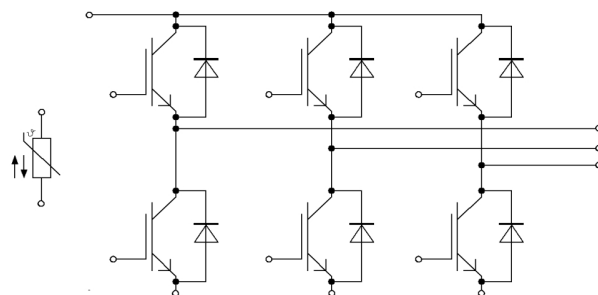
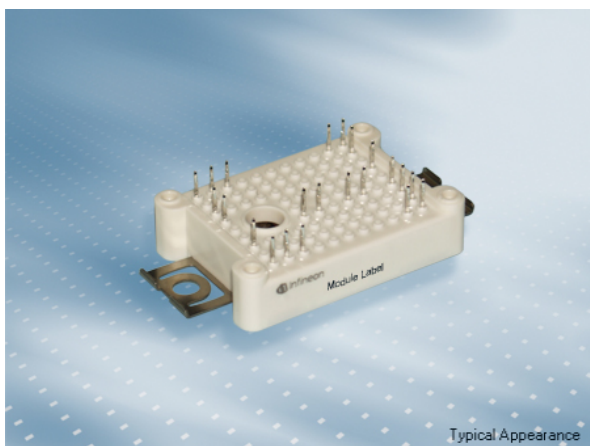


EasyPACK™ 模块 采用第七代沟槽栅/场终止IGBT7和第七代发射极控制二极管 带有pressfit压接管脚和温度检测NTC
EasyPACK™ module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and PressFIT / NTC

初步数据 / Preliminary Data



$V_{CES} = 1200V$

$I_{C\ nom} = 35A / I_{CRM} = 70A$

潜在应用

- UPS系统
- 伺服驱动器
- 电机传动
- 空调
- 辅助逆变器

电气特性

- 低 V_{CEsat}
- 沟槽栅IGBT7
- 过载操作达175°C

机械特性

- 2.5 kV 交流 1分钟 绝缘
- PressFIT 压接技术
- 低热阻的三氧化二铝 Al_2O_3 衬底
- 紧凑型设计
- 高功率密度

Potential Applications

- UPS systems
- Servo drives
- Motor drives
- Air conditioning
- Auxiliary inverters

Electrical Features

- Low V_{CEsat}
- Trenchstop™ IGBT7
- Overload operation up to 175°C

Mechanical Features

- 2.5 kV AC 1min insulation
- PressFIT contact technology
- Al_2O_3 substrate with low thermal resistance
- Compact design
- High power density

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

Content of the Code	Digit
Module Serial Number	1 - 5
Module Material Number	6 - 11
Production Order Number	12 - 19
Datecode (Production Year)	20 - 21
Datecode (Production Week)	22 - 23

初步数据
Preliminary Data

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Rated Values

集电极 - 发射极电压 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	I_{CDC}	35	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	70	A
栅极 - 发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-20	V

特征值 / Characteristic Values

			min.	typ.	max.	
集电极 - 发射极饱和电压 Collector-emitter saturation voltage	$I_C = 35\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,60 1,74 1,82	t.b.d.	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 0,75\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,15	5,80	6,45 V
栅极电荷 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	0,548		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,0		Ω
输入电容 Input capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	6,62		nF
反向传输电容 Reverse transfer capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	0,023		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{CES}		0,0073	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{GES}		100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,037 0,043 0,044		μs μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,035 0,037 0,038		μs μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,26 0,32 0,34		μs μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,14 0,24 0,30		μs μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 35\text{ nH}$ $di/dt = 700\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	2,62 3,74 4,45		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 35\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 35\text{ nH}$ $du/dt = 3300\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	2,39 3,73 4,56		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P \leq 8\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ $t_P \leq 7\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	I_{SC}	110 100		A A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个 IGBT / per IGBT		R_{thJH}	1,27		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175	$^{\circ}\text{C}$

初步数据
Preliminary Data

二极管, 逆变器 / Diode, Inverter

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	35	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	70	A
I_{2t} -值 I_{2t} - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$	I_{2t}	150 140	A^2s A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 35\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 35\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 35\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	V_F		1,72 1,59 1,52	t.b.d. V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 35\text{ A}, -di_F/dt = 700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	I_{RM}		22,4 29,6 34,0	A A A
恢复电荷 Recovered charge	$I_F = 35\text{ A}, -di_F/dt = 700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	Q_r		2,46 4,80 6,52	μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 35\text{ A}, -di_F/dt = 700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{rec}		1,12 2,03 2,64	mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode		R_{thJH}		1,81	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175	$^{\circ}\text{C}$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

			min.	typ.	max.	
额定电阻值 Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
R100 偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$	$\Delta R/R$	-5		5	%
耗散功率 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/100}$		3433		K

根据应用手册标定

Specification according to the valid application note.

