技术信息 / Technical Information

IGBT-模块
IGBT-modules

FF450R12ME3

EconoDUAL™ Modul mit Trench/Feldstop IGBT3 und High Efficiency Diode
EconoDUAL™ module with trench/fieldstop IGBT3 and Emitter Controlled High Efficiency diode

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°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_C = 80°C, $T_{vj\,max}$ = 150°C T_C = 25°C, $T_{vj\,max}$ = 150°C	$I_{C\,nom}$ I_C	450 600	A A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	900	A
总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 150	P_{tot}	2100	W
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 = 450 A, V_{GE} = 15 V I_C = 450 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C	$V_{CE\,sat}$		1,70 2,00	2,15	V V
栅极阈值电压 Gate threshold voltage	I_C = 18,0 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,0	5,8	6,5	V
栅极电荷 Gate charge	V_{GE} = -15 V ... +15 V		Q_G		4,30		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,7		Ω
输入电容 Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		32,0		nF
反向传输电容 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		1,50		nF
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			5,0	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			400	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	I_C = 450 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\,on}$		0,25 0,30		µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 450 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_r		0,09 0,10		µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 450 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\,off}$		0,55 0,65		µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 450 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_f		0,13 0,16		µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 450 A, V_{CE} = 600 V, L_S = 80 nH V_{GE} = ±15 V, di/dt = 7800 A/µs R_{Gon} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{on}		22,0 33,0		mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 450 A, V_{CE} = 600 V, L_S = 80 nH V_{GE} = ±15 V, du/dt = 3600 V/µs R_{Goff} = 1,6 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{off}		43,0 65,0		mJ mJ
短路数据 SC data	V_{GE} ≤ 15 V, V_{CC} = 900 V V_{CEmax} = V_{CES} $-L_{sCE}$ ·di/dt	t_P ≤ 10 µs, T_{vj} = 125°C	I_{SC}		1800		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			0,06	K/W
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,03		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		125	°C

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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°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	450	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	900	A
I2t-值 I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I^2t	35000	A²s

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	I_F = 450 A, V_{GE} = 0 V I_F = 450 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C	V_F		1,65 1,65	2,15	V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 450 A, - di_F/dt = 7800 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	I_{RM}		315 405		A A
恢复电荷 Recovered charge	I_F = 450 A, - di_F/dt = 7800 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	Q_r		45,0 85,0		µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 450 A, - di_F/dt = 7800 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	E_{rec}		21,0 39,0		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			0,10	K/W
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,05		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		125	°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_C = 25°C	R_{25}		5,00		kΩ
R100 偏差 Deviation of R100	T_C = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
耗散功率 Power dissipation	T_C = 25°C	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25}$ exp $[B_{25/50}(1/T_2 - 1/(298,15\ K))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25}$ exp $[B_{25/80}(1/T_2 - 1/(298,15\ K))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25}$ exp $[B_{25/100}(1/T_2 - 1/(298,15\ K))]$	$B_{25/100}$		3433		K

根据应用手册标定
Specification according to the valid application note.

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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
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	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal			14,5 13,0		mm
电气间隙 Clearance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal			12,5 10,0		mm
相对电痕指数 Comperative tracking index		CTI		> 225		
			min.	typ.	max.	
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个模块 / per module λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,009		K/W
杂散电感,模块 Stray inductance module		L_{sCE}		20		nH
模块引线电阻,端子-芯片 Module lead resistance, terminals - chip	T_C = 25°C, 每个开关 / per switch	$R_{CC'+EE'}$		1,10		mΩ
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的安装扭距 Mounting torque for modul mounting	螺丝 M5 根据相应的应用手册进行安装 Screw M5 - Mounting according to valid application note	M	3,00	-	6,00	Nm
端子联接扭距 Terminal connection torque	螺丝 M6 根据相应的应用手册进行安装 Screw M6 - Mounting according to valid application note	M	3,0	-	6,0	Nm
重量 Weight		G		345		g

