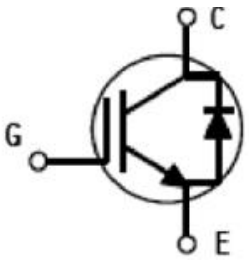
40A 650V Trenchstop Insulated Gate Bipolar Transistor

1 Description

Using DongHai's proprietary Trench design and advance FS technology, the 650V FS IGBT offers superior and switching performances, high avalanche ruggedness easy parallel operation

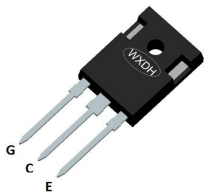


2 Features

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage: VCE(sat), typ = 1.9V @ I_C =40A and T_j =25°C
- Extremely enhanced avalanche capability

3 Applications

- Welding
- UPS
- Three-level Inverter



Type	V_{CE}	Ic	Vcesat,T_j=25℃	T_{jmax}	Package
DGC40H65M2	650V	40A	1.9V	175℃	TO-247

4 Electrical Characteristics

4.1 Absolute Maximum Ratings （Tj=25℃，unless otherwise noted）

Parameter		Symbol	Value	Units
Collector-to-Emitter Voltage		V_{CE}	650	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	40	A
	T_j=100℃		20	
Diode Pulsed Current		I_{FM}	80	A
Short circuit withstand time，V_{GE}=15V，V_{CC}=400V，Tj=150℃		T_{SC}	6	μs
Power Dissipation	T_j=25℃	P_{tot}	280	W
	T_j=100℃		140	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}	0.54	℃/W
IGBT Thermal Resistance,Junction to Ambient	R_{thJA}	37.5	℃/W
Diode Thermal Resistance,Junction to Case-sink	R_{thJC}	1.6	℃/W

4.3 Electrical Characteristics （T_j=25℃， unless otherwise noted）

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Off Characteristics						
Collector-to-Emitter Breakdown Voltage	V_{CE}	I_C=1mA,V_{GE}=0V	650	--	--	V
Collector-to-Emitter Leakage Current	I_{CES}	V_{CE}=650V,V_{GE}=0V	--	--	1	μA
Gate-to-Emitter Leakage Current	I_{GES}	V_{GE}=±30V,V_{CE}=0V	--	--	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE}=V_{GE},I_C=1mA	5	6	7	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE}=15V,I_C=40A,T_j=25℃	--	1.9	2.2	V
		V_{GE}=15V,I_C=40A,T_j=175℃	--	2.6	--	V
Transconductance	g_{fs}	V_{CE}=20V,I_C=40A	--	35	--	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{CE}=25V,V_{GE}=0V f=1MHz	--	2528	--	pF
Output Capacitance	C_{oss}		--	115	--	
Reverse Transfer Capacitance	C_{rss}		--	24	--	
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CE}=400V,I_C=40A, R_g=5Ω,V_{GE}=15V, 感性负载,T_j=25℃	--	22	--	nS
Rise time	t_r		--	63	--	nS
Turn-off delay time	$t_{d(off)}$		--	52	--	nS
Fall time	t_f		--	75	--	nS
Turn-on energy	E_{on}		--	0.83	--	mJ
Turn-off energy	E_{off}		--	0.85	--	mJ
Total switching energy	E_{ts}		--	1.68	--	mJ
Turn-on delay time	$t_{d(on)}$	V_{CE}=400V,I_C=40A, R_g=5Ω,V_{GE}=15V, 感性负载,T_j=175℃	--	22	--	nS
Rise time	t_r		--	60	--	nS
Turn-off delay time	$t_{d(off)}$		--	68	--	nS
Fall time	t_f		--	135	--	nS
Turn-on energy	E_{on}		--	0.85	--	mJ
Turn-off energy	E_{off}		--	0.92	--	mJ
Total switching energy	E_{ts}		--	1.77	--	mJ
Gate charge	Q_g	V_{CE}=520V,I_C=40A, V_{GE}=15V	--	84	--	nC

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Diode Characteristic						
Diode forward voltage	V_F	I_F=20A,T_j=25℃	--	1.7	2.2	V
		I_F=20A,T_j=175℃	--	1.3	--	V
Diode reverse recovery time	t_{rr}	I_F=20A, di/dt=100A/uS	--	124	--	nS
Diode peak reverse recovery current	I_{RRM}		--	1.4	--	A
Diode reverse recovery charge	Q_{rr}		--	98	--	nC

