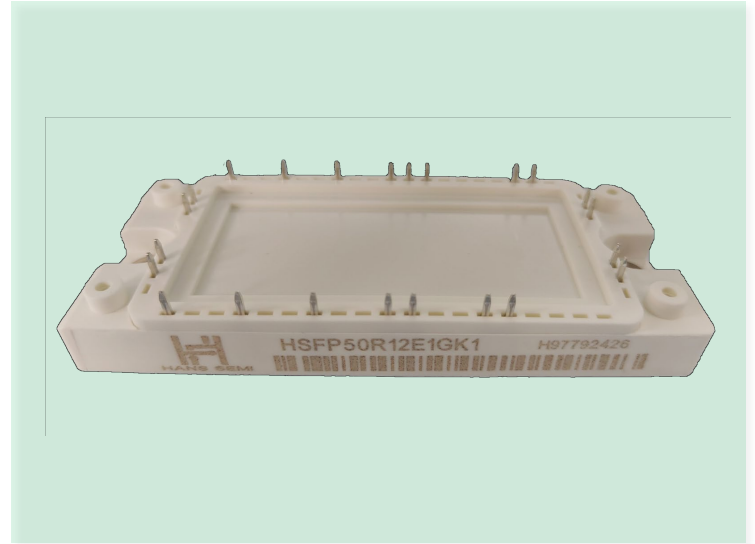


IGBT Module/IGBT 模块

Features/特性

- 1200V,50A
- 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

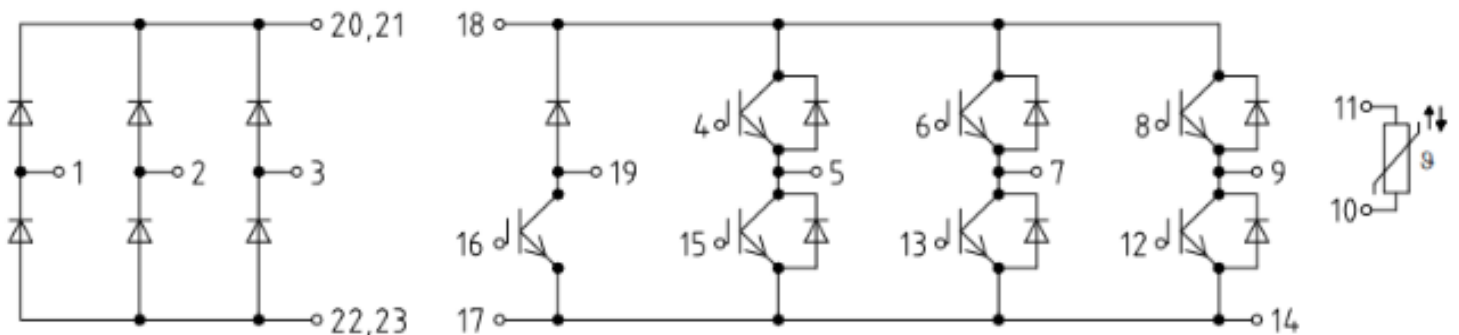
Mechanical Features/机械特性

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

Applications/应用

- 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)
- 光伏储能
- Photovoltaic energy storage

Equivalent Circuit Schematic/等效电路图



IGBT,逆变器/IGBT Inverter-Absolute Maximum Ratings (@ T_C = 25°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	±20	V
I _C	Continuous Collector Current 连续集电极直流电流	T _C = 95°C	50 A
I _{CM}	Pulsed Collector Current 集电极重复峰值电流	tp=1ms	100 A
P _{tot}	Total Power Dissipation 总功率功耗	Tvj max = 150°C	280 W

