soft switching welding machine
- 光伏储能  
Photovoltaic energy storage

### Equivalent Circuit Schematic/等效电路图



**IGBT-Absolute Maximum Ratings (@  $T_C = 25^\circ\text{C}$  unless otherwise specified)**

Symbol	Parameter	Value	Units
$V_{CES}$	Collector-Emitter Voltage 集电极-发射极电压	1200	V
$V_{GES}$	Gate-Emitter Peak Voltage 栅极-发射极峰值电压	$\pm 20$	V
$I_C$	Continuous Collector Current 连续集电极直流电流	$T_C = 100^\circ\text{C}$ 150	A
$I_{CM}$	Pulsed Collector Current 集电极重复峰值电流	$t_p = 1\text{ms}$ 300	A
$P_{tot}$	Total Power Dissipation 总功率功耗	$T_{vj\ max} = 150^\circ\text{C}$ 790	W

**IGBT Characteristics (@  $T_C = 25^\circ\text{C}$  unless otherwise specified)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE\ sat}$	Collector to Emitter Saturation Voltage 集电极-发射极饱和电压	$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		2.3	V
			$T_{vj} = 125^\circ\text{C}$		3.2	
$V_{GE\ th}$	Gate-Emitter Threshold Voltage 栅极阈值电压	$I_C = 1.0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^\circ\text{C}$		5.7		V
$I_{CES}$	Collector-Emitter Cut-off Current 集电极-发射极截止电流	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^\circ\text{C}$			1.0	mA
$I_{GES}$	Gate-emitter Leakage Current 栅极-发射极漏电流	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^\circ\text{C}$			100.0	nA
$R_{Gint}$	Internal Gate Resistor 内部栅极电阻			1.0		$\Omega$
$Q_G$	Gate Charge 栅极电荷	$V_{GE} = -15 \dots +15\text{ V}$		0.8		$\mu\text{C}$
$C_{ies}$	Input Capacitance 输入电容	$V_{CE} = 25\text{ V}, f = 1\text{ MHz}, V_{GE} = 0\text{ V}$		9.35		nF
$C_{res}$	Reverse Transfer Capacitance 反向传输电容				0.35	
$t_{don}$	Turn-on Delay Time 开通延迟时间	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		39	nS
			$T_{vj} = 125^\circ\text{C}$		45	
$t_r$	Rise Time 上升时间	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		55	nS
			$T_{vj} = 125^\circ\text{C}$		60	
$t_{doff}$	Turn-off Delay Time 关断延迟时间	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		134	nS
			$T_{vj} = 125^\circ\text{C}$		136	
$t_f$	Fall Time 下降时间	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		89	nS
			$T_{vj} = 125^\circ\text{C}$		98	
$E_{on}$	Turn-On Switching Loss Per Pulse 开通损耗能量	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		4	mJ
			$T_{vj} = 125^\circ\text{C}$		8	
$E_{off}$	Turn-off Energy Loss Per Pulse 关断损耗能量	$V_{CE} = 600\text{ V}, I_C = 150\text{ A}, R_G = 5\Omega, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25^\circ\text{C}$		14	mJ
			$T_{vj} = 125^\circ\text{C}$		15	
$I_{sc}$	SC Data 短路数据	$V_{GE} = 15\text{ V}, V_{CC} = 600\text{ V}, t_p \leq 10\ \mu\text{s}$ $V_{CEM} \leq 1200\text{ V}, T_{vj} = 150^\circ\text{C}$		480		A
$R_{thJC}$	Thermal Resistance, Junction to Case 结-外壳热阻	per IGBT			0.19	K/W
$R_{thCH}$	Thermal Resistance, Case to Heatsink 外壳-散热器热阻	per IGBT		0.081		K/W

**Diode-Absolute Maximum Ratings (@  $T_C = 25^\circ\text{C}$  unless otherwise specified)**

Symbol	Parameter	Value	Units
$V_{RRM}$	Repetitive Peak Reverse Voltage 反向重复峰值电压	1200	V
$I_F$	Diode Continuous Forward Current 连续正向直流电流	150	A
$I_{FM}$	Diode Maximum Forward Current 正向重复峰值电流	tp=1ms 300	A

