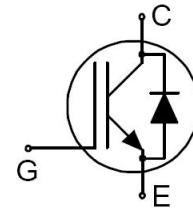


1200V , 40A , Trench-FS IGBT

Features

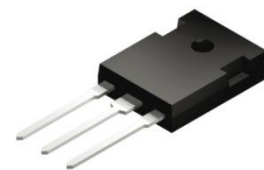
- ◆ Advanced Trench +FS (Field Stop) IGBT technology
- ◆ Low Collector-Emitter Saturation voltage, typical data is 1.8V @ 40A.
- ◆ Short-Circuit withstand time-10uS
- ◆ Easy parallel switching capability due to positive Temperature coefficient in Vce.
- ◆ Fast switching
- ◆ High input impedance
- ◆ Pb- Free product



Schematic Diagram

Applications

- ◆ General purpose inverters
- ◆ Welding
- ◆ Motor controls
- ◆ Induction Heating
- ◆ UPS



TO-247

Absolute Max Ratings(T_J = 25°C unless otherwise noted)

Symbol	Parameter	Units	Maximum
V _{CES}	Collector-to-Emitter Voltage	V	1200
V _{GES}	Gate to Emitter Voltage	V	± 30
I _C @ TC = 25°C	Collector current @T _c = 25 °C	A	80
I _C @ TC = 100°C	Collector Current @T _c = 100 °C	A	40
I _{CM}	Pulsed Drain Current ^②	A	160
I _F @ TC = 25°C	Diode continuous forward current	A	80
I _F @ TC = 100°C	Diode continuous forward current	A	40
I _{FM}	Diode maximum forward current	A	160
P _D	Power Dissipation @T _c = 25 °C	W	480
	Power Dissipation @T _c = 100 °C	W	240
T _J	Operating Junction Temperature Range	°C	-50 to + 175
T _{STG}	Storage Temperature Range	°C	-50 to + 175
T _L	Maximum Temperature of Soldering	°C	260
R _{θJC}	Maximum Junction-to-Case ^①	°C/W	0.31
R _{θJA}	Maximum Junction-to-Ambient ^②	°C/W	40

- ① These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming maximum junction temperature of $T_{J(MAX)}=175^{\circ}C$.
- ② The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

Electrical characteristics(TJ = 25°C unless otherwise noted)						
Symbol	Parameter	Test conditions	Units	Min.	Typ.	Max.
$V_{(BR)CES}$	Collector - Emitter breakdown voltage	$V_{GE} = 0V, I_D = 0.5mA$	V	1200	—	—
$V_{CE(sat)}$	Collector-Emitter Saturation voltage	$V_{GE}=15V, I_C=40A, T_C=25^{\circ}C$	V	—	1.8	2.3
		$V_{GE}=15V, I_C=40A, T_C=125^{\circ}C$	V	—	1.95	—
$V_{GE(th)}$	Gate threshold voltage	$V_{GE}= V_{CE}, I_D = 0.4mA$	V	4.0	-	6.5
V_F	Diode Forward voltage	$I_C=40A$	V	—	2.2	2.8
I_{GES}	Gate to Emitter Forward Leakage	$V_{ge}=+30V$	nA	—	—	200
I_{GESR}	Gate to Emitter reverse Leakage	$V_{ge}=-30V$		-200	—	—
I_{CES}	Zero gate voltage collector current	$V_{CE} = 1200V$	uA	—	—	100

Dynamic characteristics(T _J = 25°C unless otherwise noted)						
Symbol	Parameter	Test conditions	Units	Min.	Typ.	Max.
C _{iss}	Input capacitance	V _{GE} = 0V V _{CE} = 25V f = 1MHz	pF	—	2480	—
C _{oss}	Output capacitance			—	240	—
C _{rss}	Reverse transfer capacitance			—	125	—
Q _g	Total gate charge	I _C =40A, V _{CE} =600V, V _{GE} =15V	nC	—	192	—
Q _{ge}	Gate-to-Emitter charge			—	16	—
Q _{gc}	Gate-to-Collector("Miller") charge			—	78	—
T _{d(on)}	Turn-On DelayTime	T _J =25°, V _{CC} =600V, I _C =40A, R _G =10ohm, V _{GE} =15V	ns	—	35	—
T _r	Rise Time			—	30	—
T _{d(off)}	Turn-Off DelayTime			—	310	—
T _f	Turn-Off Fall Time			—	100	—
E _{on}	Turn-on switch loss		mJ	—	3.3	—
E _{off}	Turn-off switch loss		mJ	—	2.1	—
t _{rr}	Diode Reverse Recovery Time	I _F = 40 A, V _{GE} = 0 V, di/dt = -20 A/μs	ns	—	260	—
Q _{rr}	Diode Reverse Recovery Charge		nC	—	3050	—
SCSOA	Short Circuit Safe Operation Area	V _{CC} =600V, R _G =25 Ω, V _G =15V to 0V	uS	10		—

