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ON Semiconductor®

FGD3N60LSD
IGBT

Features

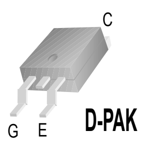
- High Current Capability
- Very Low Saturation Voltage : $V_{CE(sat)}$ = 1.2 V @ I_C = 3A
- High Input Impedance

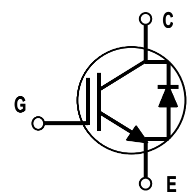
Applications

- HID Lamp Applications
- Piezo Fuel Injection Applications

Description

ON Semiconductor's Insulated Gate Bipolar Transistors (IGBTs) provide very low conduction losses. The device is designed for applica-tions where very low On-Voltage Drop is a required feature.





Absolute Maximum Ratings

Symbol	Description		FGD3N60LSD	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	6	A
	Collector Current	@ T_C = 100°C	3	A
$I_{CM\ (1)}$	Pulsed Collector Current	(1)	25	A
I_F	Diode Continous Forward Current	@ T_C = 100°C	3	A
I_{FM}	Diode Maximum Forward Current		25	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	40	W
	Derating Factor		0.32	W/°C
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8” from Case for 5 Seconds		250	°C

Notes :

(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction-to-Case	--	3.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (PCB Mount) (2)	--	100	°C/W

Notes :

(2) Mounted on 1” squre PCB (FR4 or G-10 Material)

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGD3N60LSD	FGD3N60LSDTM	D-PAK	380mm	16mm	2500

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, V_{GE} = 0V	--	--	250	uA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 3mA, $V_{CE} = V_{GE}$	2.5	3.2	5.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 3A, V_{GE} = 10V	--	1.2	1.5	V
		I_C = 6A, V_{GE} = 10V	--	1.8	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	--	185	--	pF
C_{oes}	Output Capacitance		--	20	--	pF
C_{res}	Reverse Transfer Capacitance		--	5.5	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 480 V, I_C = 3A, R_G = 470Ω, V_{GE} = 10V, Inductive Load, T_C = 25°C	--	40	--	ns
t_r	Rise Time		--	40	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	600	--	ns
t_f	Fall Time		--	600	--	ns
E_{on}	Turn-On Switching Loss		--	250	--	uJ
E_{off}	Turn-Off Switching Loss		--	1.00	--	mJ
E_{ts}	Total Switching Loss		--	1.25	--	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 480 V, I_C = 3A, R_G = 470Ω, V_{GE} = 10V, Inductive Load, T_C = 125°C	--	40	--	ns
t_r	Rise Time		--	45	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	620	--	ns
t_f	Fall Time		--	800	--	ns
E_{on}	Turn-On Switching Loss		--	300	--	uJ
E_{off}	Turn-Off Switching Loss		--	1.9	--	mJ
E_{ts}	Total Switching Loss		--	2.2	--	mJ
Q_g	Total Gate Charge	V_{CE} = 480 V, I_C = 3A, V_{GE} = 10V	--	12.5	--	nC
Q_{ge}	Gate-Emitter Charge		--	2.8	--	nC
Q_{gc}	Gate-Collector Charge		--	4.9	--	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F = 3A	T_C = 25°C	--	1.5	1.9	V
			T_C = 100°C	--	1.55	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 3A, di/dt = 100A/us V_R = 200V	T_C = 25°C	--	234	--	ns
			T_C = 100°C	--	--	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	2.64	--	A
			T_C = 100°C	--	--	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	309	--	nC
			T_C = 100°C	--	--	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