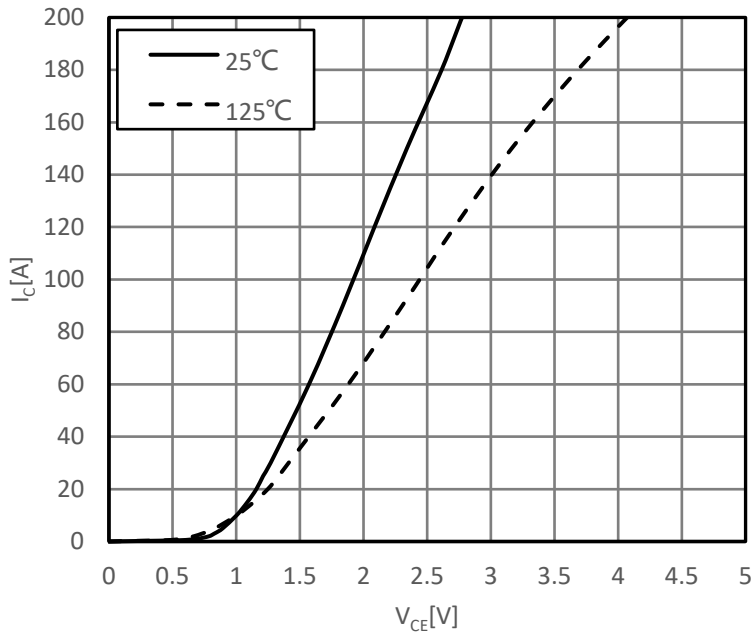
**Diode Characteristics (@  $T_C = 25^\circ\text{C}$  unless otherwise specified)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_F$	Diode Forward Voltage 正向电压	$I_C = 150\text{ A}$	$T_{vj}=25^\circ\text{C}$		1.9	V
			$T_{vj}=125^\circ\text{C}$		2.0	
$Q_r$	Recovered Charge 恢复电荷		$T_{vj}=25^\circ\text{C}$		17	$\mu\text{C}$
			$T_{vj}=125^\circ\text{C}$		26	
$I_{rm}$	Peak Reverse Recovery Current 反向恢复峰值电流	$I_F = 150\text{ A}, V_R = 600\text{ V},$ $-diF/dt = 1900\text{ A}/\mu\text{s},$ $R_G = 5\ \Omega, V_{GE} = -15\text{ V}$	$T_{vj}=25^\circ\text{C}$		127	A
			$T_{vj}=125^\circ\text{C}$		156	
$t_{rr}$	Reverse Recovery Time 反向恢复时间		$T_{vj}=25^\circ\text{C}$		155	nS
			$T_{vj}=125^\circ\text{C}$		375	
$E_{rec}$	Reverse Recovery Energy 反向恢复损耗		$T_{vj}=25^\circ\text{C}$		8	mJ
			$T_{vj}=125^\circ\text{C}$		12	
$R_{thJC}$	Thermal Resistance, Junction to Case 结-外壳热阻	per Diode			0.3	K/W
$R_{thCH}$	Thermal Resistance, Case to Heatsink 结-散热器热阻	per Diode		0.1		K/W