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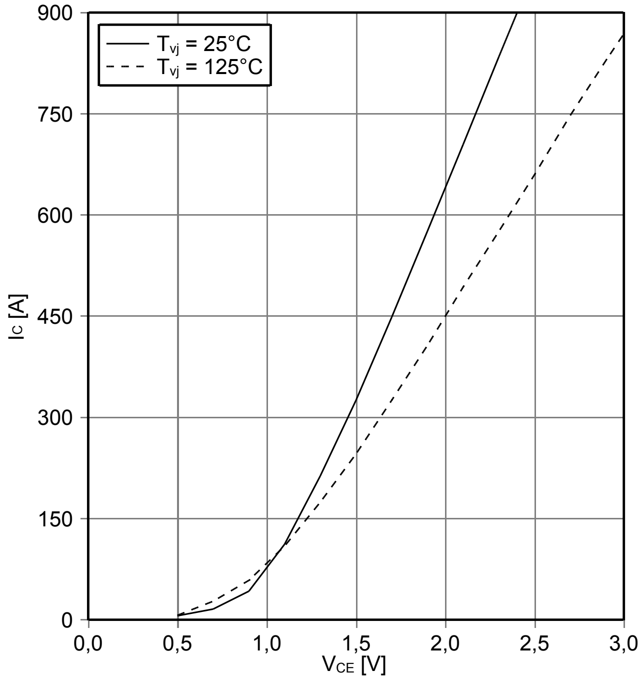
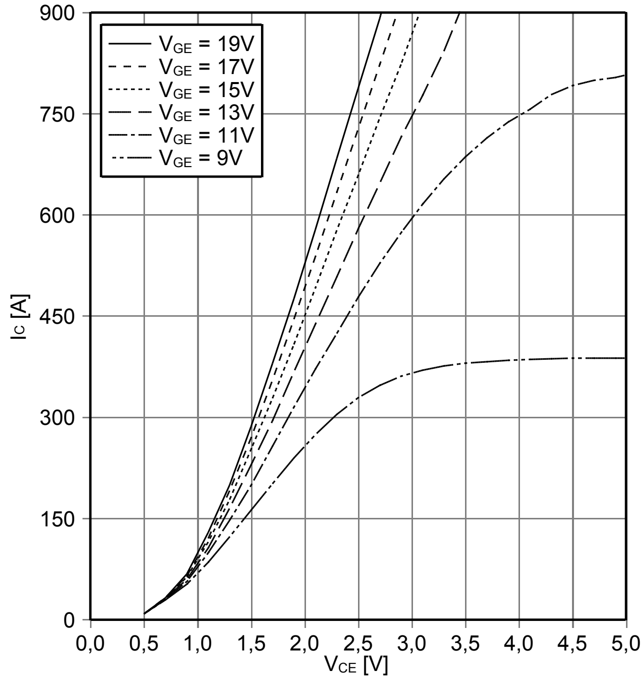
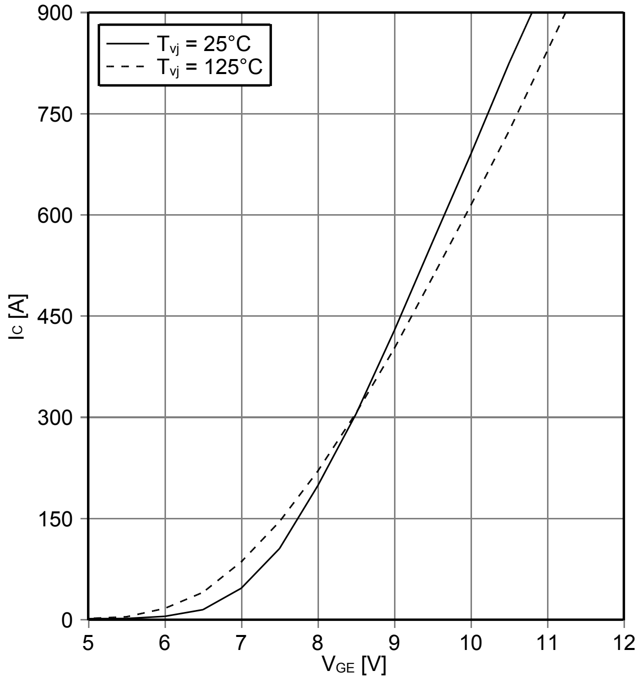
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$V_{GE} = 15$ V



