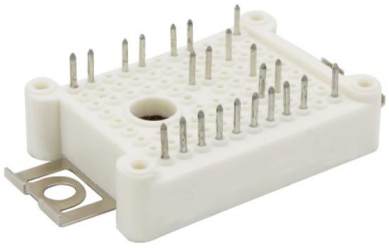
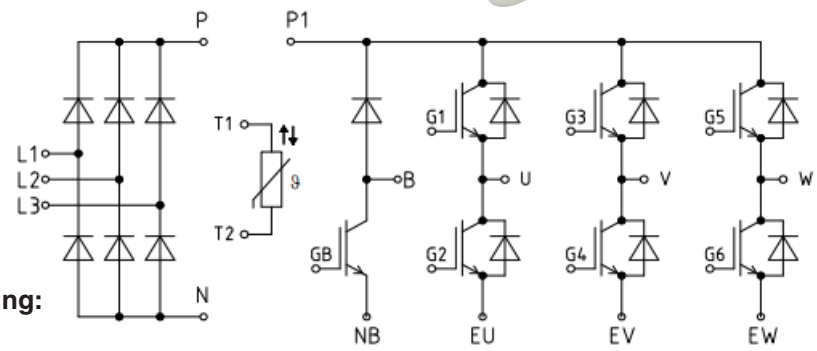
PIM - Modules in E1



Features

- 1200V 15A,VCE(sat)(typ.) = 1.90V@15A
- SPT (Soft Punch Through) technology
- Lower losses
- Higher system efficiency
- Excellent short-circuit capability
- Square RBSOA



Mechanical Data

- **Case:** E1 (plastic package). Lead free; RoHS compliant
- **Molding Compound Flammability Rating:** UL 94 V-0
- **Terminals:** High temperature soldering guaranteed: 260 °C/10 sec. at terminals

Applications

CREATEK's IGBTs offer lower losses and higher energy for application such as motor drive , inverter and other soft switching applications.

IGBT,Inverter Maximum Rated Values

Symbol	Parameter		Value	Unit
V_{CES}	Collector to Emitter Voltage		1200	V
V_{GES}	Continuous Gate to Emitter Voltage		±30	V
I_C	Continuous Collector Current	T_C = 25℃	30	A
		T_C = 100℃	15	
I_{CM}	Pulse Collector Current	T_J = 150℃	30	A
P_D	Maximum Power Dissipation (IGBT)	T_C = 25°C, T_J = 150℃	208	W
t_{sc}	Short Circuit Withstand Time		>10	μs
T_J	Maximum IGBT Junction Temperature		150	°C
T_{JOP}	Maximum Operating Junction Temperature Range		-40 to +150	°C
T_{stg}	Storage Temperature Range		-40 to +125	°C

Electrical Characteristics of IGBT at TJ = 25°C

Parameter		Test Conditions		Min	Typ	Max	Unit
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1mA		1200			V
I_{CES}	Collector to Emitter Leakage Current	V_{GE} = 0V,V_{CE} = V_{CES}				1	mA
I_{GES}	Gate to Emitter Leakage Current	V_{GE} = ±30V, V_{CE} = 0V				±200	nA
$V_{GE(th)}$	Gate Threshold Voltage	I_C = 1mA, V_{CE} = V_{GE}		4.5		5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Module Level)	I_C = 15A, V_{GE} = 15V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		2.20		

Switching Characteristics of IGBT

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V I_C = 15A R_G =10Ω V_{GE} = ±15V Inductive Load	T_J = 25℃		17		ns
t_r	Turn-on Rise Time		T_J = 25℃		26		ns
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		189		ns
t_f	Turn-off Fall Time		T_J = 25℃		251		ns
E_{on}	Turn-on Switching Loss		T_J = 25℃		1.08		mJ
E_{off}	Turn-off Switching Loss		T_J = 25℃		1.28		mJ
Q_g	Total Gate Charge	V_{CC}=960V V_{GE}=15V I_C=15A	T_J = 25℃		83		nC
R_{gint}	Integrated gate resistor	f = 1M; Vpp = 1V	T_J = 25℃		9.5		Ω
C_{ies}	Input Capacitance	V_{CE} = 25V V_{GE} = 0V f = 1MHz	T_J = 25℃		6.85		nF
C_{oes}	Output Capacitance		T_J = 25℃		1.10		
C_{res}	Reverse Transfer Capacitance		T_J = 25℃		0.55		
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (IGBT)					0.60	°C/W

