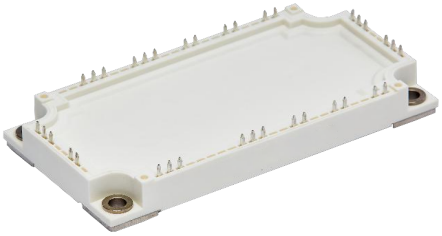
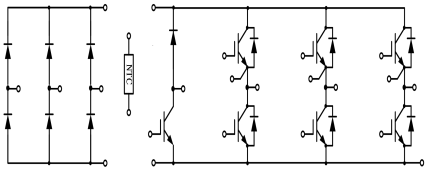
PIM IGBT Module

V_{CES} =1200V， $I_{C\,nom}$ =100A / I_{CRM} =200A



F3



Equivalent Circuit

Features：

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

Applications:

- Power Converters
- Servo Drives
- 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	$I_{C\,nom}$	100	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	200	A
Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 175°C	P_{tot}	515	W
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=100A V_{GE}=15V, I_C=100A V_{GE}=15V, I_C=100A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		1.92 2.34 2.44	2.50	V
Gate-Emitter threshold voltage	I_C=3.8mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.20	5.80	6.40	
Gate charge	V_{GE}=-15V…+15V		Q_G		0.47		µC
Internal gate resistor	T_{vj}=25°C		R_{Gint}		5.86		Ω
Input capacitance	f=1MHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		7.47		nF
Reverse transfer capacitance			C_{res}		0.28		
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=100A, V_{CE}=600 V V_{GE}=±15 V, R_G=2Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,on}$		104 113 118		ns
Rise time	I_C=100A, V_{CE}=600 V V_{GE}=±15 V, R_G=2Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		27 32 34		
Turn-off delay time	I_C=100A, V_{CE}=600 V V_{GE}=±15 V, R_G=2Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,off}$		203 251 259		
Fall time	I_C=100A, V_{CE}=600 V V_{GE}=±15 V, R_G=2Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		181 184 197		
Turn-on energy loss per pulse	I_C=100A, V_{CE}=600 V V_{GE}=±15 V, R_G=2Ω di/dt=2300 A/µs (Tvj =150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		3.04 6.17 7.22		mJ
Turn-off energy loss per pulse	I_C=100A, V_{CE}=600 V V_{GE}=±15V,R_G=2Ω, du/dt=5000V/µs (Tvj =150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		6.11 8.24 8.77		
SC data	V_{GE}≤15V, Vcc=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt	t_P≤10us, T_{vj}=150°C	I_{SC}		329		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	100	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	200	A
I^2t-value	t_p=10ms，sin180°，T_j=125°C	I^2t	1360	A^2s

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=100A, V_{GE}=0V	T_{vj}=25°C	V_F		2.20	2.80	V
	I_F=100A, V_{GE}=0V	T_{vj}=125°C			2.15		
	I_F=100A, V_{GE}=0V	T_{vj}=150°C			2.07		
Peak reverse recovery current	I_F=100A,	T_{vj}=25°C	I_{RM}		109		A
	-di$_F$/dt=2300A/μs(T_{vj}=150°C)	T_{vj}=125°C			121		
	V_R=600V, V_{GE}=-15V	T_{vj}=150°C			124		
Recovered charge	I_F=100A,	T_{vj}=25°C	Q_r		6.04		μC
	-di$_F$/dt=2300A/μs(T_{vj}=150°C)	T_{vj}=125°C			12.58		
	V_R=600V, V_{GE}=-15V	T_{vj}=150°C			15.34		
Reverse recovered energy	I_F=100A,	T_{vj}=25°C	E_{rec}		2.09		mJ
	-di$_F$/dt=2300A/μs(T_{vj}=150°C)	T_{vj}=125°C			4.72		
	V_R=600V, V_{GE}=-15V	T_{vj}=150°C			5.79		
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}=5μA	V_{RRM}	1800	V
Non-Repetitive peak reverse voltage	T_{vj}=25°C，I_{RRM}=5μA	V_{RSM}	2000	V
Maximum Average Forward Current		$I_{F(AV)}$	80	A
Surge forward current	t_p=10ms，sin180°，T_j=25°C	I_{FSM}	960	A
I^2t-value	t_p=10ms，sin180°，T_j=25°C	I^2t	4600	A^2s