初步数据
Preliminary Data

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	2,5	kV	
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		11,5 6,3	mm	
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		10,0 5,0	mm	
相对电痕指数 Comperative tracking index		CTI	> 200		
相对温度指数 (电) RTI Elec.	住房 housing	RTI	140	°C	
			min.	typ.	max.
杂散电感,模块 Stray inductance module		L _{sCE}		30	nH
储存温度 Storage temperature		T _{stg}	-40		125 °C
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80 N
重量 Weight		G		24	g

Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.

The current under continuous operation is limited to 25 A rms per connector pin.

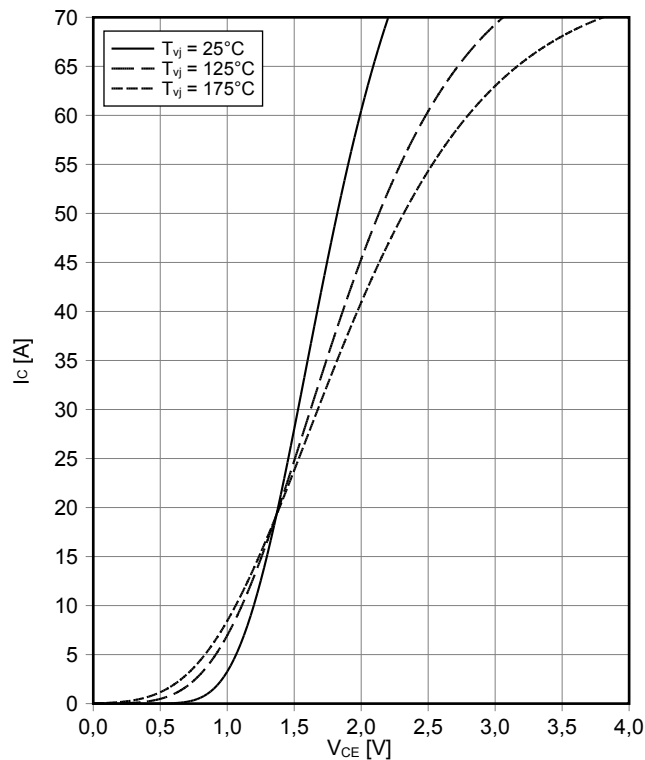
T_{vj op} > 150°C ist im Überlastbetrieb zulässig. Detaillierte Angaben sind AN 2018-14 zu entnehmen.

T_{vj op} > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

初步数据 Preliminary Data

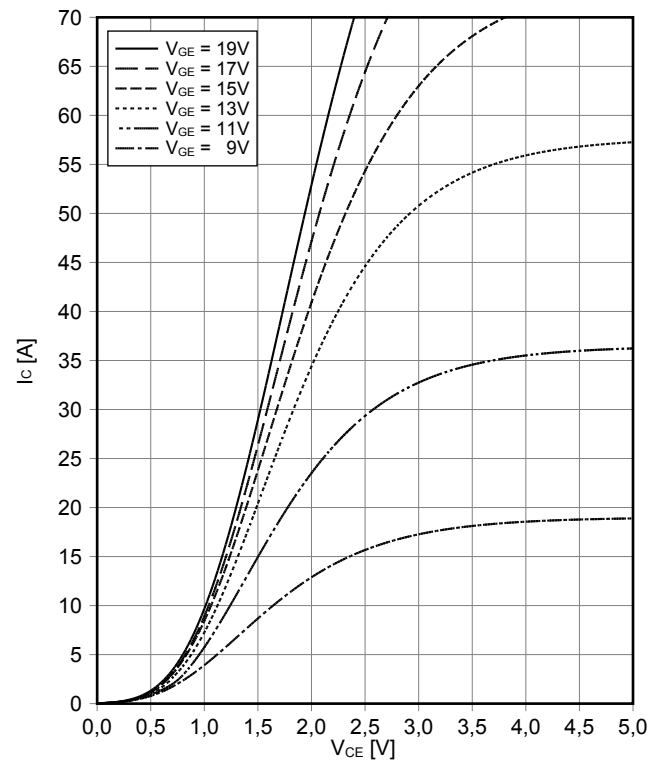
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



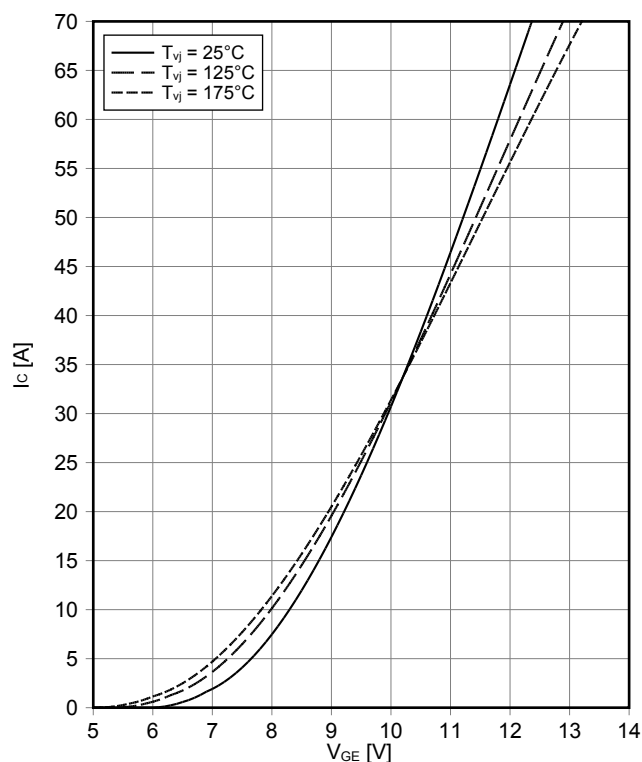
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 175^\circ\text{C}$