Diode ,Inverter Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage		1200	V
I_F	Diode Continuous Forward Current	T_C = 25℃	30	A
	Diode Continuous Forward Current	T_C = 100℃	15	
I_{FM}	Diode Maximum Forward Current		60	A

Electrical and Switching Characteristics of Freewheeling Diode

V_F	Diode Forward Voltage	I_F = 15A , V_{GE} = 0V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		1.90		
t_{rr}	Diode Reverse Recovery Time	I_F = 15A, di/dt=500A/μs, V_{rr} = 600V,	T_J = 25℃		160		ns
I_{rr}	Diode Peak Reverse Recovery Current		T_J = 25℃		17		A
Q_{rr}	Diode Reverse Recovery Charge		T_J = 25℃		1.30		uC
E_{rr}	Diode Reverse Recovery Energy		T_J = 25℃		2.36		mJ
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Diode)					1.65	°C/W

Diode, Rectifier Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J = 25℃	1600	V
I_{FRMSM}	Maximum RMS forward current per chip	T_C =80℃	30	A
I_{RMSM}	Maximum RMS current at rectifier output	T_C =80℃	30	
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	300	A
		T_J =150℃	250	
I^2t	I^2t - value	T_J =25℃	430	A^2s
		T_J =150℃	290	

Electrical Characteristics of Diode

V_F	Diode Forward Voltage	I_F = 15A	T_J = 25℃		1.05		V
			T_J = 125℃		0.85		
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Diode)					1.10	°C/W

IGBT,Brake-Chopper Maximum Rated Values

V_{CES}	Collector to Emitter Voltage		1200	V
V_{GES}	Continuous Gate to Emitter Voltage		±30	V
I_C	Continuous Collector Current	T_C = 25℃	30	A
		T_C = 100℃	15	
I_{CM}	Pulse Collector Current	T_J = 150℃	30	A
P_D	Maximum Power Dissipation (IGBT)	T_C = 25°C, T_J = 150℃	208	W
t_{sc}	Short Circuit Withstand Time		> 10	μs
T_J	Maximum IGBT Junction Temperature		150	°C
T_{JOP}	Maximum Operating Junction Temperature Range		-40 to +150	°C
T_{stg}	Storage Temperature Range		-40 to +125	°C

Electrical Characteristics of IGBT at TJ = 25°C

Parameter		Test Conditions		Min	Typ	Max	Unit
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1mA		1200			V
I_{CES}	Collector to Emitter Leakage Current	V_{GE} = 0V,V_{CE} = V_{CES}				1	mA
I_{GES}	Gate to Emitter Leakage Current	V_{GE} = ±30V, V_{CE} = 0V				±200	nA
$V_{GE(th)}$	Gate Threshold Voltage	I_C = 1mA, V_{CE} = V_{GE}		4.5		5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Module Level)	I_C = 15A, V_{GE} = 15V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		2.20		

Switching Characteristics of IGBT

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V I_C = 15A R_G =10Ω V_{GE} = ±15V Inductive Load	T_J = 25℃		17		ns
t_r	Turn-on Rise Time		T_J = 25℃		26		ns
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		189		ns
t_f	Turn-off Fall Time		T_J = 25℃		251		ns
E_{on}	Turn-on Switching Loss		T_J = 25℃		1.08		mJ
E_{off}	Turn-off Switching Loss		T_J = 25℃		1.28		mJ
Q_g	Total Gate Charge	V_{CC} = 960V V_{GE}=15V I_C=15A	T_J = 25℃		83		nC
R_{gint}	Integrated gate resistor	f = 1M; Vpp = 1V	T_J = 25℃		9.5		Ω
C_{ies}	Input Capacitance	V_{CE} = 25V V_{GE} = 0V f = 1MHz	T_J = 25℃		6.85		nF
C_{oes}	Output Capacitance		T_J = 25℃		1.10		
C_{res}	Reverse Transfer Capacitance		T_J = 25℃		0.55		
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (IGBT)					0.60	°C/W

