

# TSG25N120B

## IGBT

## DRAWING

### Features

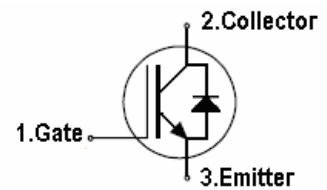
- 1200V,25A
- $V_{CE(sat)(typ.)}=2.3V@V_{GE}=15V, I_C=25A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA using NPT technology



G C E

### General Description

TS NPT IGBTs offer lower losses and higher energy efficiency for application such as IH (induction heating), UPS, general inverter and other soft switching applications.



### Absolute Maximum Ratings

Symbol	Parameter	Spec	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 30$	V
$I_C$	Continuous Collector Current ( $T_C=25\text{ }^\circ\text{C}$ )	50	A
	Continuous Collector Current ( $T_C=100\text{ }^\circ\text{C}$ )	25	A
$I_{CM}$	Pulsed Collector Current (Note 1)	190	A
$I_F$	Diode Continuous Forward Current ( $T_C=100\text{ }^\circ\text{C}$ )	20	A
$I_{FM}$	Diode Maximum Forward Current (Note 1)	190	A
$t_{sc}$	Short Circuit Withstand Time	10	us
$P_D$	Maximum Power Dissipation ( $T_C=25\text{ }^\circ\text{C}$ )	192	W
	Maximum Power Dissipation ( $T_C=100\text{ }^\circ\text{C}$ )	76	W
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	Spec	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	0.45	$^\circ\text{C}/\text{W}$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	0.85	$^\circ\text{C}/\text{W}$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	40	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	1200			V	
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$			250	$\mu A$	
$I_{GES}$	Gate Leakage Current, Forward	$V_{GE}=30V, V_{CE}=0V$			100	nA	
	Gate Leakage Current, Reverse	$V_{GE}=-30V, V_{CE}=0V$			-100	nA	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5		5.5	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=25A$		2.3	2.5	V	
$Q_g$	Total Gate Charge	$V_{CC}=600V$		120	140	nC	
$Q_{ge}$	Gate-Emitter Charge	$V_{GE}=15V$		30	50	nC	
$Q_{gc}$	Gate-Collector Charge	$I_C=25A$		60	80	nC	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=25A$ $R_G=28\Omega$ Inductive Load $TC=25^\circ C$		40		ns	
$t_r$	Turn-on Rise Time			50		ns	
$t_{d(off)}$	Turn-off Delay Time			450		ns	
$t_f$	Turn-off Fall Time			100		ns	
$E_{on}$	Turn-on Switching Loss				1.5		mJ
$E_{off}$	Turn-off Switching Loss				1.2		mJ
$E_{ts}$	Total Switching Loss				2.7		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V$		540		pF	
$C_{oes}$	Output Capacitance	$V_{GE}=0V$		135		pF	
$C_{res}$	Reverse Transfer Capacitance	$f=100kHz$		77		pF	
$R_{Gint}$	Integrated gate resistor		1.8	1.9	2.0	$\Omega$	

Electrical Characteristics of Diode (TC=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
$V_F$	Diode Forward Voltage	$I_F=25A$	1.8		2.4	V	
$t_{rr}$	Diode Reverse Recovery Time	$V_{CE}=600V$ $I_F=20A$ $dI_F/dt=500A/\mu s$		110		ns	
$I_{rr}$	Diode peak Reverse Recovery Current				16		A
$Q_{rr}$	Diode Reverse Recovery Charge				1060		nC