特征值/Characteristics (@ T_C = 25°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 = 50 A, V _{GE} = 15 V	Tvj=25°C		2.1	V
			Tvj=125°C		2.5	
V _{GE th}	Gate-Emitter Threshold Voltage 栅极阈值电压	I _C = 1.0 mA, V _{CE} = V _{GE} , Tvj = 25°C		5.7		V
I _{CES}	Collector-Emitter Cut-off Current 集电极-发射极截止电流	V _{CE} = 1200 V, V _{GE} = 0 V, Tvj = 25°C			1.0	mA
I _{GES}	Gate-emitter Leakage Current 栅极-发射极漏电流	V _{CE} = 0 V, V _{GE} = 20 V, Tvj = 25°C			100.0	nA
R _{Gint}	Internal Gate Resistor 内部栅极电阻			3.5		Ω
Q _G	Gate Charge 栅极电荷	V _{GE} =-15...+15V		0.6		μC
C _{ies}	Input Capacitance 输入电容	V _{CE} =25V, f=1MHz, V _{GE} =0V		2.8		nF
C _{res}	Reverse Transfer Capacitance 反向传输电容				0.1	
t _{don}	Turn-on Delay Time 开通延迟时间	V _{CE} =600V, I _C =50A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		92	nS
			Tvj=125°C		98	
t _r	Rise Time 上升时间		Tvj=25°C		280	nS
			Tvj=125°C		284	
t _{doff}	Turn-off Delay Time 关断延迟时间		Tvj=25°C		306	nS
			Tvj=125°C		322	
t _f	Fall Time 下降时间		Tvj=25°C		236	nS
			Tvj=125°C		292	
E _{on}	Turn-On Switching Loss Per Pulse 开通损耗能量		Tvj=25°C		11	mJ
			Tvj=125°C		14	
E _{off}	Turn-off Energy Loss Per Pulse 关断损耗能量		Tvj=25°C		3	mJ
			Tvj=125°C		5	
I _{sc}	SC Data 短路数据	V _{GE} = 15 V, V _{cc} = 600V, tp ≤ 10 μs V _{CEM} ≤ 1200V, Tvj = 125°C		164		A
R _{thJC}	Thermal Resistance, Junction to Case 结-外壳热阻	per IGBT			0.54	K/W
R _{thCH}	Thermal Resistance, Case to Heatsink 外壳-散热器热阻	per IGBT		0.295		K/W

二极管, 逆变器/Diode, Inverter-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	50	A
I_{FM}	Diode Maximum Forward Current 正向重复峰值电流	$t_p=1\text{ms}$ 100	A

特征值/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	$I_C = 50\text{ A}$	$T_{vj}=25^\circ\text{C}$		2.2	V	
			$T_{vj}=125^\circ\text{C}$		2.3		
Q_r	Recovered Charge 恢复电荷	$I_F = 50\text{ A}, V_R = 600\text{ V}, R_G = 15\ \Omega, V_{GE} = -15\text{ V}$	$T_{vj}=25^\circ\text{C}$		5.1	μC	
			$T_{vj}=125^\circ\text{C}$		9		
I_{rm}	Peak Reverse Recovery Current 反向恢复峰值电流		$T_{vj}=25^\circ\text{C}$		36	A	
			$T_{vj}=125^\circ\text{C}$		48		
t_{rr}	Reverse Recovery Time 反向恢复时间		$T_{vj}=25^\circ\text{C}$		80	nS	
			$T_{vj}=125^\circ\text{C}$		140		
E_{rec}	Reverse Recovery Energy 反向恢复损耗		$T_{vj}=25^\circ\text{C}$		1.6	mJ	
			$T_{vj}=125^\circ\text{C}$		2.7		
R_{thJC}	Thermal Resistance, Junction to Case 结-外壳热阻		per Diode			0.81	K/W
R_{thCH}	Thermal Resistance, Case to Heatsink 结-散热器热阻		per Diode		0.44		K/W

二极管, 整流器/Diode, Rectifier-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	1600	V
I_{FRMSM}	最大正向均方根电流(每芯片) Maximum RMS forward current per chip	$T_C=80^\circ\text{C}$ 70	A
I_{RMSM}	最大整流器输出均方根电流 Maximum RMS current at rectifier output	$T_C=80^\circ\text{C}$ 80	A
I_{FSM}	正向浪涌电流 Surge forward current	$t_p=1\text{ms}$ 450	A

特征值/Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	正向电压 Forward voltage	$I_F = 50\text{ A}$ $T_C=125^\circ\text{C}$		2.10		V
I_R	反向电流 Reverse current	$V_R=1600\text{ V}$ $T_C=125^\circ\text{C}$		1.00		mA
R_{thJC}	Thermal Resistance, Junction to Case 结-外壳热阻	per Diode			0.85	K/W
R_{thCH}	Thermal Resistance, Case to Heatsink 结-散热器热阻	per Diode		0.47		K/W

IGBT,制动-斩波器/IGBT,Brake-Chopper-Absolute Maximum Ratings (@ T_C = 25°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	±20	V
I _C	Continuous Collector Current 连续集电极直流电流	T _C = 100°C	25 A
I _{CM}	Pulsed Collector Current 集电极重复峰值电流	tp=1ms	50 A
P _{tot}	Total Power Dissipation 总功率功耗	Tvj max = 150°C	160 W