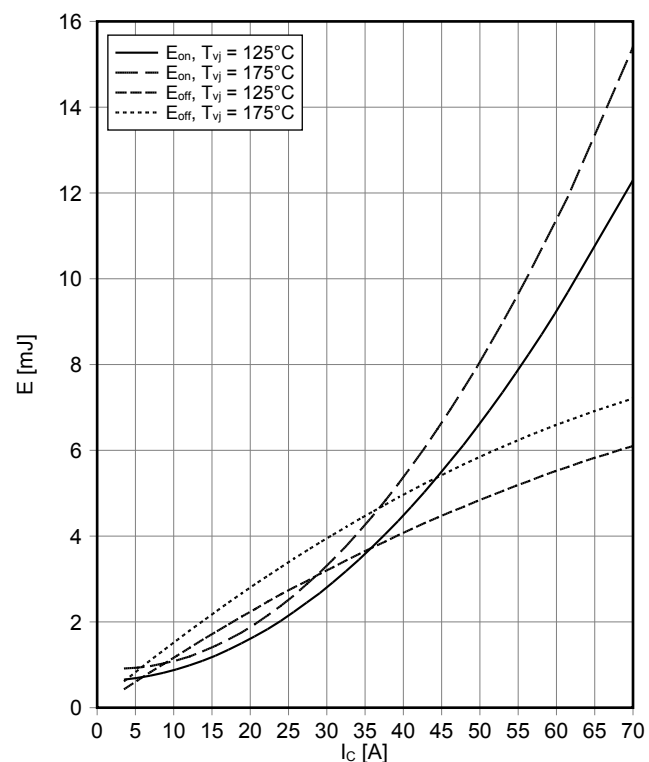
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

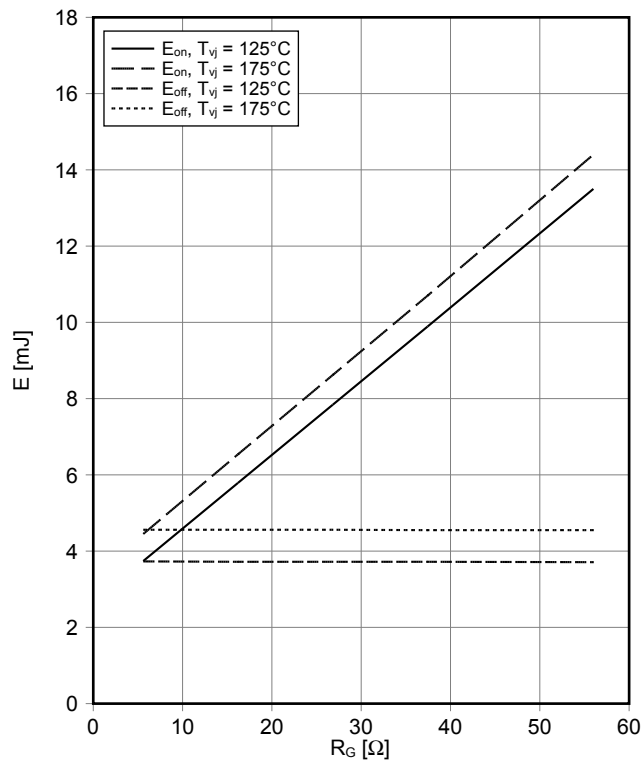
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.6\ \Omega$, $R_{Goff} = 5.6\ \Omega$, $V_{CE} = 600\text{ V}$