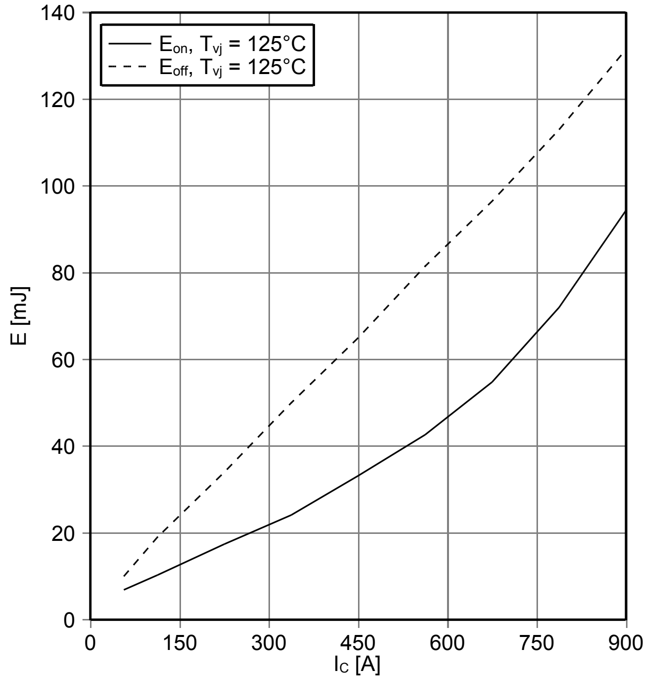
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$T_{vj} = 125°C$



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



开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$V_{GE} = ±15$ V, $R_{Gon} = 1.6$ Ω, $R_{Goff} = 1.6$ Ω, $V_{CE} = 600$ V



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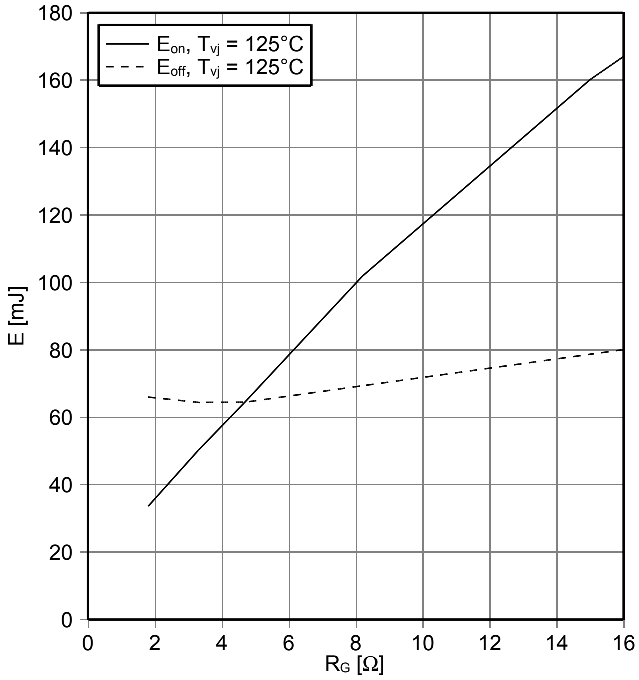
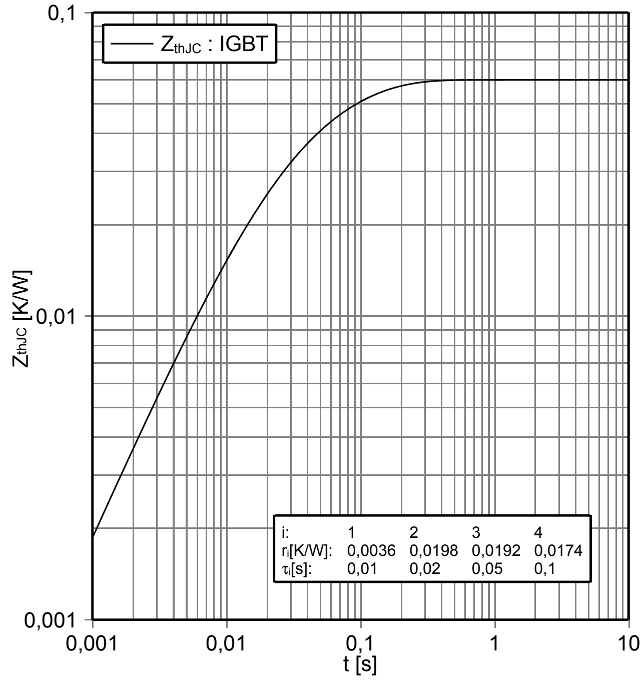
初步数据
Preliminary Data

