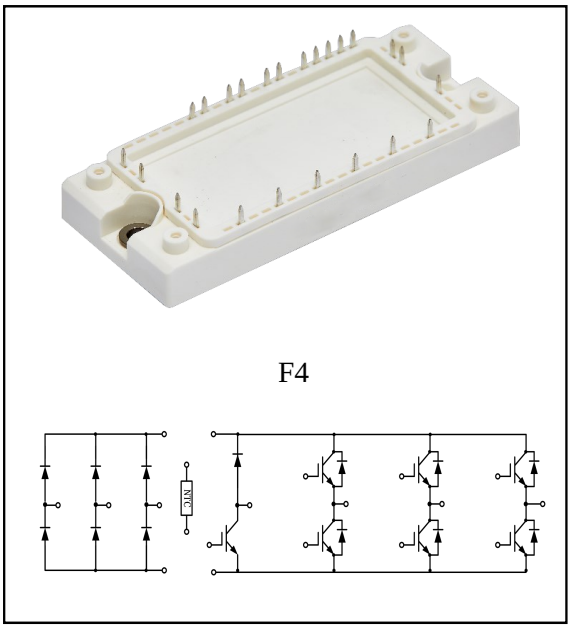
PIM IGBT Module

V_{CES} =1200V， $I_{C\,nom}$ =40A / I_{CRM} =80A



Electrical characteristics：

- 1200V Trench /Field Stop process
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications:

- Variable Frequency Drive
- Servo drive
- Inverter

IGBT, Inverter

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
Continuous DC collector current	T_C=100°C, $T_{vj\,max}$=175°C	$I_{C\,nom}$	40	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	80	A
Gate emitter voltage		V_{GE}	±20	V

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{GE}=15V, I_C=40A V_{GE}=15V, I_C=40A V_{GE}=15V, I_C=40A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		1.78 2.11 2.17	2.3	V
Gate-Emitter threshold voltage	I_C=1.5mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.3	5.8	6.4	
Internal gate resistor			R_{Gint}		None		Ω

Input capacitance	f=100KHz, V_{CE}=25 V, V_{GE}=0 V T_{vj}=25°C	C_{ies}		2.71		nF
Reverse transfer capacitance		C_{res}		0.13		
Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V T_{vj}=25°C	I_{CES}			1	mA
Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V T_{vj}=25°C	I_{GES}			100	nA
Turn-on delay time	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	$t_{d\,on}$		67 60 56		ns
Rise time	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	t_r		52 53 55		
Turn-off delay time	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	$t_{d\,off}$		326 370 379		
Fall time	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	t_f		127 219 258		
Turn-on energy loss per pulse	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, di/dt=550A/μs(Tvj=150°C), (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	E_{on}		4.39 6.28 6.89		mJ
Turn-off energy loss per pulse	I_C=40A, V_{CE}=600 V, V_{GE}=±15 V, R_G=30Ω, du/dt=4700V/μs(Tvj=150°C), (inductive load) T_{vj}=25°C / T_{vj}=125°C / T_{vj}=150°C	E_{off}		2.00 3.01 3.30		
SC data	V_{GE}≤15V, Vcc=650V, V_{CEmax}=V_{CES}-L_{sCE}·di/dt t_P≤10us, T_{vj}=150°C	I_{SC}		190		A
Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

Diode, Inverter

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	40	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	80	A
I^2t-value	t_p=10ms，sin180° ， T_j=125°C	I^2t	680	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Forward voltage	I_F=40A, V_{GE}=0V T_{vj}=25°C I_F=40A, V_{GE}=0V T_{vj}=125°C I_F=40A, V_{GE}=0V T_{vj}=150°C	V_F		2.11 1.77 1.70	2.55	V
Peak reverse recovery current	I_F=40A, T_{vj}=25°C $-di_F/dt$=550A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	I_{RM}		24 40 43		A
Recovered charge	I_F=40A, T_{vj}=25°C $-di_F/dt$=550A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	Q_r		0.97 6.37 7.70		μC
Reverse recovered energy	I_F=40A, T_{vj}=25°C $-di_F/dt$=550A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	E_{rec}		0.08 1.89 2.35		mJ
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