特征值/Characteristics (@ T_C = 25°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 = 25 A, V _{GE} = 15 V	Tvj=25°C		1.8	V
			Tvj=125°C		2.1	
V _{GE th}	Gate-Emitter Threshold Voltage 栅极阈值电压	I _C = 0.25 mA, V _{CE} = V _{GE} , Tvj = 25°C		5.6		V
I _{CES}	Collector-Emitter Cut-off Current 集电极-发射极截止电流	V _{CE} = 1200 V, V _{GE} = 0 V, Tvj = 25°C			1.0	mA
I _{GES}	Gate-emitter Leakage Current 栅极-发射极漏电流	V _{CE} = 0 V, V _{GE} = 20 V, Tvj = 25°C			100.0	nA
Q _G	Gate Charge 栅极电荷	V _{GE} =-15...+15V		0.4		μC
Cies	Input Capacitance 输入电容	V _{CE} =25V, f=1MHz, V _{GE} =0V		1.5		nF
Cres	Reverse Transfer Capacitance 反向传输电容				0.05	
tdon	Turn-on Delay Time 开通延迟时间	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		10	nS
			Tvj=125°C		26	
tr	Rise Time 上升时间	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		234	nS
			Tvj=125°C		271	
tdoff	Turn-off Delay Time 关断延迟时间	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		140	nS
			Tvj=125°C		210	
tf	Fall Time 下降时间	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		488	nS
			Tvj=125°C		564	
Eon	Turn-On Switching Loss Per Pulse 开通损耗能量	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		4	mJ
			Tvj=125°C		6	
Eoff	Turn-off Energy Loss Per Pulse 关断损耗能量	V _{CE} =600V, I _C =25A, R _G =15Ω, V _{GE} =±15V	Tvj=25°C		3	mJ
			Tvj=125°C		4	
I _{sc}	SC Data 短路数据	V _{GE} = 15 V, V _{CC} = 600V, tp ≤ 10 μs V _{CEM} ≤ 1200V, Tvj = 125°C		78		A
R _{thJC}	Thermal Resistance, Junction to Case 结-外壳热阻	per IGBT			0.95	K/W
R _{thCH}	Thermal Resistance, Case to Heatsink 外壳-散热器热阻	per IGBT		0.52		K/W

二极管,制动-斩波器/Diode,Brake-Chopper-Absolute Maximum Ratings (@ T_C = 25°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	15	A
I _{FM}	Diode Maximum Forward Current 正向重复峰值电流	tp=1ms 30	A

特征值 (@ T_C = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _F	Diode Forward Voltage 正向电压	I _C = 15 A	Tvj=25°C	1.7		V
			Tvj=125°C	1.6		
Q _r	Recovered Charge 恢复电荷		Tvj=25°C	2.3		μC
			Tvj=125°C	3		
I _{rm}	Peak Reverse Recovery Current 反向恢复峰值电流	I _F = 15A, V _R = 600 V, R _G = 15 Ω, V _{GE} = -15 V	Tvj=25°C	15		A
			Tvj=125°C	18		
t _{rr}	Reverse Recovery Time 反向恢复时间		Tvj=25°C	260		nS
			Tvj=125°C	310		
E _{rec}	Reverse Recovery Energy 反向恢复损耗		Tvj=25°C	0.9		mJ
			Tvj=125°C	1.3		
R _{thJC}	Thermal Resistance,Junction to Case 结-外壳热阻	per Diode			1.50	K/W
R _{thCH}	Thermal Resistance,Case to Heatsink 结-散热器热阻	per Diode		0.82		K/W