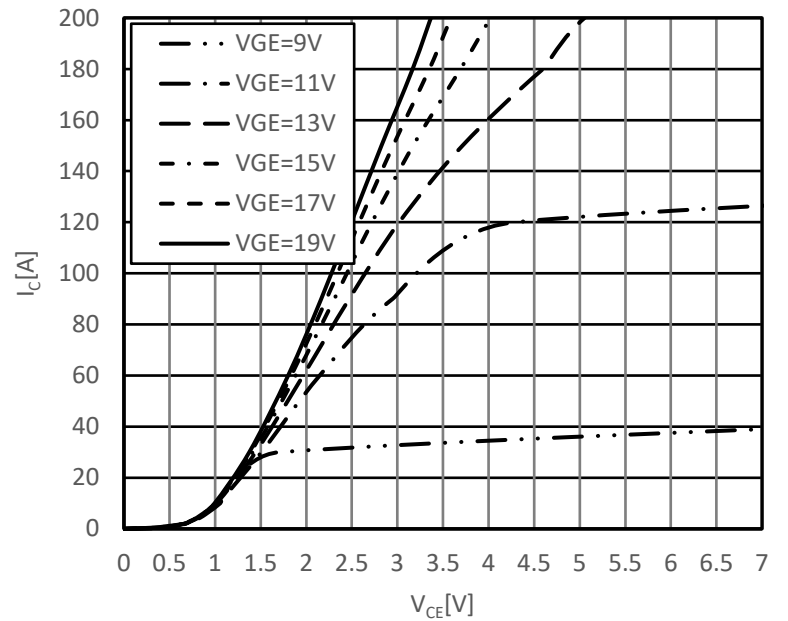
## Module

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{ISOL}$	Isolation Test Voltage 绝缘测试电压	RMS, f = 50 Hz, t = 1 min	2500			V
$T_{vj\ max}$	Maximum Junction Temperature 最大结温				150	°C
$T_{vj\ op}$	Operating Junction Temperature 工作结温		-40		150	°C
$T_{STG}$	Storage Temperature Range 储存温度		-40		125	°C
$R_{thCH}$	Case to Heatsink 外壳-散热器热阻	per Module		0.05		K/W
$M_s$	Mounting Torque For Modul Mounting 模块安装的安装扭矩	Recommended(M6)	3		5	Nm
$M_t$	Terminal Connection Torque 端子连接扭矩	Recommended(M5)	2.5		5	Nm
$G$	Weight 重量			150		g

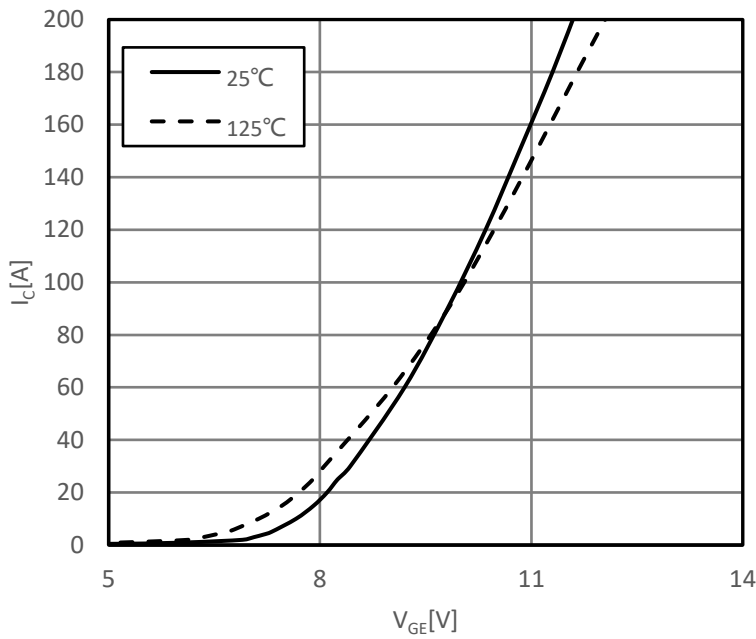
输出特性IGBT,逆变器 (典型)  
output characteristic IGBT,Inverter (typical)  
 $I_C=f(V_{CE})$   
 $V_{GE}=15V$



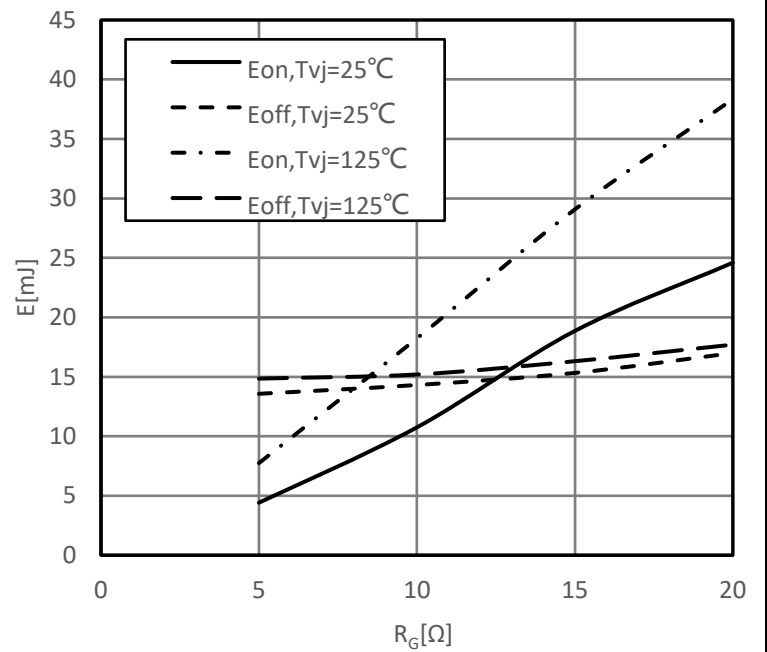
输出特性IGBT,逆变器 (典型)  
output characteristic IGBT,Inverter (typical)  
 $I_C=f(V_{CE})$   
 $T_{vj}=125^\circ C$



