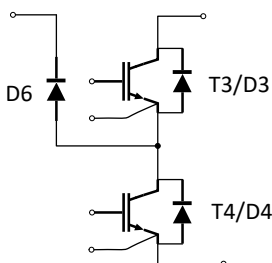
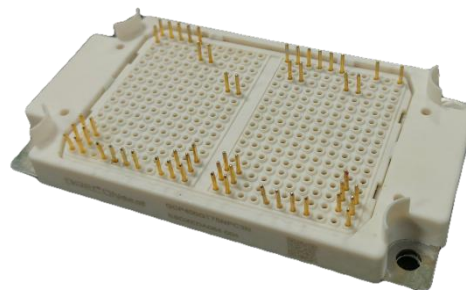
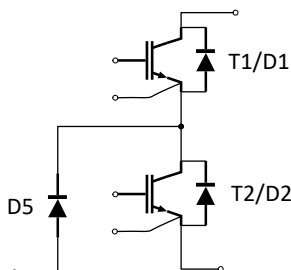


GCP400GH65NPC3N

等效电路原理图



Equivalent Circuit Schematic



400A/650V

说明

翠展 IGBT 功率模块具有超低的导通损耗以及良好的短路可靠性。该产品是为了通用逆变器以及不间断电源等应用所设计。

典型应用

- 太阳能应用
- 三电平应用

电气特性

- 低开关损耗
- I 型 NPC 三电平逆变模块
- V_{CEsat} 正温度系数
- 低 V_{CEsat}

机械特性

- 铜基板
- 标准封装
- 集成 NTC 温度传感器

Description

GRECON IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

Typical Applications

- Solar applications
- Three-level application

Electrical Features

- Low Switching Losses
- I type NPC Three-Level Inverter Module
- V_{CEsat} with positive Temperature Coefficient
- Low V_{CEsat}

Mechanical Features

- Copper Base Plate
- Standard Housing
- Integrated NTC temperature sensor

IGBT-T1.T2.T3.T4

最大额定值 / Maximum Rated Values

Parameter	Symbol	Conditions	Value	Unit
集电极-发射极电压 Collector-emitter voltage	V _{CES}	T _{vj} =25°C	650	V
连续集电极直流电流 Continuous DC collector current	I _{C nom}	T _C =100°C, T _{vj max} =175°C	400	A
集电极重复峰值电流 Repetitive peak collector current	I _{CRM}	t _p =1ms	800	A
总功率损耗 Total power dissipation	P _{tot}	T _C =25°C, T _{vj max} =175°C	1365	W
栅极-发射极峰值电压 Gate-emitter peak voltage	V _{GES}	T _{vj} =25°C	±20	V

特征值 / Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
栅极阈值电压 Gate threshold voltage	V _{GEth}	V _{GE} =V _{CE} , I _C =8.5mA, T _{vj} =25°C		5.5	6.0	V
栅极-发射极漏电流 Gate-emitter leakage current	I _{GES}	V _{CE} =0V, V _{GE} =20V, T _{vj} =25 °C			200	nA
集电极-发射极截止电流 Collector-emitter cut-off current	I _{CES}	V _{CE} =1200V, V _{GE} =0V, T _{vj} =25°C			1	mA
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°C		1.75		V
		I _C =400A, V _{GE} =15V, T _{vj} =125°C		2.05		
		I _C =400A, V _{GE} =15V, T _{vj} =150°C		2.13		
内部栅极电阻 Internal gate resistance	R _{gint}	T _{vj} =25°C		1.05		Ω
栅极电荷 Gate charge	Q _G	V _{GE} =-8V~+15V, V _{CE} =300V		25.05		uC
输入电容 Input capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f=1MHz, T _{vj} =25°C		1.35		nF
反向传输电容 Reverse transfer capacitance	C _{res}			0.21		