开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm15$ V, $I_C = 450$ A, $V_{CE} = 600$ V

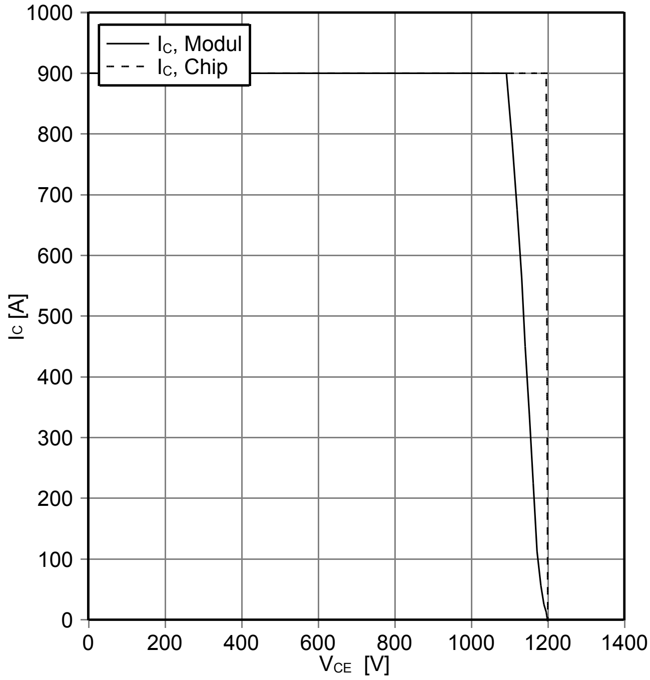


瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT,Inverter
$Z_{thJC} = f(t)$