初步数据 Preliminary Data

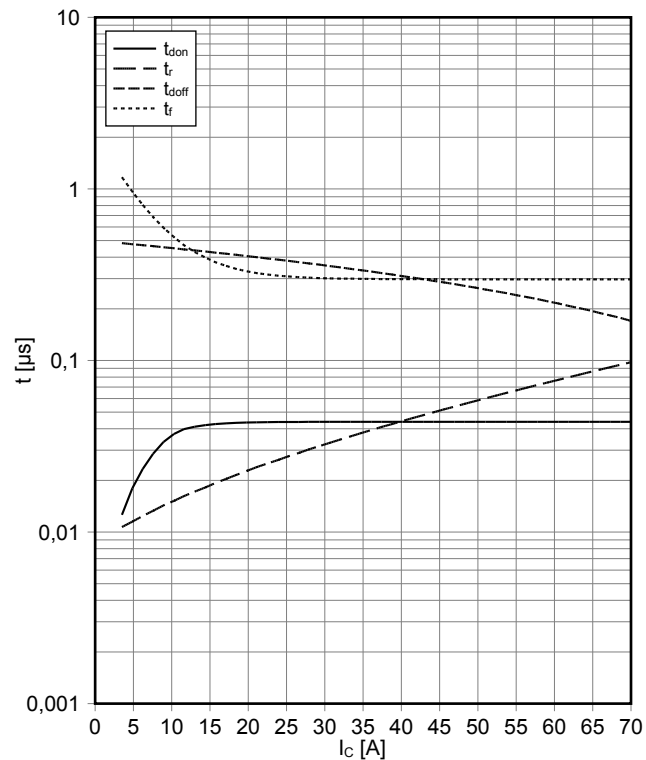
开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 35\text{ A}$, $V_{CE} = 600\text{ V}$



??? IGBT, 逆变器 (典型) switching times IGBT, Inverter (typical)

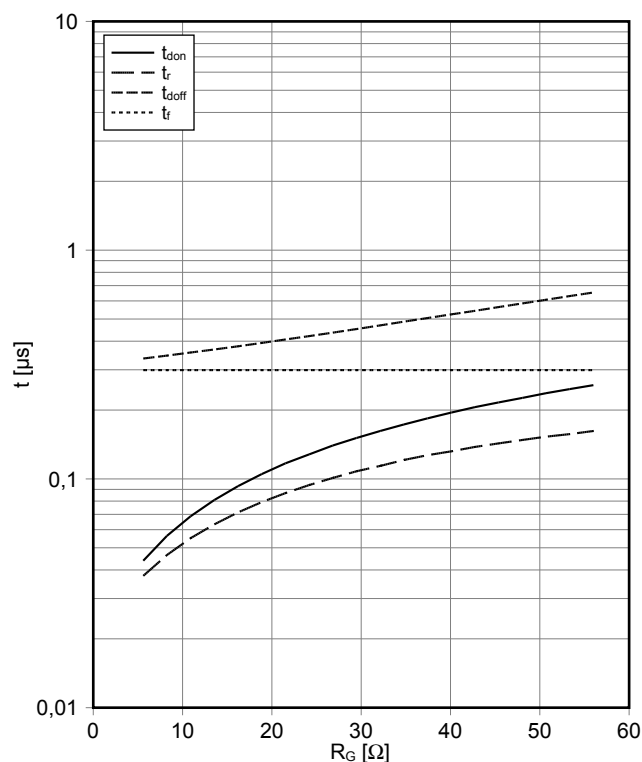
$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.6\text{ Ω}$, $R_{Goff} = 5.6\text{ Ω}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 175^\circ\text{C}$



??? IGBT, 逆变器 (典型)

switching times IGBT, Inverter (typical)

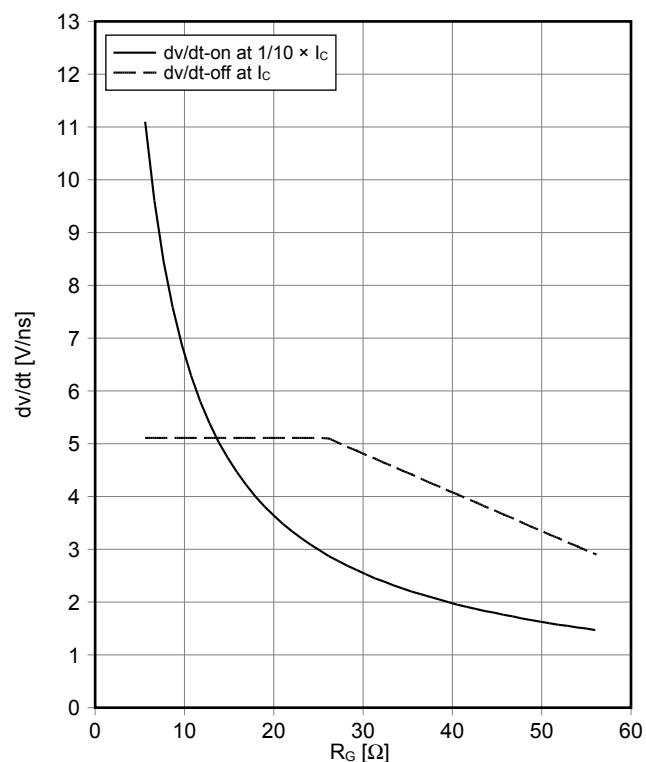
$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 35\text{ A}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 175^\circ\text{C}$



dv/dt IGBT, 逆变器 (典型)