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
开通延迟时间（电感负载） Turn-on delay time , inductive load	$t_{d\ on}$	$I_c=400A, V_{CE}=300V$ $R_{gon}=R_{goff}=5.6\Omega$ $V_{GE}=-8V/+15V$ $di/dt_{on}=3550A/us$ $dv/dt_{off}=8775V/us$ $T_{vj}=25^{\circ}C$		136.2		ns
上升时间（电感负载） Rise time , inductive load	t_r			103.5		
关断延迟时间（电感负载） Turn-off delay time , inductive load	$t_{d\ off}$			359.7		
下降时间（电感负载） Fall time , inductive load	t_f			54.1		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	E_{on}	$I_c=400A, V_{CE}=300V$ $R_{gon}=R_{goff}=5.6\Omega$ $V_{GE}=-8V/+15V$ $di/dt_{on}=3350A/us$ $dv/dt_{off}=7100V/us$ $T_{vj}=125^{\circ}C$		4.6		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	E_{off}			14.2		
开通延迟时间（电感负载） Turn-on delay time , inductive load	$t_{d\ on}$			130.2		ns
上升时间（电感负载） Rise time , inductive load	t_r			105.4		
关断延迟时间（电感负载） Turn-off delay time , inductive load	$t_{d\ off}$			386.1		
下降时间（电感负载） Fall time , inductive load	t_f			61.5		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	E_{on}	$I_c=400A, V_{CE}=300V$ $R_{gon}=R_{goff}=5.6\Omega$ $V_{GE}=-8V/+15V$ $di/dt_{on}=3150A/us$ $dv/dt_{off}=6910V/us$ $T_{vj}=150^{\circ}C$		5.7		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	E_{off}			16.2		
开通延迟时间（电感负载） Turn-on delay time , inductive load	$t_{d\ on}$			130.5		ns
上升时间（电感负载） Rise time , inductive load	t_r			106.6		
关断延迟时间（电感负载） Turn-off delay time , inductive load	$t_{d\ off}$			392.3		
下降时间（电感负载） Fall time , inductive load	t_f			64.5		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	E_{on}			6.1		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	E_{off}			16.5		

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
短路数据 SC data	I _{sc}	t _p ≤6us, V _{GE} =15V, V _{ce} =300V, V _{CEM} ≤750V, T _{vj} =25°C		2100		A
		t _p ≤4us, V _{GE} =15V, V _{ce} =300V, V _{CEM} ≤750V, T _{vj} =150°C		1950		A
结-壳热阻 Thermal resistance, junction to case	R _{thJC}	每个 IGBT / per IGBT			0.102	K/W
在开关状态下温度 Temperature under switching conditions	T _{vj op}		-40		150	°C

二极管-D5.D6/ Diode-D5.D6

最大额定值 / Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25\text{ }^{\circ}\text{C}$	650	V
连续正向直流电流 Continuous DC forward current	I_F		400	A
正向重复峰值电流 Repetitive peak forward current	I_{FRM}	$t_p=1\text{ms}$	800	A

特征值 / Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
正向电压 Forward voltage	V_F	$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=25^{\circ}\text{C}$		2.15		V
		$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=125^{\circ}\text{C}$		1.95		
		$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=150^{\circ}\text{C}$		1.90		
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=3300\text{A/us}$ $T_{vj}=25^{\circ}\text{C}$		21.5		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			198		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			7.2		mJ
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=3040\text{A/us}$ $T_{vj}=125^{\circ}\text{C}$		30.2		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			235		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			9.1		mJ
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=2950\text{A/us}$ $T_{vj}=150^{\circ}\text{C}$		35.5		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			250		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			9.9		mJ

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
结-壳热阻 Thermal resistance, junction to case	R_{thJC}	每个二极管 / per diode			0.188	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op}$		-40		150	°C

二极管-D1.D2.D3.D4/Diode-D1.D2.D3.D4

最大额定值 / Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25\text{ }^{\circ}\text{C}$	650	V
连续正向直流电流 Continuous DC forward current	I_F		400	A
正向重复峰值电流 Repetitive peak forward current	I_{FRM}	$t_p=1\text{ms}$	800	A

特征值 / Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
正向电压 Forward voltage	V_F	$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=25^{\circ}\text{C}$		2.00		V
		$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=125^{\circ}\text{C}$		1.84		
		$I_F=400\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=150^{\circ}\text{C}$		1.82		
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=3290\text{A/us}$ $T_{vj}=25^{\circ}\text{C}$		22.5		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			212		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			6.5		mJ
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=3060\text{A/us}$ $T_{vj}=125^{\circ}\text{C}$		29.8		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			240		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			8.2		mJ
恢复电荷 Recovered charge	Q_{rr}	$I_F=400\text{A}$, $V_R=300\text{V}$ $-di_F/dt=2960\text{A/us}$ $T_{vj}=150^{\circ}\text{C}$		32.1		μC
反向恢复峰值电流 Peak reverse recovery current	I_{RM}			256		A
反向恢复损耗（每脉冲） Reverse recovery energy	E_{rec}			9.0		mJ

