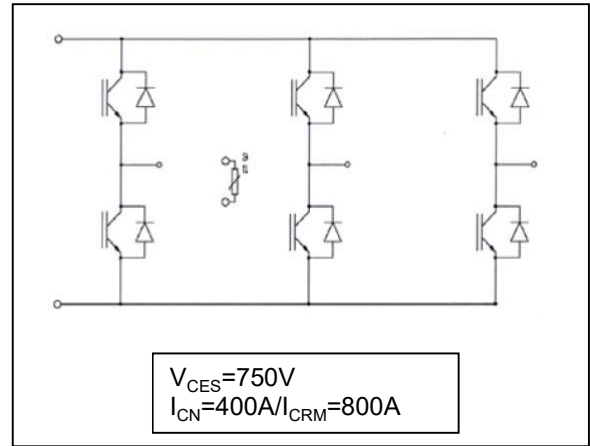
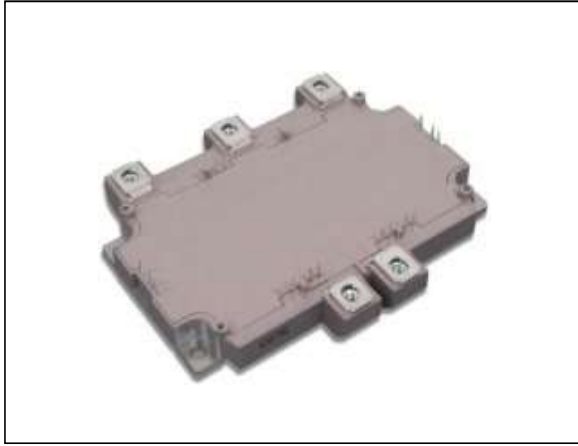


750V 400A IGBT Full Bridge Module

750V 400A IGBT 全桥模块



Features:

- 750V Trench+ Field Stop technology
- Freewheeling diodes with fast and soft reverse recovery
- $V_{CE(sat)}$ with positive temperature coefficient
- Low switching losses
- Short circuit ruggedness

Typical Applications:

- Motor drives
- Hybrid electrical vehicles
- Automotive applications
- Commercial agriculture vehicles

产品特性:

- 750V 沟槽栅+场截止技术
- 快速的软恢复特性续流二极管
- 导通压降具有正温度系数
- 低开关损耗
- 良好的短路稳定性

典型应用:

- 电机驱动器
- 混合动力汽车
- 汽车应用
- 商用农用车

Package / 封装

Item	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
绝缘测试电压 Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 1 min		2.5		kV
模块基板材料 Material of module baseplate				Cu		
内部绝缘 Internal isolation		基本绝缘 (class 1, IEC 61140) Basic insulation (class 1, IEC 61140)		Al_2O_3		
爬电距离 Creepage distance	d_{Creep}	端子-散热片/terminal to heatsink		12.0		mm
	d_{Creep}	端子-端子/terminal to terminal		6.1		
电气间隙 Clearance	d_{Clear}	端子-散热片/terminal to heatsink		12.0		mm
	d_{Clear}	端子-端子/terminal to terminal		6.1		
相对电痕指数 Comparative tracking index	CTI			> 200		

Item	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
杂散电感, 模块 Stray inductance module	L_{SCE}			10		nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C=25^\circ C$		0.76		m Ω
储存温度 Storage temperature	T_{stg}		-40		125	$^\circ C$
模块安装的安装扭矩 Mounting torque for module mounting	M5	底板-散热器/baseplate to heatsink	3.0		6.0	Nm
功率端子连接扭矩 Terminal connection torque	M6		3.0		6.0	Nm
重量 Weight	G			460		g

IGBT
Maximum Rated Values / 最大额定值

Item	Symbol	Conditions	Values	Unit
集电极-发射极电压 Collector-emitter Voltage	V_{CES}	$T_{vj}=25^{\circ}C$	750	V
栅极-发射极电压 Maximum gate-emitter voltage	V_{GES}		± 20	V
瞬态栅极-发射极电压 Transient gate-emitter voltage	V_{GES}	$t_p \leq 10\mu s, D=0.01$	± 30	V
额定电流 Implemented collector current	I_{CN}		400	A
连续集电极直流电流 Continuous DC collector current	I_C	$T_C = 65^{\circ}C, T_{vjmax} = 175^{\circ}C$	430	A
最大脉冲集电极电流 Pulsed collector current, t_p limited by T_{jmax}	I_{Cpulse}		800	A
功率损耗 Power dissipation	P_{tot}	$T_C=25^{\circ}C$	1250	W

