

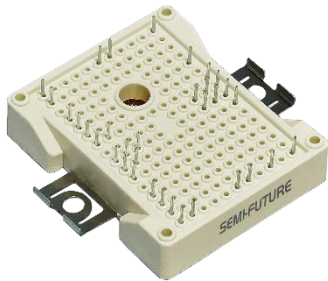
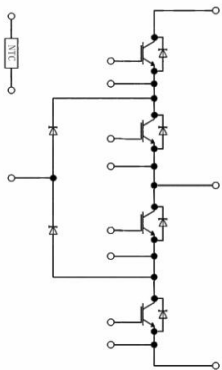
3-Level IGBT Module

电气特性:

- 650V 沟槽栅/场终止工艺
- 低开关损耗
- 正温度系数

典型应用:

- 三电平应用
- UPS
- 光伏应用



$V_{CES} = 650V$, $I_{C\ nom} = 150A$ / $I_{CRM} = 300A$

IGBT,逆变器/IGBT, Inverter

最大额定值/Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	$T_{vj}=25^{\circ}C$	V_{CES}	650	V
连续集电极直流电流 Continuous DC collector current	$T_C=100^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	150	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ ms$	I_{CRM}	300	A
栅极-发射极电压 Gate emitter voltage		V_{GE}	± 20	V

特征值/Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	$V_{GE}=15V$, $I_C=150A$ $T_{vj}=25^{\circ}C$ $V_{GE}=15V$, $I_C=150A$ $T_{vj}=125^{\circ}C$ $V_{GE}=15V$, $I_C=150A$ $T_{vj}=150^{\circ}C$	V_{CESat}		1.57 1.82 1.86	1.95	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=2.4mA$, $V_{GE}=V_{CE}$ $T_{vj}=25^{\circ}C$	$V_{GE(th)}$	4.7	5.3	5.9	
栅极电荷 Gate charge	$V_{GE} = -15\ V \dots +15\ V$	Q_G		1.54		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}C$	R_{Gint}		None		Ω
输入电容 Input capacitance	$f=1\ MHz$, $V_{CE}=25\ V$, $V_{GE}=0\ V$ $T_{vj}=25^{\circ}C$	C_{ies}		16.47		nF

反向传输电容 Reverse transfer capacitance			C_{res}		0.27		nF
集电极-发射极截至电流 Collector-emitter cut-off current	$V_{CE}=650V$, $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	I_{CES}			1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0V$, $V_{GE}=20V$	$T_{vj}=25^{\circ}C$	I_{GES}			400	nA
开通延迟时间 Turn-on delay time	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{d\ on}$		12 12 14		ns
上升时间 Rise time	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_r		28 29 31		
关断延迟时间 Turn-off delay time	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{d\ off}$		167 180 182		
下降时间 Fall time	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_f		54 59 63		
开通损耗能量 Turn-on energy loss per pulse	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{on}		0.66 0.83 0.91		mJ
关断损耗能量 Turn-off energy loss per pulse	$I_C=150A$, $V_{CE}=300V$ $V_{GE}=\pm 15V$, $R_G=3.3\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{off}		1.28 1.66 1.80		
结-外壳热阻 Thermal resistance, junction to case			R_{thJC}		0.206		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	$^{\circ}C$

二极管，逆变器/Diode, Inverter

最大额定值/Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$	V_{RRM}	650	V
连续正向直流电流 Continuous DC forward current		I_F	150	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1ms$	I_{FRM}	300	A
I2t-值 I²t-value	$V_R=0V$, $t_p=10ms$, $T_{vj}=125^{\circ}C$	I^2t	1200	A²s

特征值/Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=125^{\circ}\text{C}$ $I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=150^{\circ}\text{C}$	V_F		1.62 1.71 1.69	2.00	V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 150\text{ A}$, $T_{vj}=25^{\circ}\text{C}$ $-diF/dt=4281\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $VR = 300\text{ V}$, $V_{GE} = -15\text{ V}$ $T_{vj}=150^{\circ}\text{C}$	I_{RM}		83 102 112		A
恢复电荷 Recovered charge	$I_F = 150\text{ A}$, $T_{vj}=25^{\circ}\text{C}$ $-diF/dt=4281\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $VR = 300\text{ V}$, $V_{GE} = -15\text{ V}$ $T_{vj}=150^{\circ}\text{C}$	Q_r		3.05 5.32 6.17		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F = 150\text{ A}$, $T_{vj}=25^{\circ}\text{C}$ $-diF/dt=4281\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $VR = 300\text{ V}$, $V_{GE} = -15\text{ V}$ $T_{vj}=150^{\circ}\text{C}$	E_{rec}		0.69 1.28 1.49		mJ
结-外壳热阻 Thermal resistance, junction to case		R_{thJC}		0.303		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