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
结-壳热阻 Thermal resistance, junction to case	R_{thJC}	每个二极管 / per diode			0.225	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op}$		-40		150	°C

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
额定电阻值 Rated resistance	R ₂₅			5		kΩ
R100 偏差 Deviation of R100	ΔR/R	T _c =100°C, R ₁₀₀ =493.3Ω	-5		5	%
耗散功率 Power dissipation	P ₂₅				20	mW
B-值 B-value	B _{25/50}	R ₂ =R _{25exp} [B _{25/50} (1/T ₂ -1/(298.15K))]		3380		K

模块 / Module

特征值（除非另有说明，否则 T_c=25°C）

Characteristic Values (T_c=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
绝缘电压 Isolation voltage	V _{isol}	RMS,t=1min, f=50Hz	2500			V
最大结温 Maximum junction temperature	T _{Jmax}				175	°C
在开关状态下温度 Operating junction temperature	T _{vj op}		-40		150	°C
储存温度 Storage temperature	T _{stg}		-40		125	°C
杂散电感（模块） Stray inductance module	L _{CE}			20		nH
模块安装扭矩 Mounting torque for module mounting	M	M5 螺丝（底板到散热器） Screw M5 baseplate to heatsink	3.0		6.0	N.m
模块重量 / Weight of module	G			260		g

电气特性（曲线） / Electrical Characteristics (curves)