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=80A, T_j=25°C		V_F		1.10	1.20	V
Reverse current	V_R=V_{RRM}	T_{vj}=25°C	I_R			10	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 curren	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	50	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	100	A
Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	270	W
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=50A V_{GE}=15V, I_C=50A V_{GE}=15V, I_C=50A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		2.10 2.53 2.61	2.90	V
Gate-Emitter threshold voltage	I_C=1.6mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.20	5.80	6.40	
Gate charge	V_{GE}=-15V…+15V		Q_G		0.24		μC
Internal gate resistor	T_{vj}=25°C		R_{Gint}		2.78		Ω
Input capacitance	f=1MHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		2.96		nF
Reverse transfer capacitance			C_{res}		0.11		
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=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,on}$		56 60 61		ns
Rise time	I_C=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		36 43 45		
Turn-off delay time	I_C=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,off}$		189 235 245		
Fall time	I_C=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		184 221 244		
Turn-on energy loss per pulse	I_C=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω di/dt=800 A/μs (Tvj =150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		3.50 5.83 6.59		mJ
Turn-off energy loss per pulse	I_C=50A, V_{CE}=600 V V_{GE}=±15 V, R_G=15Ω du/dt=5600V/μs (Tvj =150°C) (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		2.93 4.05 4.42		
SC data	V_{GE}≤15V, Vcc=800V 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, 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	30	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	60	A
I^2t-value	t_p=10ms, sin180°， T_{vj}=125°C	I^2t	120	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Forward voltage	I_F=30A, V_{GE}=0V T_{vj}=25°C I_F=30A, V_{GE}=0V T_{vj}=125°C I_F=30A, V_{GE}=0V T_{vj}=150°C	V_F		1.94 1.64 1.57	2.40	V
Peak reverse recovery current	I_F=30A, T_{vj}=25°C -di$_F$/dt=800A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	I_{RM}		20 29 31		A
Recovered charge	I_F=30A, T_{vj}=25°C -di$_F$/dt=800A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	Q_r		2.04 5.23 6.18		μC
Reverse recovered energy	I_F=30A, T_{vj}=25°C -di$_F$/dt=800A/μs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	E_{rec}		0.95 2.01 2.28		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	±2%	$B_{25/50}$		3375		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		300		g

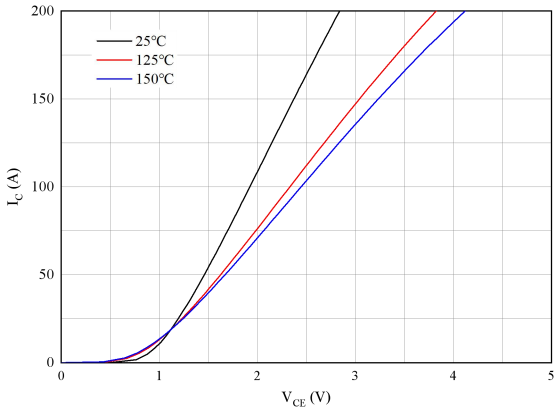


Fig 1. Typical output characteristics (V_{GE}=15V)

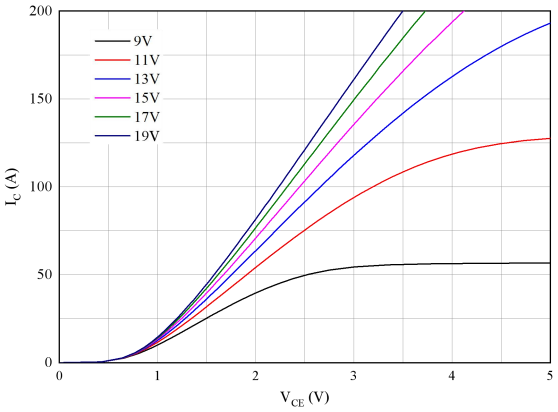


Fig 2. Typical output characteristics (T_{vj}=150℃)

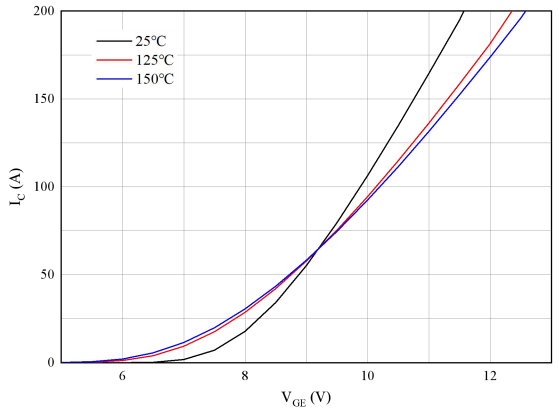


Fig 3. Typical transfer characteristic(V_{CE}=20V)