Notes：

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

5 Typical Characteristic Curves

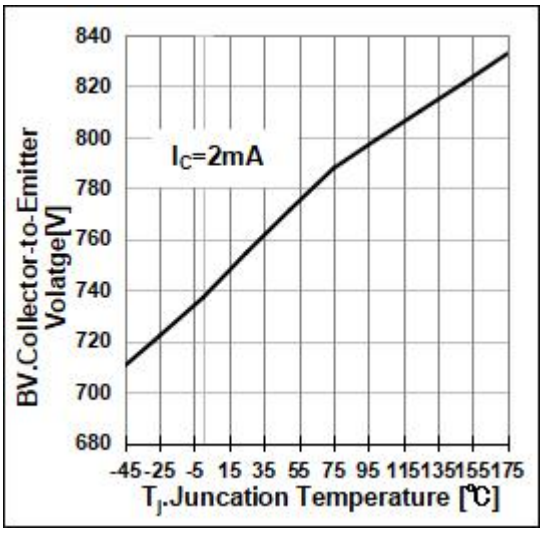


Fig1.**Collector-to-Emitter Breakdown Voltage Temperature characteristic**

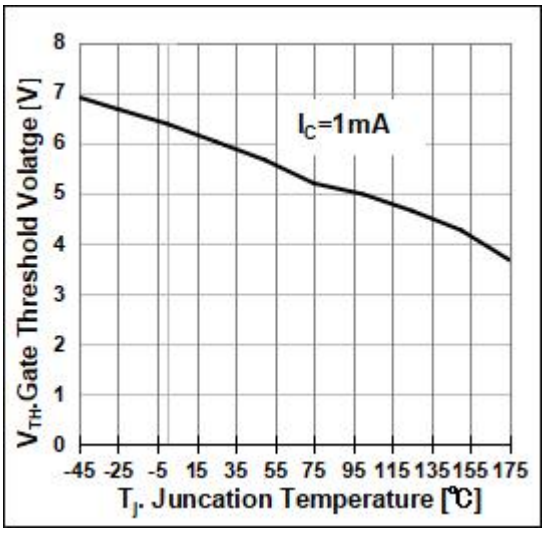


Fig2.**Gate Threshold Voltage Temperature characteristic**

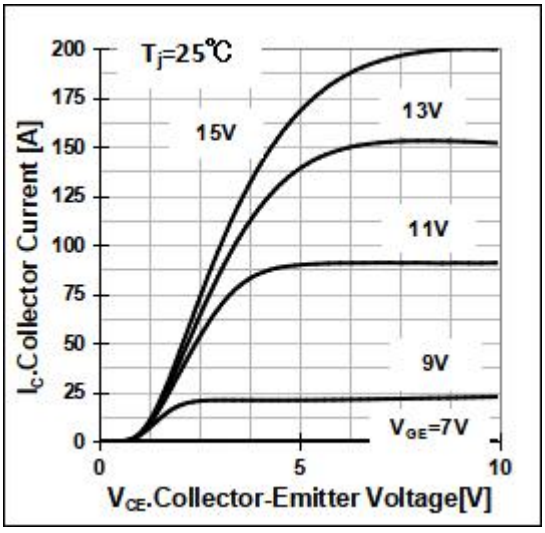


Fig3.**Typical output characteristic**

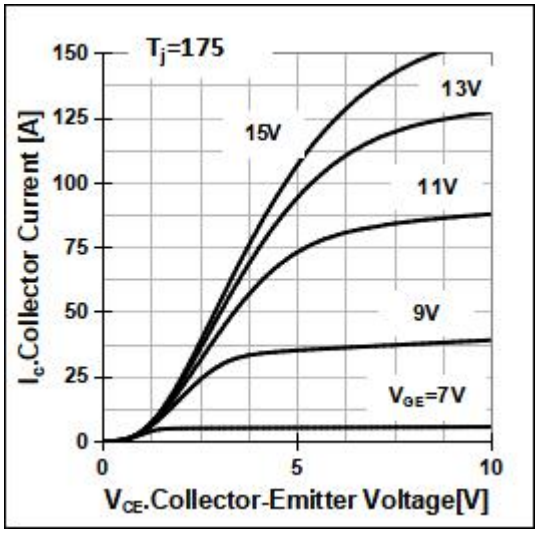