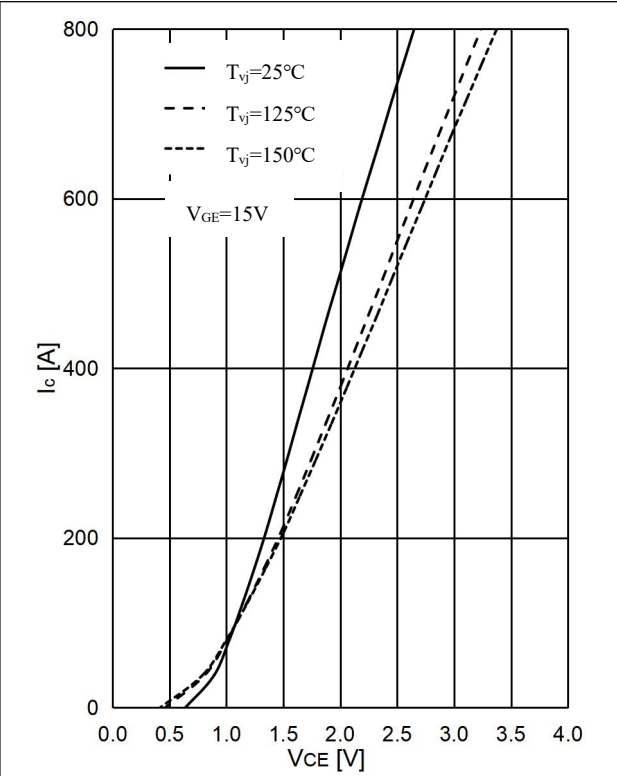


图 1 . IGBT 输出特性,T1&T2&T3&T4
Fig 1. IGBT Output Characteristic,T1&T2&T3&T4

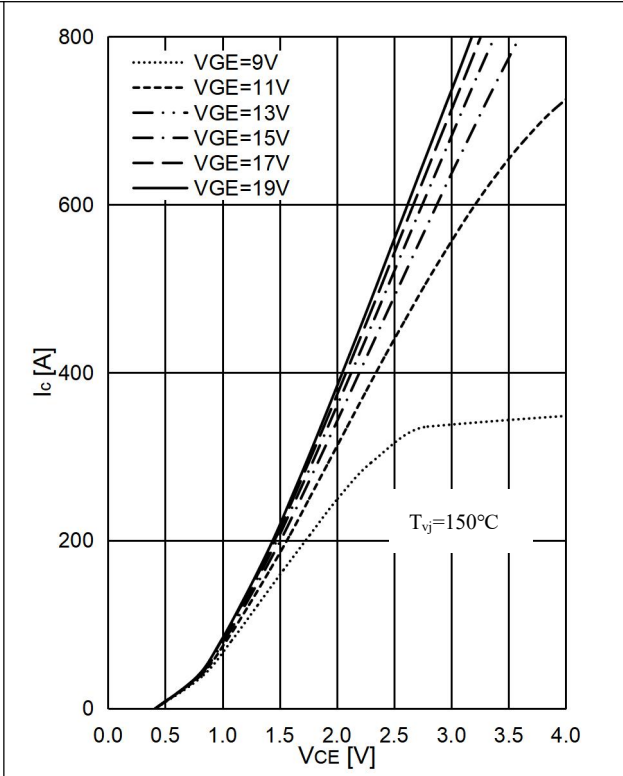


图 2 . IGBT 输出特性,T1&T2&T3&T4
Fig 2. IGBT Output Characteristic,T1&T2&T3&T4

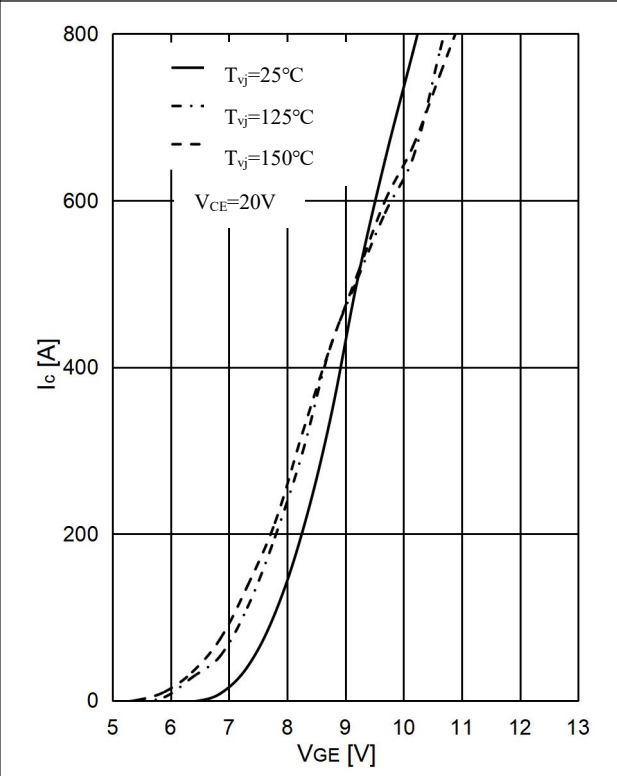


图 3 . IGBT 转移特性,T1&T2&T3&T4