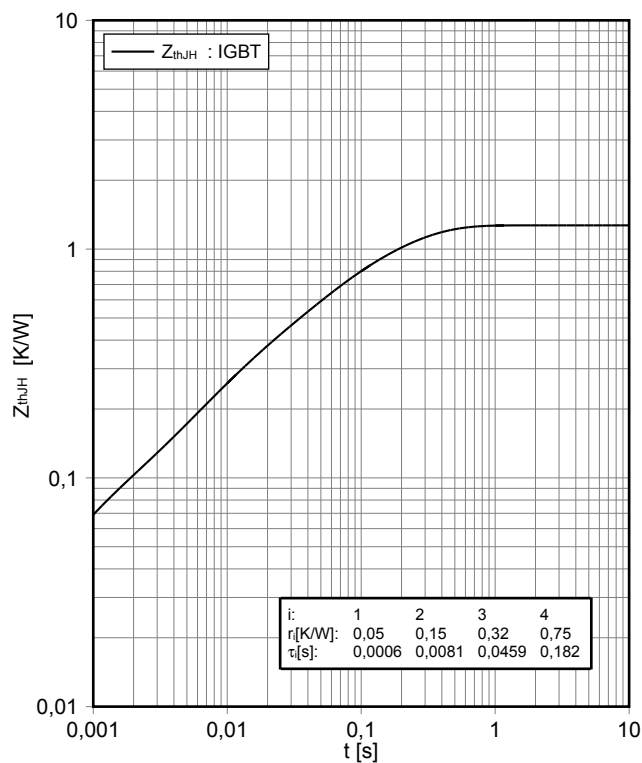
dv/dt IGBT, Inverter (typical)

$dv/dt = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 35\text{ A}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 25^\circ\text{C}$

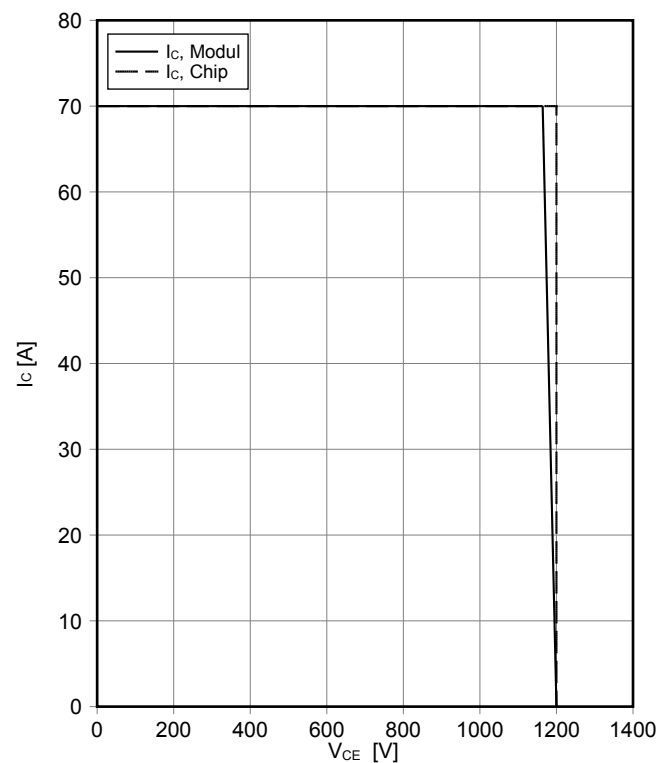


初步数据 Preliminary Data

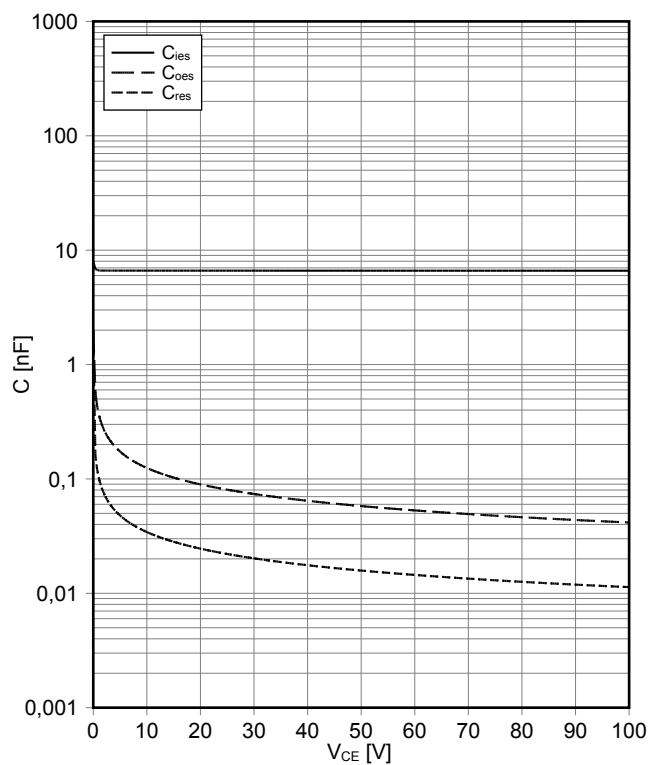
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJH} = f(t)$