Characteristic Values / 特征值

Item	Symbol	Conditions	Values			Unit	
			Min.	Typ.	Max.		
集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=400A, V_{GE}=15V$	$T_{vj}=25^{\circ}C$		1.70	2.10	V
			$T_{vj}=125^{\circ}C$		1.95		
			$T_{vj}=150^{\circ}C$		2.00		
栅极阈值电压 Gate threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=5mA$		5.5	5.9	6.5	V
集电极-发射极截止电流 Collector-emitter cut-off current	I_{CES}	$V_{CE}=750V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$			100	μA
			$T_{vj}=150^{\circ}C$			5	mA
栅极-发射极漏电流 Gate-emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V, T_{vj}=25^{\circ}C$		-200		200	nA
栅极电荷 Gate Charge	Q_G	$V_{CE}=300V, I_C=400A, V_{GE}=\pm 15V$			3		μC
栅极内阻 Internal gate resistor	R_{Gint}				1		Ω
输入电容 Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=100kHz$			6.2		nF
输出电容 Output Capacitance	C_{oes}				1.5		
反向传输电容 Reverse Transfer Capacitance	C_{res}				0.23		
开通延迟时间 (电感负载) Turn-on delay time, inductive load	$t_{d(on)}$	$V_{CC}=300V, I_C=400A, R_{Gon}=3.3\Omega, V_{GE}=-8/+15V$	$T_{vj}=25^{\circ}C$		172		ns
			$T_{vj}=125^{\circ}C$		172		ns
			$T_{vj}=150^{\circ}C$		165		ns
上升时间 (电感负载) Rise Time, inductive load	t_r		$T_{vj}=25^{\circ}C$		70		ns
			$T_{vj}=125^{\circ}C$		73		ns
			$T_{vj}=150^{\circ}C$		74		ns
关断延迟时间 (电感负载) Turn-off delay time, inductive load	$t_{d(off)}$	$V_{CC}=300V, I_C=400A, R_{Goff}=12\Omega, V_{GE}=-8/+15V$	$T_{vj}=25^{\circ}C$		180		ns
			$T_{vj}=125^{\circ}C$		1100		ns
			$T_{vj}=150^{\circ}C$		1067		ns
下降时间 (电感负载) Fall time, inductive load	t_f		$T_{vj}=25^{\circ}C$		68		ns
			$T_{vj}=125^{\circ}C$		84		ns
			$T_{vj}=150^{\circ}C$		87		ns
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	E_{on}	$V_{CC}=300V, I_C=400A, R_G=3.3\Omega, R_{Goff}=12\Omega, V_{GE}=-8/+15V$	$T_{vj}=25^{\circ}C$		8.4		mJ
			$T_{vj}=125^{\circ}C$		10.1		mJ
			$T_{vj}=150^{\circ}C$		11.9		mJ
关断损耗能量 (每脉冲) Turn off Energy loss per pulse	E_{off}		$T_{vj}=25^{\circ}C$		24.9		mJ
			$T_{vj}=125^{\circ}C$		29.0		mJ
			$T_{vj}=150^{\circ}C$		31.7		mJ

Characteristic Values / 特征值

Item	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
短路数据 SC data	I_{SC}	$V_{GE} \leq 15V,$ $V_{CC}=300V$ $t_p \leq 6\mu s$ $T_{vj}=150^\circ C$		2000		A
IGBT结壳热阻 IGBT thermal resistance, junction to case	R_{thJC}				0.12	K/W
工作温度 Operating Temperature	T_{Jop}		-40		150	$^\circ C$

Diode / 二极管
Maximum Rated Values / 最大额定值

Item	Symbol	Conditions	Values	Unit
反向重复峰值电压 Repetitive reverse voltage	V_{RRM}	$T_{vj}=25^\circ C$	750	V
连续正向直流电流 Continuous DC forward current	I_F		400	A
二极管正向不重复峰值电流 Diode pulsed current, t_p limited by T_{Jmax}	I_{Fpulse}	$t_p = 1 ms$	800	