Fig 3. IGBT Transfer Characteristic

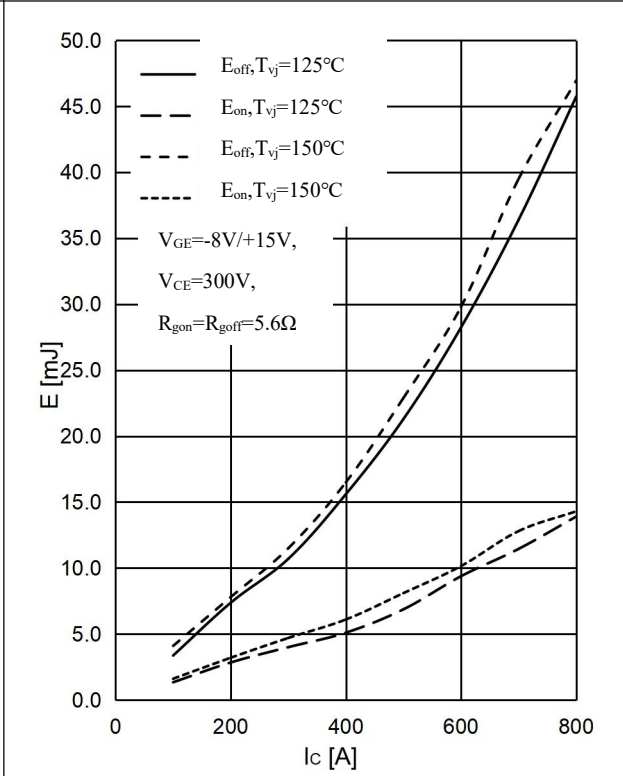


图 4 . IGBT 开关损耗-集电极电流,T1&T2&T3&T4
IGBT Switching Loss Eon & Eoff vs. Ic

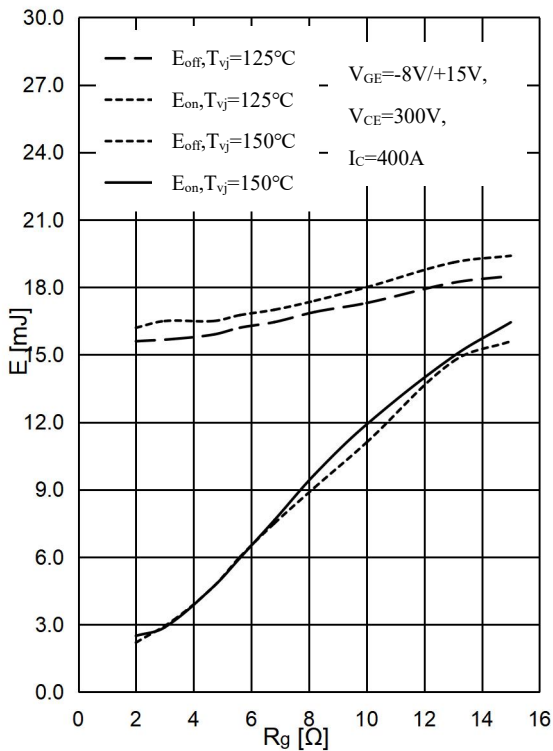


图 5 . IGBT 开关损耗-栅极电阻,T1&T2&T3&T4
Fig 5. IGBT Switching Loss E_{on} & E_{off} vs. R_G