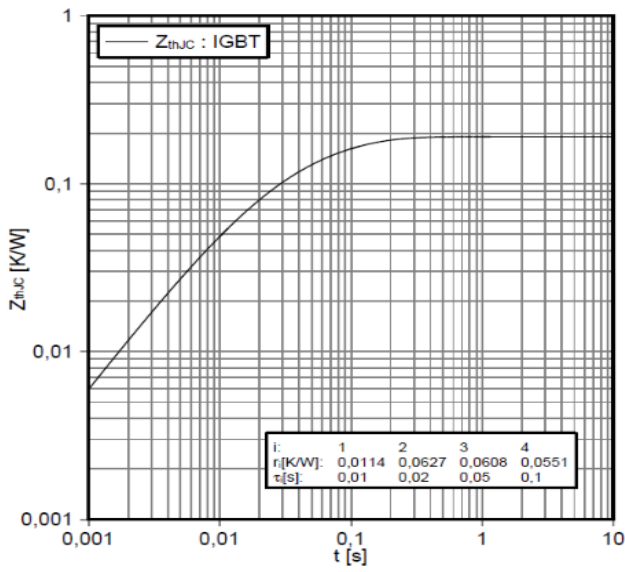
传输特性IGBT,逆变器(典型)  
transfer characteristic IGBT,Inverter(typical)  
 $I_C=f(V_{GE})$   
 $V_{CE}=20V$



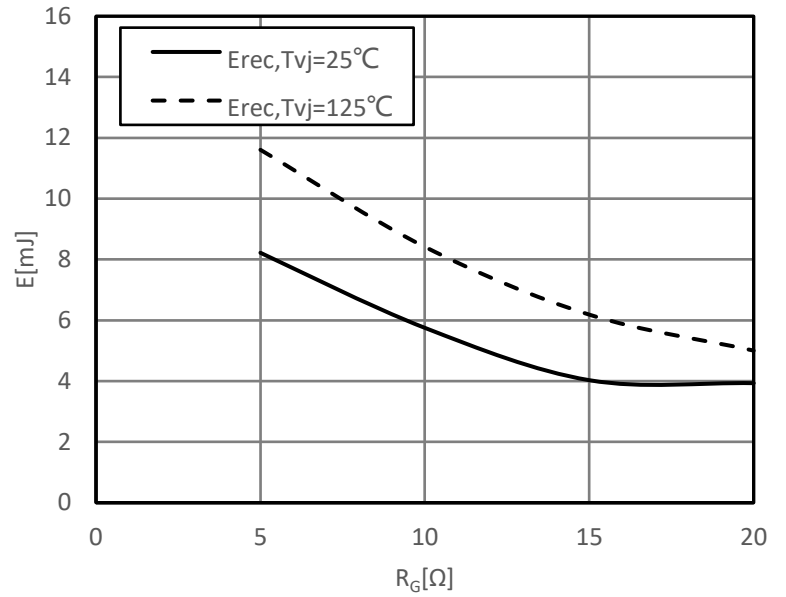
开关损耗IGBT,逆变器 (典型)  
switching losses IGBT,Inverter(typical)  
 $E_{on}=f(R_G), E_{off}=f(R_G)$   
 $V_{GE}=\pm 15V, I_C=150A, V_{CE}=600V$