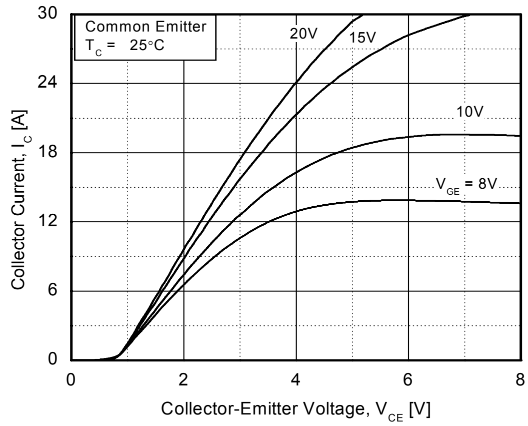


Figure 2. Typical Output Characteristics

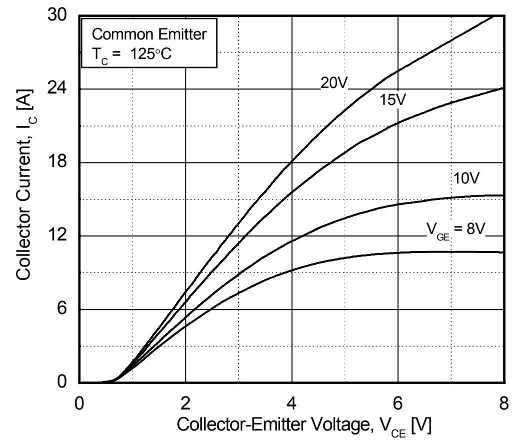


Figure 3. Typical Output Characteristics

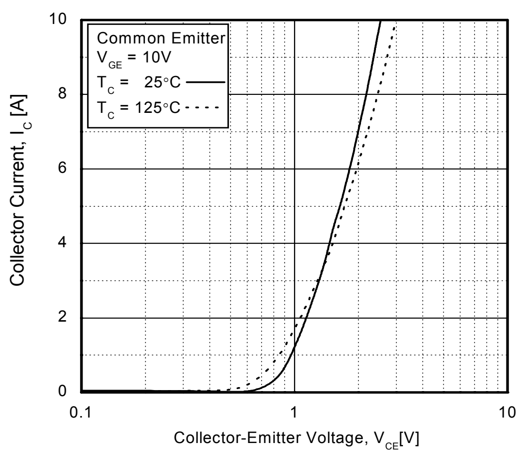


Figure 4. Transfer Characteristics

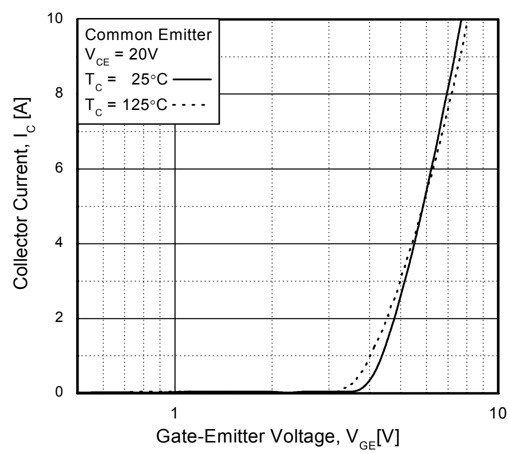


Figure 5. Saturation Voltage vs. Case

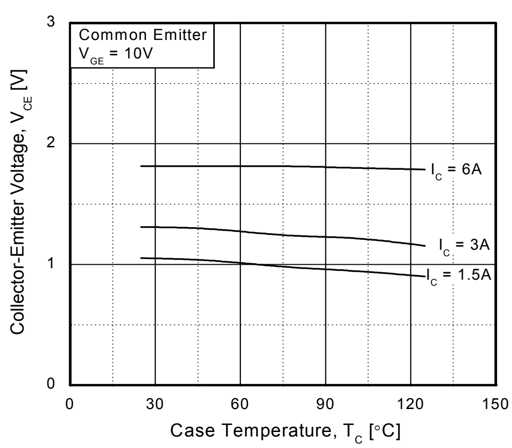
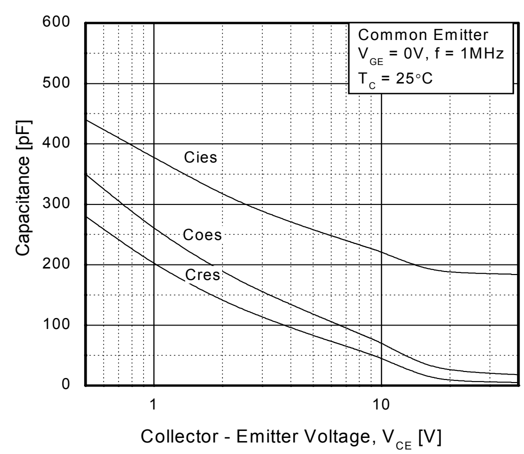