Diode，Rectifier

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C，I_{RRM}=0.05mA	V_{RRM}	1600	V
Non-Repetitive peak reverse voltage	T_{vj}=25°C，I_{RRM}=0.05mA	V_{RSM}	1800	V
Maximum Average Forward Current	Ts=80°C，T_{vj}=25°C	$I_{F(AV)}$	35	A
Surge forward current	t_p=10ms，sin180°，T_{vj}=125°C	I_{FSM}	530	A
I^2t-value	t_p=10ms，sin180°，T_{vj}=125°C	I^2t	1400	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Forward voltage	I_F=40A, T_{vj}=25°C	V_F		1.16	1.40	V
Reverse current	V_R=V_{RRM} T_{vj}=25°C	I_R			100	μA
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

IGBT, Brake-Chopper

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	25	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	50	A
Gate emitter voltage		V_{GE}	±20	V

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{GE}=15V, I_C=25A V_{GE}=15V, I_C=25A V_{GE}=15V, I_C=25A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		1.81 2.11 2.20	2.50	V
Gate-Emitter threshold voltage	I_C=1mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.2	5.8	6.4	
Internal gate resistor			R_{Gint}		None		Ω
Input capacitance	f=100KHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		1.46		nF
Reverse transfer capacitance			C_{res}		0.06		
Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V	T_{vj}=25°C	I_{CES}			1	mA
Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V	T_{vj}=25°C	I_{GES}			100	nA
Turn-on delay time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ on}$		72 60 58		ns
Rise time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		57 62 63		
Turn-off delay time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ off}$		283 324 335		
Fall time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω ((inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		171 238 250		
Turn-on energy loss per pulse	I_C=25A, V_{CE}=600 V V_{GE}= ± 15V,R_G=40 Ω di/dt=370A/μs(Tvj=150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		2.66 3.55 3.89		mJ

Turn-off energy loss per pulse	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω du/dt=4800V/µs(Tvj=150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		1.37 1.87 2.02		
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

Diode, Brake-Chopper

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	15	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	30	A
I^2t-value	V_R=0V, t_p=10ms, T_{vj}=125 °C	I^2t	50	A^2s

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=15A, V_{GE}=0V I_F=15A, V_{GE}=0V I_F=15A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		2.05 1.67 1.60	2.70	V
Peak reverse recovery current	I_F=15A, -di_F/dt=370A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		4 10 13		A
Recovered charge	I_F=15A, -di_F/dt=370A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		0.26 1.02 1.31		µC
Reverse recovered energy	I_F=15A, -di_F/dt=370A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		0.05 0.25 0.35		mJ
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

NTC-Thermistor

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Rated resistances	T_c=25°C， ±5%	R_{25}		5.0		KΩ
B-value	±1%	$B_{25/50}$		3380		K

Module

Parameter	Conditions	Symbol	Value			Unit
Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}	2500			V
Internal isolation			Al_2O_3			
Storage temperature		T_{stg}	-40		125	°C
Mounting torque for modul mounting		M	3.0		6.0	Nm
Weight		W		170		g

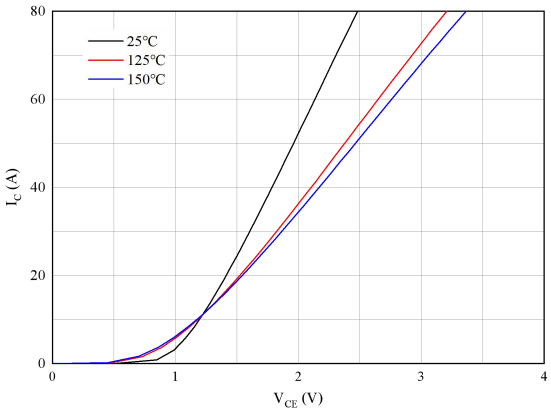


Fig 1. Typical output characteristics (V_{GE}=15V)