Typical Characteristics

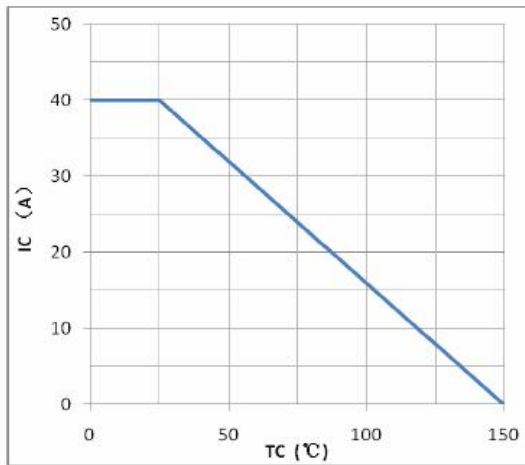


Figure1: maximum DC collector current VS. case temperature

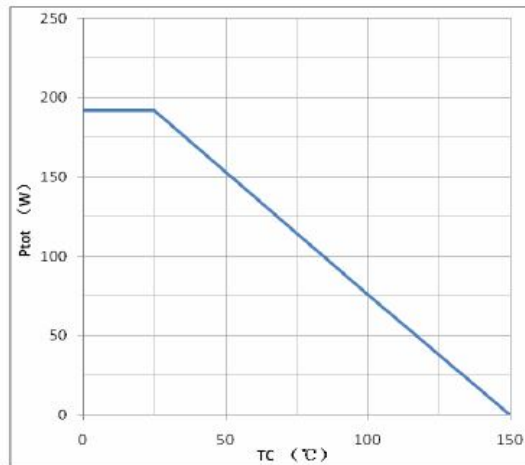


Figure2: power dissipation VS. case temperature

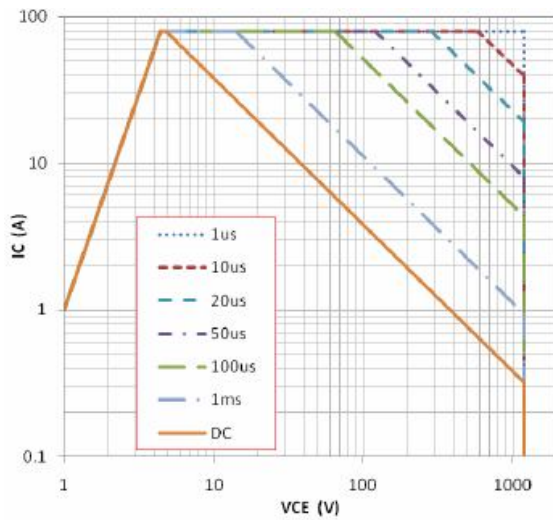


Figure3: forward SOA, TC=25°C, TJ ≤ 150°C

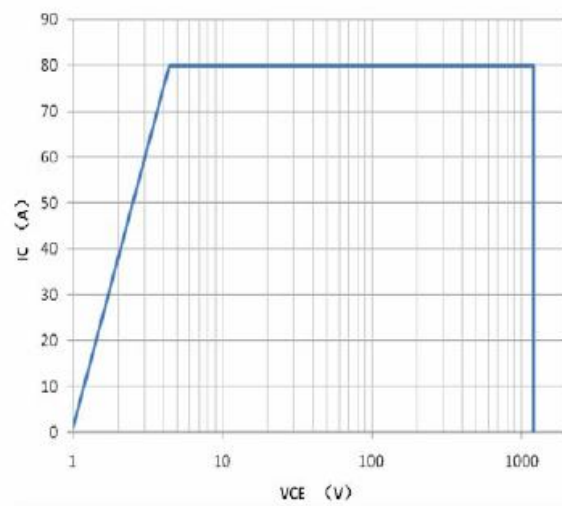


Figure4: reverse bias SOA, TJ=150°C, VGE=15V

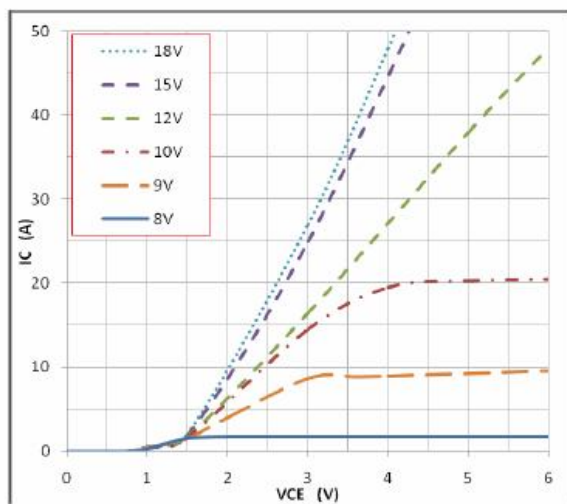


Figure5: typical IGBT output characteristics, TJ=25°C, tp=300us