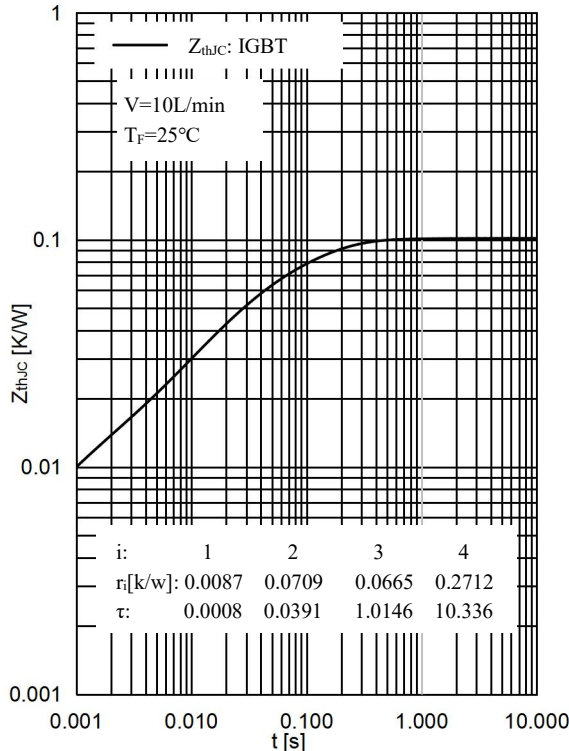


图 6 . IGBT 瞬态热阻抗,T1&T2&T3&T4
Fig 6. IGBT Transient thermal impedance

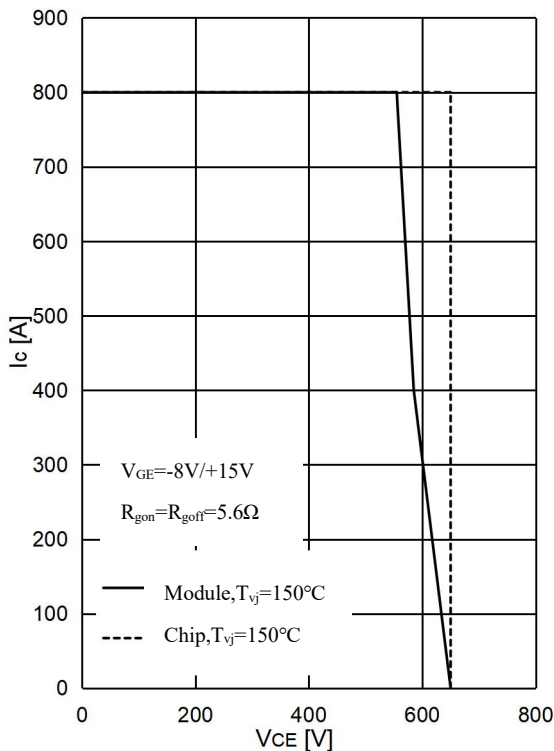


图 7 . IGBT 反偏安全工作区,T1&T2&T3&T4
Fig 7. IGBT RBSOA

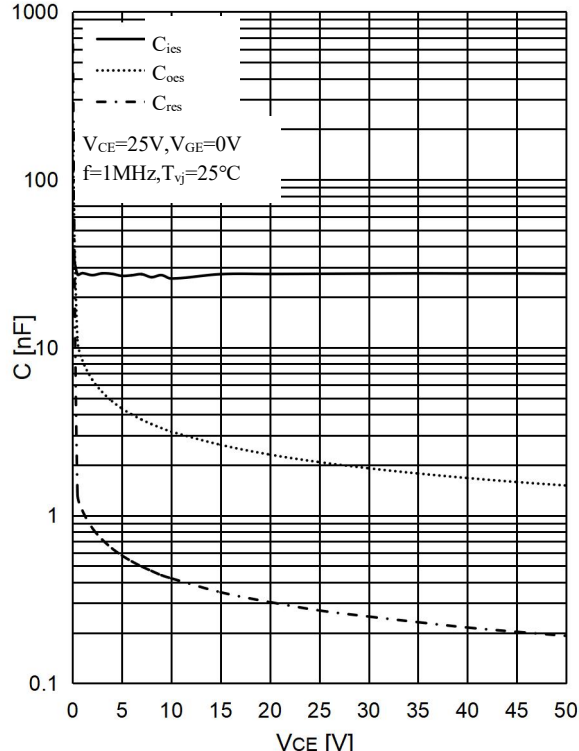


图 8. IGBT 电容特性,T1&T2&T3&T4
Fig 8. IGBT Capacity Characteristic

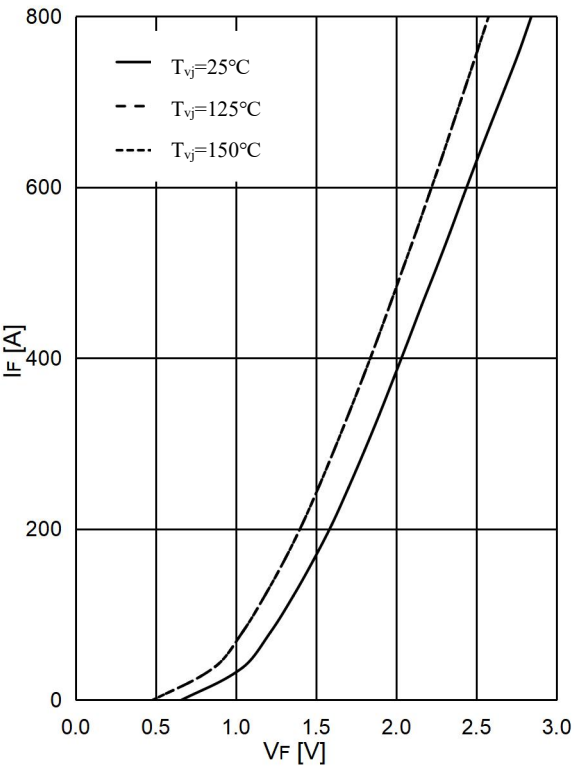


图 9 . 二极管 D1&D2&D3&D4 正向偏压特性
Fig 9 . Diode D1&D2&D3&D4 Forward characteristic

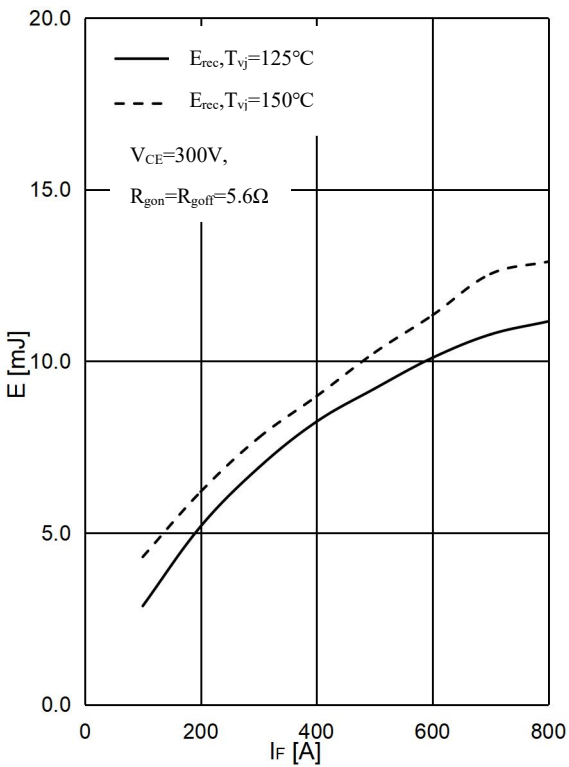


图 10 . 二极管 D1&D2&D3&D4 开关损耗-正向电流
Fig 10. Diode D1&D2&D3&D4 Switching Loss E_{rec} vs. I_F