Typical electrical and thermal characteristics:

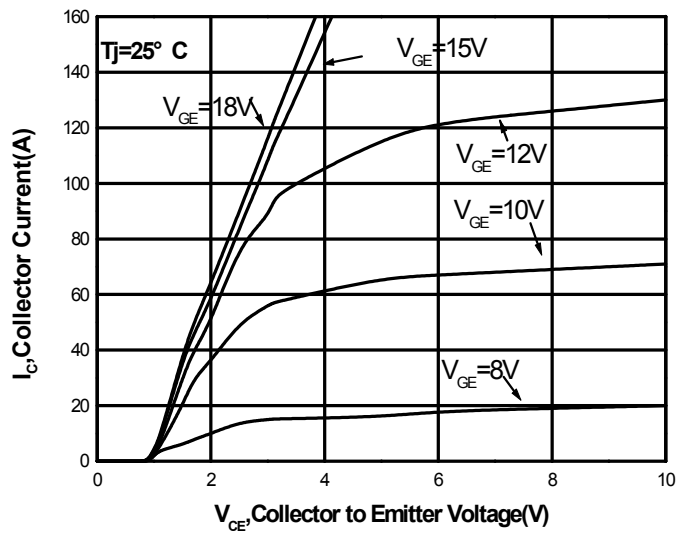


Figure 1: Typical Output Characteristics
($T_J=25^{\circ}\text{C}$)

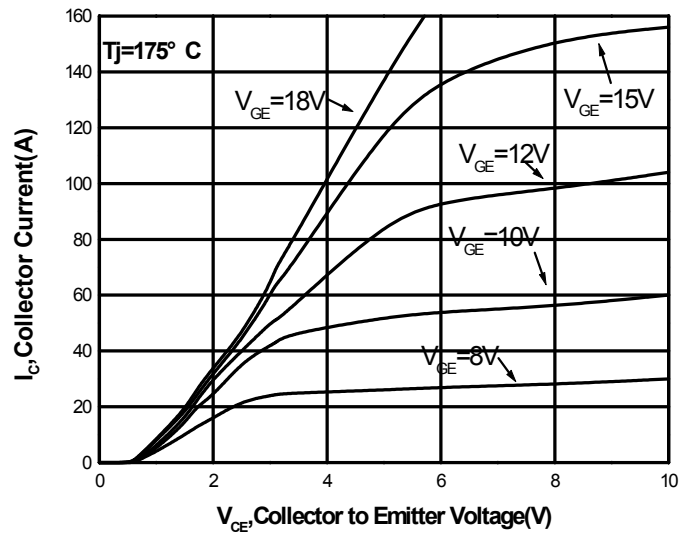


Figure 2: Typical Output Characteristics
($T_J=175^{\circ}\text{C}$)

