1200V, 40A, Trench FS II Fast IGBT

General Description

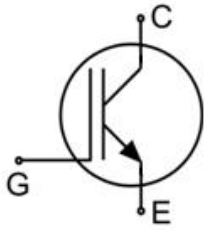
Using NCE's proprietary trench design and advanced FS (Field Stop) second generation technology, the 1200V Trench FSII IGBT offers superior conduction and switching performances, and easy parallel operation;

Features

- Trench FSII Technology Offering
- Very low $V_{CE(sat)}$
- High speed switching
- Positive temperature coefficient in $V_{CE(sat)}$
- Very tight parameter distribution
- High ruggedness, temperature stable behavior

Application

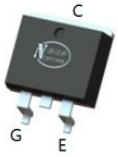
- Welding



Schematic diagram

Package Marking and Ordering Information

Device	Device Package	Device Marking
NCE40T120WD	TO-263	NCE40T120WD



TO-263

Absolute Maximum Ratings (T_C=25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	±30	V
I_C	Collector Current	80	A
	Collector Current @T_C = 100 °C	40	A
I_{Cpuls}	Pulsed Collector Current，t_p limited by T_{jmax}	160	A
-	turn off safe operating area，V_{CE}=1200V，T_j=175°C	160	A
P_D	Power Dissipation @ T_C = 25°C	468	W
	Power Dissipation @T_C = 100 °C	234	W
T_J,T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	°C
T_L	Maximum Temperature for Soldering	260	°C

Thermal Characteristic

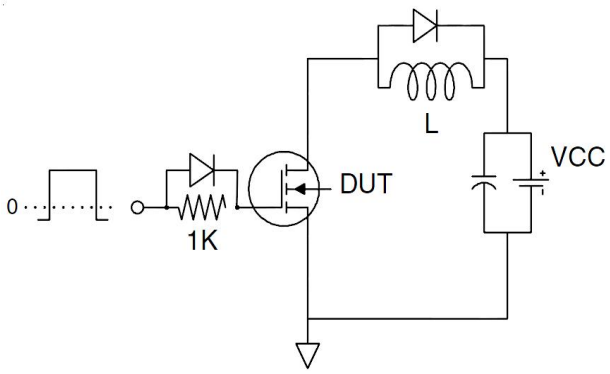
Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	0.32	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	°C/W

Electrical Characteristics (T_C=25°C unless otherwise noted)

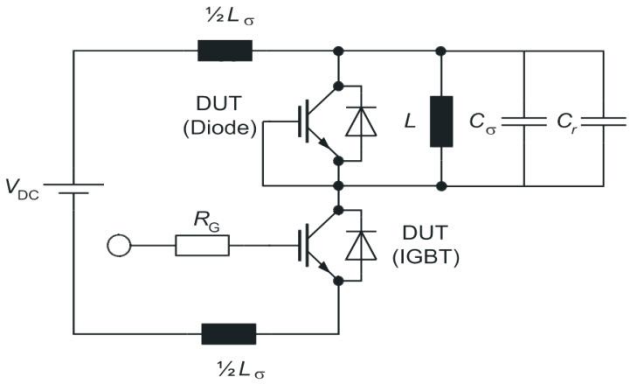
Symbol	Parameter	Conditions	Value			Units
			Min.	Typ.	Max.	
Static Characteristics						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V,I_{CE}=1mA	1200	--	--	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} =0V,V_{CE}=1200V	--	--	200	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE}=+30V,V_{CE}=0V	--	--	200	nA
$I_{GES(R)}$	Gate to Emitter Reverse Leakage	V_{GE}=-30V,V_{CE} =0V	--	--	200	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V, T_j=25°C	--	2.2	2.4	V
		I_C=40A, V_{GE}=15V, T_j=175°C	--	2.4	--	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1mA,V_{CE}=V_{GE}	4.5	--	6.5	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE}=30V,V_{GE}=0V, f=1MHz	--	6190	--	pF
C_{oes}	Output Capacitance		--	185	--	
C_{res}	Reverse Transfer Capacitance		--	133	--	
Q_g	Total Gate Charge	V_{CC}=960V, I_C=40A, V_{GE}=15V	--	242	--	nC
Q_{ge}	Gate to Emitter Charge		--	51	--	
Q_{gc}	Gate to Collector Charge		--	115	--	
Switching Characteristics						
$t_{d(ON)}$	Turn-on Delay Time	V_{CE}=600V,I_C=40A, V_{GE}=0/15V, R_g=8Ω Inductive Load	--	19	--	ns
t_r	Rise Time		--	17	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	170	--	
t_f	Fall Time		--	18	--	
E_{on}	Turn-On Switching Loss		--	2.1	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.2	--	
E_{ts}	Total Switching Loss		--	3.3	--	
E_{on}	Turn-On Switching Loss	V_{CE}=600V,I_C=40A, V_{GE}=0/15V, R_g=8Ω T_j=175°C	--	2.8	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.7	--	
E_{ts}	Total Switching Loss		--	4.5	--	