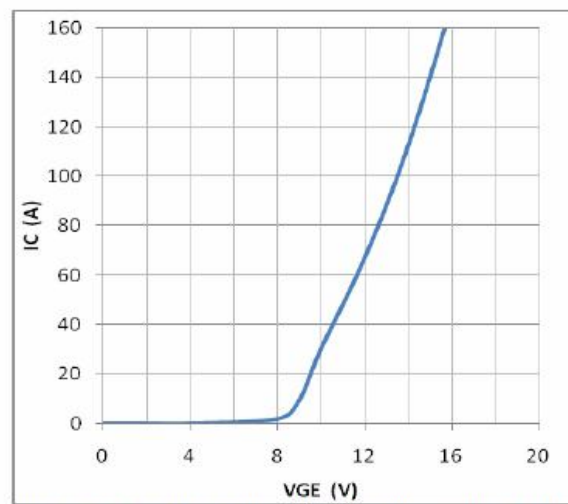


Figure6: typical trans characteristics, VCE=20V, tp=20us

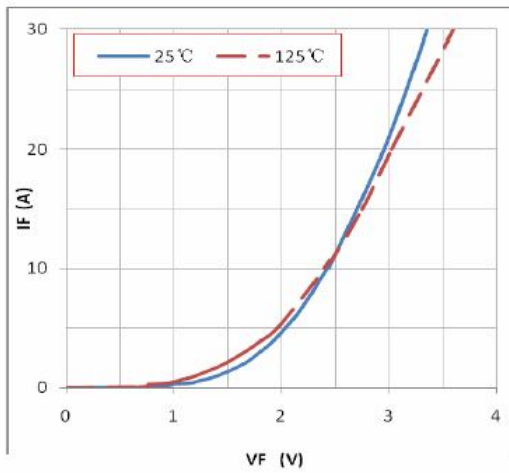


Figure7: typical diode forward characteristic,  $t_p=300\mu s$

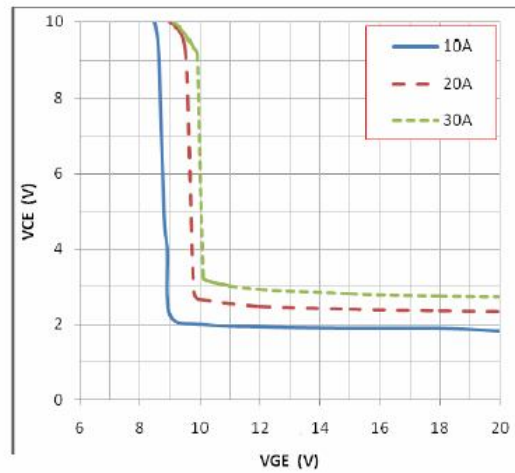


Figure8: typical VCE VS. VGE,  $I_J=25^\circ C$

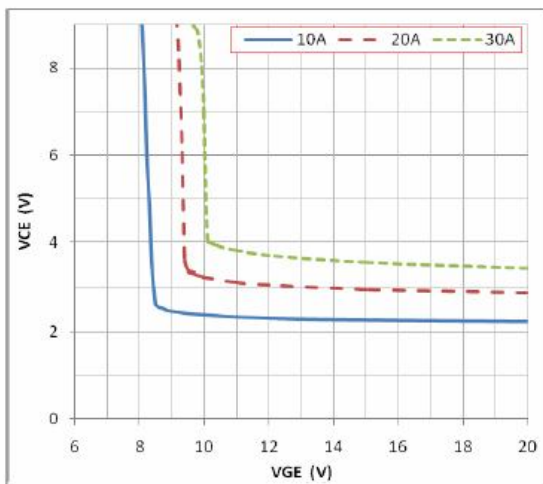


Figure9: typical VCE VS. VGE,  $T_J=125^\circ C$

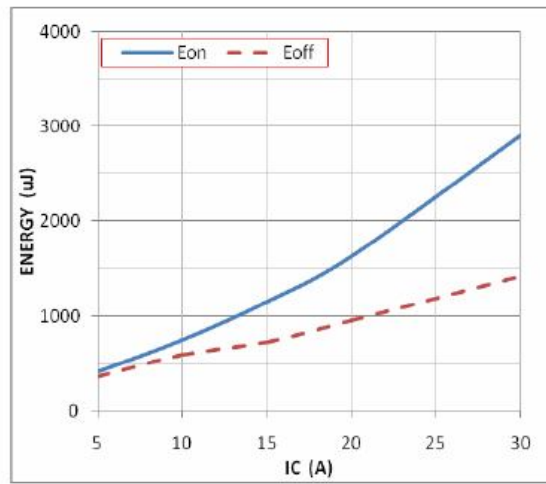


Figure10: typical energy loss VS. IC,  $TC=25^\circ C, L=500\mu H, VCE=600V, VGE=15V, R_g=28\Omega$

