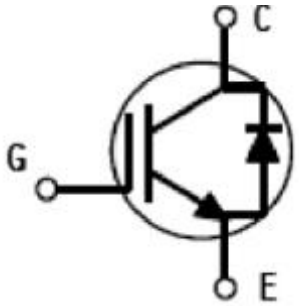
40A 1200V Trenchstop Insulated Gate Bipolar Transistor

1 Description

These Insulated Gate Bipolar Transistor used advanced trench and Fieldstop technology design, provided excellent Vcesat and switching speed ,low gate charge. Which accords with the RoHS standard.



2 Features

- Low Vcesat
- Low gate charge
- Excellent switching speed
- Easy paralleling capability due to positive temperature Coefficient in Vcesat
- Tsc≥10μs
- Fast recovery full current anti-parallel diode

3 Applications

- Welding
- UPS
- Three-leve Inverter

Type	Vces	Ic	Vcesat,T_j=25℃	T_{jmax}	Package
G40N120D	1200V	40A (T_j=100℃)	1.7V (Typ)	175℃	TO-247-3L

4 Electrical Characteristics

4.1 Absolute Maximum Ratings （Tc=25℃,unless otherwise specified）

Parameter		Symbol	Value	Units
Collector-to-Emitter Voltage		V_{CES}	1200	V
Gate-to-Emitter Voltage		V_{GE}	±30	V
DC Collector current	T_j=25℃	I_C	80	A
	T_j=100℃		40	A
Pulsed Collector Current #1		I_{CM}	160	A
Diode forward current	T_j=25℃	I_F	80	A
	T_j=100℃		40	
Diode Pulsed Current		I_{FM}	160	A
Short circuit withstand time, V_{GE}=15V, V_{CC}=600V, Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s T_j=150℃		T_{SC}	10	μs
Power Dissipation	T_j=25℃	P_{tot}	388	W
	T_j=100℃		155	W
Junction Temperature Range		T_j	-45～175	℃
Storage Temperature Range		T_{stg}	-45～150	℃
Soldering temperature		T_L	260	℃

4.2 Thermal Characteristics

Parameter	Symbol	Rating	Units
IGBT Thermal Resistance Junction to Case-sink	R_{thJC}	0.32	℃/W
IGBT Thermal Resistance Junction to Ambient	R_{thJA}	37.1	℃/W
Diode Thermal Resistance Junction to Case-sink	R_{thJC}	0.61	℃/W

4.3 Electrical Characteristics (Tc=25℃, unless otherwise specified)

Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
Static Characteristics						
Collector-to-Emitter Breakdown Voltage	V_{ces}	I_C=250μA,V_{GE}=0V,T_j=25℃	1200	--	--	V
		I_C=1mA,V_{GE}=0V, T_j=150℃	1420	--	--	V
Collector-to-Emitter Leakage Current	I_{CES}	V_{CE}=1.2KV,V_{GE}=0V,T_j=25℃	--	--	1	μA
		V_{CE}=1.2KV,V_{GE}=0V,T_j=150℃	--	--	600	μA
Gate-to-Emitter Leakage Current	I_{GES}	V_{GE}=±30V,V_{CE}=0V,T_j=25℃	--	--	±100	nA
		V_{GE}=±30V,V_{CE}=0V,T_j=150℃	--	--	±200	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE}=V_{GE},I_C=250μA	4.5	5.5	6.5	V
Collector-emitter saturation voltage	V_{cesat}	V_{GE}=15V,I_C=40A,T_j=25℃	--	1.7	2.0	V
		V_{GE}=15V,I_C=30A,T_j=150℃	--	1.9	2.2	V
		V_{GE}=15V,I_C=40A,T_j=150℃	--	2.1	2.5	V
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{CE}=25V,V_{GE}=0V, f=1MHz,T_a=25℃	--	6483	--	pF
Output Capacitance	C_{oss}		--	187	--	
Reverse Transfer Capacitance	C_{rss}		--	39	--	
IGBT Characteristics						
Turn-on delay time	td(on)	V_{CE}=600V,I_C=40A, R_g=10Ω,V_{GE}=15V, 感性负载,T_c=25℃	--	40	--	nS
Rise time	tr		--	36	--	nS
Turn-off delay time	td(off)		--	372	--	nS
Fall time	tf		--	114	--	nS
Turn-on energy	Eon		--	0.94	--	mJ
Turn-off energy	Eoff		--	2.53	--	mJ
Total switching energy	Ets		--	3.47	--	mJ
Turn-on delay time	td(on)	V_{CE}=600V,I_C=40A, R_g=10Ω,V_{GE}=15V, 感性负载,T_c=150℃	--	34	--	nS
Rise time	tr		--	36	--	nS
Turn-off delay time	td(off)		--	448	--	nS
Fall time	tf		--	238	--	nS
Turn-on energy	Eon		--	1.1	--	mJ
Turn-off energy	Eoff		--	3.38	--	mJ
Total switching energy	Ets		--	4.48	--	mJ
Gate charge	Qg	V_{CE}=600V,I_C=40A, V_{GE}=15V	--	329	--	nC