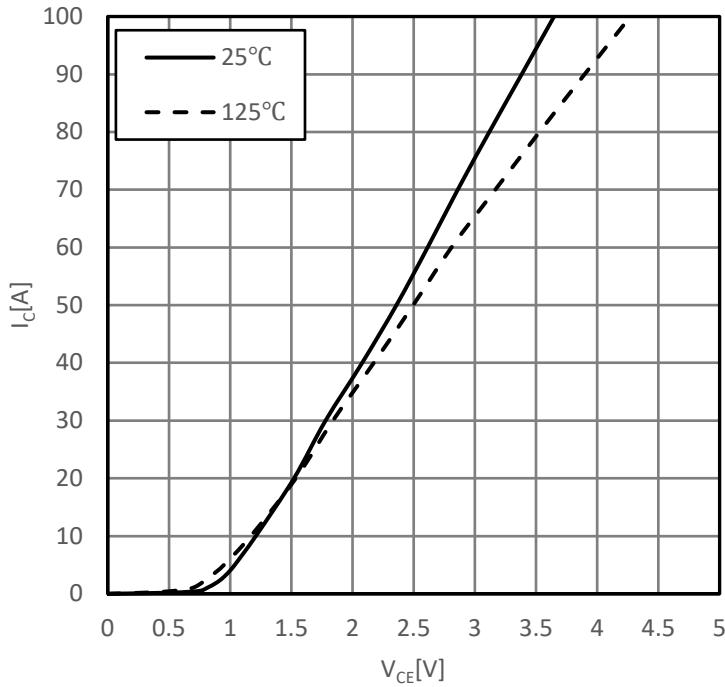
负温度系数热敏电阻/NTC Thermistor, 特征值(@ T_C = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R ₂₅	额定电阻值 Rated resistance			5		kΩ
ΔR/R	R100_x005f偏差 Deviation of R100	T _C = 100°C, R ₁₀₀ = 493Ω	-5		5	%
P ₂₅	耗散功率 Power dissipation				20	m/W
B _{25/50}	B-值 B-value	R ₂ = R ₂₅ exp [B _{25/50} (1/T ₂ - 1/(298,15 K))]		3375		K
B _{25/80}	B-值 B-value	R ₂ = R ₂₅ exp [B _{25/80} (1/T ₂ - 1/(298,15 K))]		3411		K
B _{25/100}	B-值 B-value	R ₂ = R ₂₅ exp [B _{25/100} (1/T ₂ - 1/(298,15 K))]		3433		K

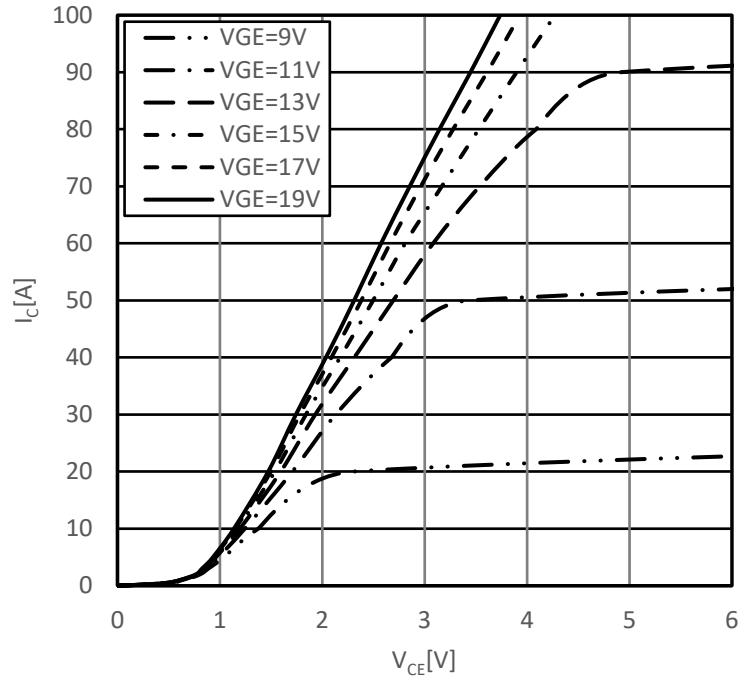
Module

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 °C
T _{vj max}	Maximum Junction Temperature 最大结温				150	°C
T _{vj op}	Operating Junction Temperature 工作结温		-40		150	
T _{STG}	Storage Temperature Range 储存温度		-40		125	
R _{thCH}	Case to Heatsink 外壳-散热器热阻	per Module		0.02		K/W
Ms	Mounting Torque For Modul Mounting 模块安装的安装扭矩	Recommended(M5)	3		6	Nm
G	Weight 重量					g

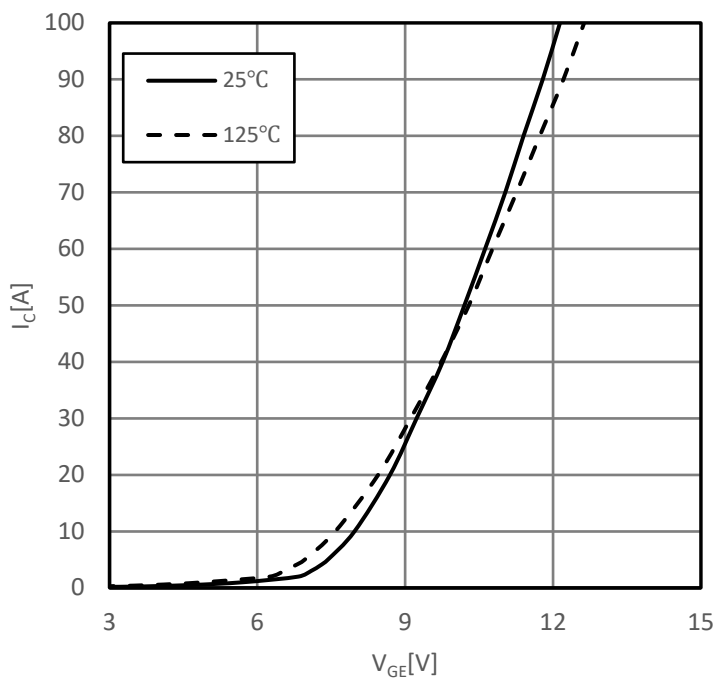
输出特性IGBT,逆变器 (典型)
output characteristic IGBT,Inverter (typical)
 $I_C=f(V_{CE})$
 $V_{GE}=15V$