Test Circuit

1) Gate Charge Test Circuit

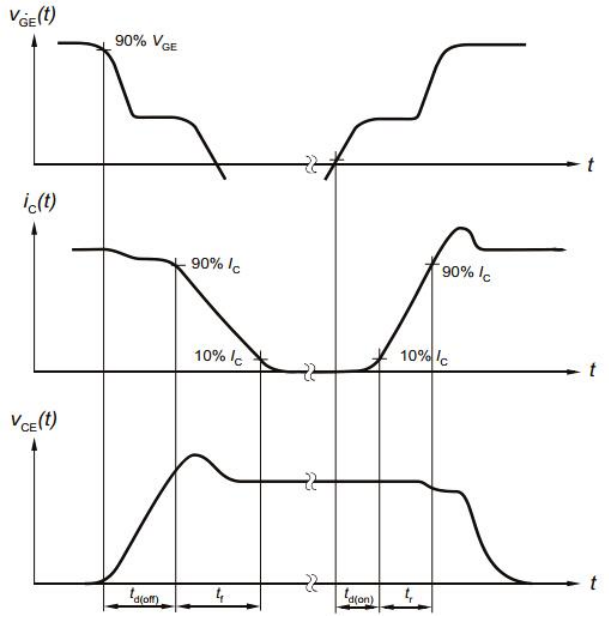


2) Switch Time Test Circuit

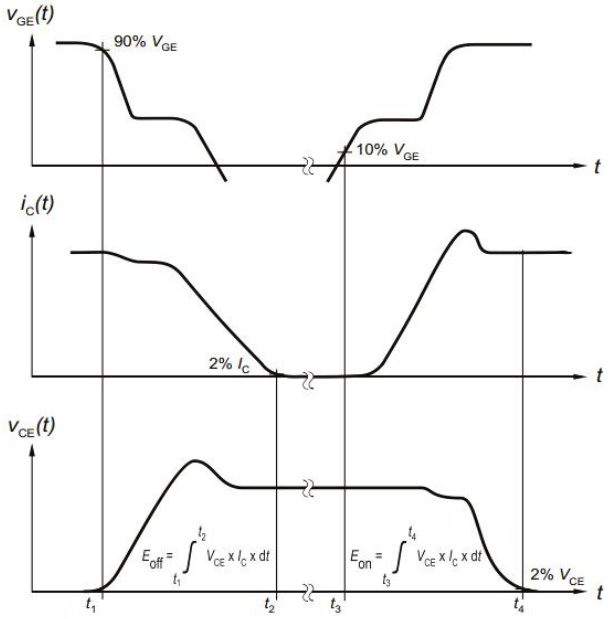


Switching characteristics

1) Definition of switching times



2) Definition of switching losses



Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

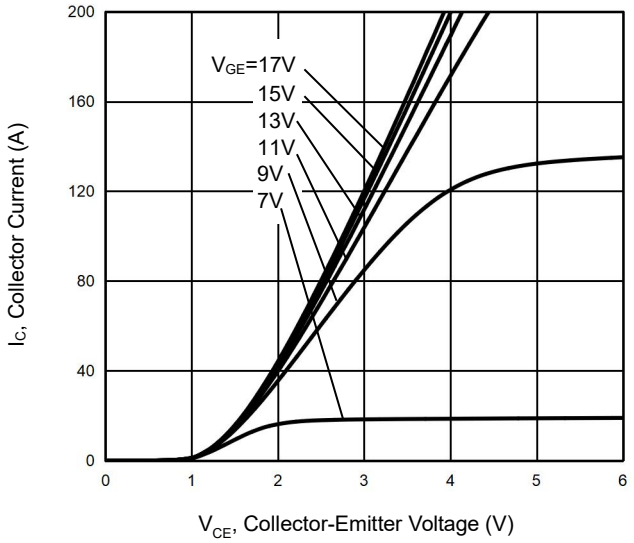