Diode Characteristic						
Diode forward voltage	V_F	I_F=40A, T_j=25℃	--	3.3	4.8	V
		I_F=40A, T_j=150℃	--	2.6	3.6	V
		I_F=20A, T_j=25℃ #2	--	2.6	3.8	V
		I_F=20A, T_j=150℃	--	1.5	2.0	V
Diode reverse recovery time	trr	I_F=40A , di/dt=200A/uS , V_R=400V	--	86	--	ns
Diode peak reverse recovery current	Irrm		--	5.8	--	A
Diode reverse recovery charge	Qrr		--	280	--	nC

Notes：

#1 Pulse duration is limited bv $T_{j,max}$

#2 **VF classification :**

A	B	C	D
~2.6V	2.6V~3.0V	3.0V~3.4V	3.4V~3.8V

5 Typical Characteristic Curves

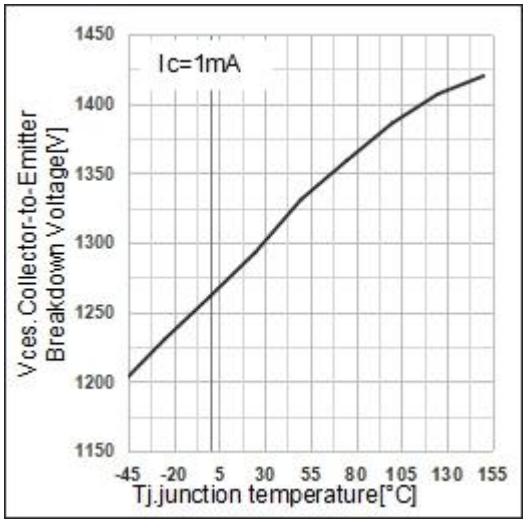


Fig1.**Collector-to-Emitter Breakdown Voltage of temperature characteristic**

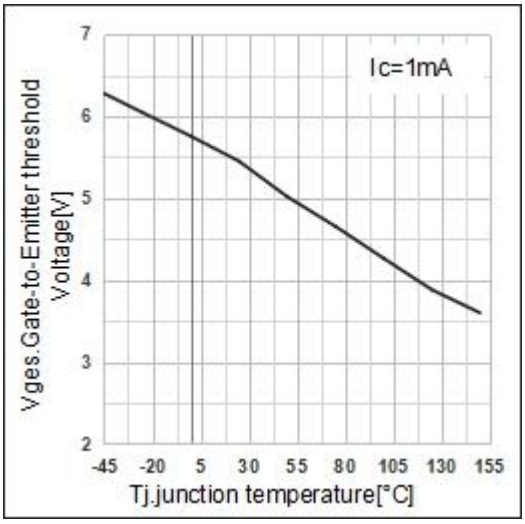


Fig2.**Gate-to-Emitter Threshold Voltage of temperature characteristic**

5 Typical Characteristic Curves(Continue)

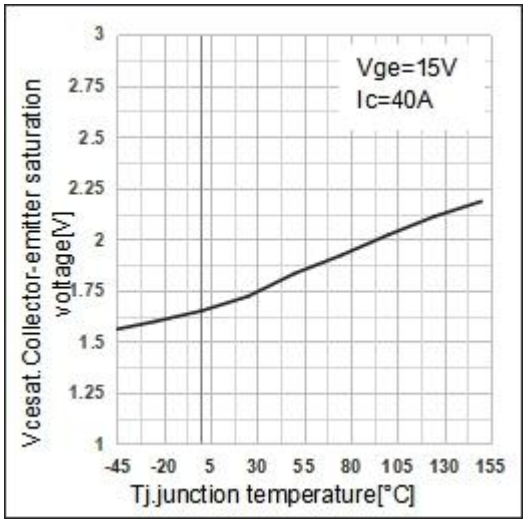


Fig3.**Collector-emitter saturation voltage of temperature characteristic**

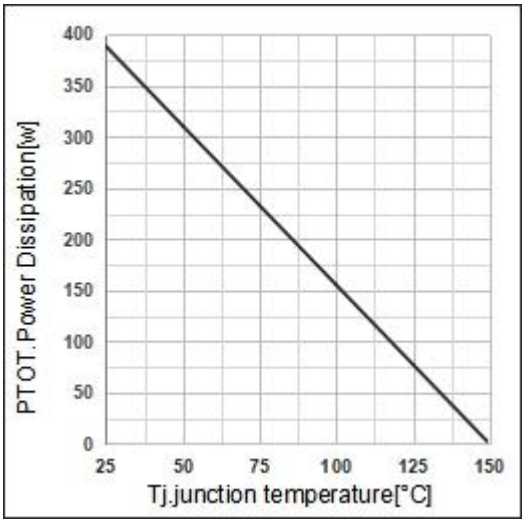


Fig4.**Power Dissipation**

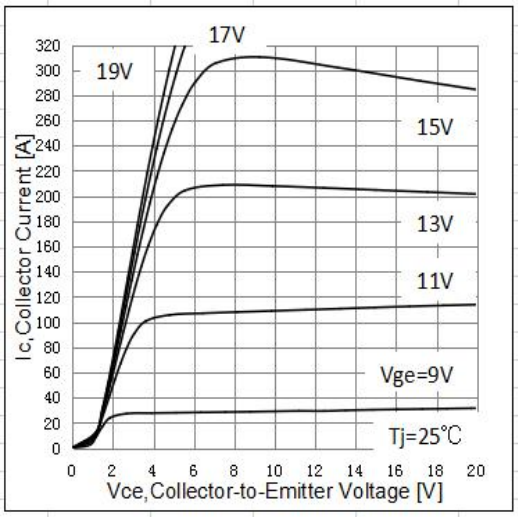


Fig5.**Typical output characteristic**