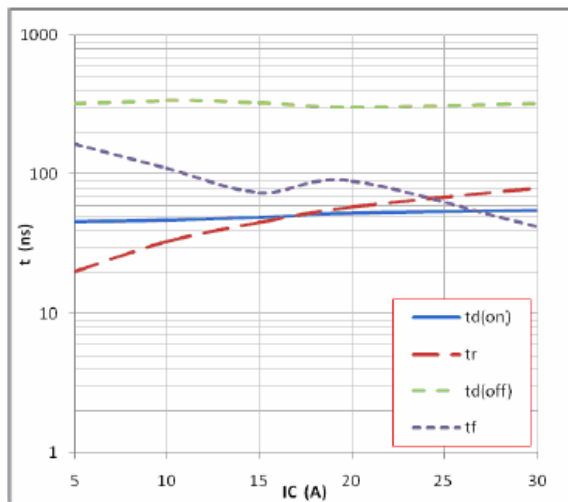


Figure11: typical switching time VS. IC,  $TC=25^\circ C, L=500\mu H, VCE=600V, VGE=15V, R_g=28\Omega$

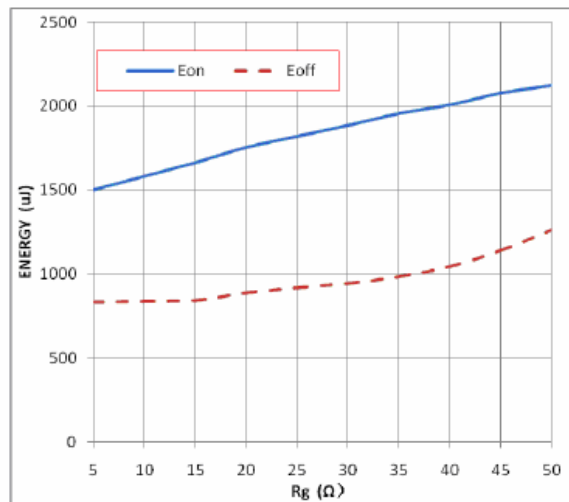


Figure12: typical energy loss VS. Rg,  $TC=25^\circ C, L=500\mu H, VCE=600V, VGE=15V, IC=25A$

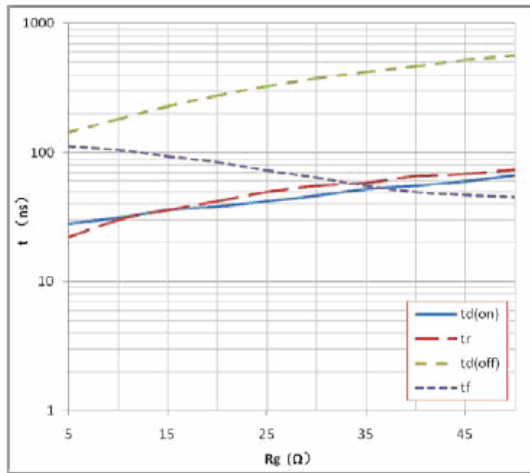


Figure13: typical switching time VS.  $R_g$ ,  $T_C=25^\circ C$ ,  $L=500\mu H$ ,  $V_{CE}=600V$ ,  $V_{GE}=15V$ ,  $I_C=25A$