Diode ,Brake-Chopper Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage		1200	V
I_F	Diode Continuous Forward Current	T_C = 25℃	30	A
	Diode Continuous Forward Current	T_C = 100℃	15	
I_{FM}	Diode Maximum Forward Current		60	A

Electrical and Switching Characteristics of Freewheeling Diode

V_F	Diode Forward Voltage	I_F = 15A , V_{GE} = 0V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		1.90		
t_{rr}	Diode Reverse Recovery Time	I_F = 15A, di/dt=500A/μs, V_{rr} = 600V,	T_J = 25℃		160		ns
I_{rr}	Diode Peak Reverse Recovery Current		T_J = 25℃		17		A
Q_{rr}	Diode Reverse Recovery Charge		T_J = 25℃		1.30		uC
E_{rr}	Diode Reverse Recovery Energy		T_J = 25℃		2.36		mJ
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Diode)					1.65	°C/W

NTC – Thermistor Characteristic Values

R_{25}	T_C = 25℃	5		KΩ
△R/R	T_C = 100℃ ,R_{100}=493Ω		±5	%
P_{25}	T_C = 25℃	50		mW
$B_{25/50}$	$R_2 = R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K)]$	3375		K
$B_{25/80}$	$R_2 = R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K)]$	3410		K

Module Characteristics

Parameter		Min.	Typ.	Max.	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted),f = 50Hz, 1minute	2500			V
$R_{\theta CS}$	Case-To-Sink(Conductive Grease Applied)		0.1		°C/W
M	Mounting Screw: M4	1.5		2.0	N·m
G	Weight		24		g