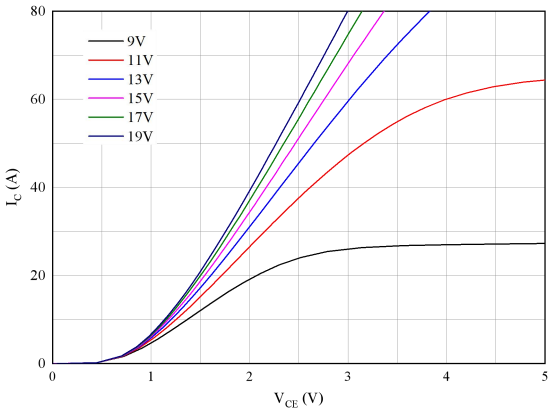


Fig 2 . Typical output characteristics (T_{vj}=150℃)

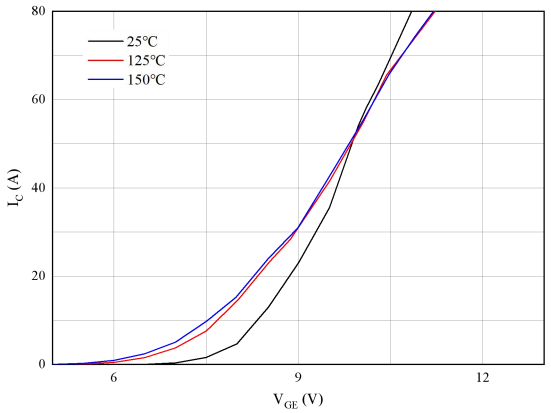


Fig 3. Typical transfer characteristic(V_{CE}=20V)