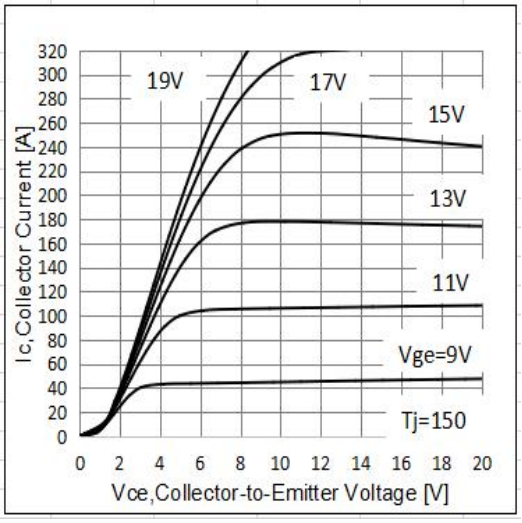


Fig6.**Typical output characteristic**

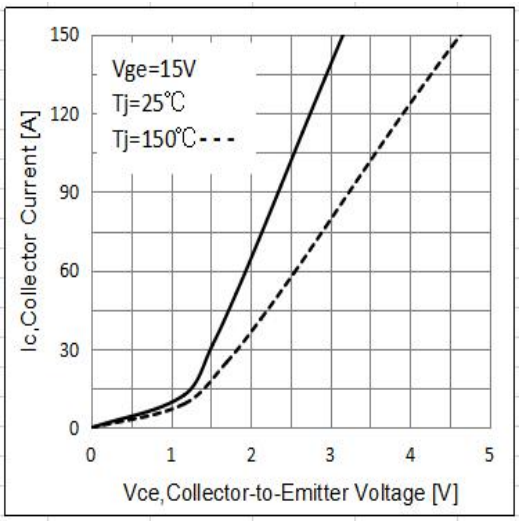


Fig7.**Collector-emitter saturation voltage Characteristic**

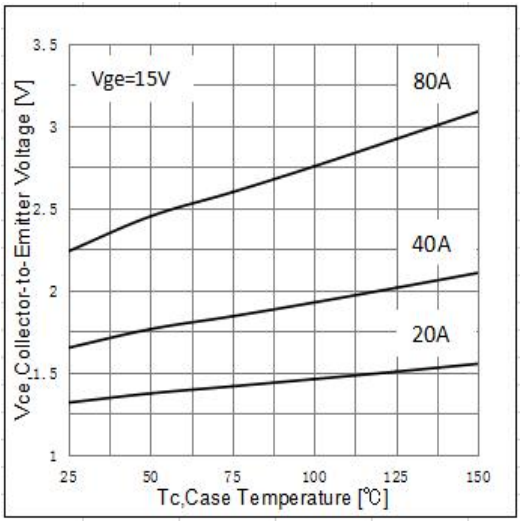


Fig8.**Collector-emitter saturation voltage Temperature Characteristic**

5 Typical Characteristic Curves(Continue)

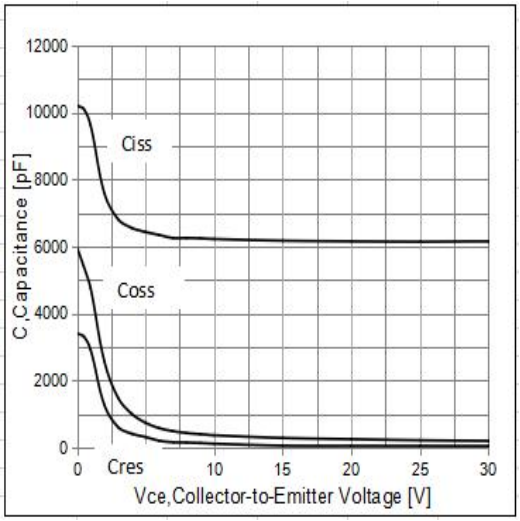


Fig9.**Typical capacitance as a function of collector-emitter voltage**

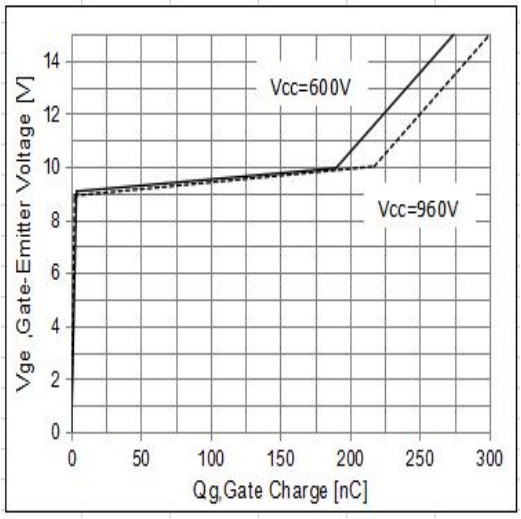


Fig10.**Typical gate charge**