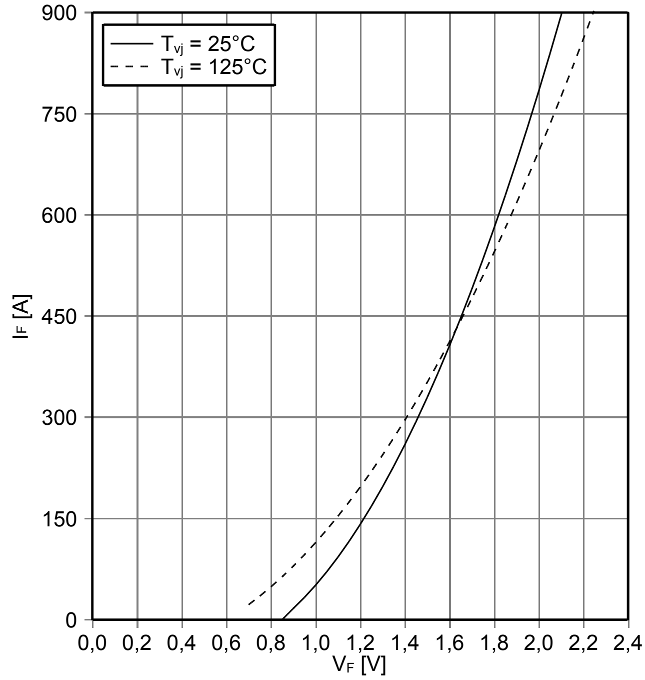


i:	1	2	3	4
r_i[K/W]:	0,0036	0,0198	0,0192	0,0174
τ_i[s]:	0,01	0,02	0,05	0,1

反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm15$ V, $R_{Goff} = 1.6\ \Omega$, $T_{vj} = 125°C$



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



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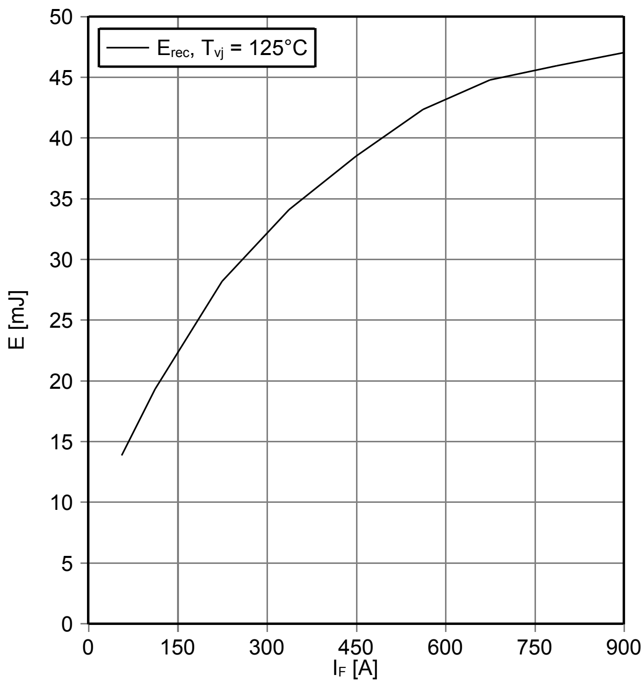
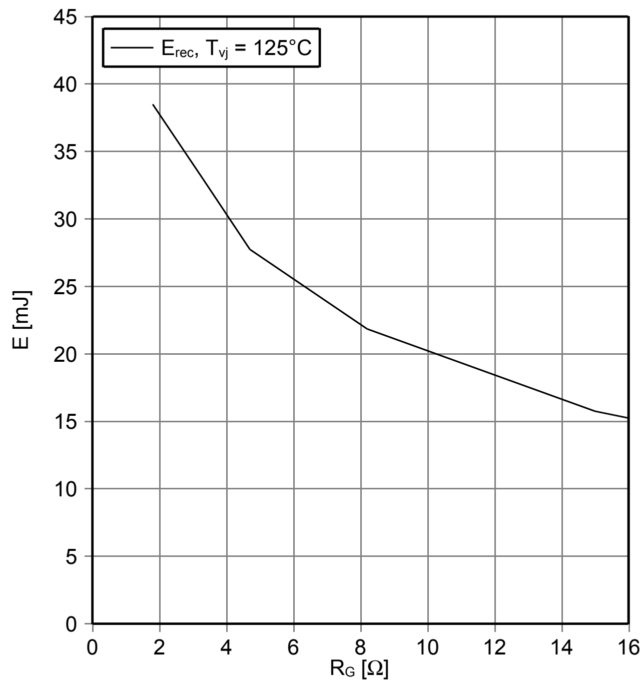
初步数据
Preliminary Data