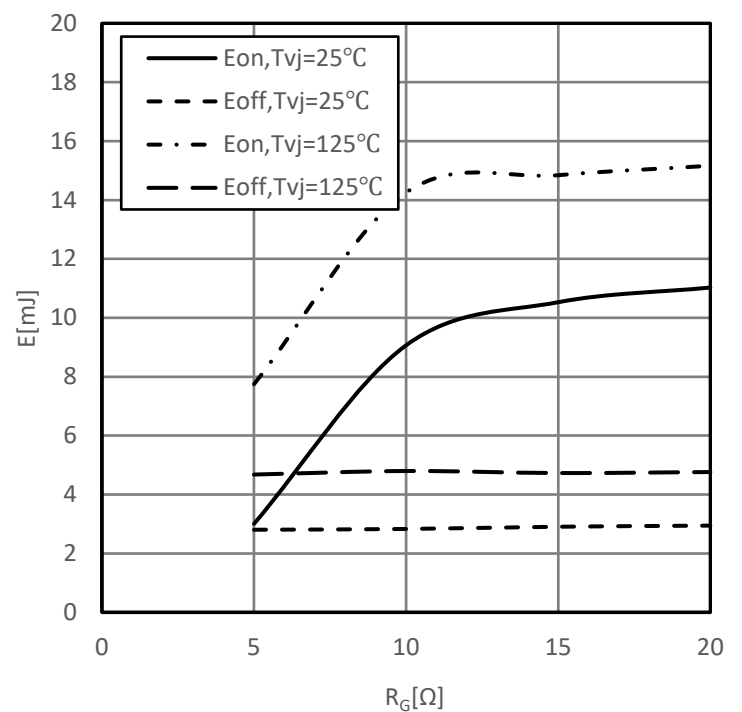
输出特性IGBT,逆变器 (典型)
output characteristic IGBT,Inverter (typical)
 $I_C=f(V_{CE})$
 $T_{vj}=125^{\circ}C$



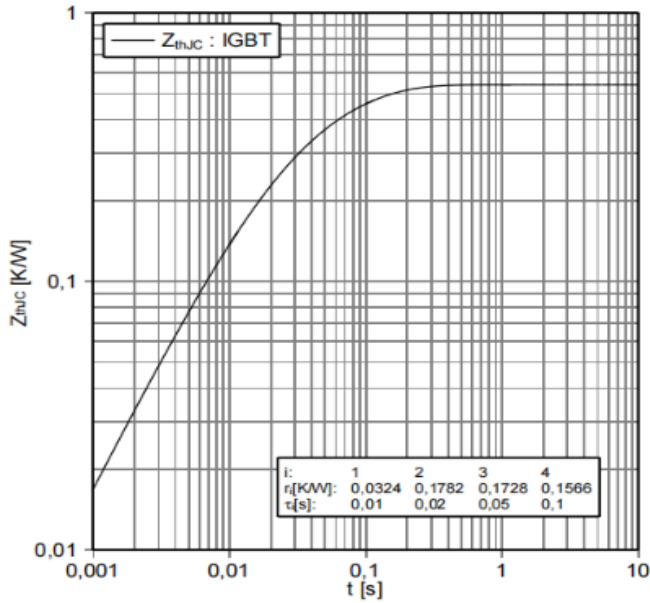
传输特性IGBT,逆变器(典型)
transfer characteristic IGBT,Inverter(typical)
 $I_C=f(V_{GE})$
 $V_{CE}=20V$