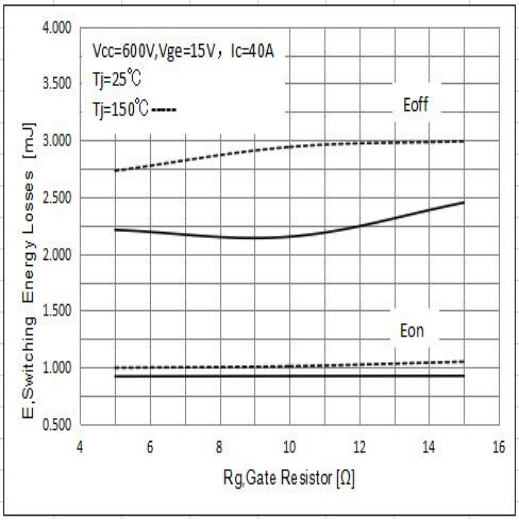


Fig11.**Typical switching energy losses as a function of gate resistor**

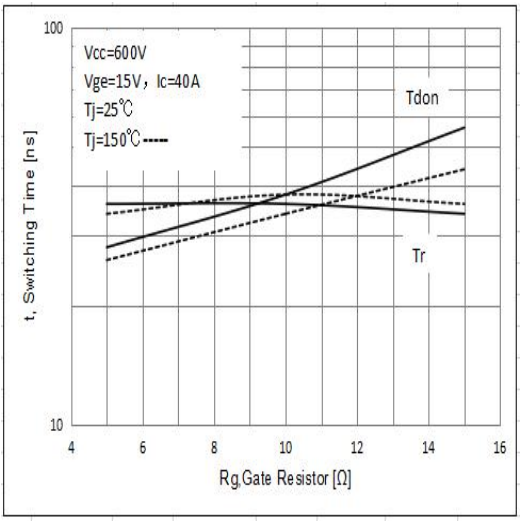


Fig12.**Typical switching times as a function of gate resistor**

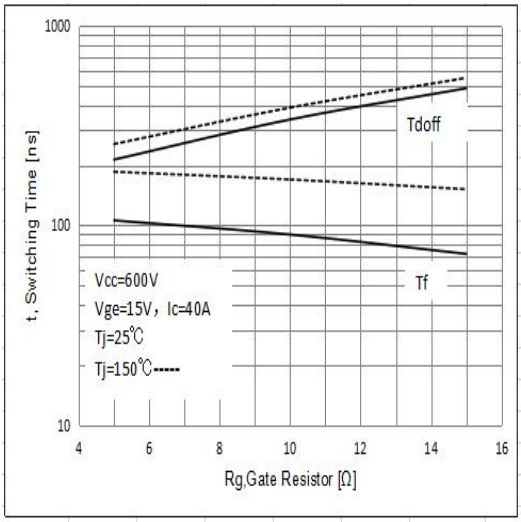


Fig13.**Typical switching times as a function of gate resistor**

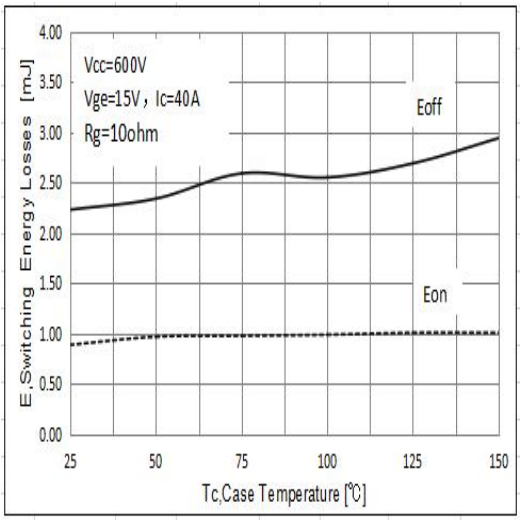


Fig14.**Typical switching energy losses as a function of Case Temperature**

5 Typical Characteristic Curves(Continue)

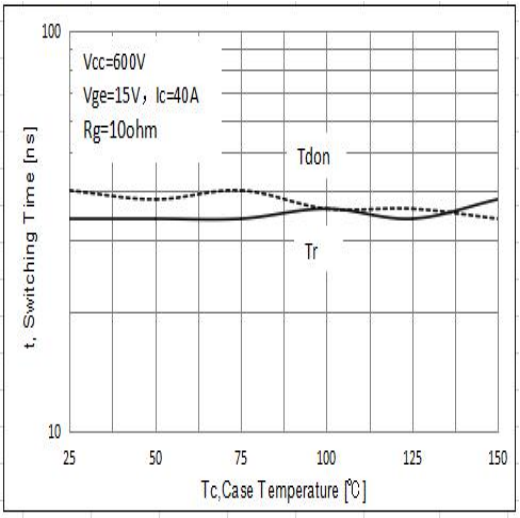