Characteristic Values / 特征值

Item	Symbol	Conditions	Values			Unit	
			Min.	Typ.	Max.		
正向电压 Forward voltage	V_F	$I_F=400A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$		1.65	2.00	V
			$T_{vj}=125^{\circ}C$		1.70		
			$T_{vj}=150^{\circ}C$		1.70		
反向恢复峰值电流 Peak reverse recovery current	I_{RRM}	$I_F=400A$ $di_F/dt=-6700A/\mu s$ ($T_{vj}=150^{\circ}C$) $V_R=300V,$ $V_{GE}=-8V$	$T_{vj}=25^{\circ}C$		244		A
			$T_{vj}=125^{\circ}C$		276		
			$T_{vj}=150^{\circ}C$		288		
反向恢复电荷 Reverse recovery charge	Q_{RR}	$V_R=300V,$ $V_{GE}=-8V$	$T_{vj}=25^{\circ}C$		22.1		μC
			$T_{vj}=125^{\circ}C$		34.6		
			$T_{vj}=150^{\circ}C$		40.6		
反向恢复损耗（每脉冲） Reverse recovery energy loss per pulse	E_{rec}		$T_{vj}=25^{\circ}C$		8.2		mJ
			$T_{vj}=125^{\circ}C$		12.5		
			$T_{vj}=150^{\circ}C$		15.0		
二极管结-冷却液热阻 Diode thermal resistance, junction-cooling fluid	R_{thJFD}				0.20	K/W	
工作温度 Operating Temperature	T_{Jop}		-40		150	$^{\circ}C$	

NTC-Thermistor / 负温度系数热敏电阻

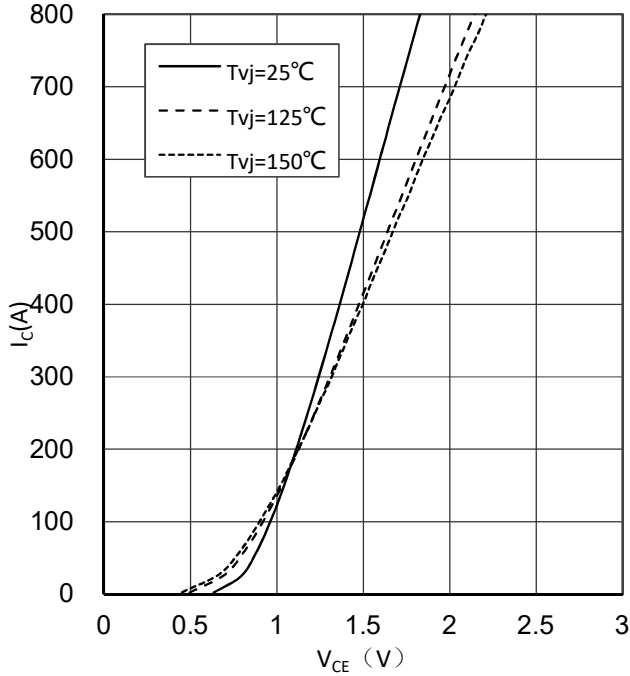
Characteristic Values / 特征值

Item	Symbol	Conditions	Values	Unit
额定电阻值 Rated resistance	R_{25}	$T_C=25^{\circ}C$	5.00	k Ω
B-值 B-value	$R_{25/50}$		3375	K

输出特性 (典型)

Output characteristic (typical)

$I_C = f(V_{CE})$

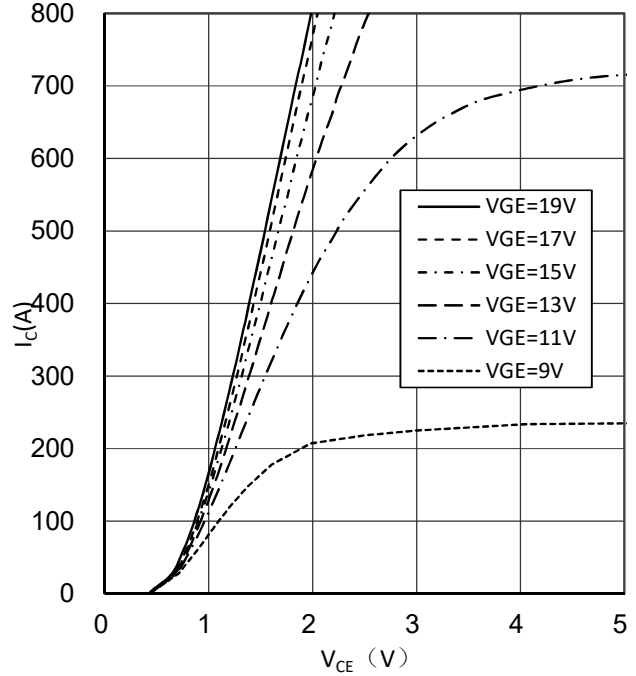


输出特性 (典型)