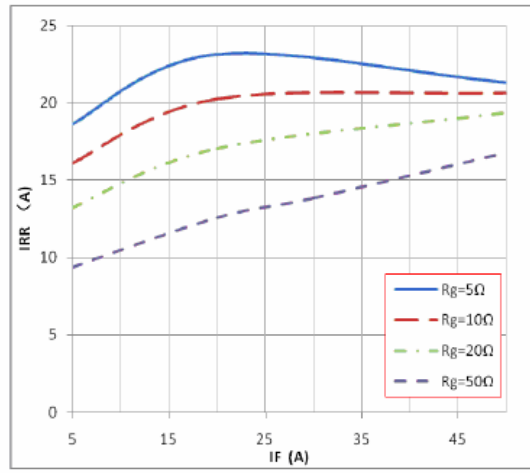


Figure14: typical diode IRR VS.  $I_F$ ,  $T_C=25^\circ C$ ,  $V_{CC}=600V$ ,  $V_{GE}=15V$

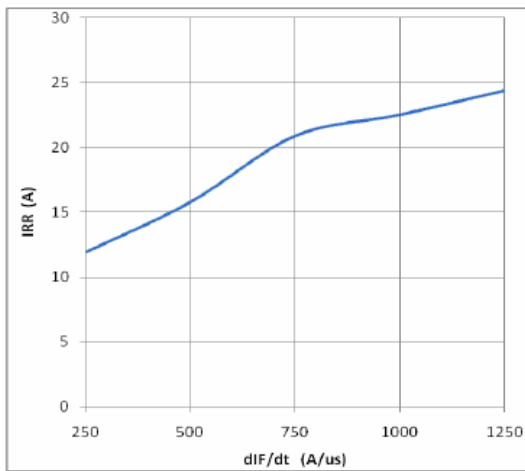


Figure15: typical diode IRR VS.  $dI_F/dt$ ,  $V_{CC}=600V$ ,  $V_{GE}=15V$ ,  $I_F=25A$