Typical Characteristics

Fig 1. output characteristic IGBT(Inverter),
$I_C=f(V_{CE})$,VGE=15V

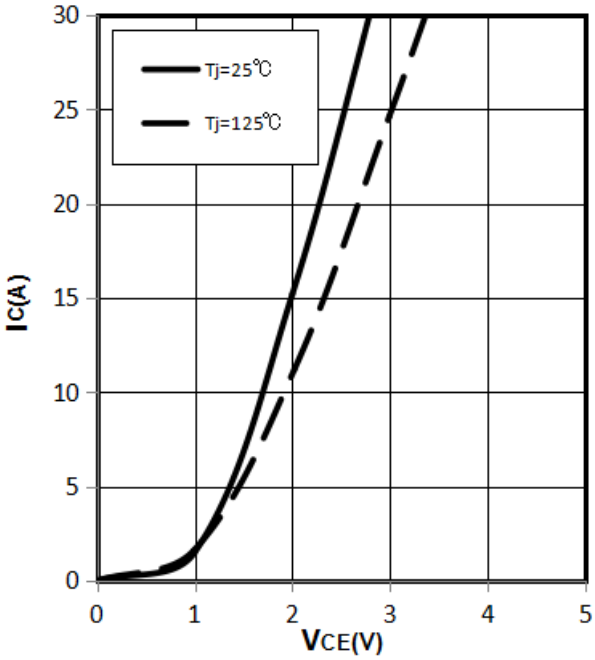


Fig 2. output characteristic IGBT(Inverter),
$I_C=f(V_{CE})$,T_j=125℃

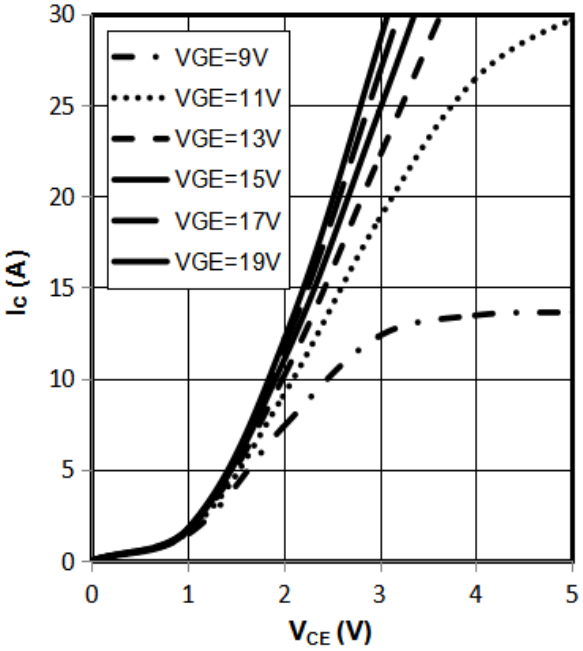


Fig 3. transfer characteristic IGBT(Inverter),
$I_C=f(V_{GE})$,V_{CE}=20V

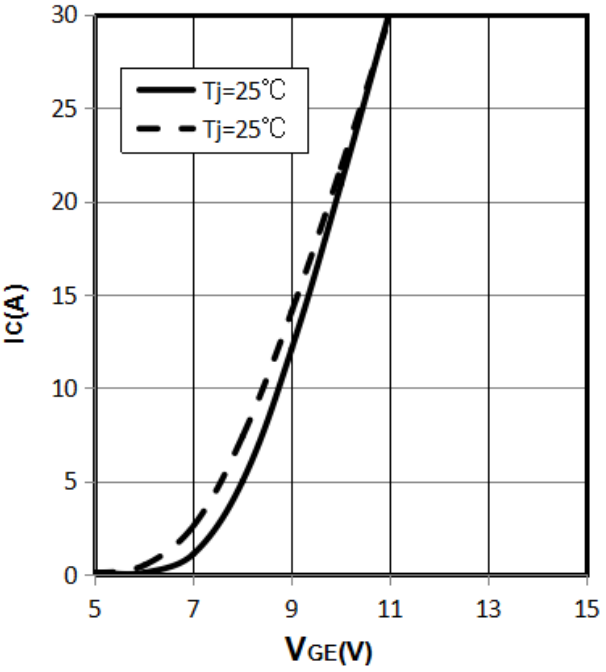
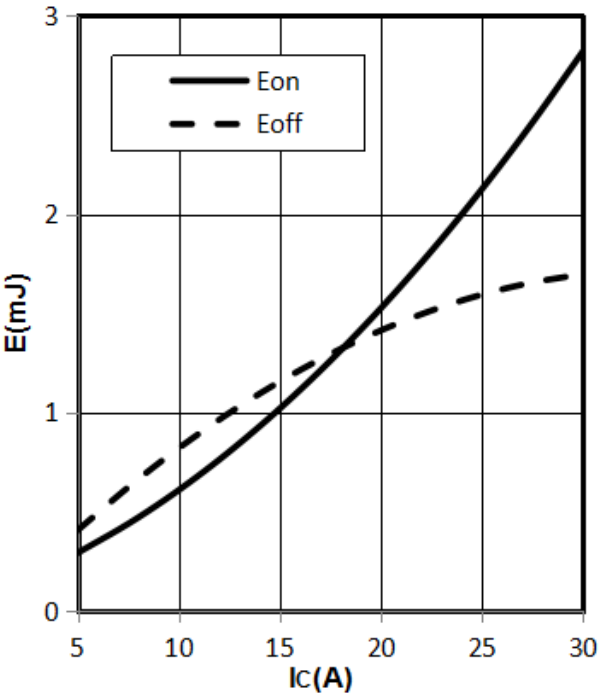


Fig 4. switching losses IGBT(Inverter), $E_{on}=f(Ic)$,$E_{off}=f(I_c)$,
V_{GE}=±15V,R_G=10Ω,V_{CE}=600V,Tj=125℃



Typical Characteristics

Fig 5. switching losses IGBT(Inverter), $E_{on}=f(R_G)$,$E_{off}=f(R_G)$, $V_{GE}=\pm15V$,$I_C=15A$,$V_{CE}=600V$,Tj=125℃