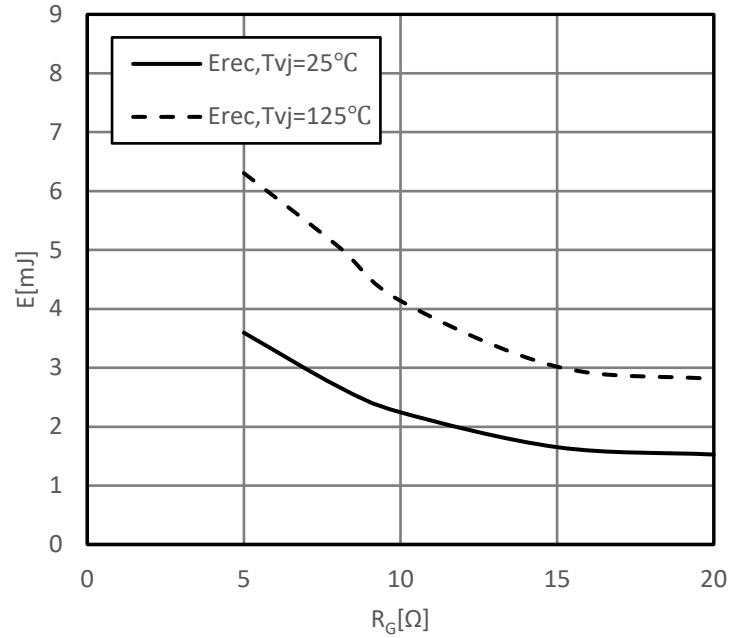
开关损耗IGBT,逆变器 (典型)
switching losses IGBT,Inverter(typical)
 $E_{on}=f(R_G), E_{off}=f(R_G)$
 $V_{GE}=\pm 15V, I_C=50A, V_{CE}=600V$



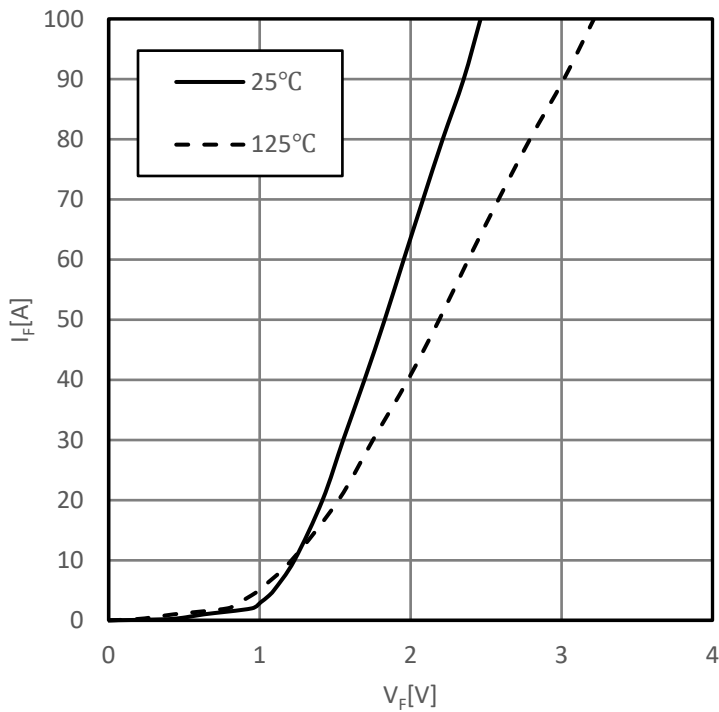
瞬态热阻抗IGBT,逆变器
transient thermal impedance IGBT,Inverter
 $Z_{thJC}=f(t)$



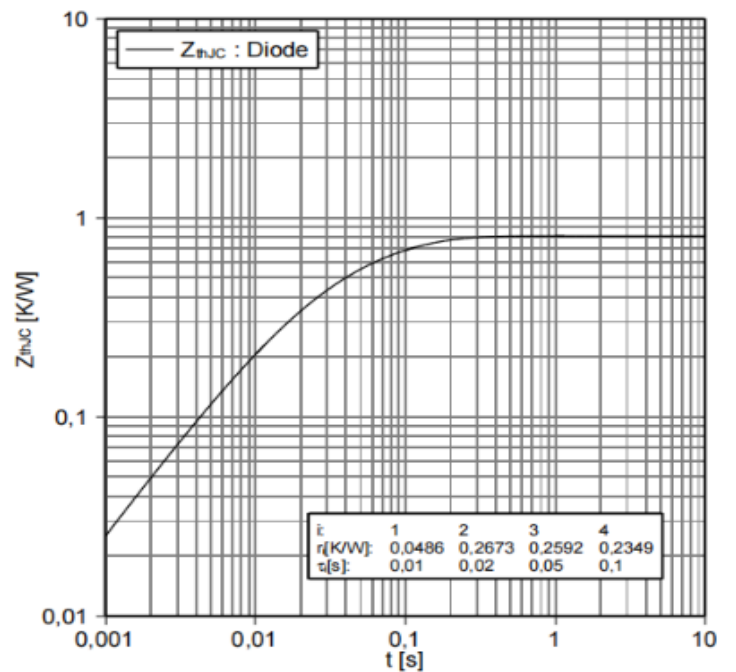
开关损耗二极管,逆变器 (典型)
switching losses Diode,Inverter(typical)
 $E_{rec}=f(R_G)$
IF=50A,VCE=600V