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Gate Charge

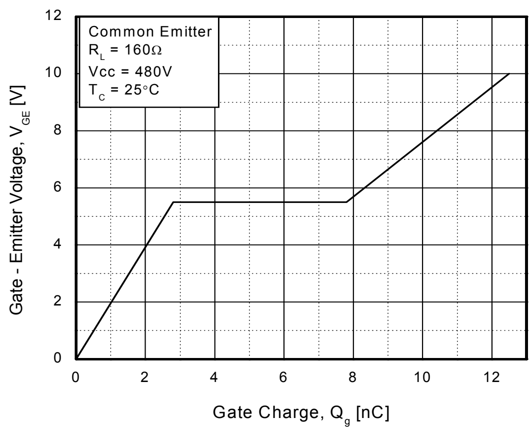


Figure 8. Turn-On Characteristics vs. Gate Resistance

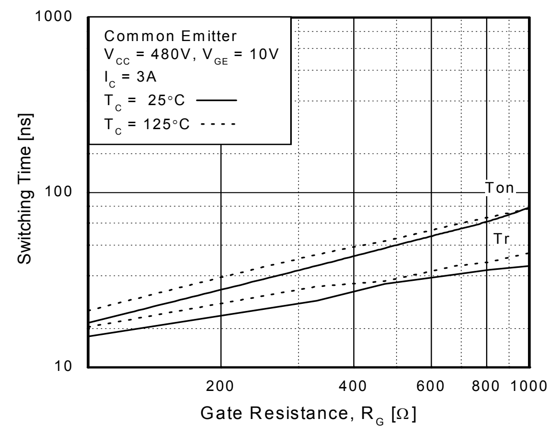


Figure 9. Turn-Off Characteristics vs. Gate Resistance

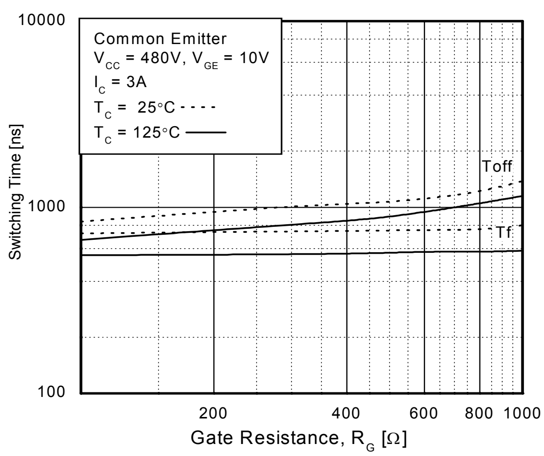


Figure 10. Switching Loss vs. Gate Resistance

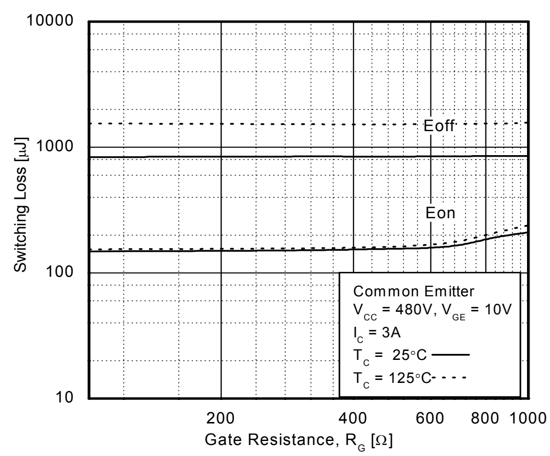


Figure 11. Turn-On Characteristics vs. Collector Current

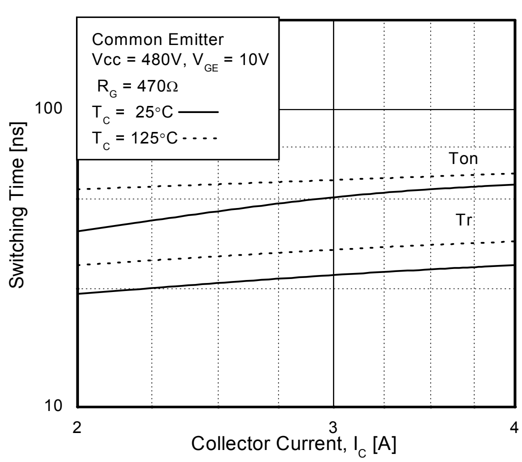
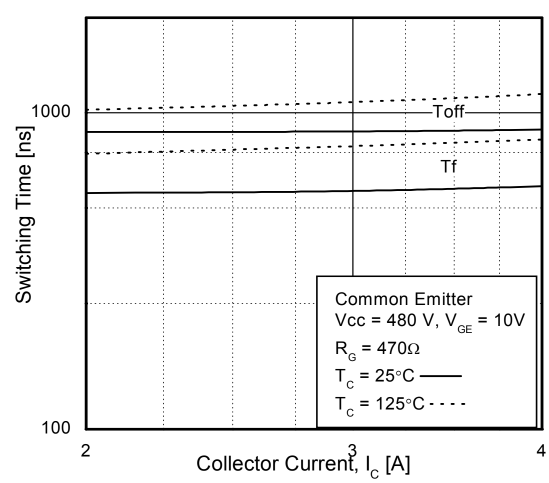