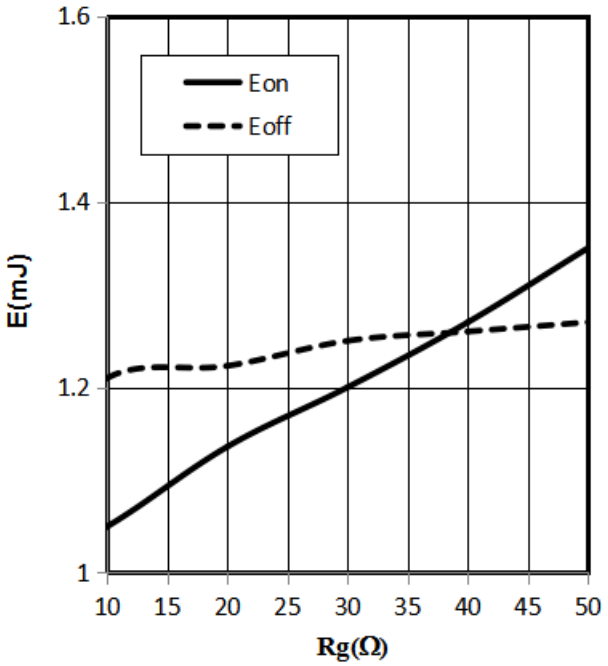


Fig 6. transient thermal impedance IGBT(Inverter) , Zthjc=f(t)

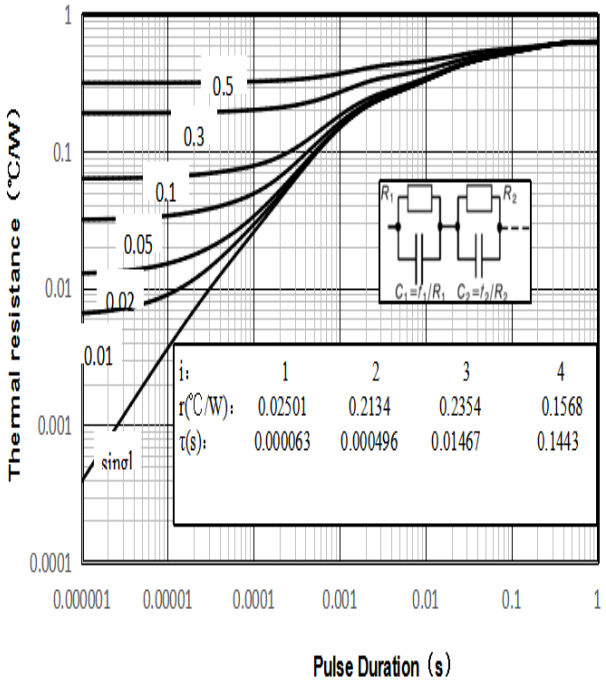


Fig 7. reverse bias safe operating area IGBT(Inverter), $I_C=f(V_{CE})$,$V_{GE}=\pm15V$,$R_G=10\Omega$， Tj=125℃

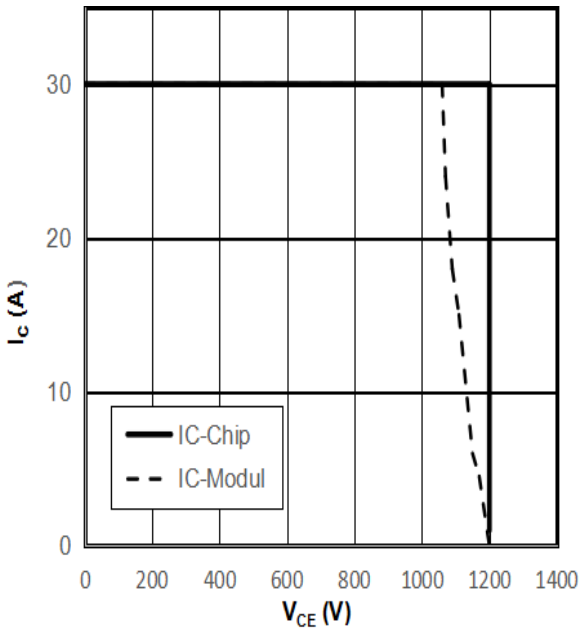
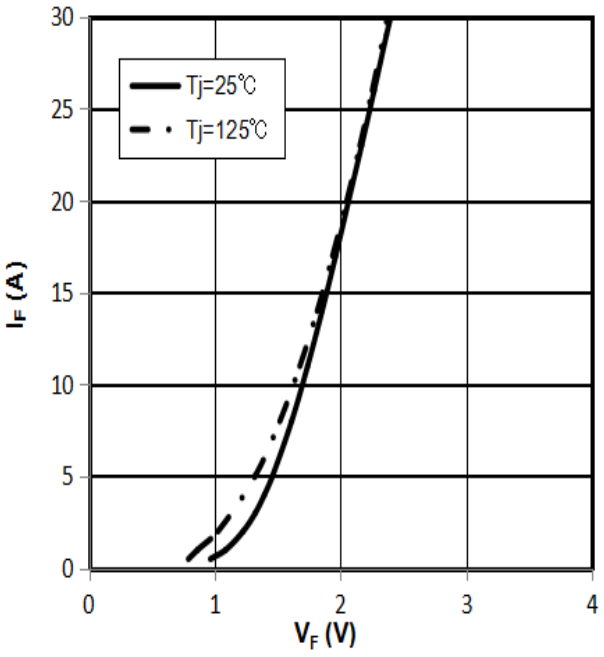