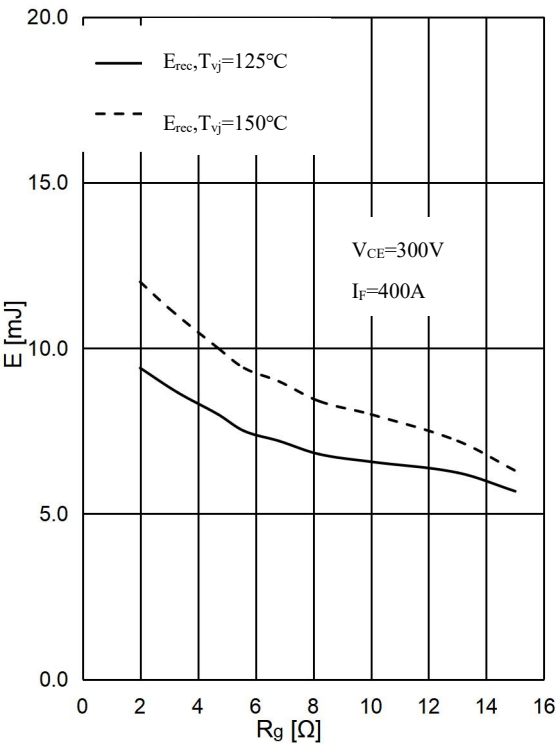


图 11 . 二极管 D1&D2&D3&D4 开关损耗-栅极电阻
Fig 11. Diode D1&D2&D3&D4 Switching Loss E_{rec} vs. R_G