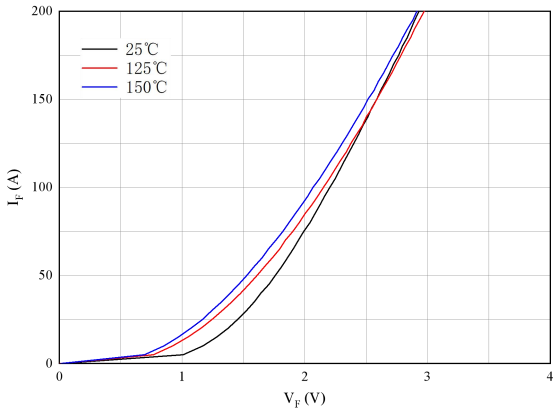


Fig 4. Forward characteristic of Diode

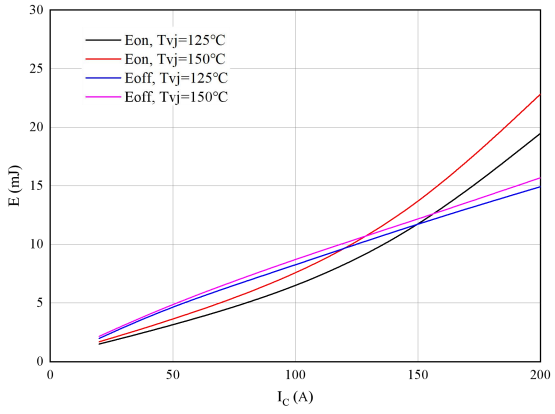


Fig 5. Switching losses of IGBT
V_{GE}=±15V, R_{Gon}=2Ω, R_{Goff}=2Ω, V_{CE}=600V