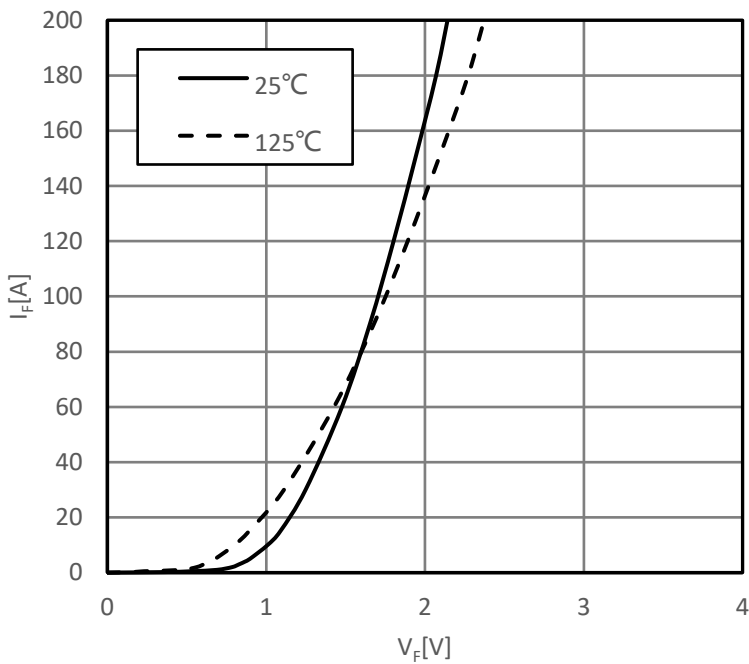
瞬态热阻抗IGBT,逆变器  
transient thermal impedance IGBT,Inverter  
 $Z_{thJC}=f(t)$



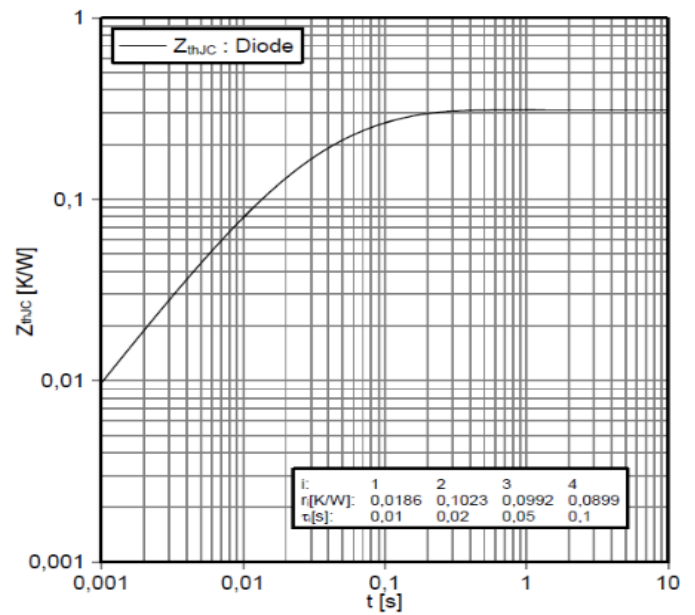
开关损耗二极管,逆变器 (典型)  
switching losses Diode,Inverter(typical)  
 $E_{rec}=f(R_G)$   
 $I_F=150A, V_{CE}=600V$



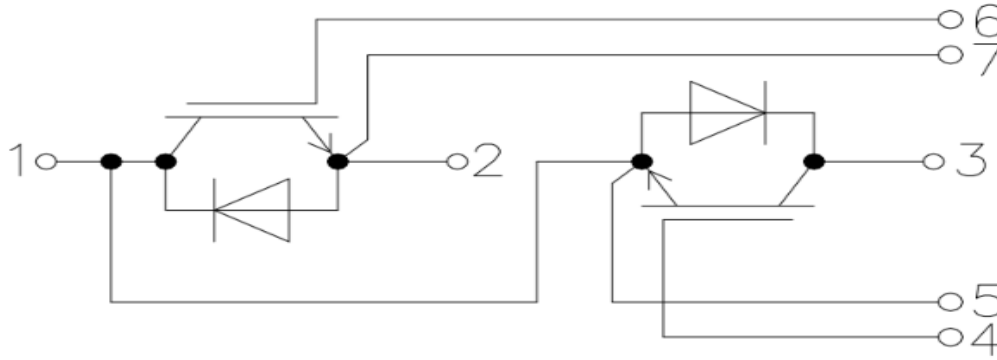
正向偏压特性二极管,逆变器 (典型)  
forward characteristic of Diode, Inverter(typical)  
 $I_F=f(V_F)$



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



## 接线图/circuit\_diagram\_headline



## 封装尺寸/package outlines