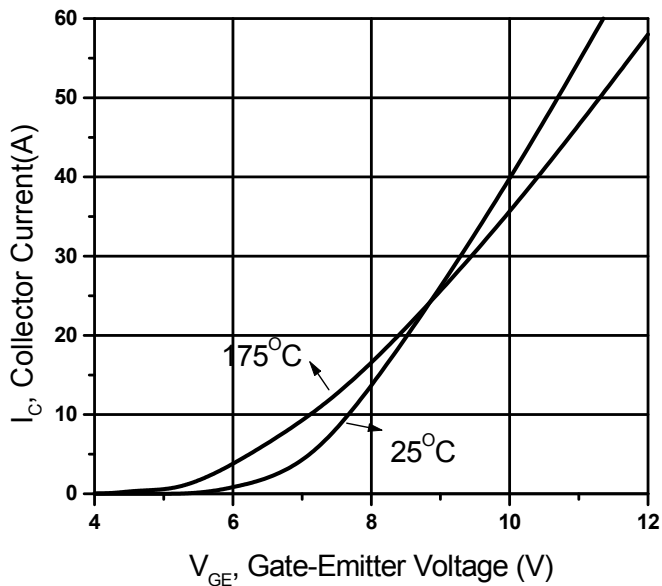


Figure 3: Typical Transfer Characteristics

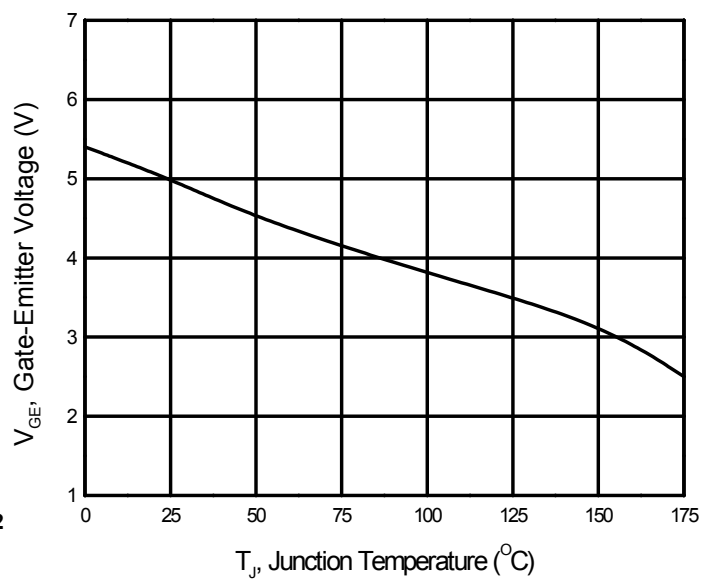


Figure 4: Gate to Emitter threshold Voltage
as a function of T_J

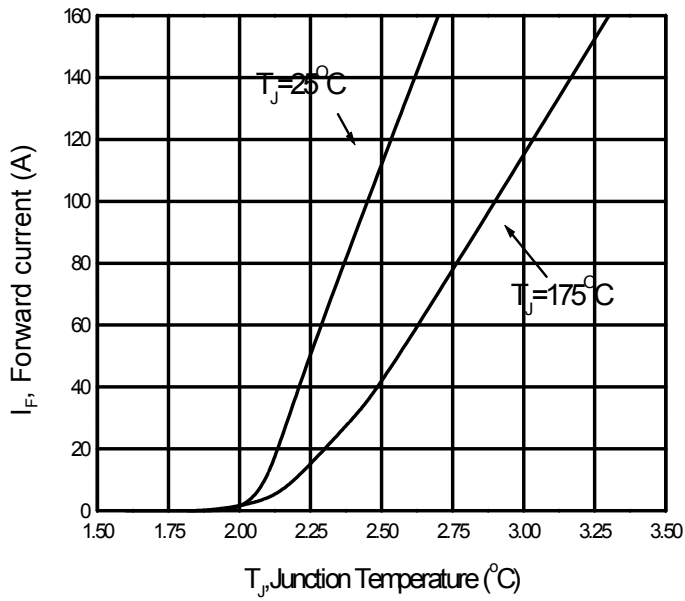


Figure 5: Typical Diode Forward Characteristics

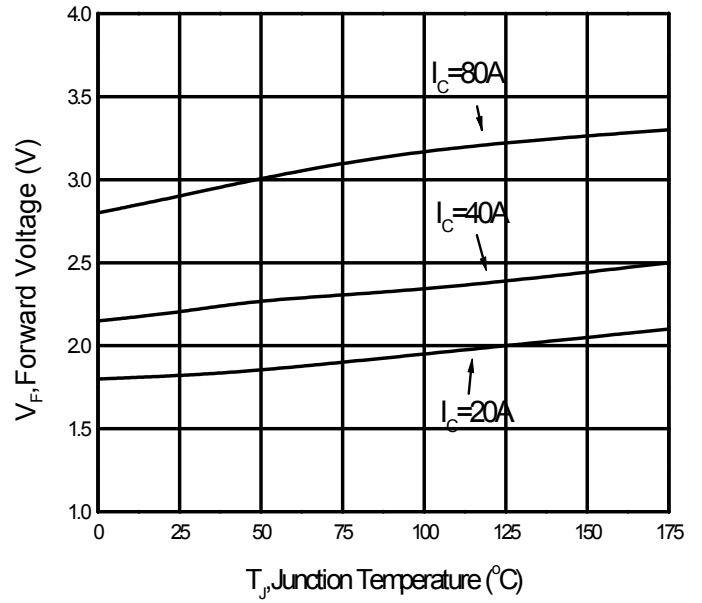


Figure 6: Forward Voltage as a function of T_J