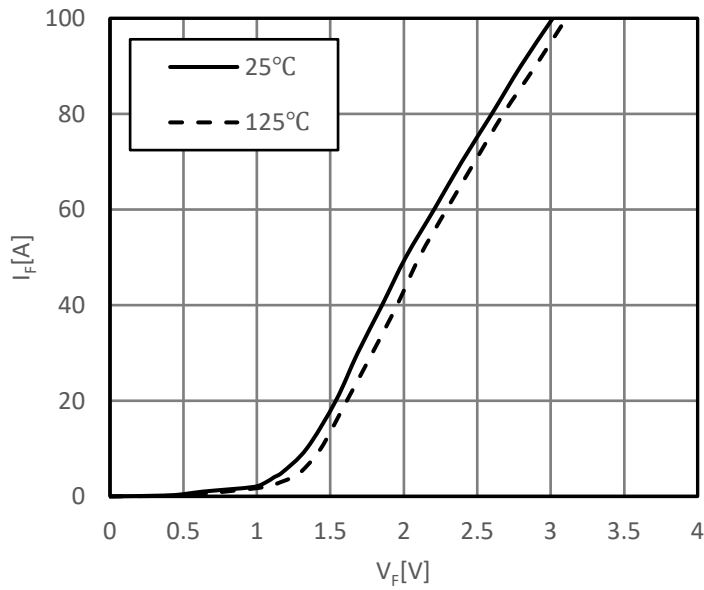
正向偏压特性二极管,逆变器 (典型)
forward characteristic of Diode, Inverter(typical)
IF=f(VF)



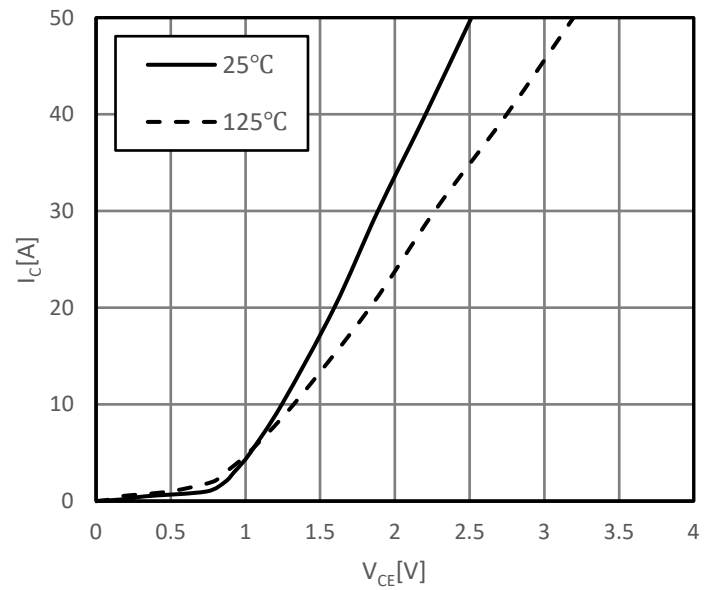
瞬态热阻抗二极管,逆变器
transient thermal impedance Diode,Inverter
 $Z_{thJC}=f(t)$



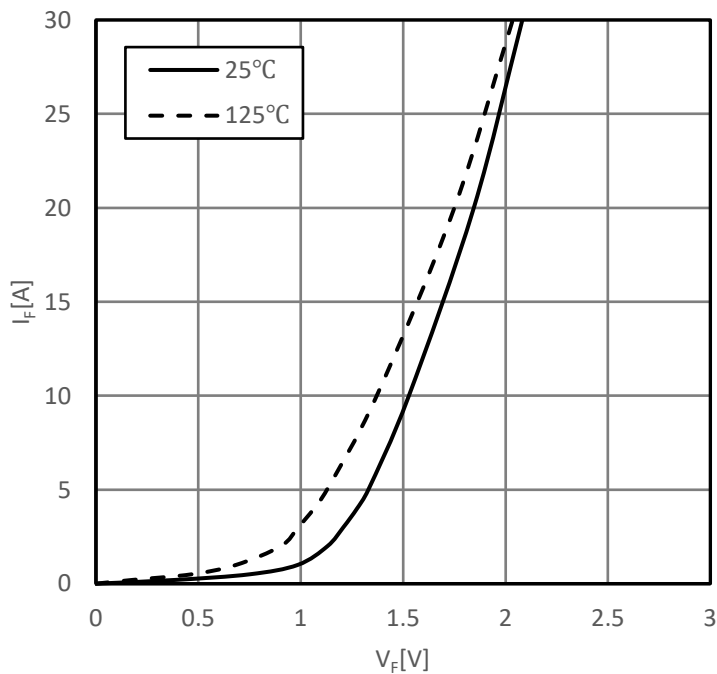
正向偏压特性二极管,整流器 (典型)
forward characteristic of Diode, Inverter(typical)
 $I_F=f(V_F)$