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

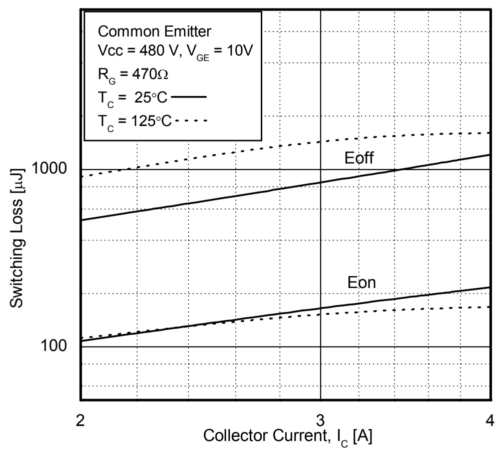


Figure 14. Forward Characteristics

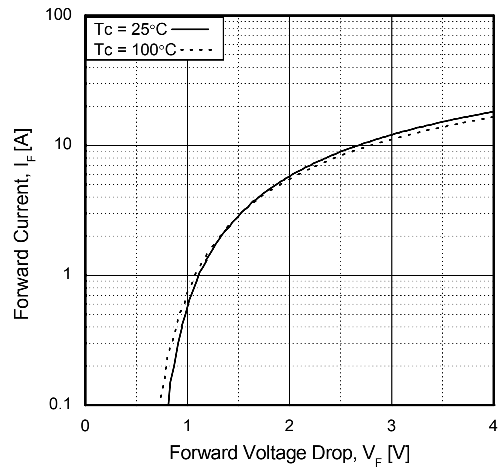


Figure 15. Forward Voltage Drop Vs Tj