Figure 2 Transfer Characteristics

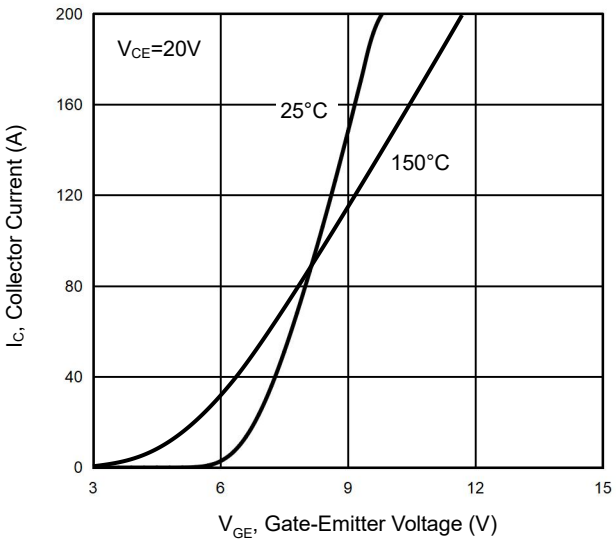


Figure 3 $V_{CE(sat)}$ vs. Case Temperature

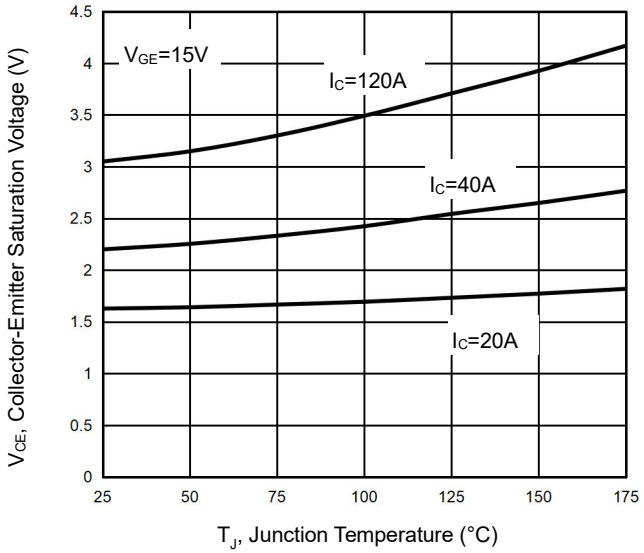


Figure 4 Saturation Voltage vs. V_{GE}

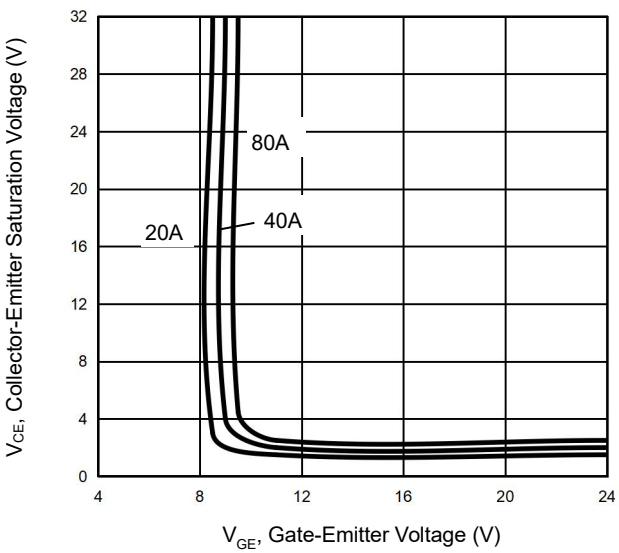


Figure 5 Capacitance Characteristics

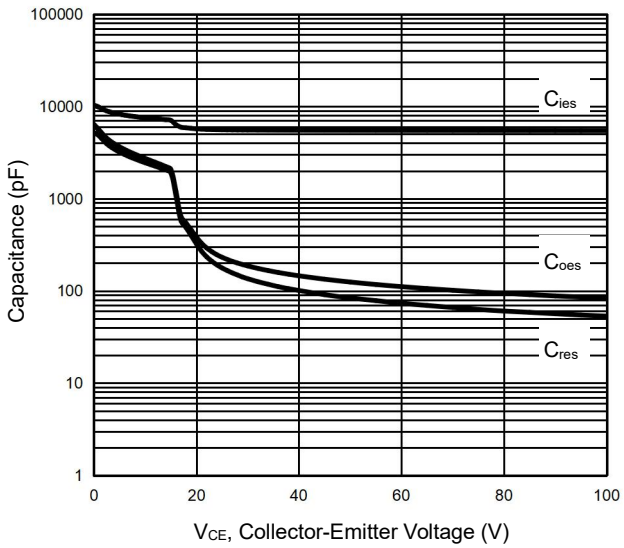
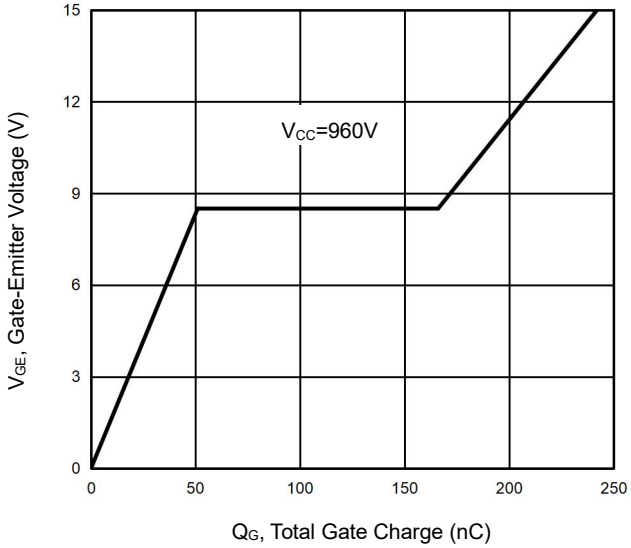