Fig4.**Typical output characteristic**

5 Typical Characteristic Curves(Continue)

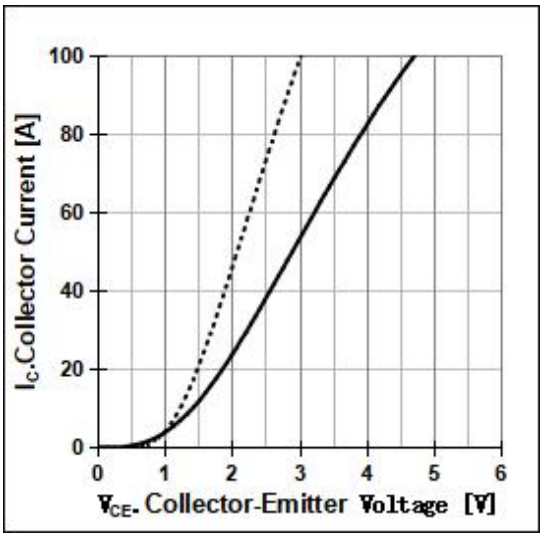


Fig5.**Collector-emitter saturation voltage Characteristic**

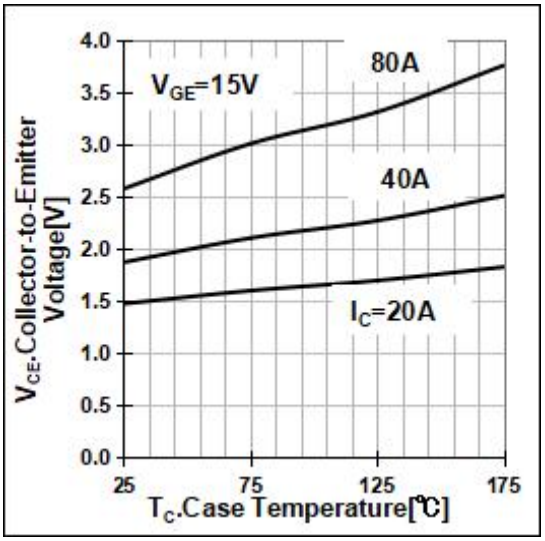


Fig6.**Collector-emitter saturation voltage Temperature Characteristic**

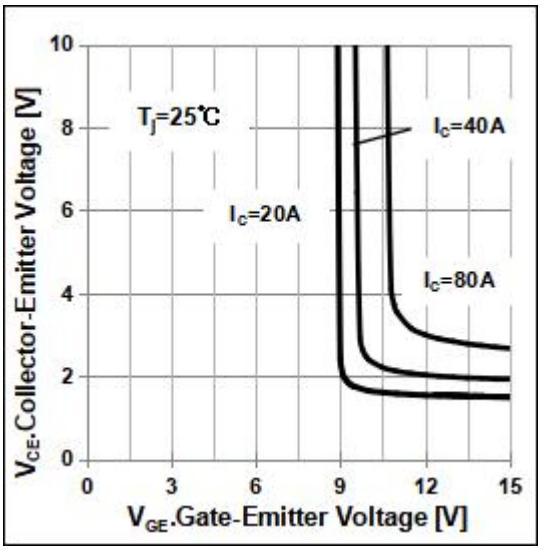


Fig7.**Typical Transfer characteristic curve of Saturation Voltage vs Vge**