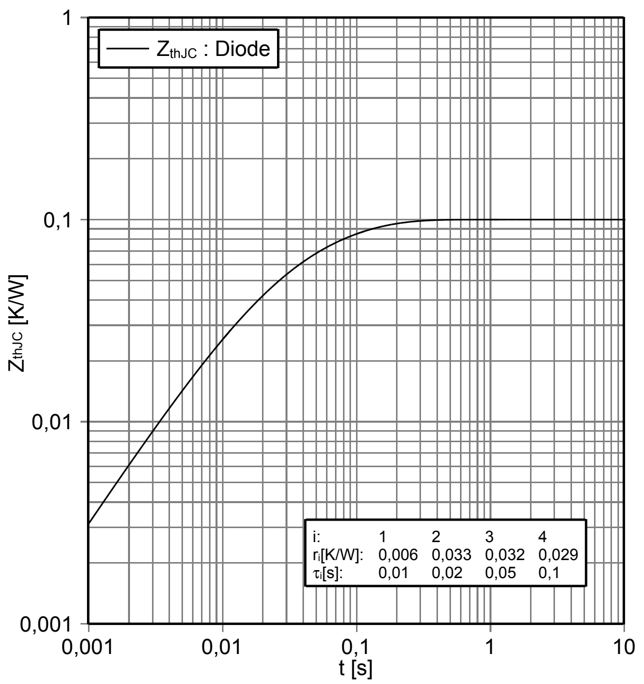
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 1.6\ \Omega$, $V_{CE} = 600$ V



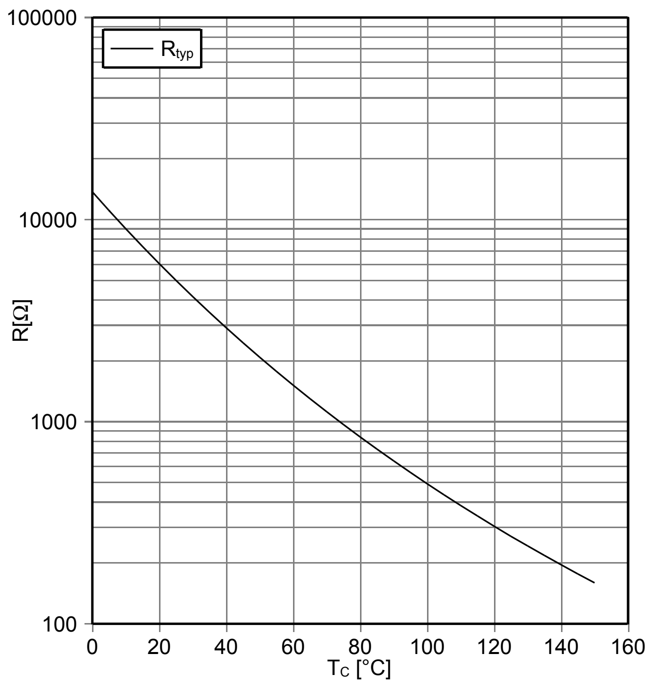
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 450$ A, $V_{CE} = 600$ V