Output characteristic (typical)

$I_C = f(V_{CE})$

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

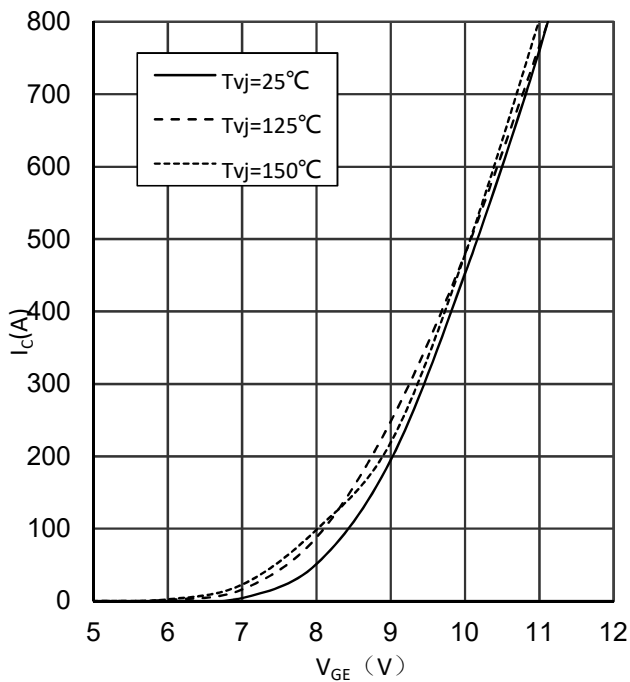


传输特性 (典型)

Transfer characteristic (typical)

$I_C = f(V_{GE})$

$V_{CE} = 20\text{V}$

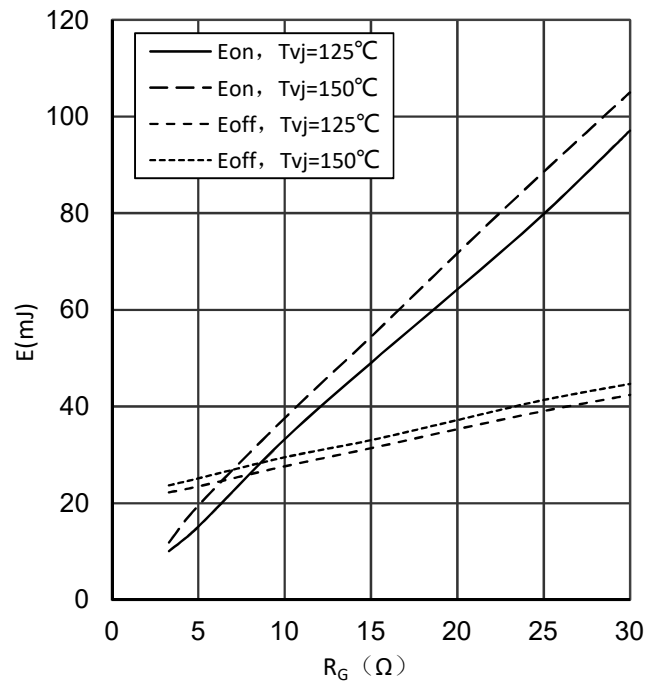


IGBT开关损耗 (典型)

Switching losses IGBT (typical)