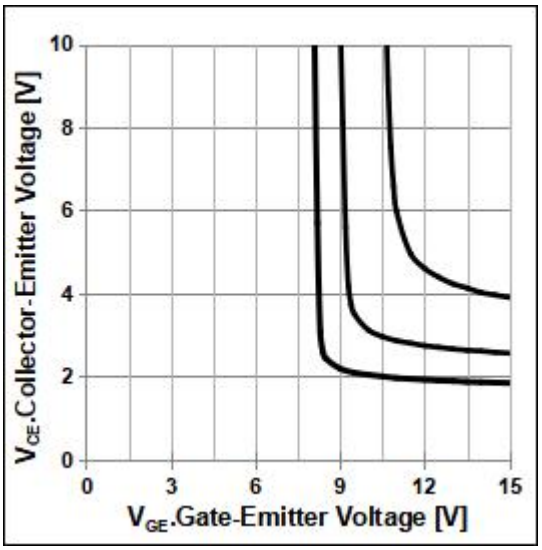


Fig8. **Typical Transfer characteristic curve of Saturation Voltage vs Vge**

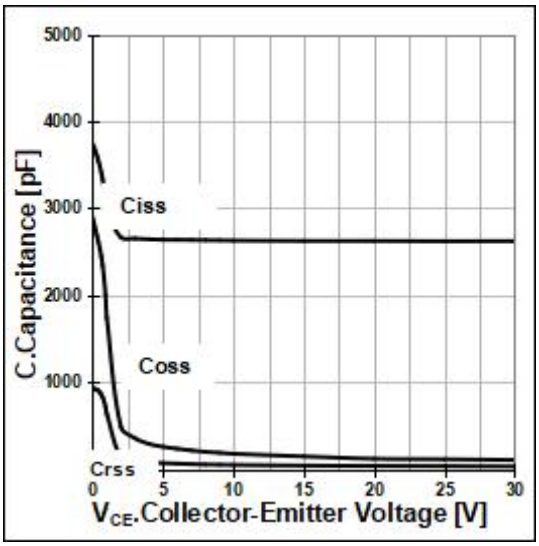


Fig9.**Typical capacitance as a function of collector-emitter voltage**

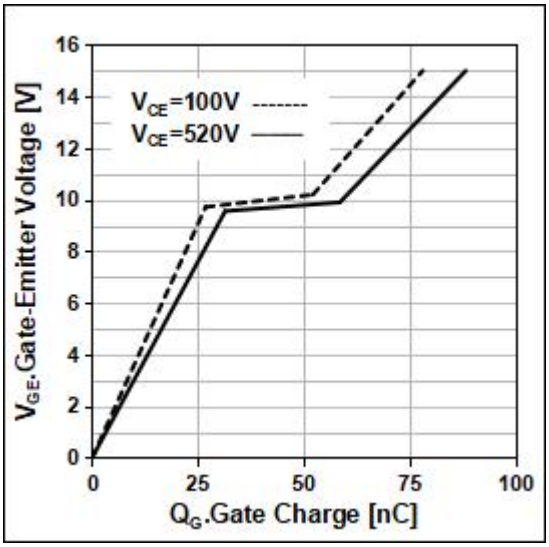


Fig10.**Typical gate charge**

5 Typical Characteristic Curves(Continue)

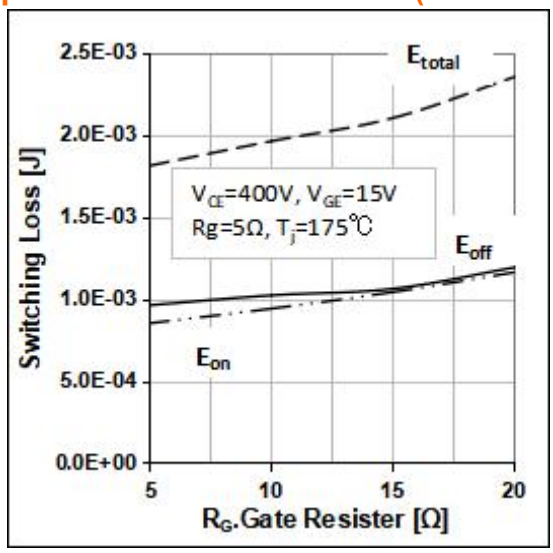


Fig11.**Typical switching energy losses as a function of gate resistor**