Fig15.**Typical switching times as a function of Case Temperature**

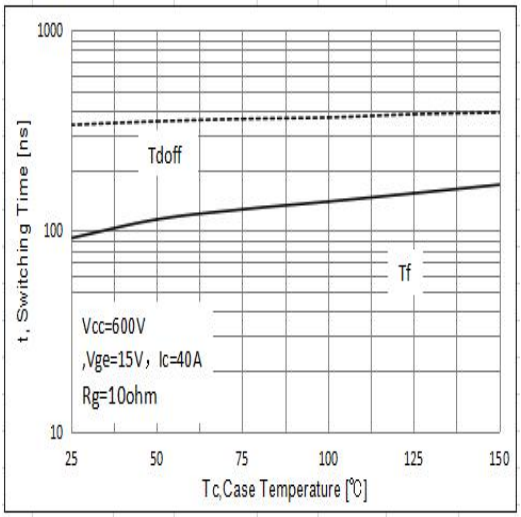


Fig16.**Typical switching times as a function of Case Temperature**

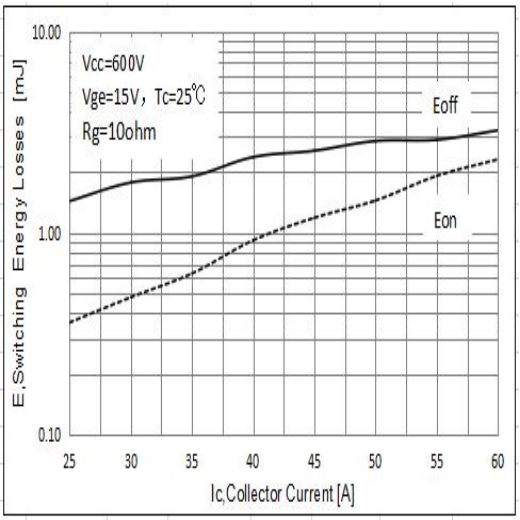


Fig17.**Typical switching energy losses as a function of Collector Current**

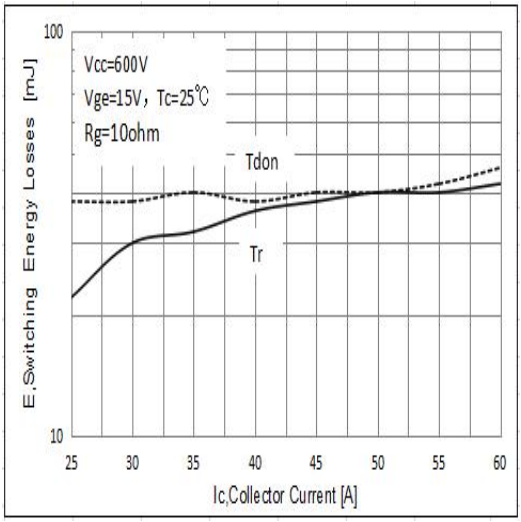


Fig18.**Typical switching times as a function of Collector Current**

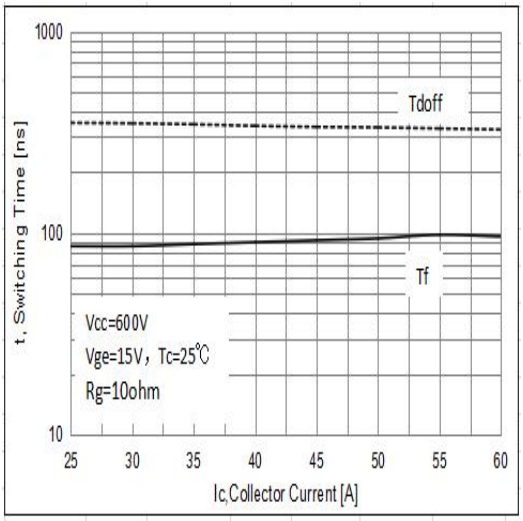


Fig19.**Typical switching times as a function of Collector Current**