Fig 8. forward characteristic of Diode(Inverter) , $I_F=f(V_F)$



Typical Characteristics

Fig 9. Forward Characteristics of Diode(Rectifier)

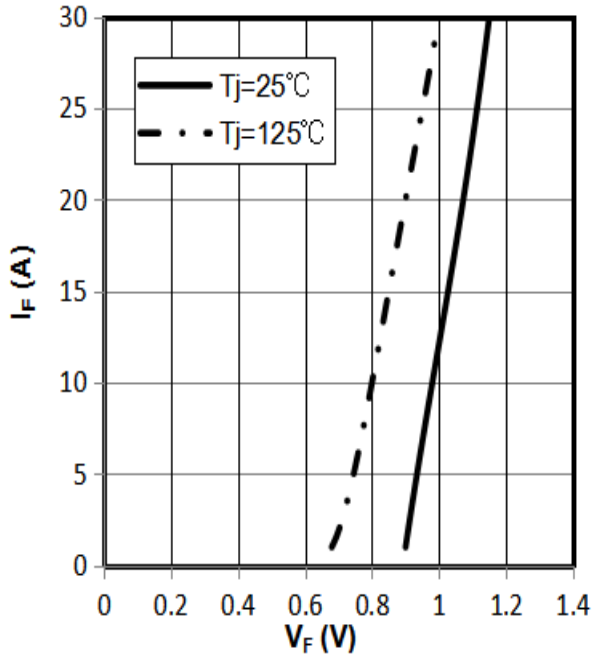