Figure 6 Gate Charge Wave Form



Typical Electrical and Thermal Characteristics

Figure 7 Switching Loss vs. R_G

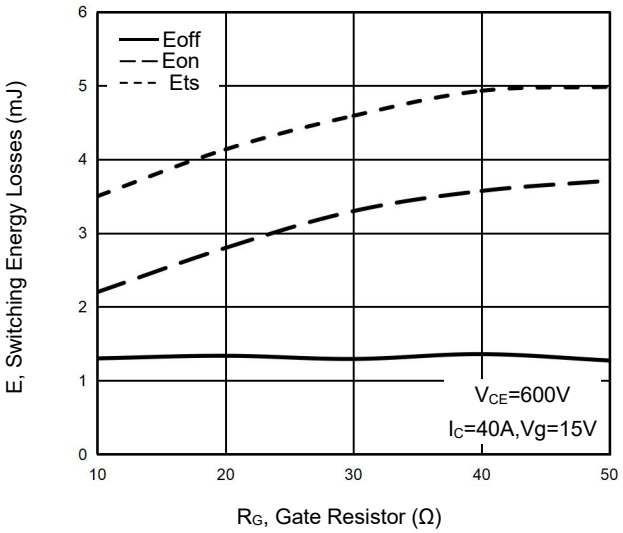


Figure 8 Switching Loss vs. Collector Current

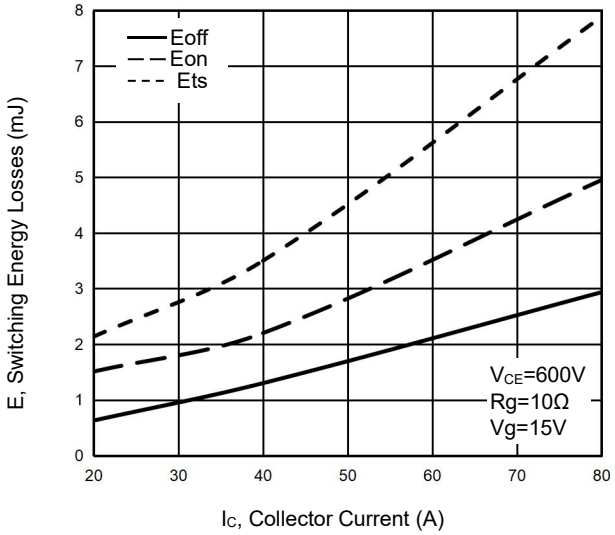


Figure 9 Switching Energy vs. Temperature