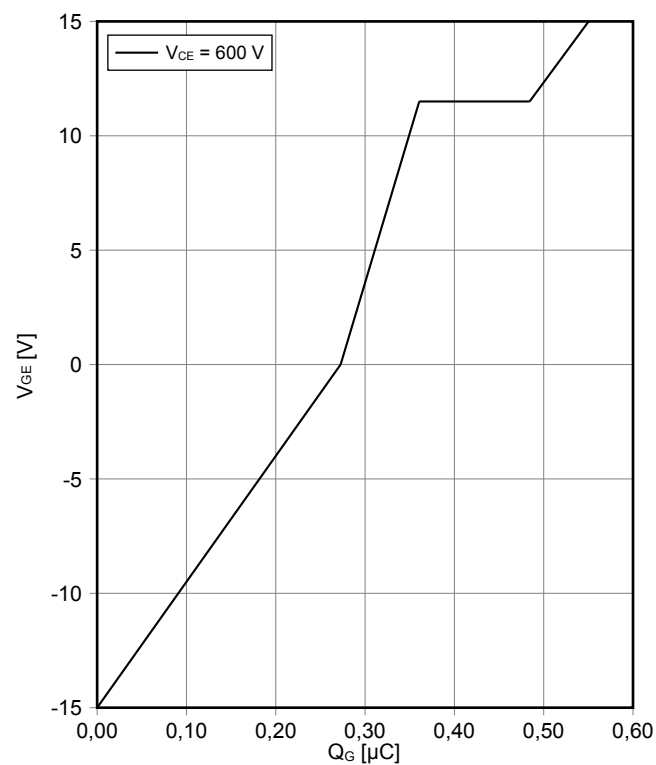
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 5.6 \Omega$, $T_{vj} = 175^\circ\text{C}$



电容特性 IGBT, 逆变器 (典型)
capacity characteristic IGBT, Inverter (typical)
 $C = f(V_{CE})$
 $V_{GE} = 0 \text{ V}$, $T_{vj} = 25^\circ\text{C}$, $f = 100\text{kHz}$

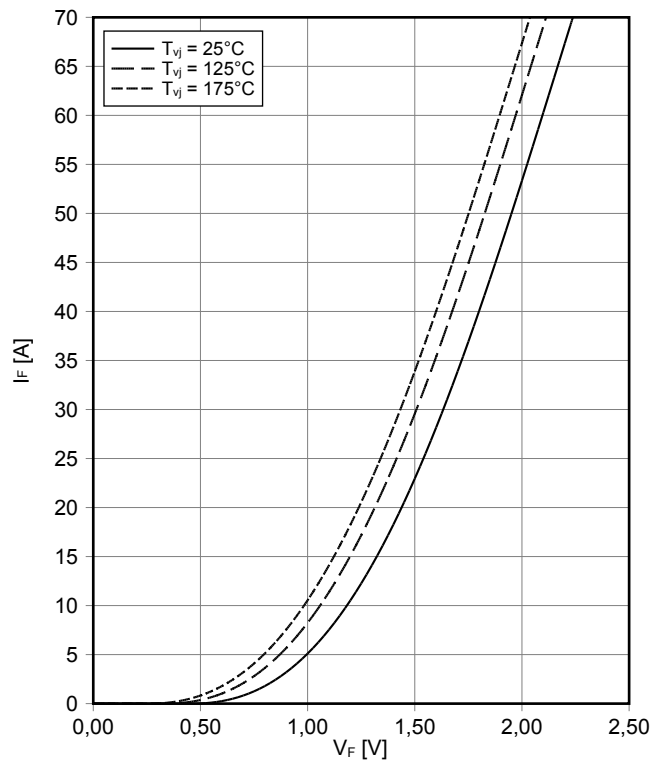


栅极电荷特性 IGBT, 逆变器 (典型)
gate charge characteristic IGBT, Inverter (typical)
 $V_{GE} = f(Q_G)$
 $I_C = 35 \text{ A}$, $T_{vj} = 25^\circ\text{C}$