$E = f(R_G)$

$V_{GE} = -8/+15\text{V}$, $I_C = 400\text{A}$, $V_{CE} = 300\text{V}$

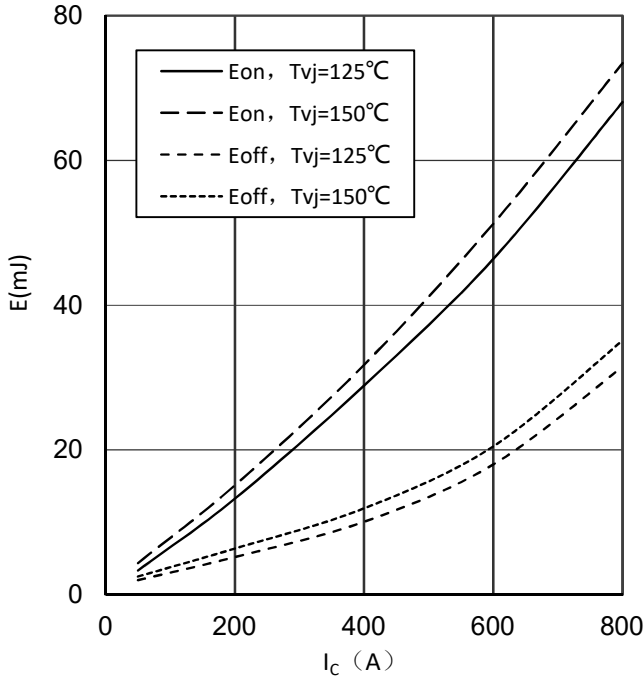


IGBT开关损耗 (典型)

Switching losses IGBT (typical)

$E = f(I_c)$

$V_{GE} = -8/+15V, R_{Gon} = 3.3\Omega, R_{Goff} = 12\Omega, V_{CE} = 300V$

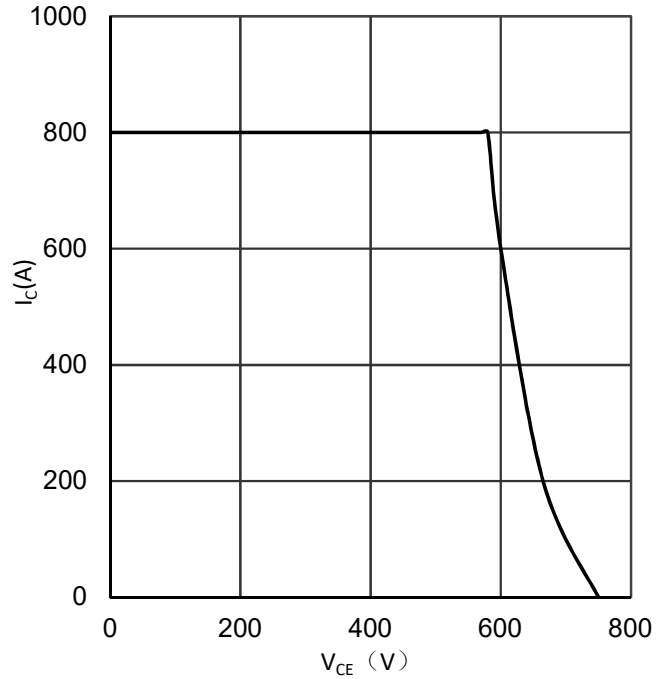


反偏安全工作区 (RBSOA)

Reverse bias safe operating area(RBSOA)

$I_c = f(V_{CE})$

$V_{GE} = -8/+15V, R_{goff} = 12\Omega, T_{vj} = 150^\circ C$

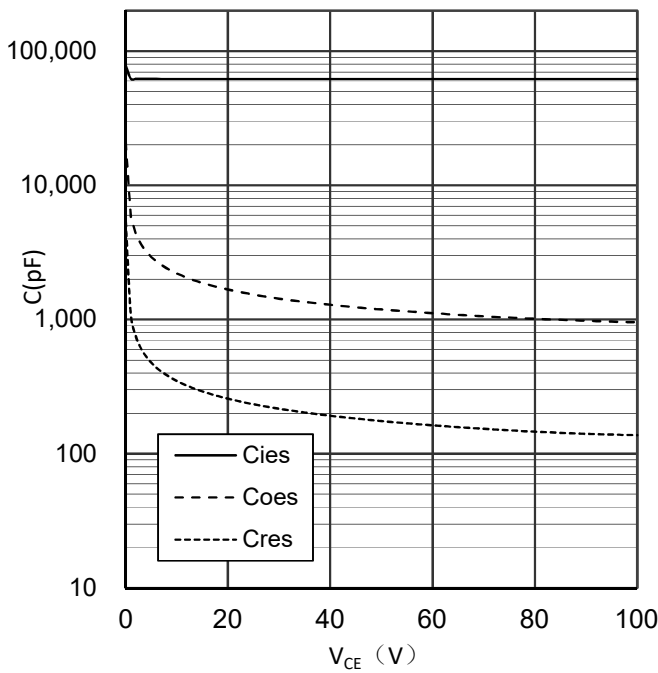


电容 (典型)

Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

$f = 100\text{ kHz}, V_{GE} = 0V$

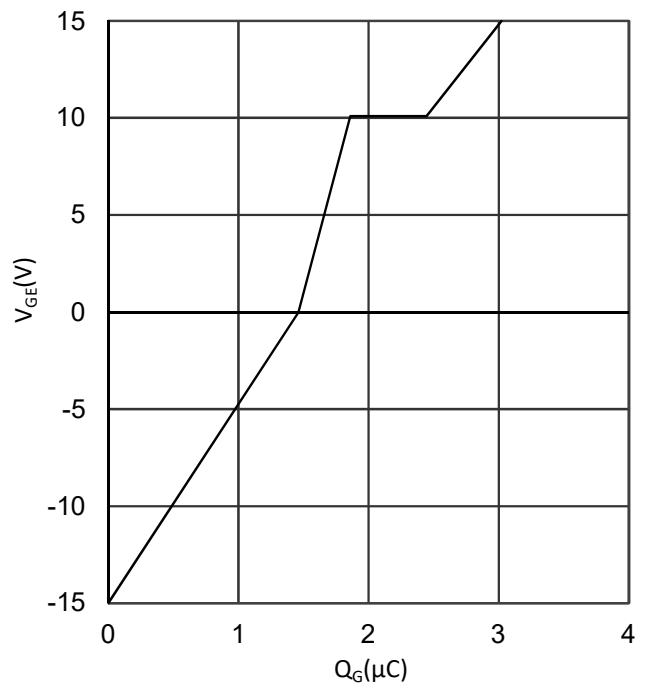


门极电荷 (典型)

Gate charge (typical)

$V_{GE} = f(Q_G)$

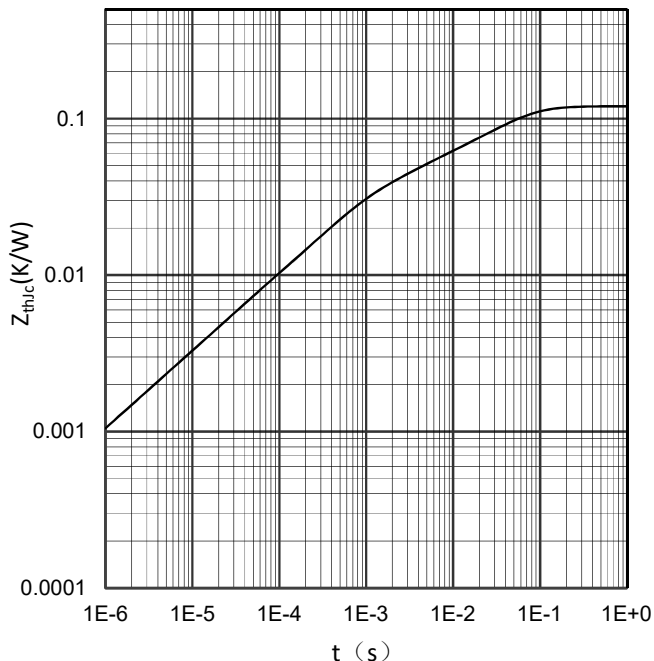
$I_c = 400A, V_{CE} = 300V$



IGBT瞬态热阻抗

IGBT transient thermal impedance

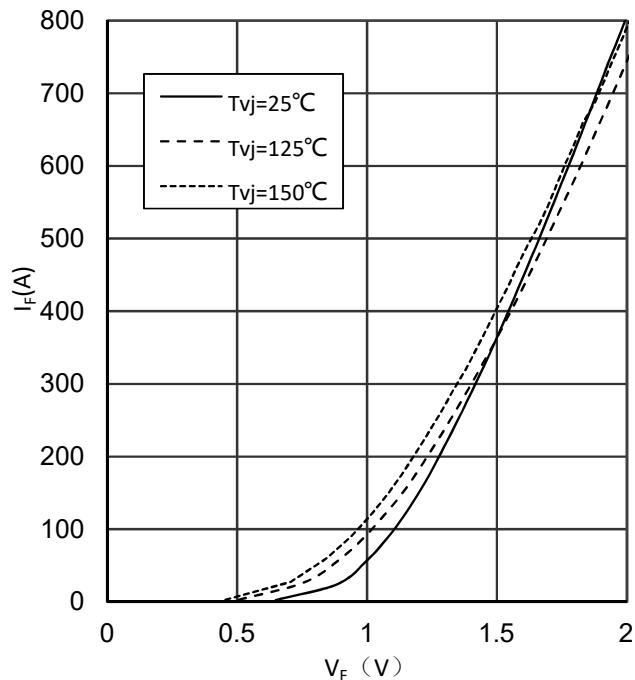
$Z_{th(j-c)} = f(t)$



正向偏压特性 二极管 (典型)