Fig 10.forward characteristic of Diode(Brake-Chopper)，$I_F=f(V_F)$

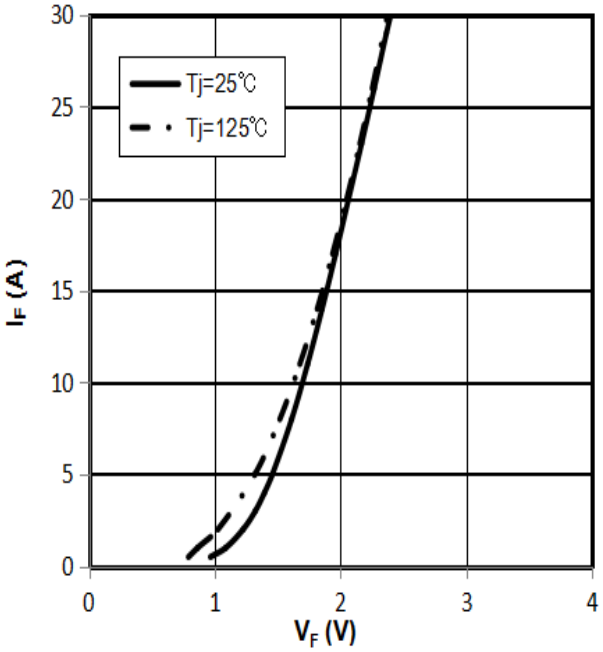
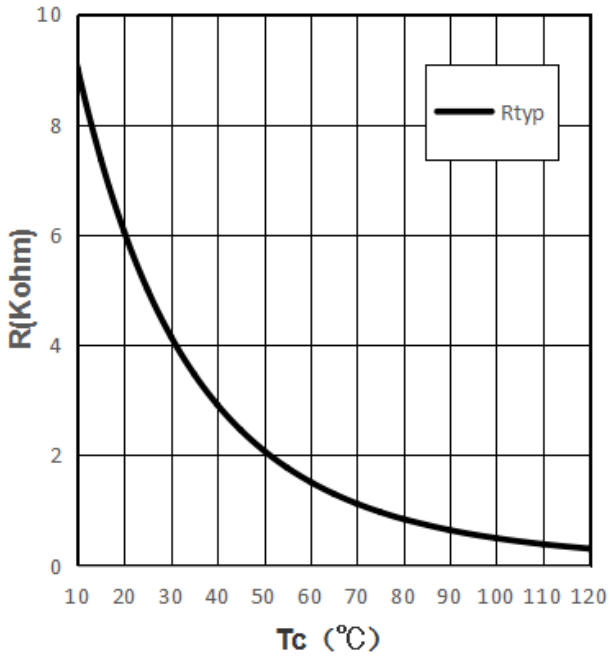
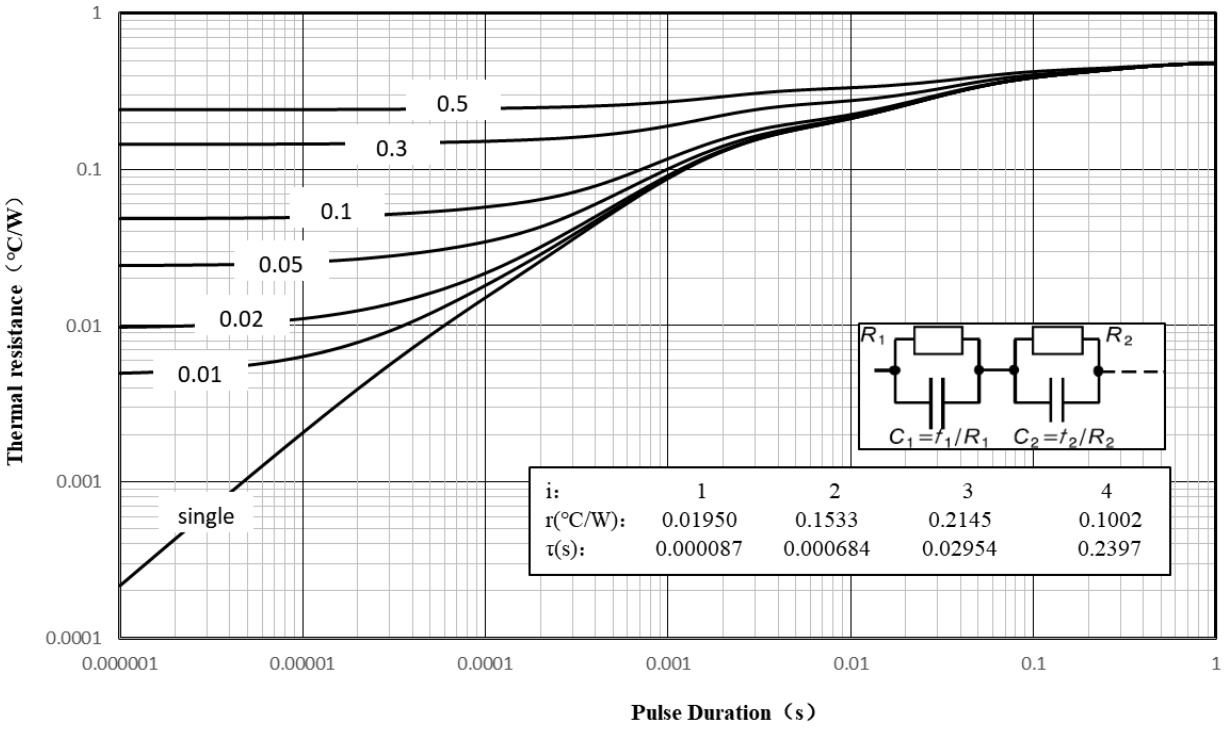


Fig 11.NTC-Thermistor-temperature characteristic(typical)