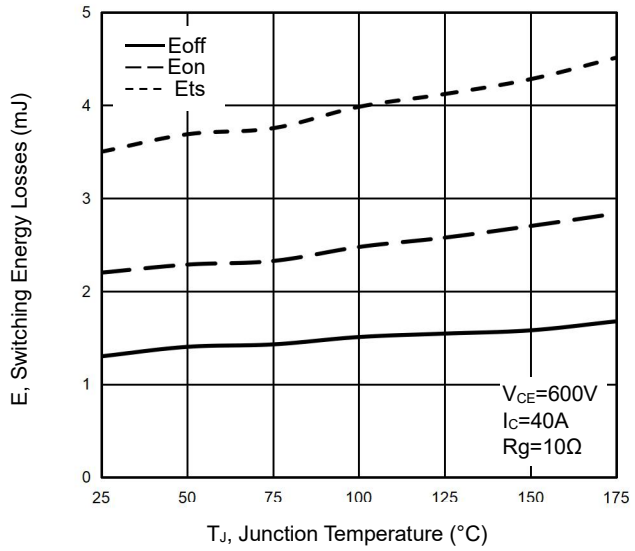


Figure 10 Forward Bias Safe Operating Area

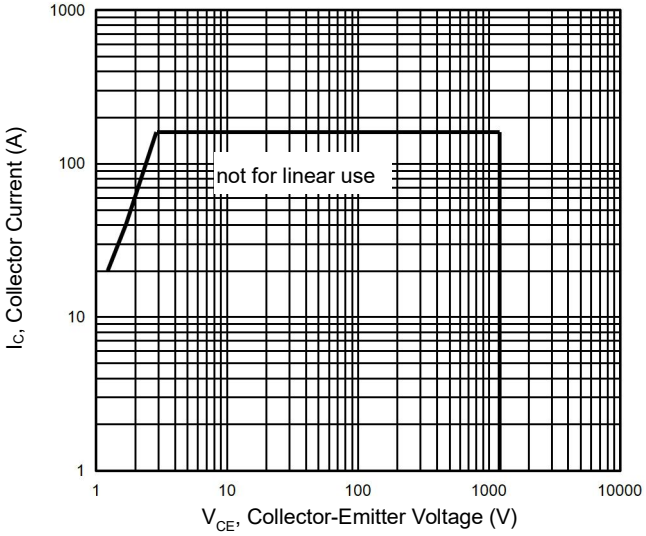


Figure 11 Gate-Emitter Threshold Voltage as a Function of Junction Temperature

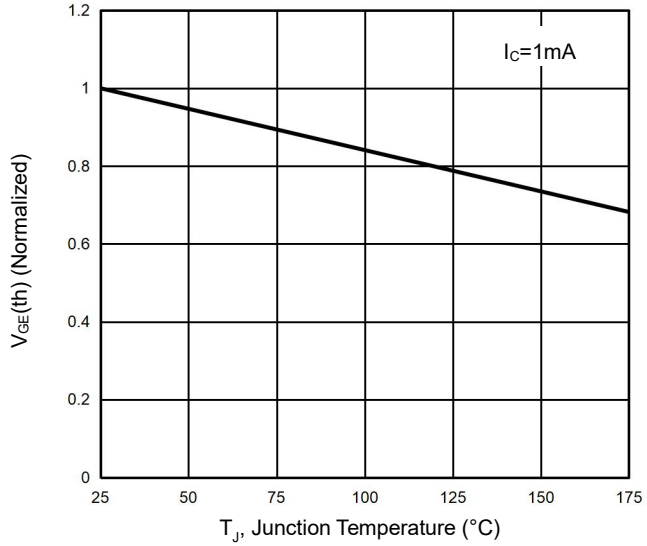
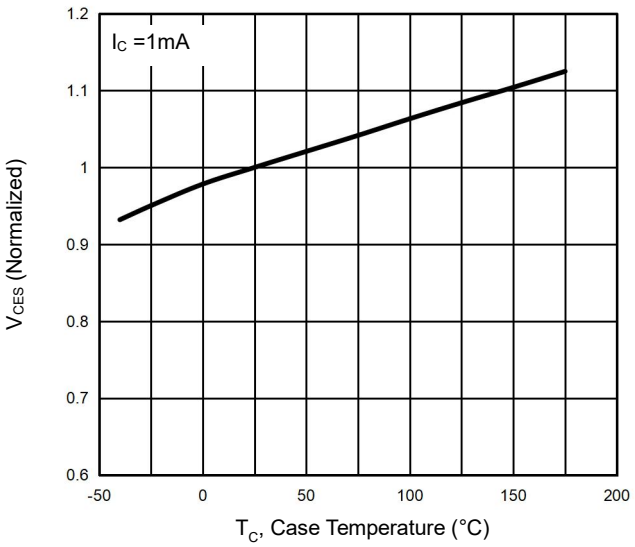