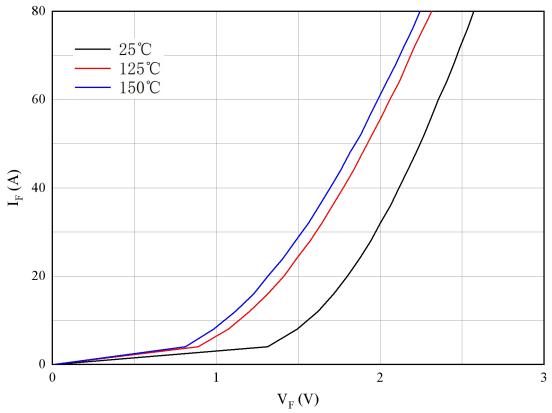


Fig 4. Forward characteristic of Diode

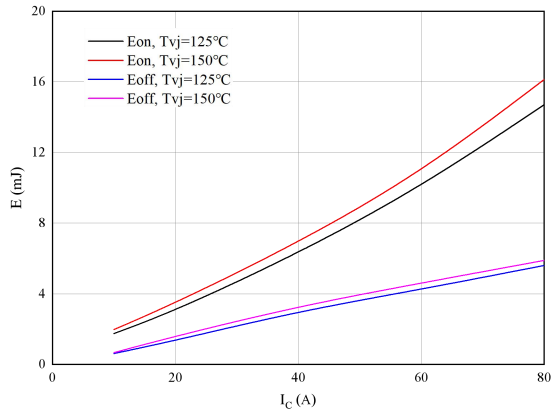


Fig 5 . Switching losses of IGBT
VGE=±15V, Rgon=30Ω, Rgoff=30Ω, VCE=600V

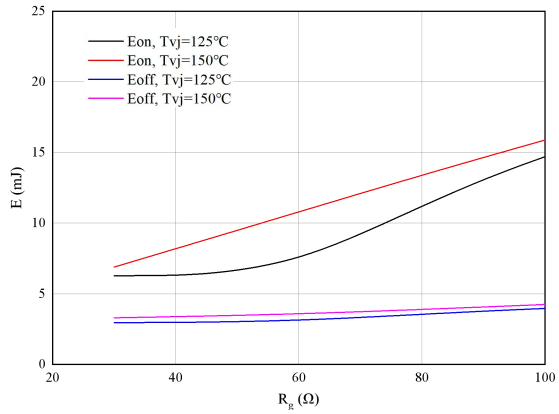


Fig 6. Switching losses of IGBT
VGE=±15V, IC=40A, VCE=600V

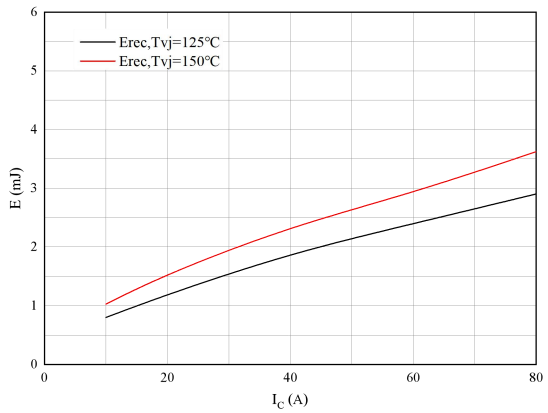


Fig 7 . Switching losses of Diode

Rgon=30Ω , VCE=600V

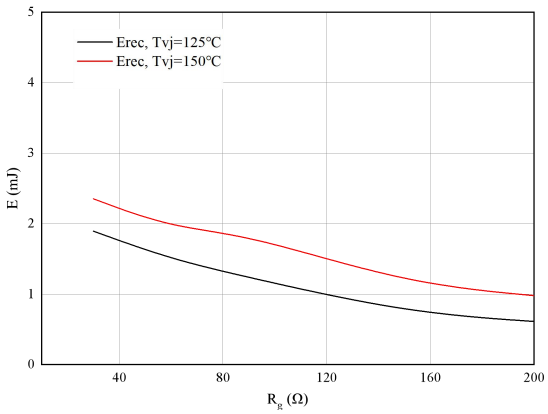


Fig 8. Switching losses of Diode

IF=40A, VCE=600V

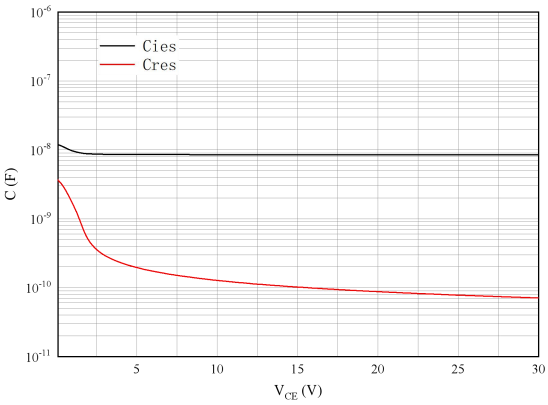


Fig 9. Capacitance characteristic

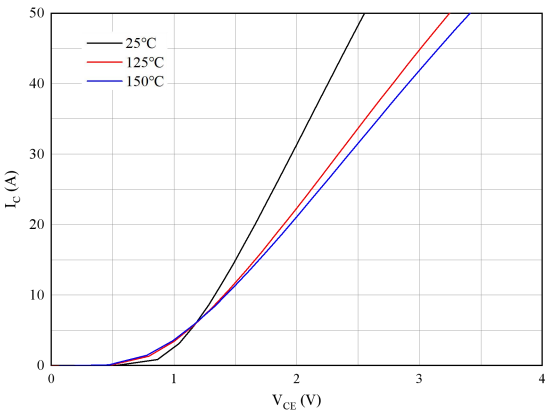


Fig 10. Typical output characteristics (V_{GE}=15V)