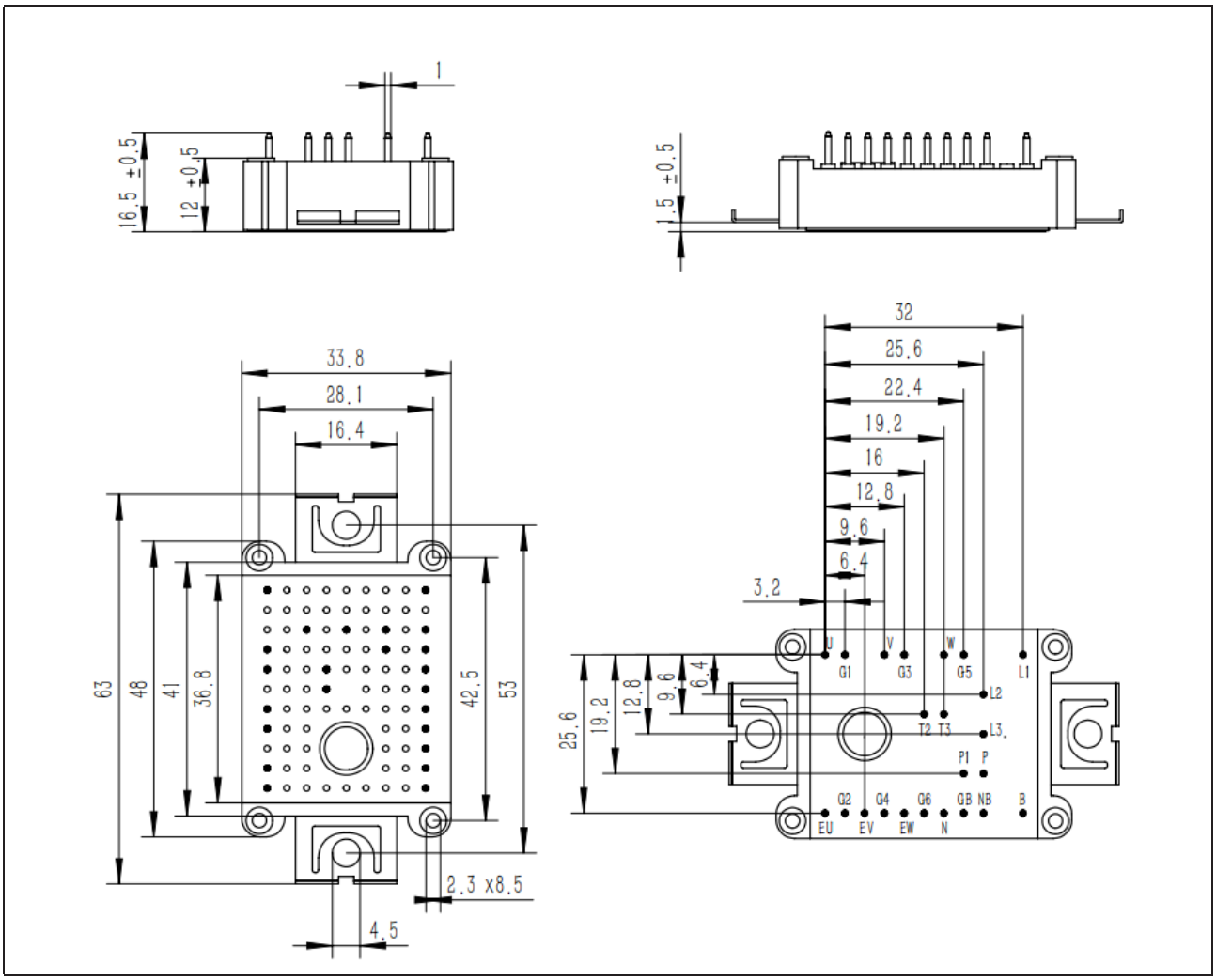


Typical Characteristics

Fig 21. IGBT transient thermal resistance(D=tp/T)



Package Dimensions



Ordering information

Order code	Package	Packaging option	Base quantity	Packaging specification
GSK15PJ120E1	E1	BOX	30pcs / BOX	

Revision history

Date	Revision	Changes
23-May-2018	1.0	Initial release

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