Forward characteristic of Diode (typical)

$I_F = f(V_F)$

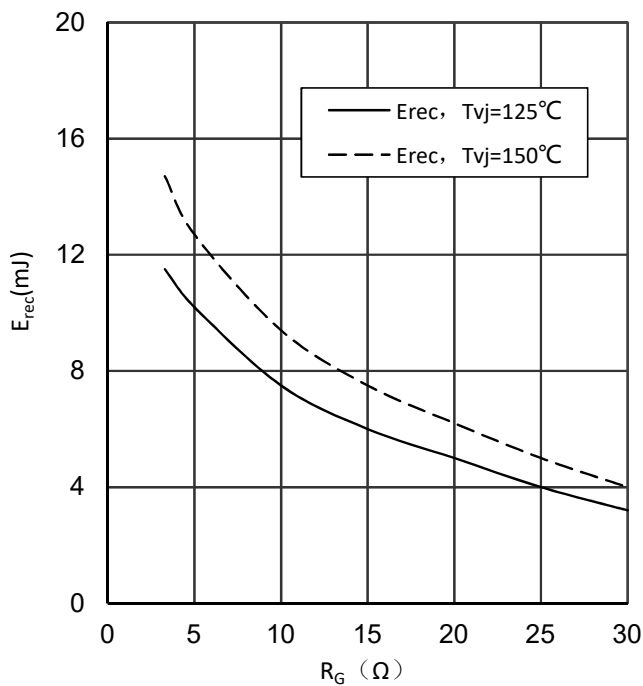


开关损耗 二极管 (典型)

Switching losses Diode (typical)

$E_{rec} = f(R_G)$

$I_F = 400A, V_{CE} = 300V$

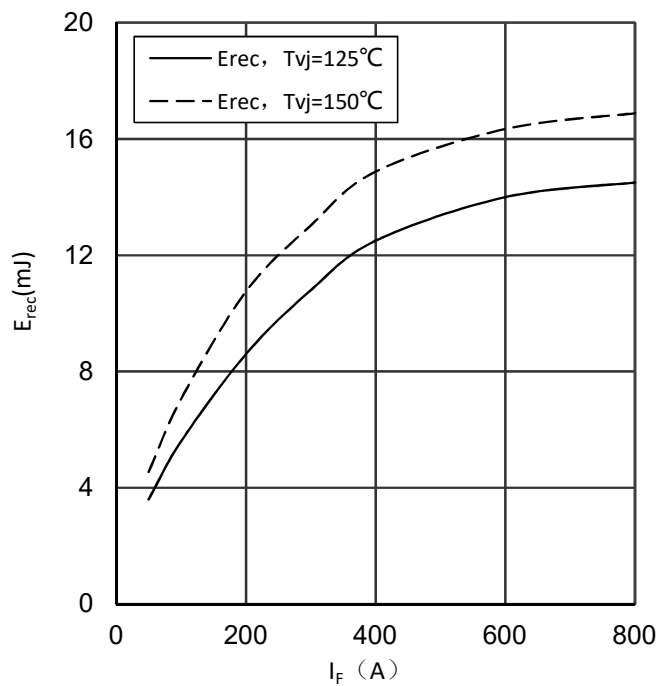


开关损耗 二极管 (典型)

Switching losses Diode (typical)