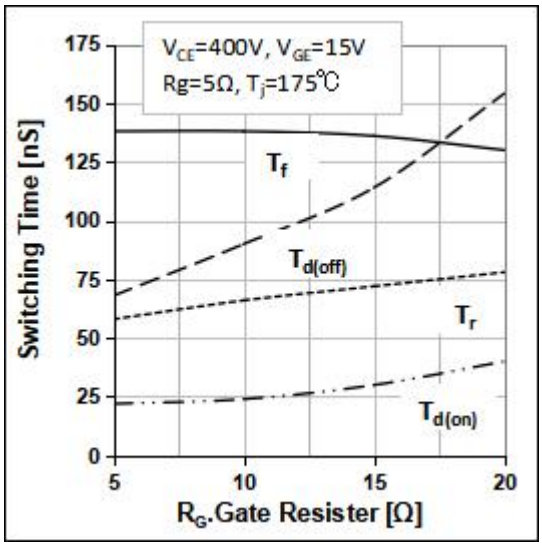


Fig12.**Typical switching times as a function of gate resistor**

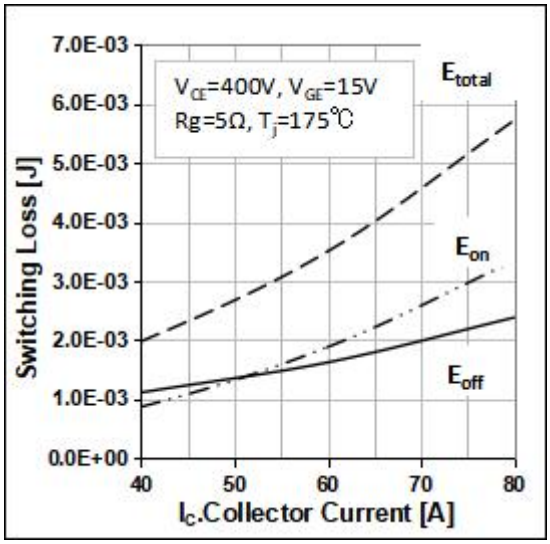


Fig13.**Typical switching energy losses as a function of Collector Current**

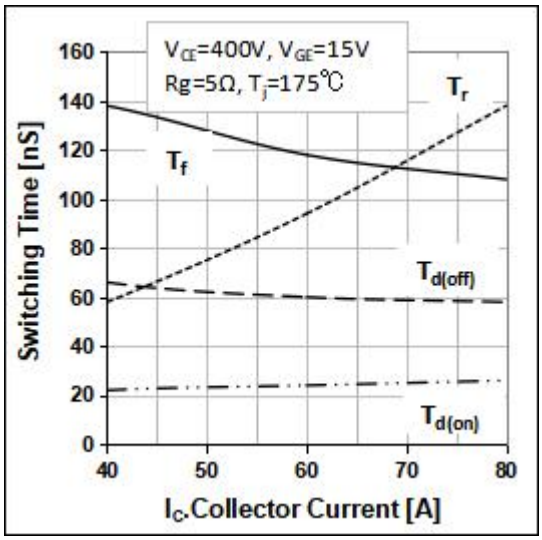


Fig14.**Typical switching times as a function of Collector Current**

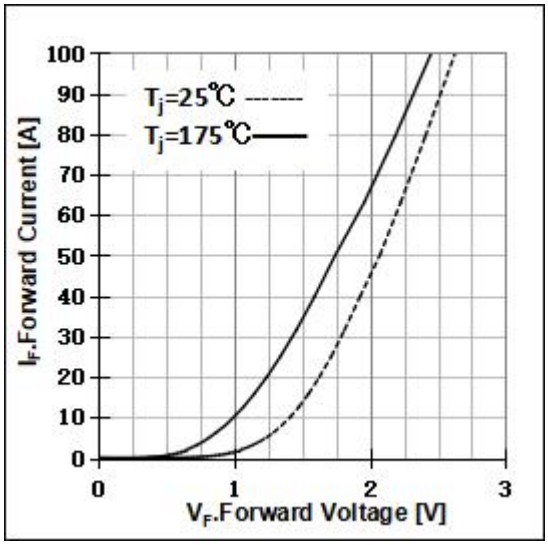