二极管，D5-D6/Diode, D5-D6

最大额定值/Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$	V_{RRM}	650	V
连续正向直流电流 Continuous DC forward current		I_F	150	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	I_{FRM}	300	A
I²t 值 I²t-value	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_{vj}=125^{\circ}\text{C}$	I^2t	1200	A^2s

特征值/Characteristic Value

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=125^{\circ}\text{C}$ $I_F=150\text{A}$, $V_{GE}=0\text{V}$ $T_{vj}=150^{\circ}\text{C}$	V_F		1.65 1.76 1.73	2.00	V
反向电流 Reverse current	$I_F = 150\text{ A}$, $T_{vj} = 25^{\circ}\text{C}$ $- diF/dt=4281\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $VR = 300\text{ V}$ $T_{vj}=150^{\circ}\text{C}$	I_{RM}		83 102 112		A

恢复电荷 Recovered charge	IF = 150 A, - diF/dt=4281A/μs(Tvj=150°C) VR = 300 V	Tvj = 25°C Tvj=125°C Tvj=150°C	Qr		3.05 5.32 6.17		μC
反向恢复损耗（每脉冲） Reverse recovery energy	IF = 150 A, - diF/dt=4281A/μs(Tvj=150°C) VR = 300 V	Tvj = 25°C Tvj=125°C Tvj=150°C	Erec		0.69 1.28 1.49		mJ
结-外壳热阻 Thermal resistance, junction to case			RthJC		0.303		K/W
在开关状态下温度 Temperature under switching conditions			Tvj op	-40		150	°C

负温度系数热敏电阻/NTC-Thermistor

特征值/Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
额定电阻值 Rated resistances	Tc=25°C, ±5%	R25		5		kΩ
B-值 B-value	±1%	B25/50		3380		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, f=50Hz, t=60s	VISOL	2500			V
内部绝缘 Internal isolation			Al2O3			
储存温度 Storage temperature		Tstg	-40		125	°C
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
重量 Weight		W		41		g

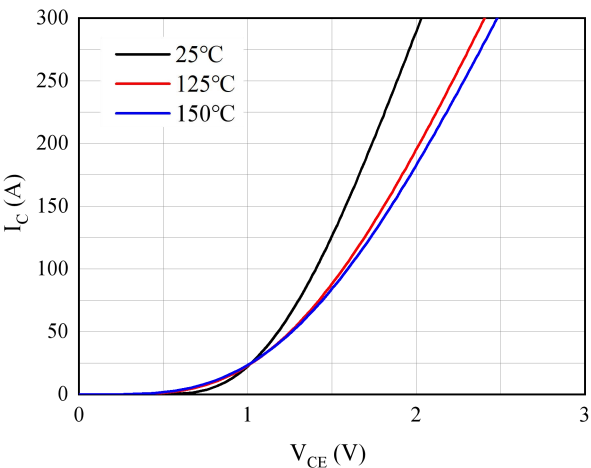


图 1. 典型输出特性 ($V_{GE}=15V$)
Figure 1. Typical output characteristics ($V_{GE}=15V$)

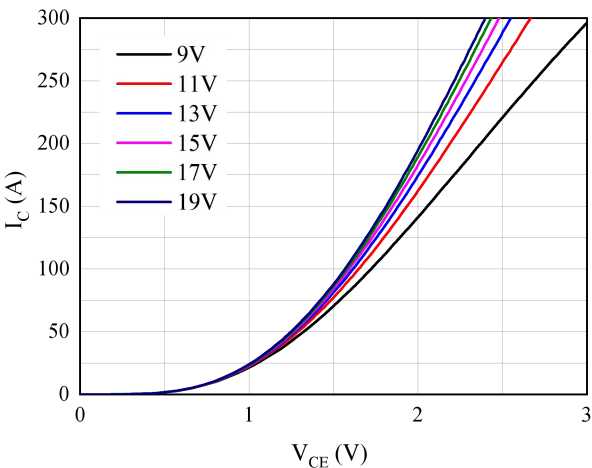


图 2. 典型输出特性 ($T_{vj}=150^{\circ}C$)
Figure 2. Typical output characteristics ($T_{vj}=150^{\circ}C$)