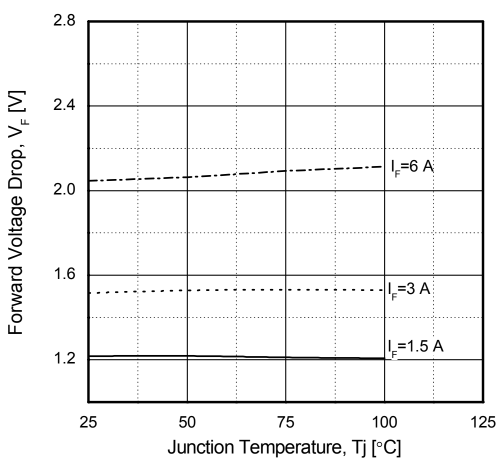


Figure 16. SOA Characteristics

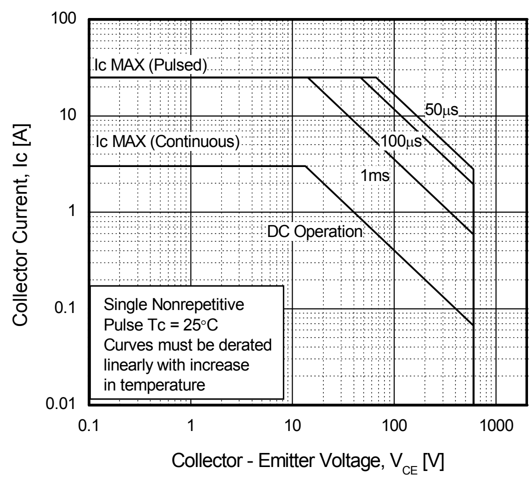
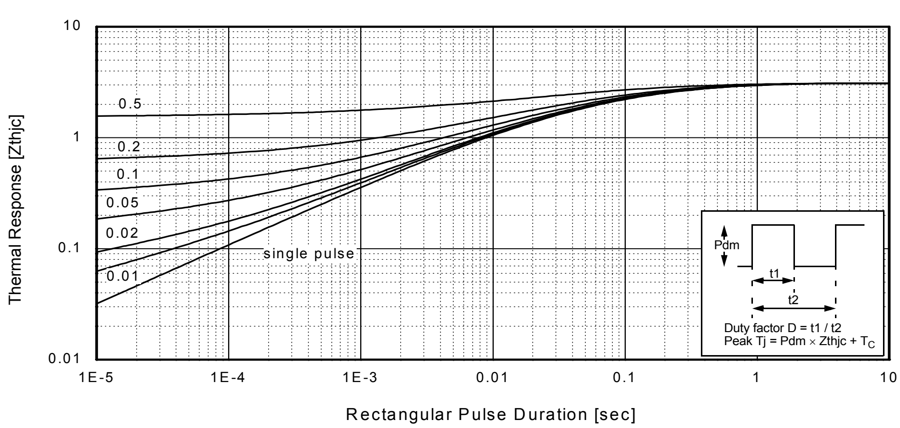
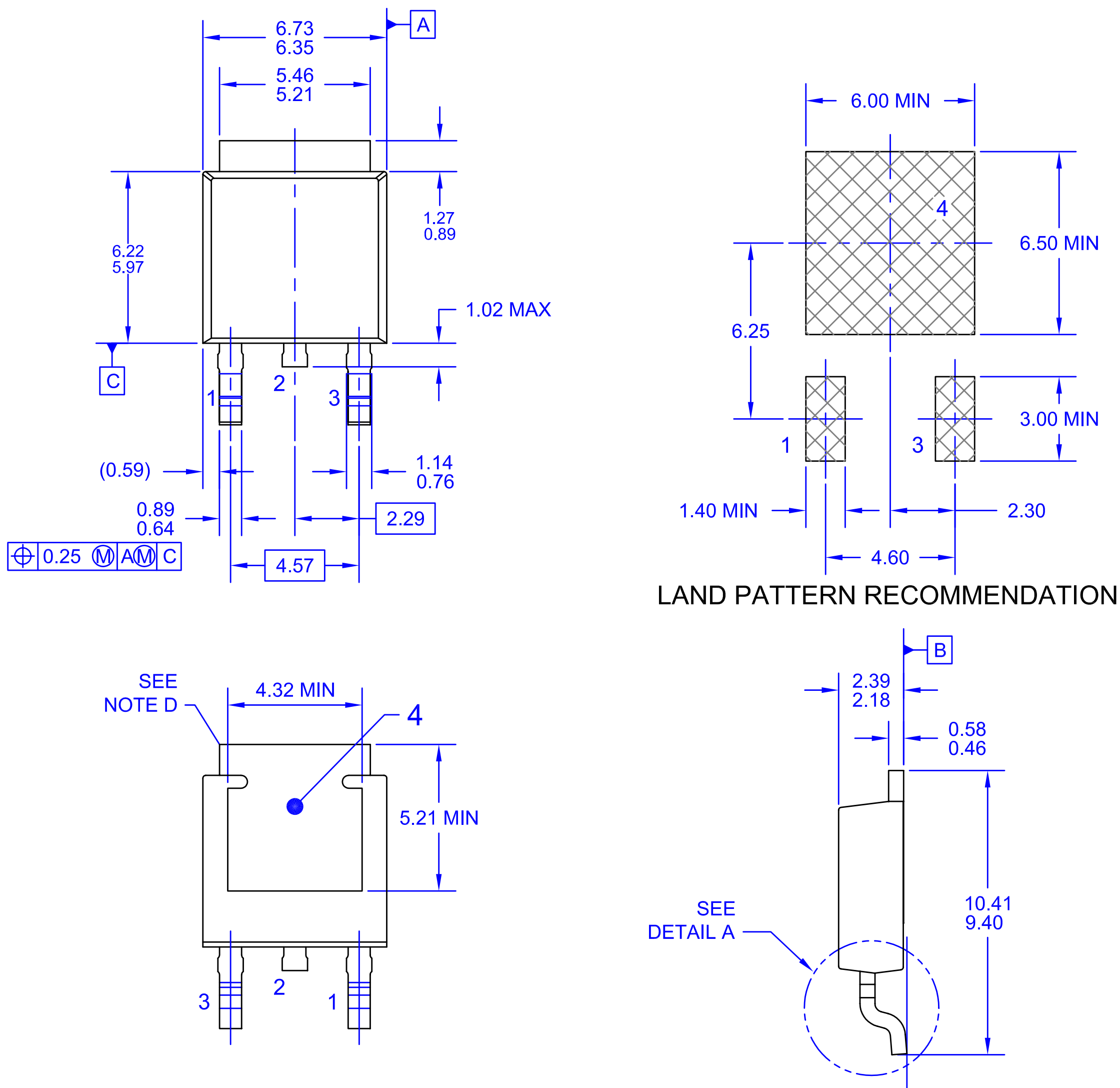


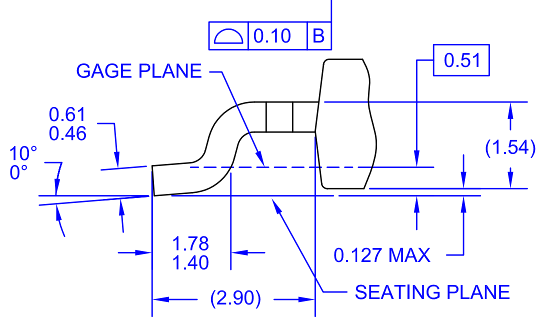
Figure 17. Transient Thermal Impedance of IGBT



Mechanical Dimensions

D-PAK





NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
F) DIMENSIONS ARE EXCLUSSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV8

Dimensions in Millimeters