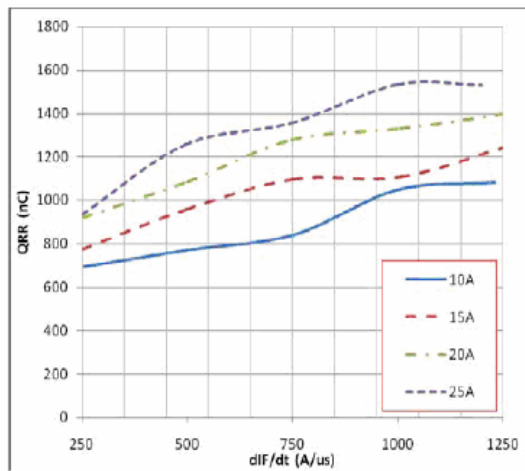


Figure16: typical diode QRR VS.  $dI_F/dt$ ,  $V_{CC}=600V$ ,  $V_{GE}=15V$

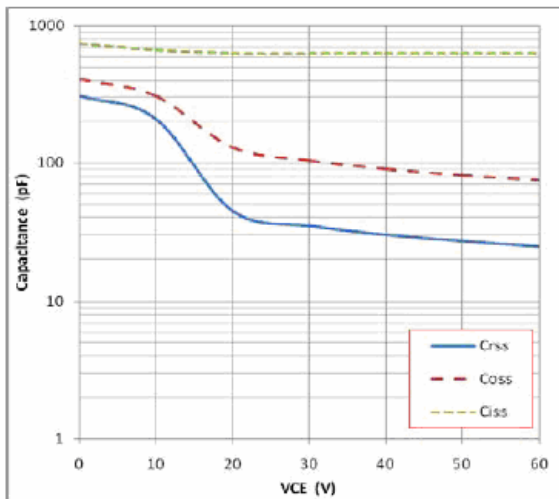


Figure17: typical capacitance VS.  $V_{CE}$ ,  $V_{GE}=0V$ ,  $f=100kHz$

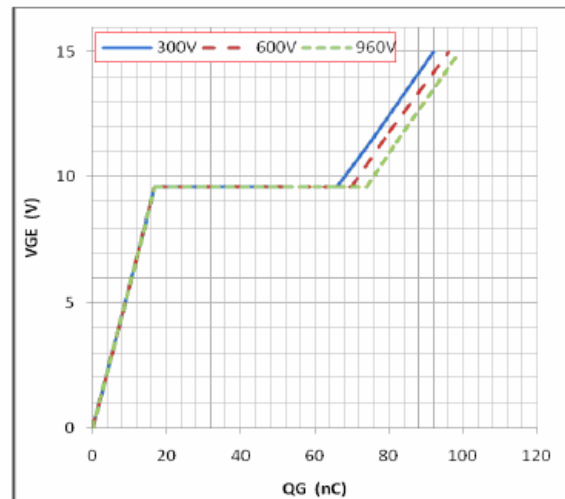


Figure18: typical gate charge VS.  $V_{GE}$ ,  $I_C=25A$

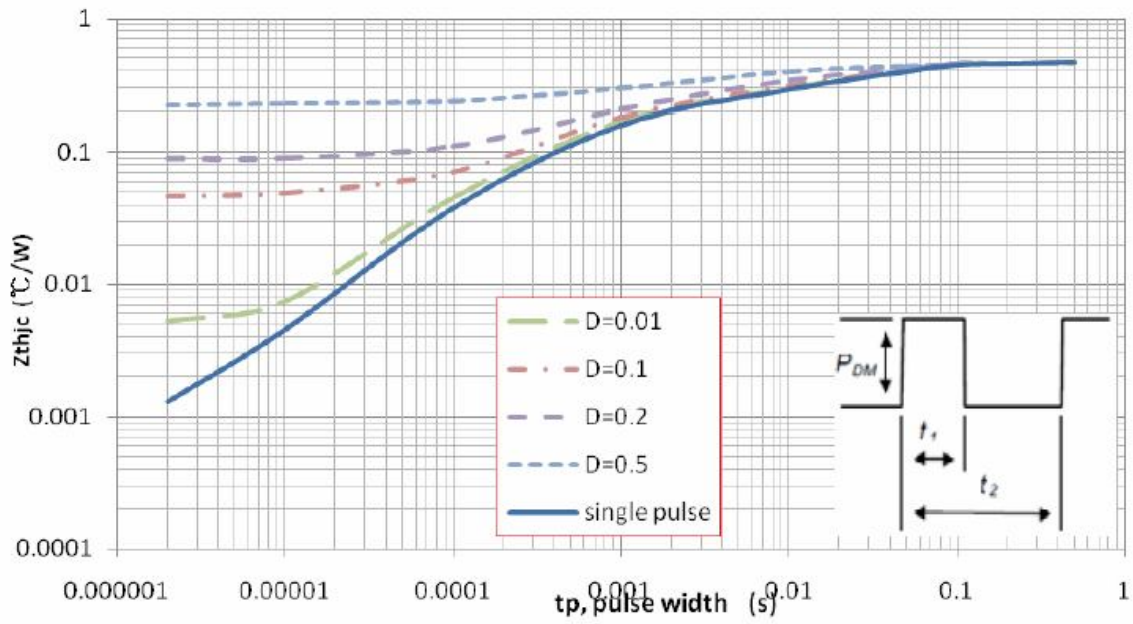


Figure19: normalized transient thermal impedance, junction-to-case

Note1: Duty factor  $D=t_1/t_2$ ; Note2: peak  $T_J=P_{DM} \times Z_{thjc}+T_C$

Mechanical Dimensions