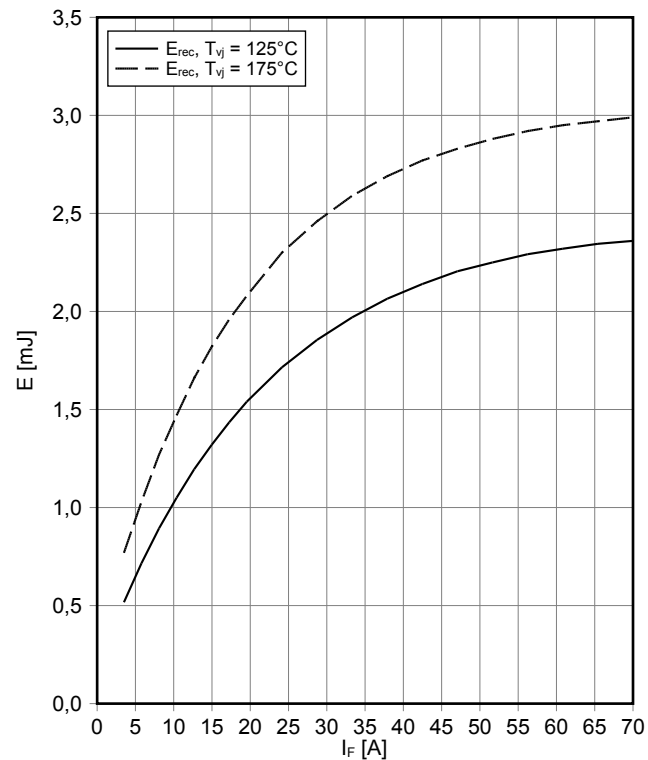


初步数据 Preliminary Data

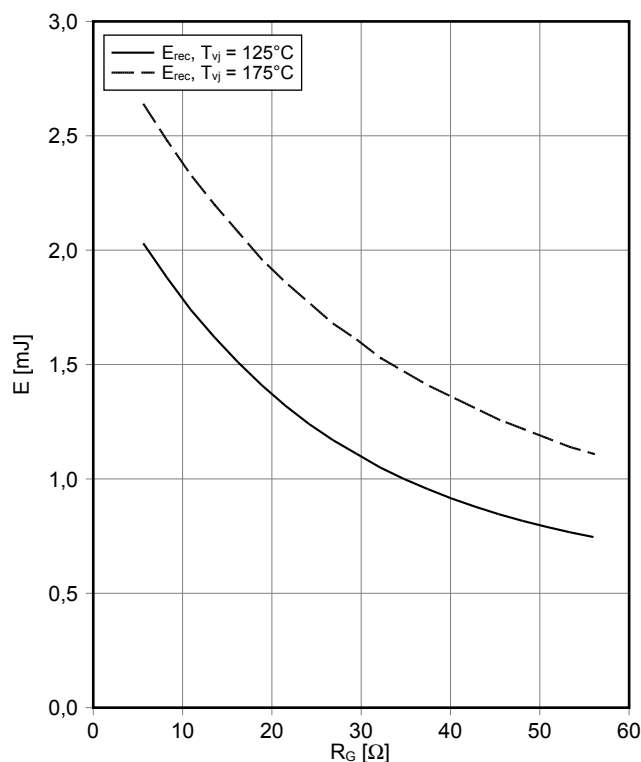
正向偏压特性 二极管,逆变器 (典型)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



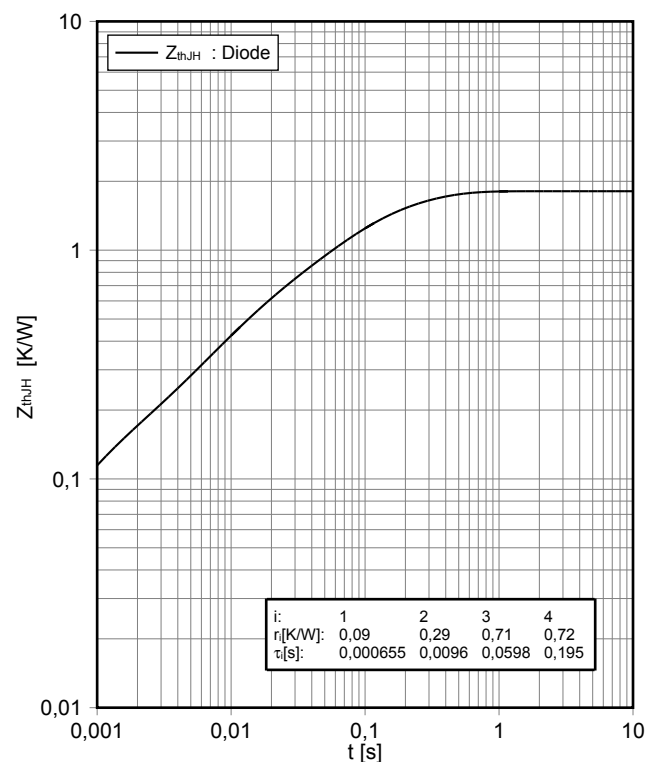
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 5.6 \Omega$, $V_{CE} = 600 \text{ V}$



开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 35 \text{ A}$, $V_{CE} = 600 \text{ V}$



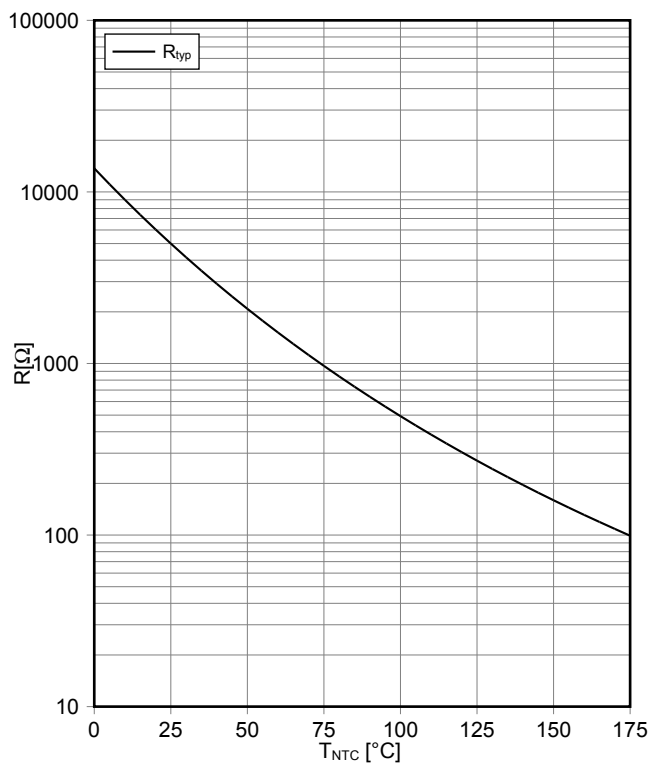
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter
 $Z_{thJH} = f(t)$