Fig15.**Typical diode forward current as a function of forward voltage**

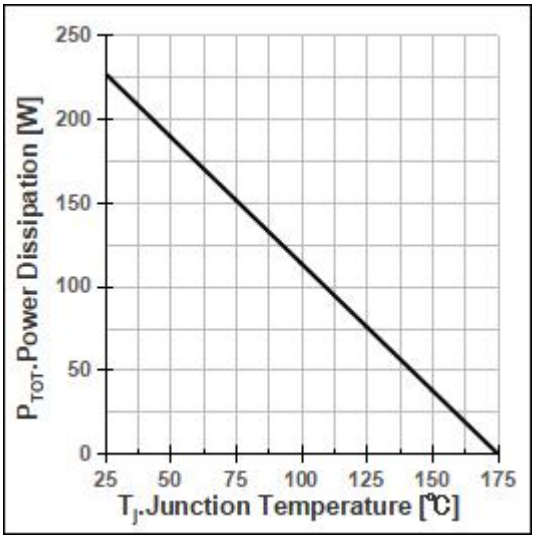


Fig16.**Power dissipation temperature characteristic**

5 Typical Characteristic Curves(Continue)

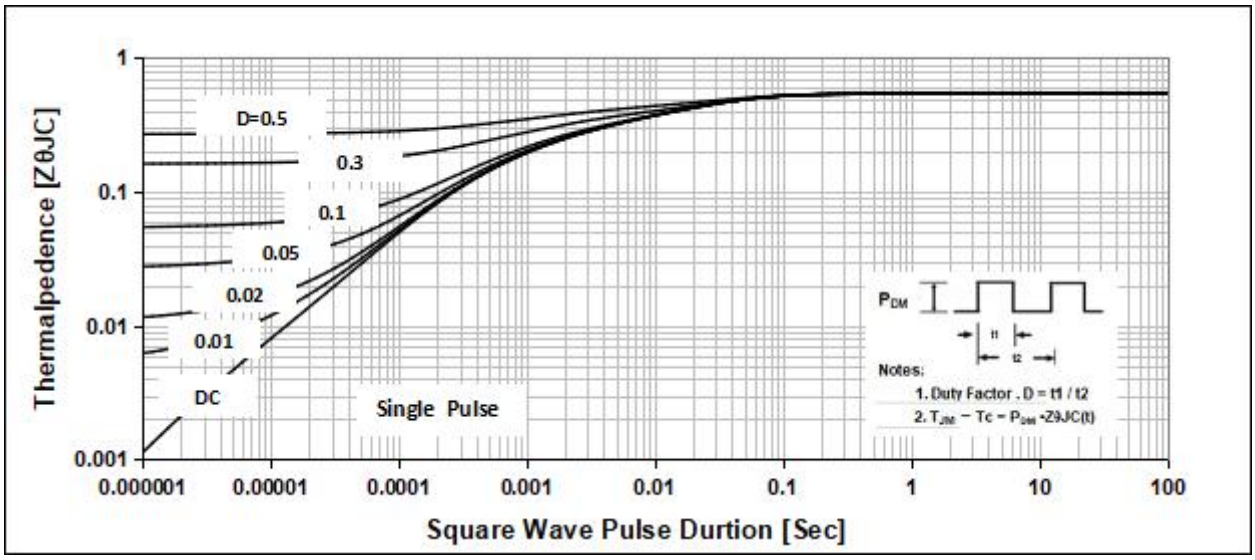
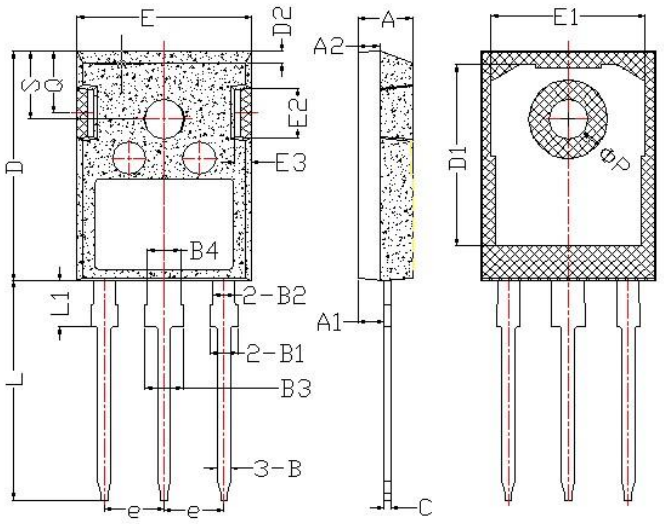


Fig17.**IGBT transient thermal resistance**

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 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
2022.11.02	1.0	Original	