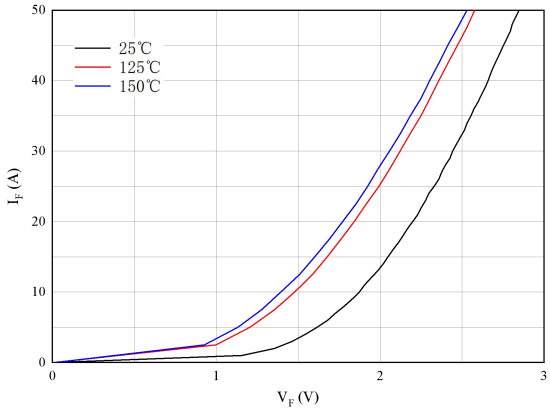


Fig11.Forward characteristic of Diode

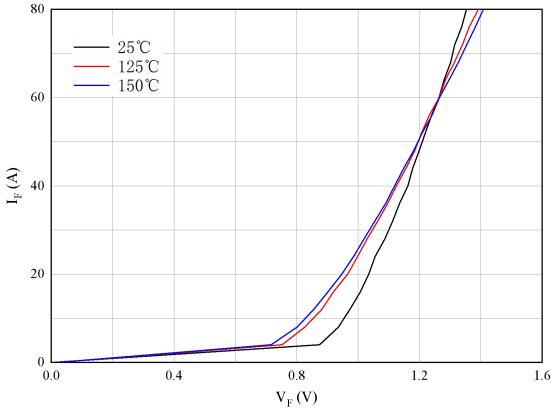


Fig 12.Forward characteristic of Diode

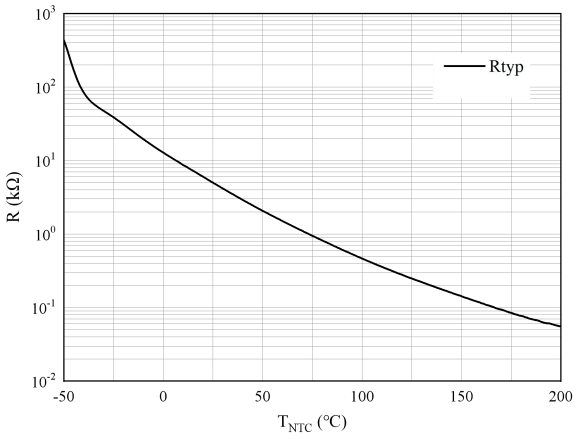
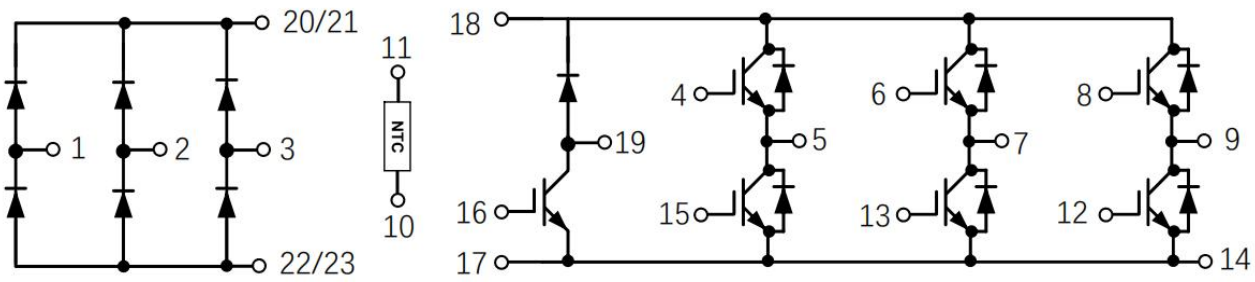


Fig 13.NTC-Themistor-temperature characteristic

Circuit diagram



Package outlines