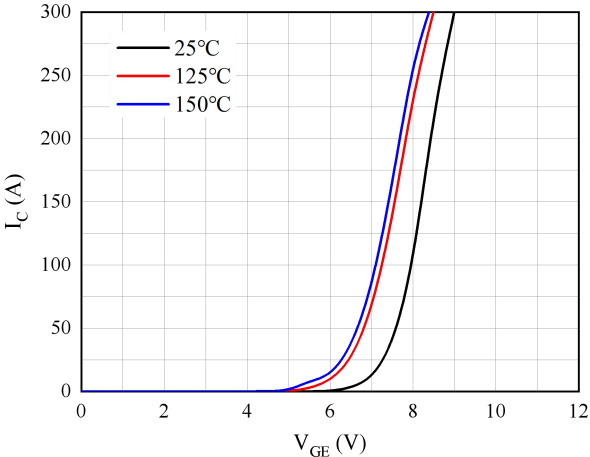


图 3. 典型传输特性($V_{CE}=20V$)
Figure 3. Typical transfer characteristic($V_{CE}=20V$)

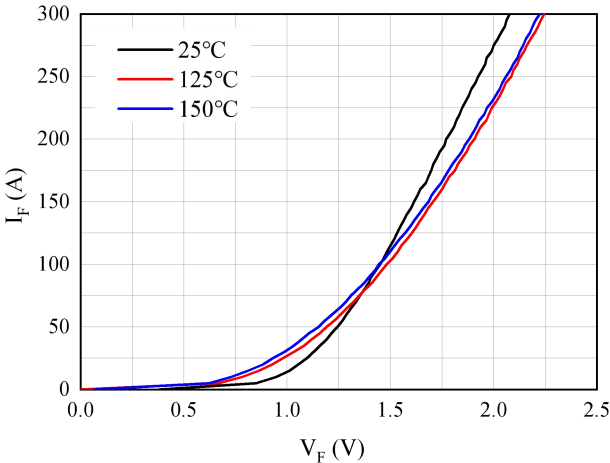


图 4. 正向偏压特性 二极管
Figure 4. Forward characteristic of Diode

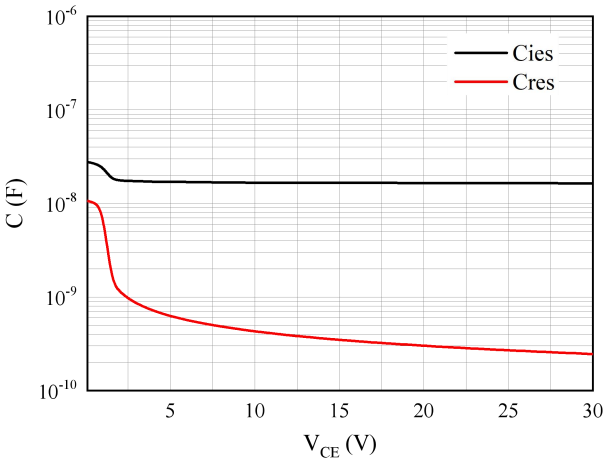


图 5. 电容特性
Figure 5. Capacitance characteristic

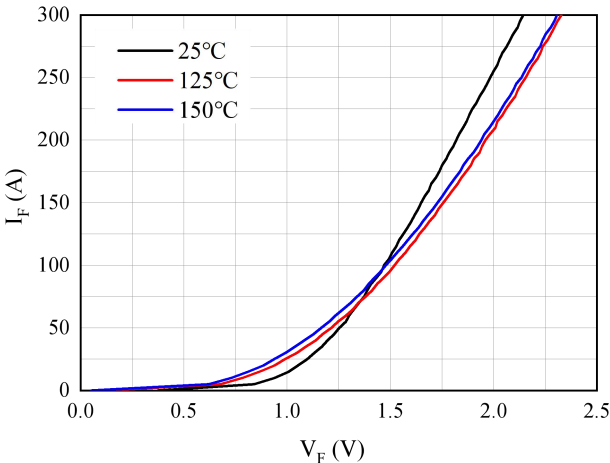


图 6. 正向偏压特性 二极管 D5-D6
Figure 6. Forward characteristic of Diode,D5-D6