负温度系数热敏电阻 温度特性

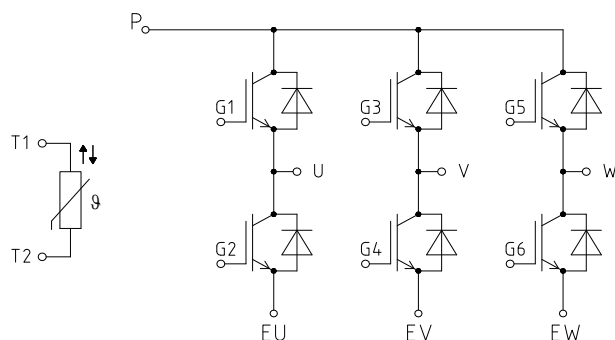
NTC-Thermistor-temperature characteristic (typical)

$R = f(T_{NTC})$

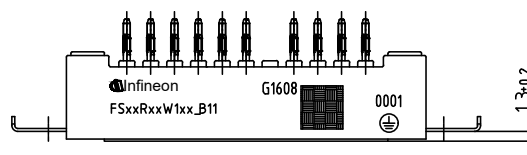
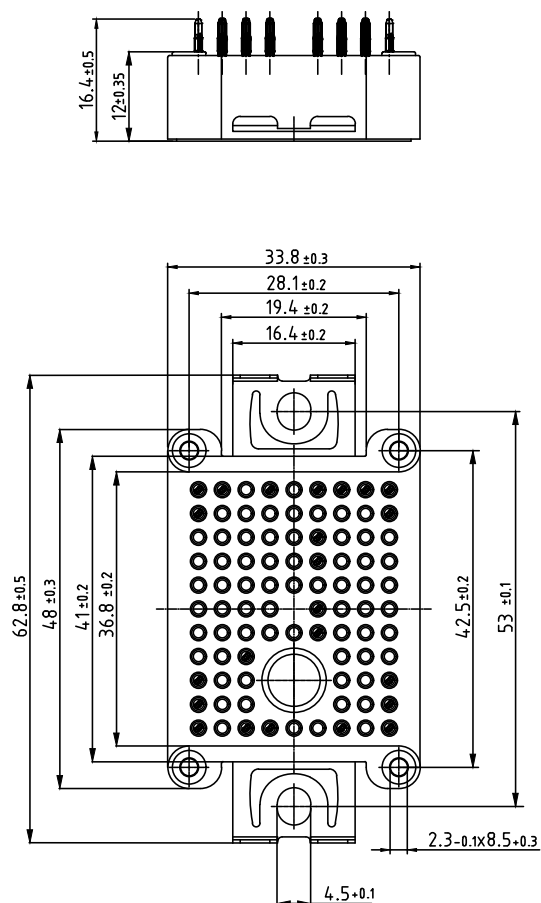


接线图 / Circuit diagram

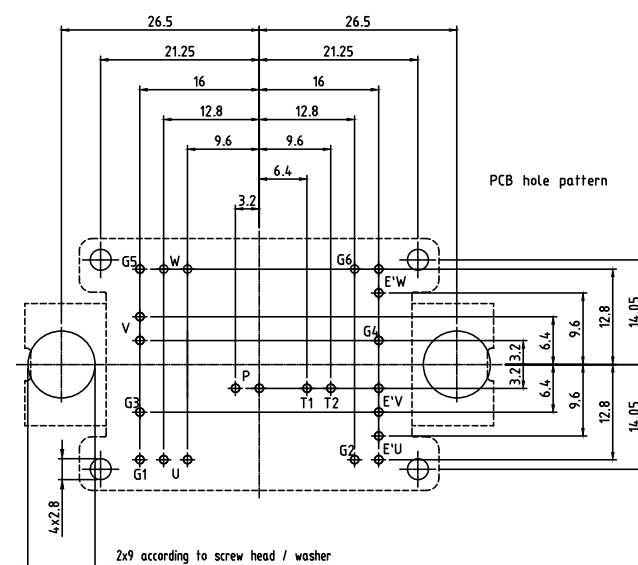
初步数据
Preliminary Data



封装尺寸 / Package outlines



- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern ± 0.1
- Hole specification for contacts see AN 2009-01
- Diameters of drill $\phi 1.15$ mm and copper thickness in hole 25-50 μ m



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Edition 2019-10-30

Published by
Infineon Technologies AG
81726 München, Germany

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