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



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



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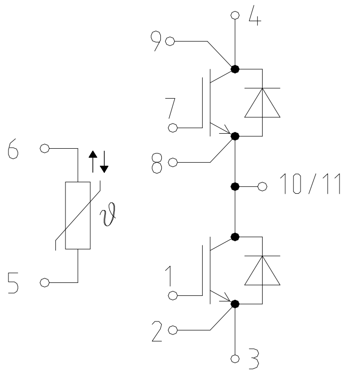
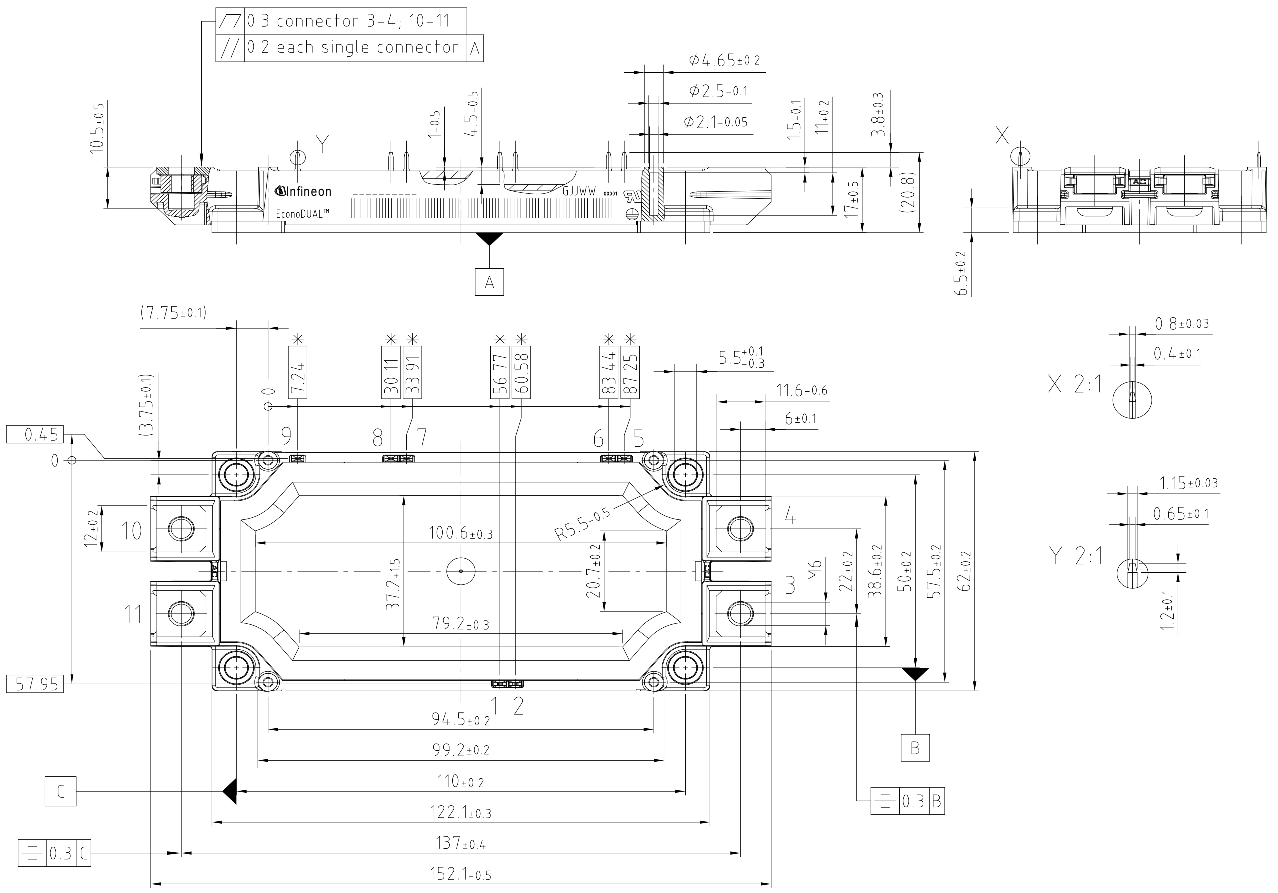
初步数据
Preliminary Data

接线图 / circuit_diagram_headline



封装尺寸 / package outlines



∗ = all dimensions with a tolerance of ⌖ Ø0.5

dimensions valid in mounted condition

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初步数据
Preliminary Data

使用条件和条款

使用条件和条款
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-得到质量协议的结论
- 建立联合的测试和出厂产品检查， 我们可以根据测试的实际情况供货
如果有必要，请根据实际需要将类似的说明给你的客户
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This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics. The information in the valid application- and assembly notes of the module must be considered.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.infineon.com). For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

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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