Figure 12 V_{CES} vs. Temperature



Typical Electrical and Thermal Characteristics

Figure 13 Switching Time vs. I_C

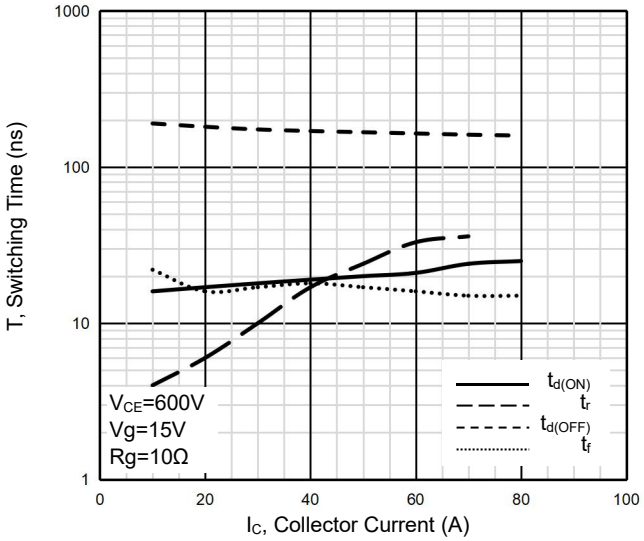


Figure 14 I_C vs. Temperature

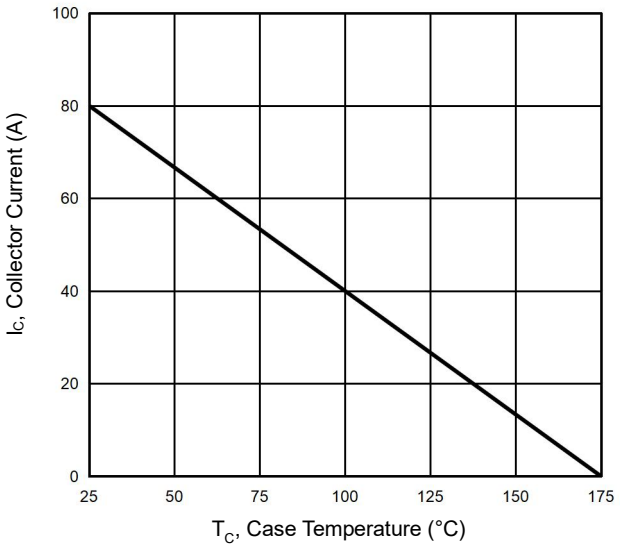


Figure 15 Power Dissipation as a Function of Case Temperature

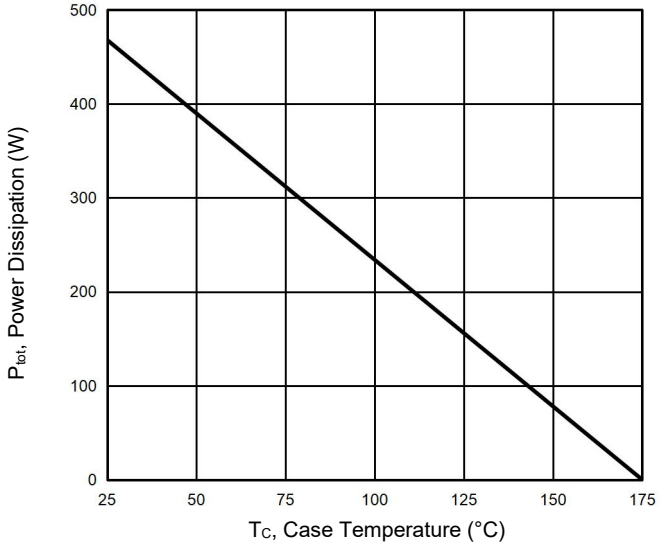
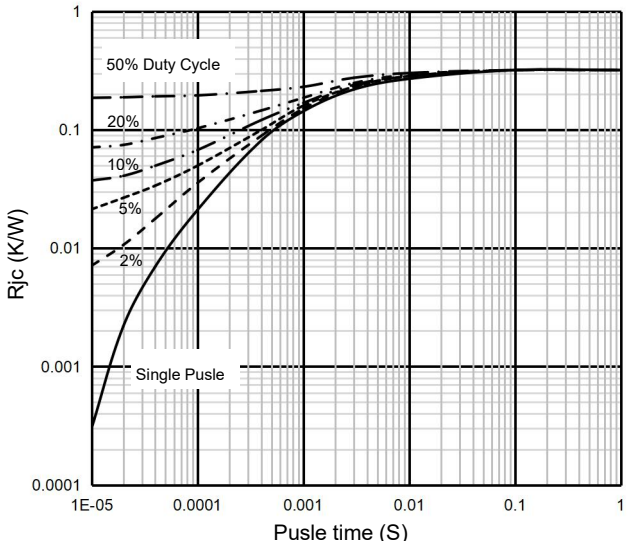
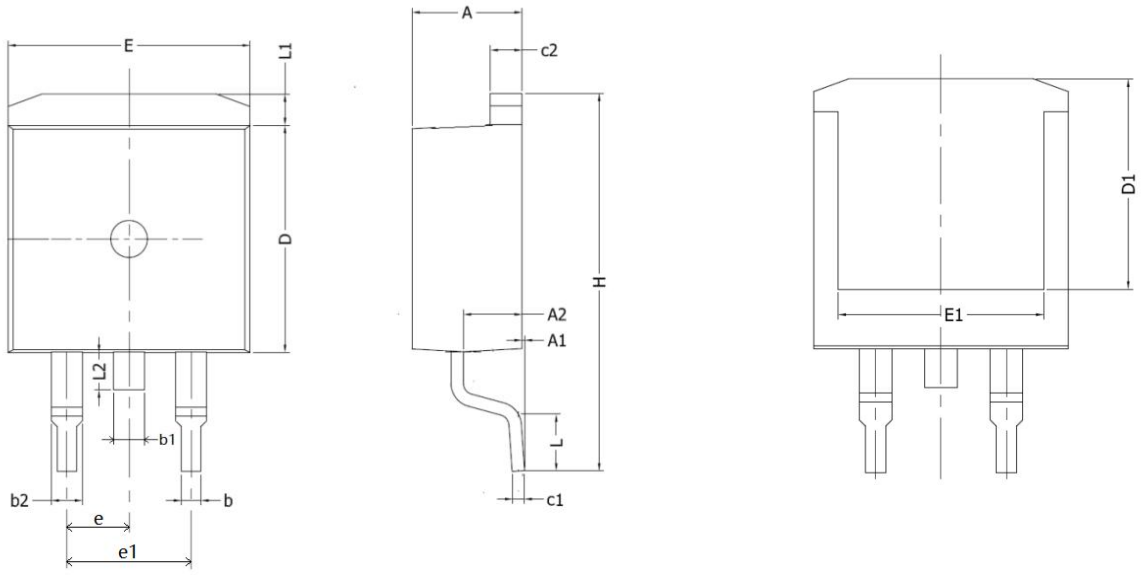


Figure 16 IGBT Transient Thermal Impedance



TO-263-E Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.20	4.60	0.16	0.18
A1	0.00	0.25	0.00	0.01
A2	2.20	2.60	0.09	0.10
b	0.70	0.90	0.03	0.04
b1	1.17	1.37	0.04	0.05
b2	1.20	1.75	0.04	0.07
c1	0.40	0.60	0.01	0.02
c2	1.15	1.40	0.04	0.05
D	9.10	9.30	0.35	0.36
D1	7.63	8.23	0.30	0.32
E	10.05	10.45	0.39	0.41
E1	8.35	8.95	0.32	0.35
e	2.54BSC		0.10BSC	
e1	5.08BSC		0.20BSC	
H	14.61	15.88	0.57	0.62
L	1.78	2.79	0.07	0.0
L1	1.36REF		0.05REF	
L2	1.30REF		0.05REF	

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