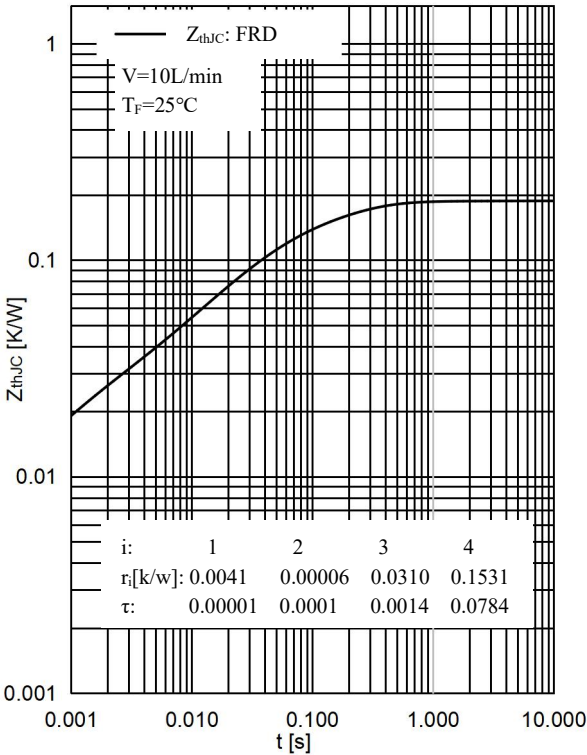
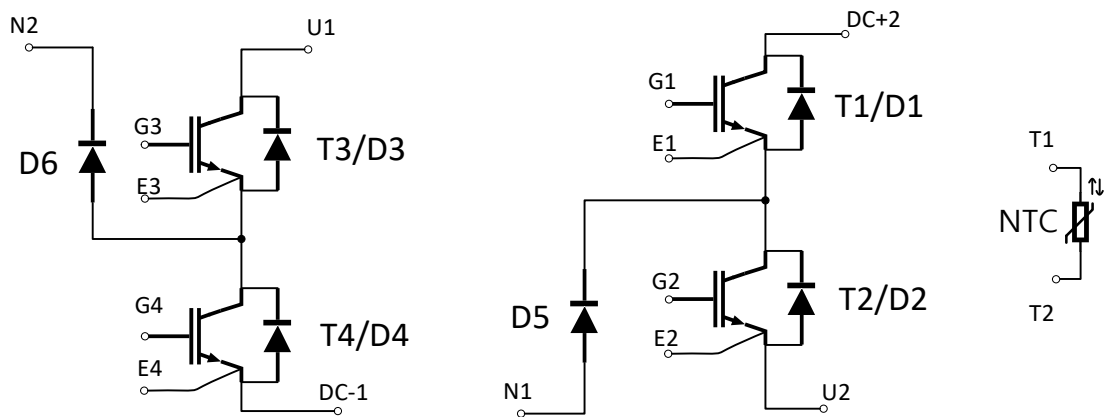
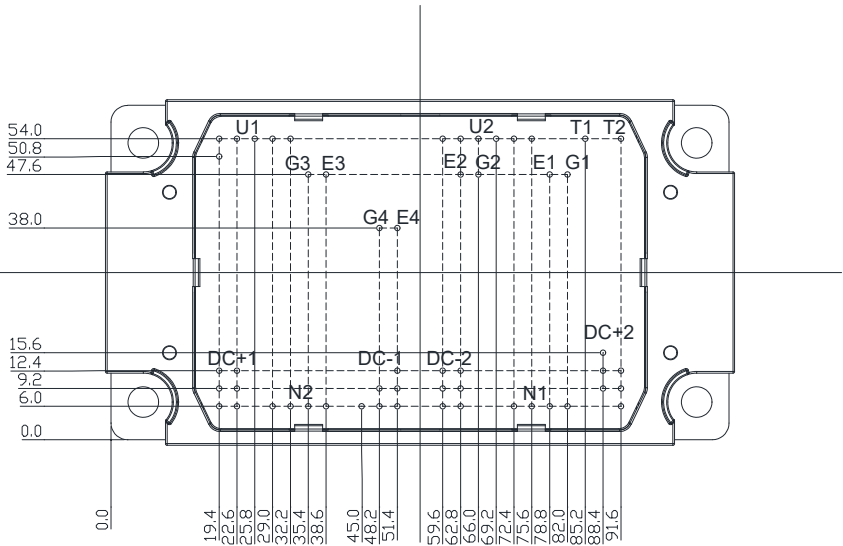
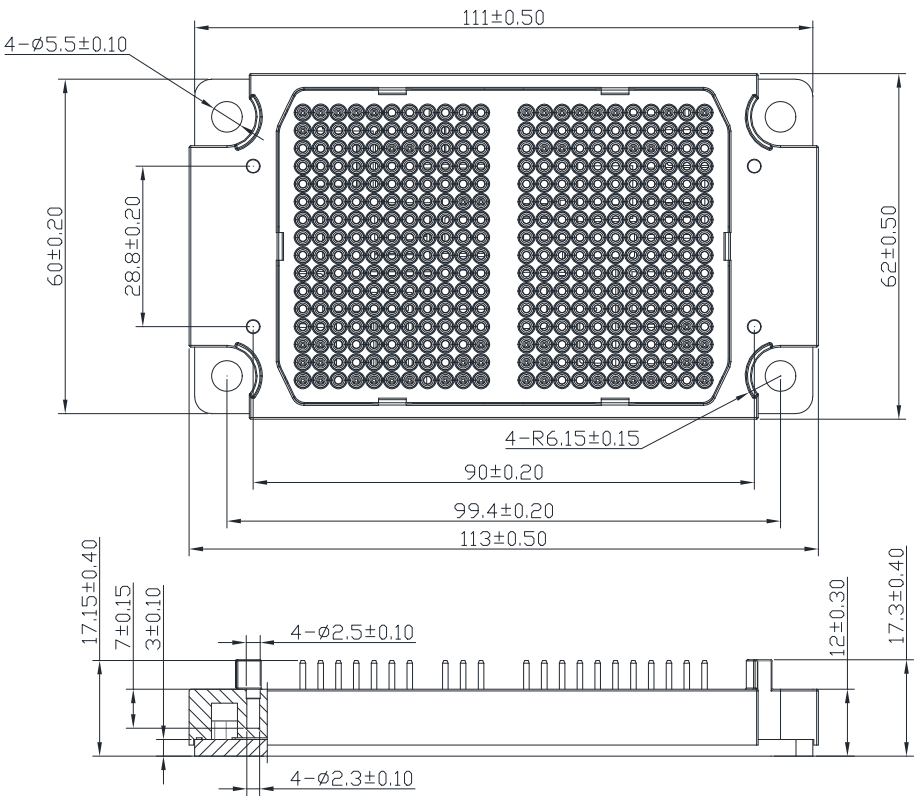


图 12 . 二极管 D1&D2&D3&D4 瞬态热阻抗
Fig 12. Diode D1&D2&D3&D4 Transient thermal impedance

电路图 / Circuit Diagram



封装尺寸 / Package Dimensions



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Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify. Please note, that for any such applications we urgently recommend :

- to perform joint Risk and Quality Assessments;
- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

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