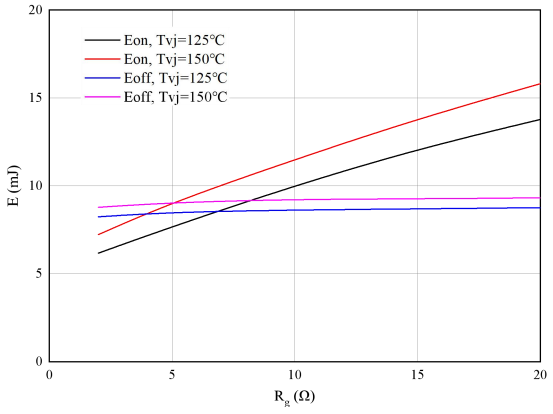


Fig 6. Switching losses of IGBT
V_{GE}=±15V, I_C=100A, V_{CE}=600V

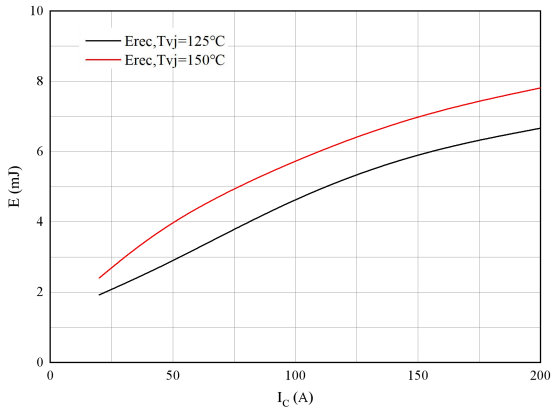


Fig 7. Switching losses of Diode
R_{Gon}=2 Ω , V_{CE}=600V

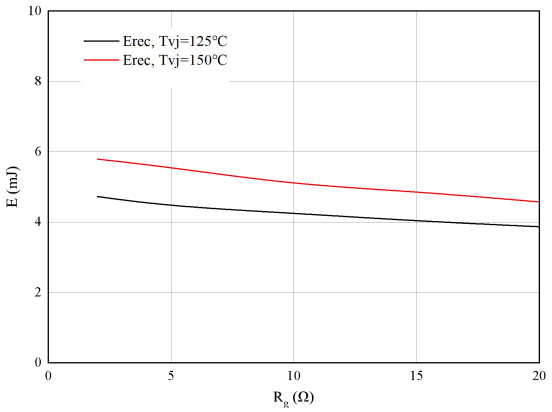


Fig 8. Switching losses of Diode
I_F=100A, V_{CE}=600V

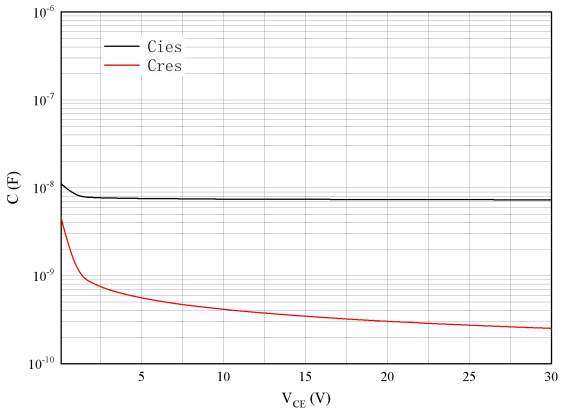


Fig 9. Capacitance characteristics

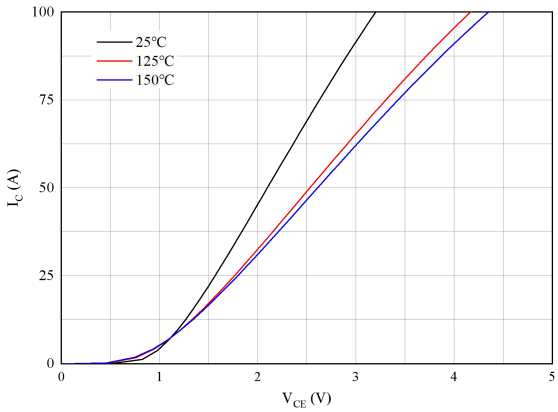


Fig 10. Typical output characteristics (V_{GE}=15V)

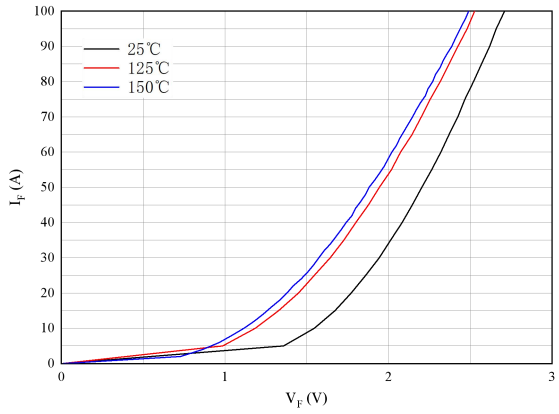


Fig 11. Forward characteristic of Diode

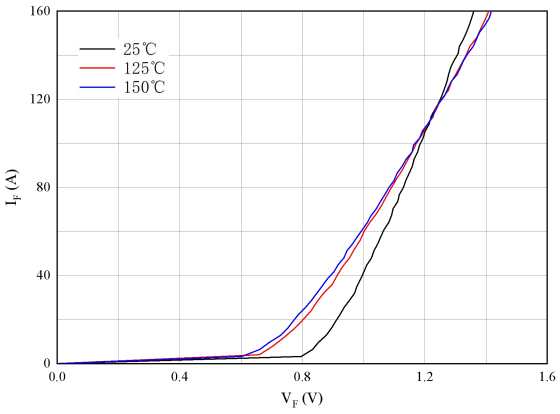


Fig 12.Forward characteristic of Diode

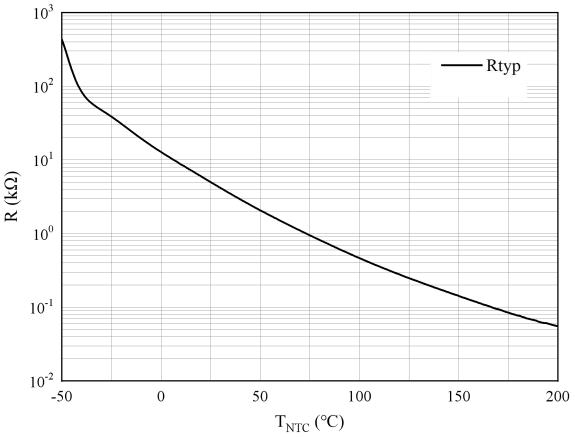
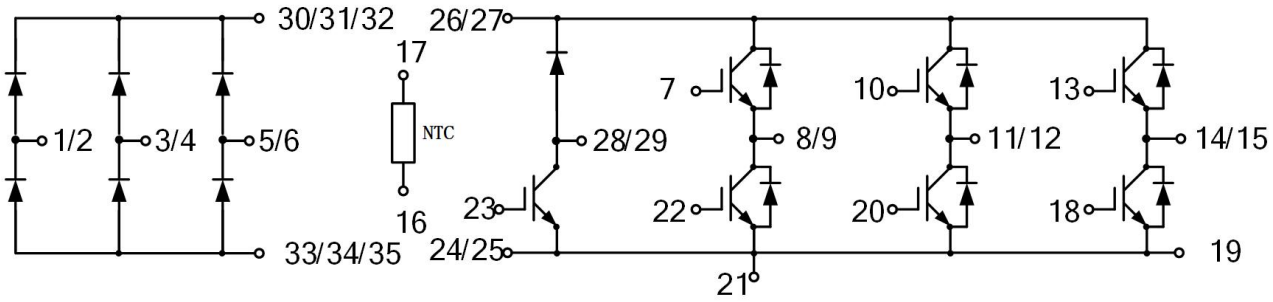


Fig 13. NTC-Themistor-temperature characteristic

Circuit diagram



Package outlines