$E_{rec} = f(I_F)$

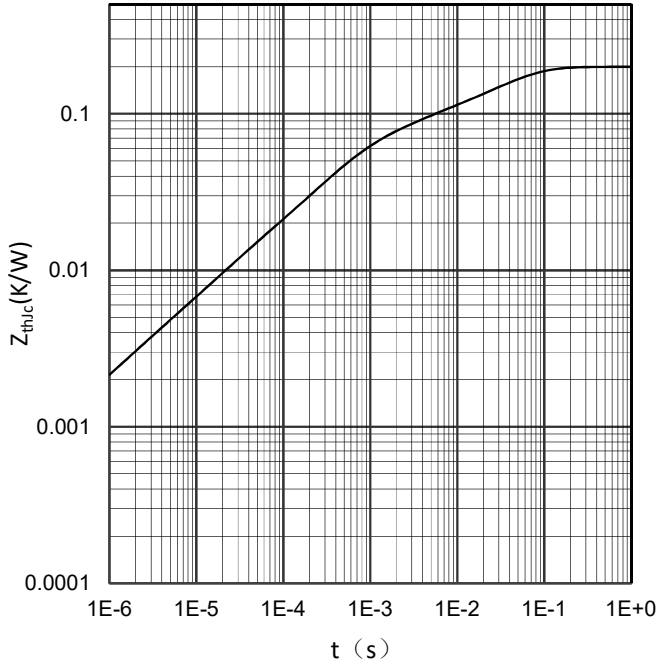
$R_G = 3.3Ω, V_{CE} = 300V$



二极管瞬态热阻抗

Diode transient thermal impedance

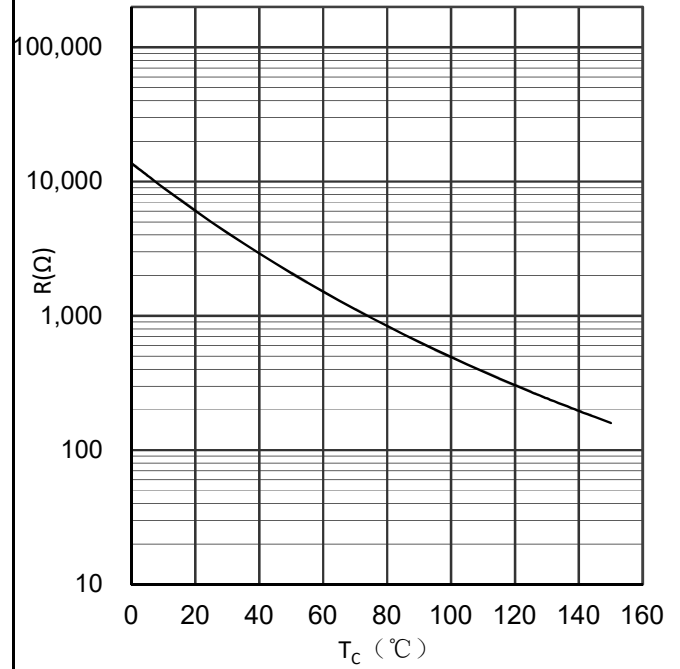
$$Z_{th(j-c)} = f(t)$$



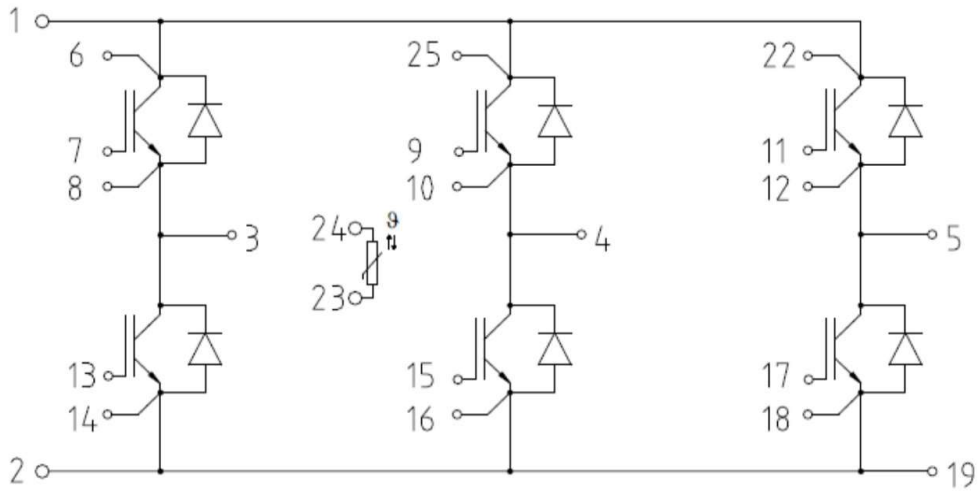
热敏电阻温度特性 (典型)

NTC-Thermistor-temperature characteristic (typical)

$$R = f(T)$$



Circuit diagram headline / 接线图



Package outlines / 封装尺寸