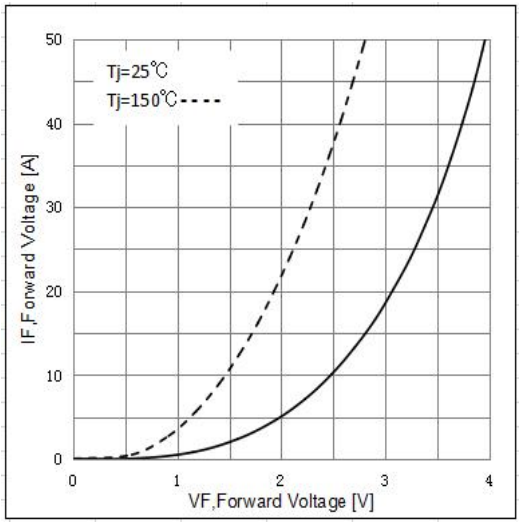


Fig20.**Typical diode forward current as a function of forward voltage**

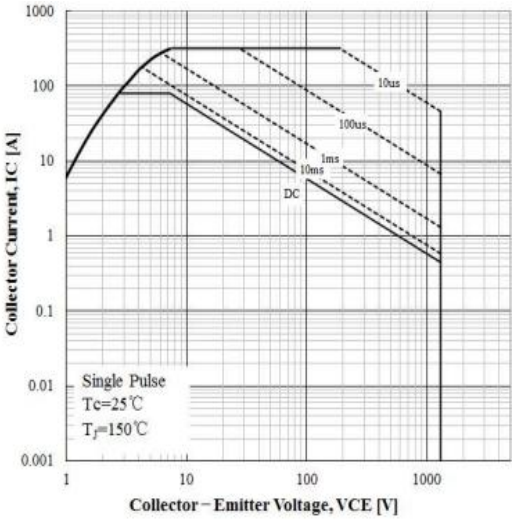


Fig21.**Forward bias safe operating area**

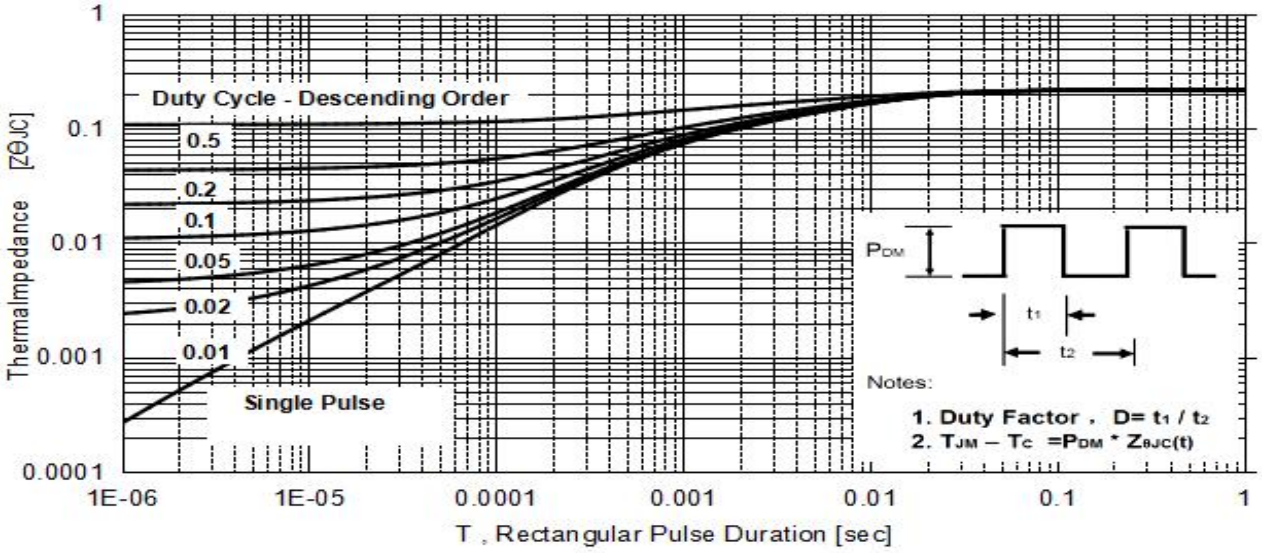


Fig22.**IGBT transient thermal resistance**

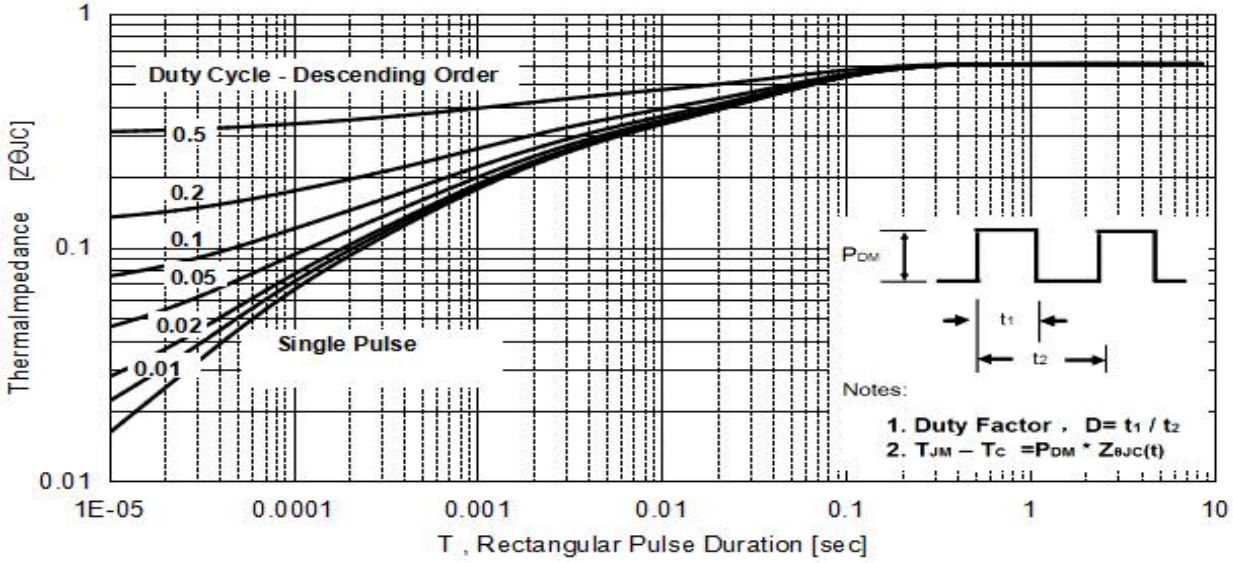
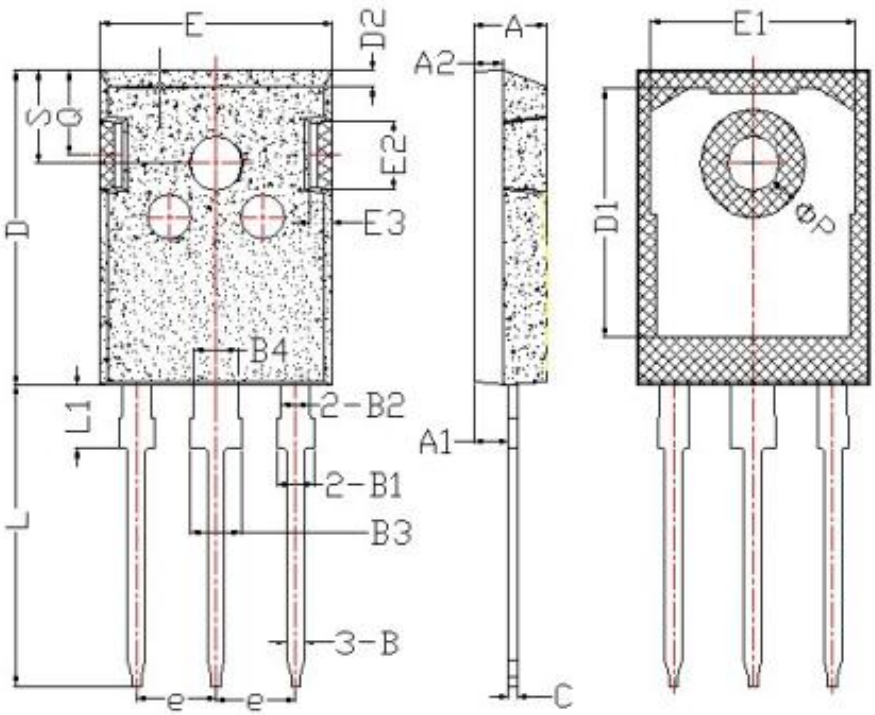


Fig23.**Diode transient thermal resistance**

6 Dimensions (TO-247)



项　目	规范(mm)		项　目	规范(mm)	
	MIN	MAX		MIN	MAX
A	4.60	5.20	E	15.50	16.10
A1	2.20	2.60	E1	13.00	14.70
B	0.90	1.40	E2	3.80	5.30
B1	1.75	2.35	E3	0.80	2.60
B2	1.75	2.15	e	5.20	5.70
B3	2.80	3.35	L	19.00	20.50
B4	2.80	3.15	L1	3.90	4.60
C	0.50	0.70	ΦP	3.30	3.70
D	20.60	21.30	Q	5.20	6.00
D1	16.00	18.00	S	5.80	6.60

7 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

8 Appendix

Revision history:

Date	REV.	Description	Page
2020.10.12	1.0	Original	
2022.02.10	1.1	结温优化版	
2022.04.19	1.2	新增 BV、Vth、Vcesat 与 Tj 关系，P_{TOT} 曲线	
2022.7.25	1.3	修正最高结温为 150℃	Page1
		增加直流@150℃数据	Page2
		增加 V_F@I_F=40A 数据；增加 V_F@150℃规范	Page3
		增加 V_F@I_F=20A 分档	Page3