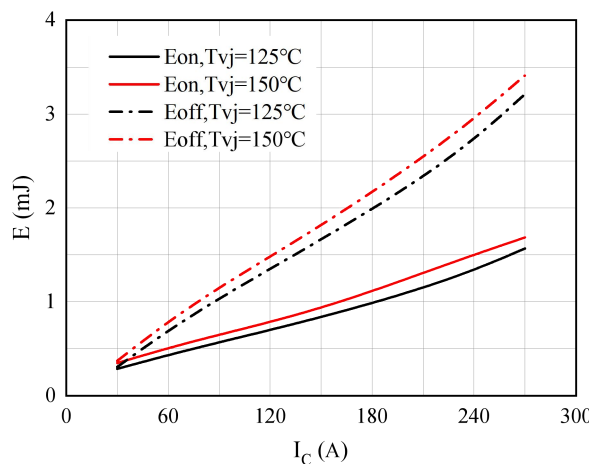


图 7. 开关损耗 逆变器

Figure 7. Switching losses of IGBT

VGE=±15V, RGon=3.3Ω, RGoff=3.3Ω, VCE=300V

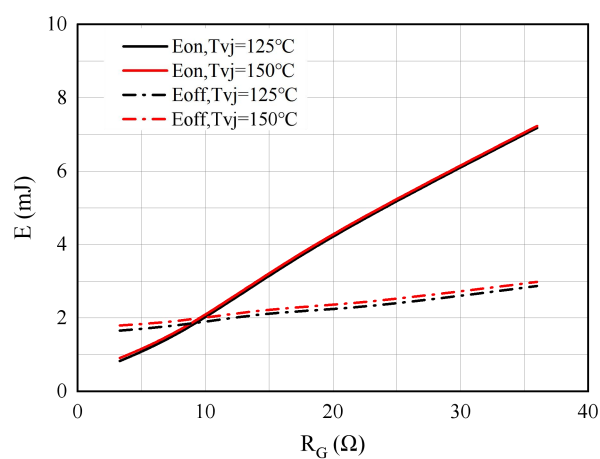


图 8. 开关损耗 逆变器

Figure 8. Switching losses of IGBT

VGE=±15V, IC=150A, VCE=300V

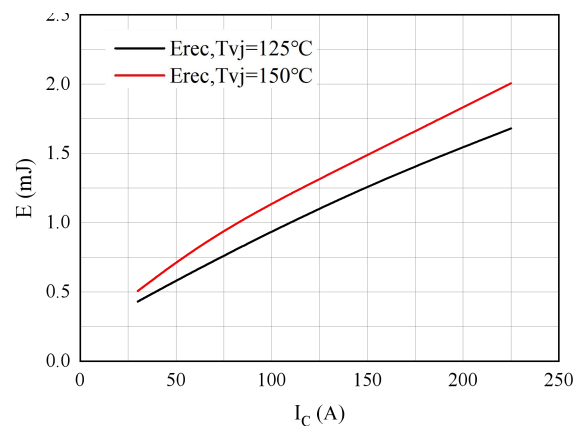


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode

RGon=3.3Ω, VCE=300V

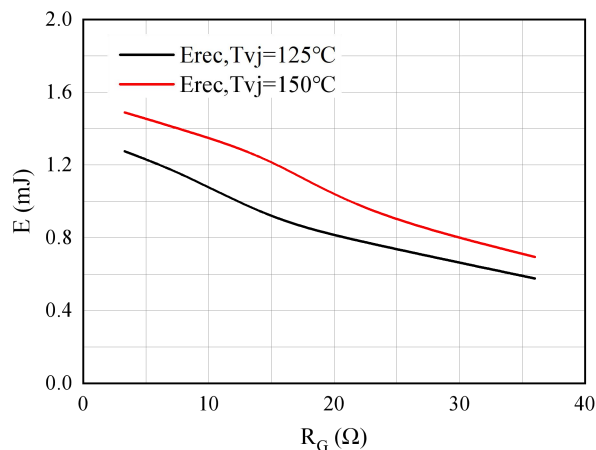


图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode

IF=150A, VCE=300V

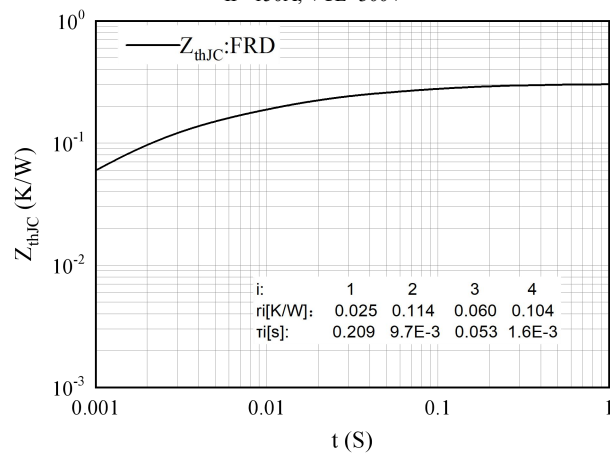
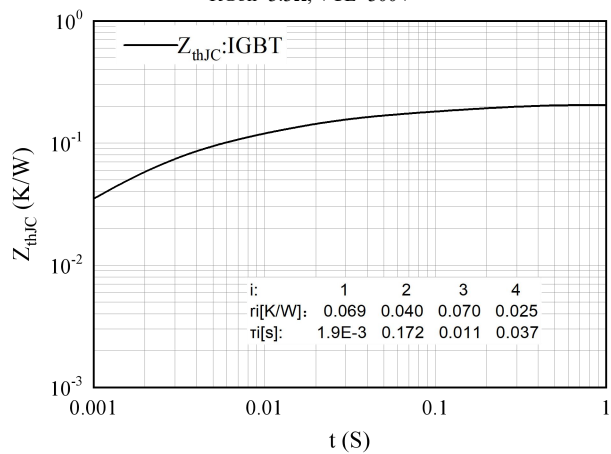


图 11. 瞬态热阻抗 IGBT

Figure 11. Transient thermal impedance IGBT

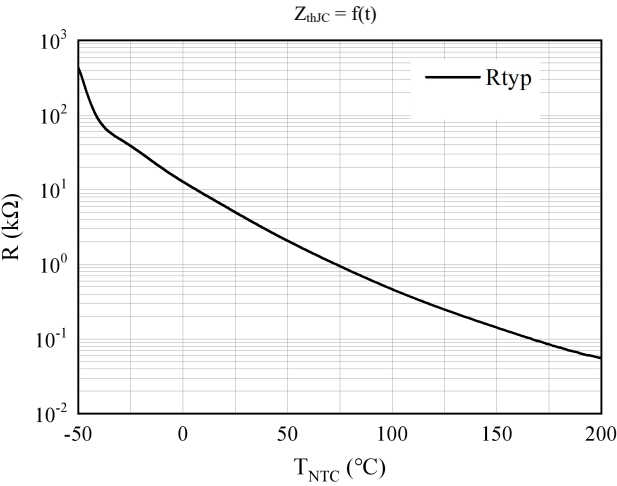


图 12. 瞬态热阻抗 二极管

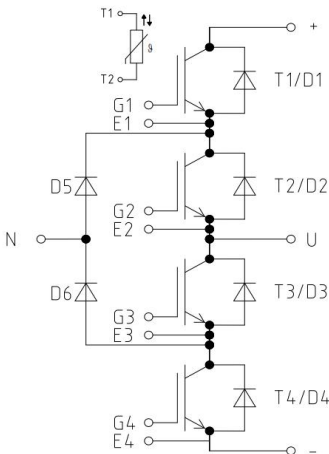
Figure 12. Transient thermal impedance Diode

$Z_{thJC} = f(t)$

图 13. 负温系数热敏电阻 温度特性

Figure 13. NTC-Themistor-temperature characteristic

Circuit diagram



Package outlines