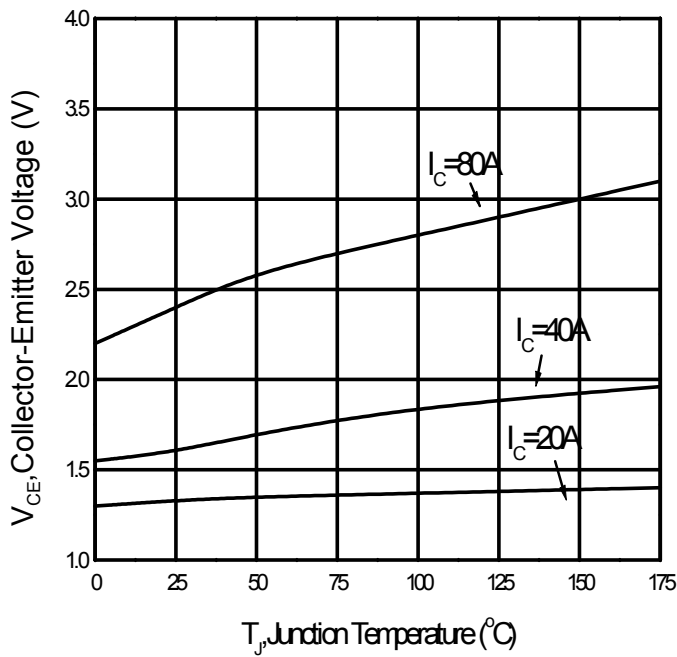


Figure 7: Typical $V_{CE(sat)}$ as a Function of T_J

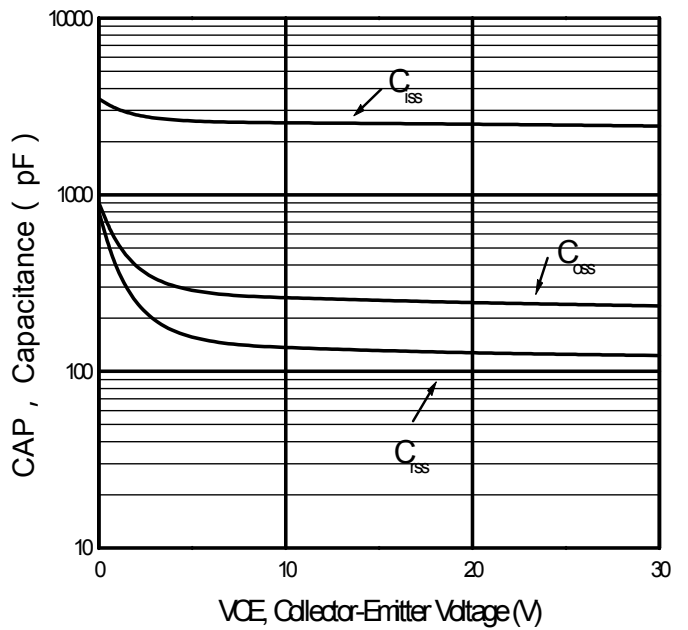


Figure 8: Capacitance Characteristics

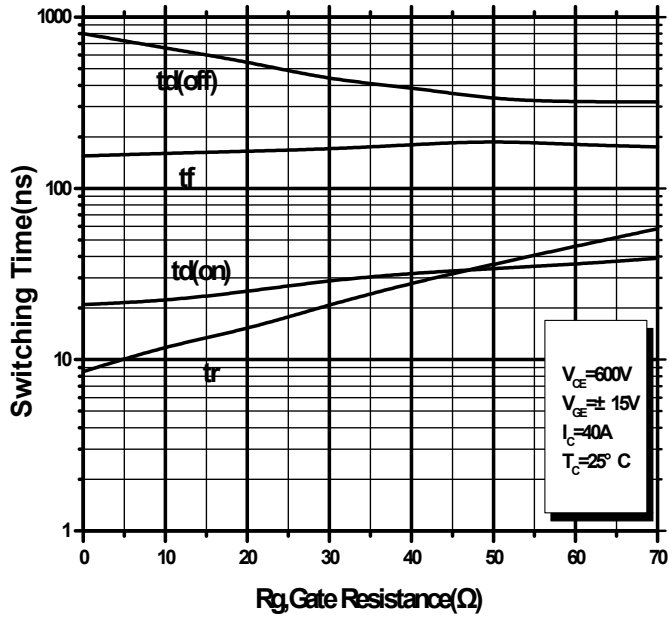


Figure 9: Switching Time Vs R_g

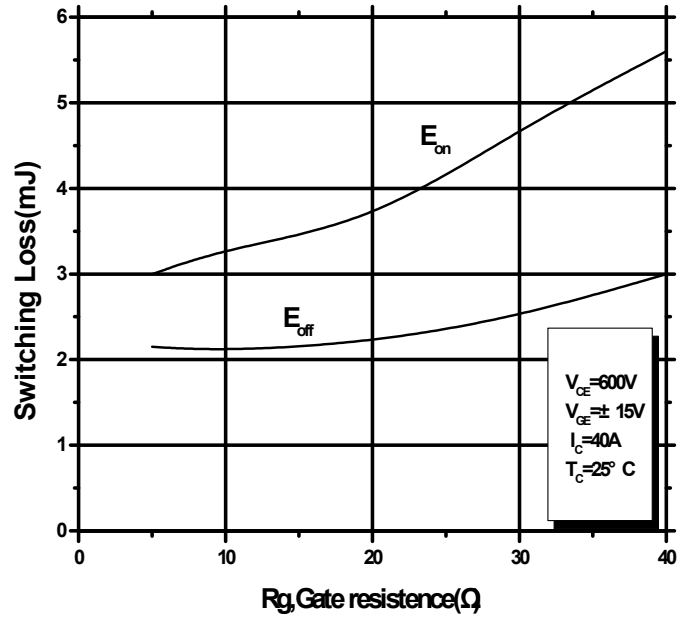


Figure 10: Switching Loss Vs R_g

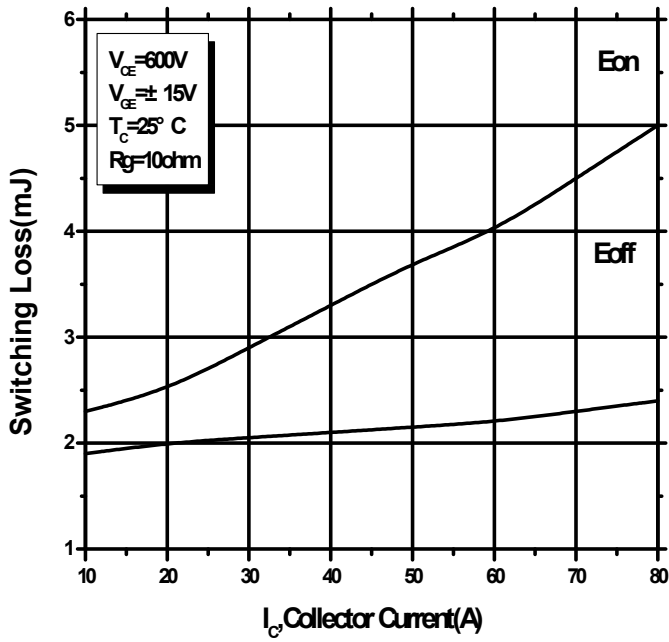