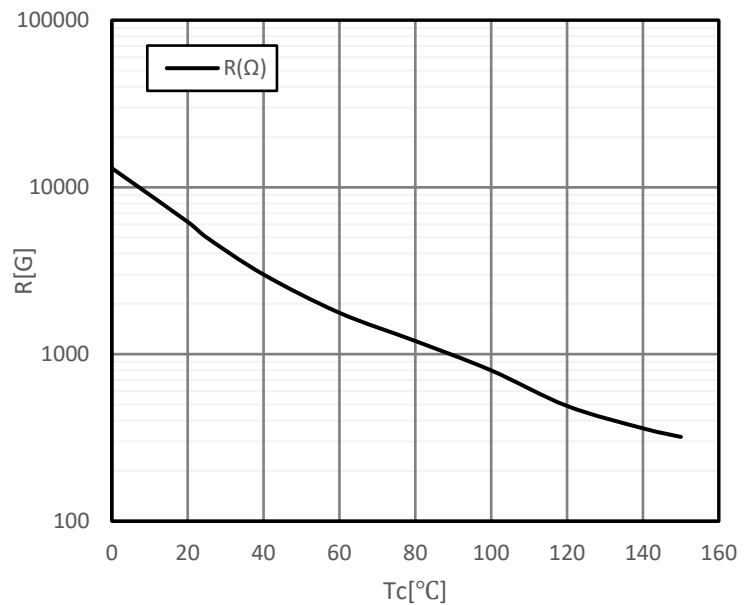
输出特性IGBT,制动-斩波器 (典型)
output characteristic IGBT, Inverter (typical)
 $I_C=f(V_{CE})$
 $V_{GE}=15V$



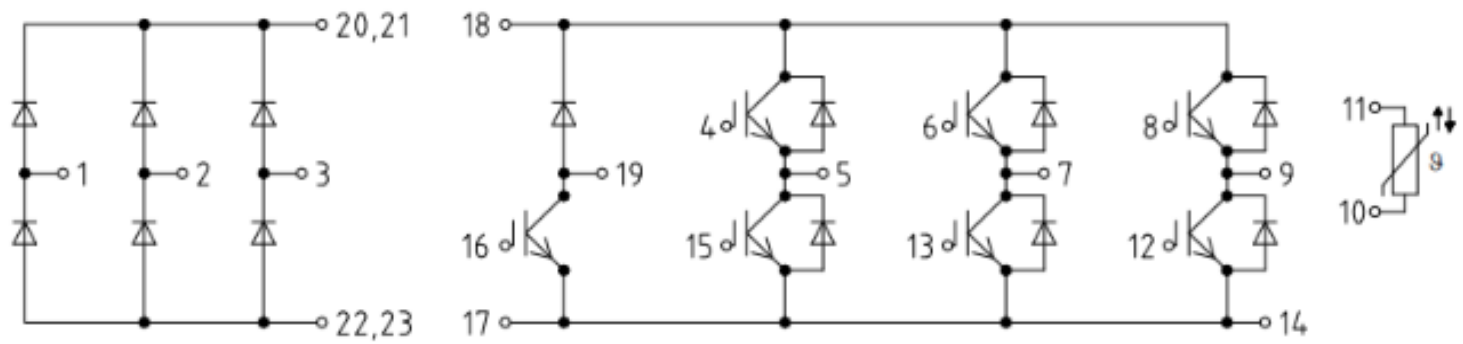
正向偏压特性二极管,制动-斩波器 (典型)
forward characteristic of Diode, Inverter(typical)
 $I_F=f(V_F)$



负温度系数热敏电阻温度特性
NTC-Thermistor-temperature characteristic
 $R=f(T)$



接线图/circuit_diagram_headline



封装尺寸/package outlines