Figure 11: Switching Loss Vs I_C

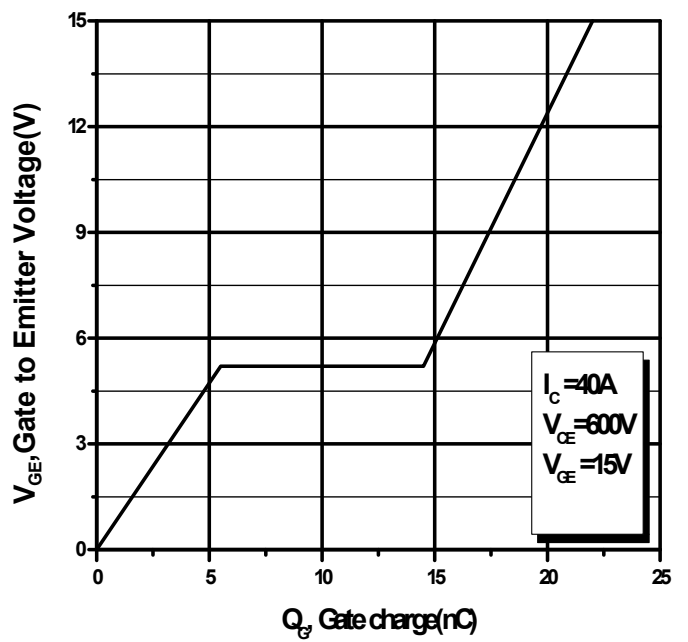


Figure 12: Gate Charge Characteristics

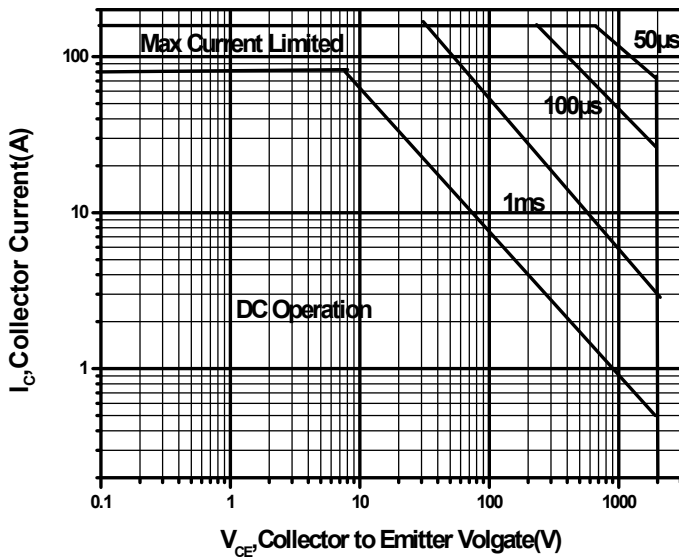


Figure 13: Maximum Forward Biased Safe Operating Area

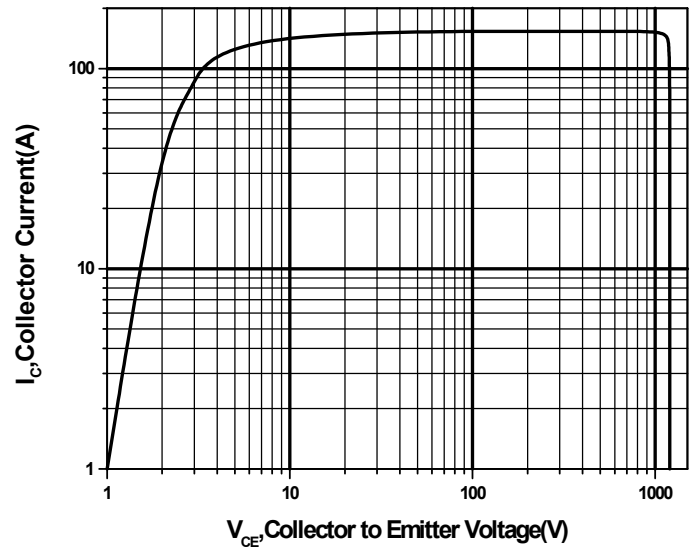


Figure 14: Turn Off Safe Operating Area

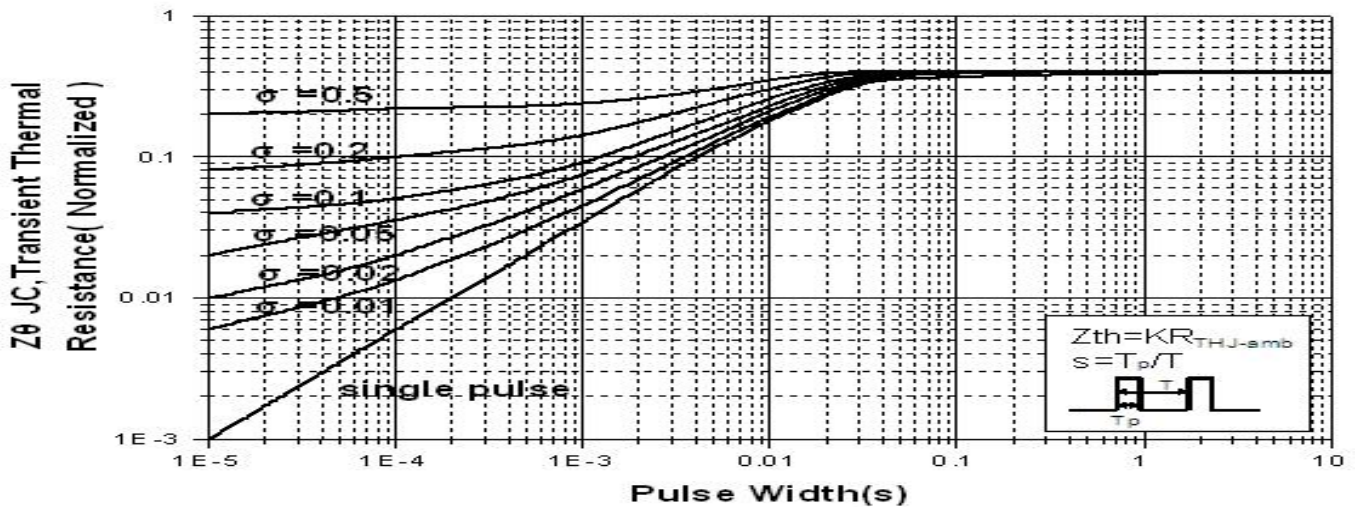
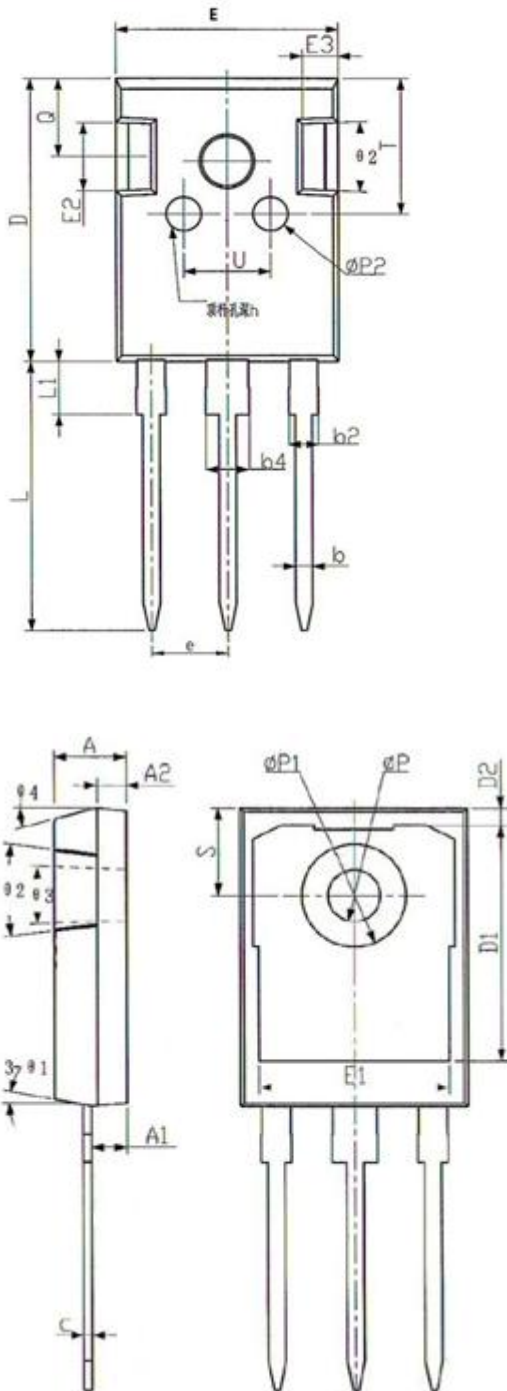


Figure 15: Normalized Maximum Transient Thermal Impedance

Mechanical Data: TO-247



Dimensions			
Symbol	unit:mm		
	Min	Typ	Max
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16	1.21	1.26
b2	1.96	2.01	2.06
b4	2.96	3.01	3.06
c	0.59	0.61	0.66
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.44BSC		
h	0.05	-	0.20
L	19.80	19.92	20.01
L1	-	-	4.30
ΦP	3.50	3.60	3.70
ΦP1	-	-	7.30
ΦP2	2.40	2.50	2.60
Q	5.60	5.80	6.00
S	6.15BSC		
T	9.80	-	10.20
U	6.00	-	6.40
θ1	6°	7°	8°
θ2	4°	5°	6°
θ3	1°	-	1.5°
θ4	14°	15°	16°

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ShenZhen Invsemi Co.,Ltd

2nd Floor,Building 8th,Huafeng Cyber Park,9th Baoqing Road,

Longgang District,ShenZhen,China 518119

Tel/Fax: 0755-89890048

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