

FCI25N60N_F102

N-Channel SupreMOS® MOSFET

600 V, 25 A, 125 mΩ

Features

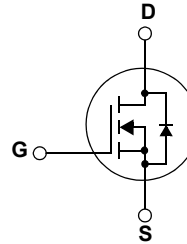
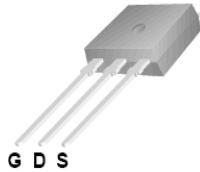
- $R_{DS(on)} = 107 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 12.5 \text{ A}$
- Ultra Low Gate Charge (Typ. $Q_g = 57 \text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss,eff} = 262 \text{ pF}$)
- 100% Avalanche Tested
- RoHS Compliant

Applications

- Solar Inverter
- AC-DC Power Supply

Description

The SupreMOS® MOSFET is Fairchild Semiconductor®'s next-generation of high voltage super-junction (SJ) technology employing a deep trench filling process that differentiate it from the conventional MOSFETs. This advanced technology and precise process control provide lowest R_{sp} on-resistance, superior switching performance and ruggedness. SupreMOS MOSFET is suitable for high frequency switching power converter applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted*

Symbol	Parameter	FCI25N60N_F102	Unit
V_{DSS}	Drain to Source Voltage	600	V
V_{GSS}	Gate to Source Voltage	± 30	V
I_D	Drain Current	Continuous ($T_C = 25^\circ\text{C}$)	25
		Continuous ($T_C = 100^\circ\text{C}$)	16
I_{DM}	Drain Current	Pulsed (Note 1)	75
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	861
I_{AR}	Avalanche Current		8.3
E_{AR}	Repetitive Avalanche Energy		2.2
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	15
	MOSFET dv/dt		100
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	216
		Derate above 25°C	1.72
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCI25N60N_F102	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.58	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information $T_C = 25^\circ\text{C}$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCI25N60N	FCI25N60N_F102	I2PAK	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{ mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.74	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 480\text{ V}, T_J = 125^\circ\text{C}$	-	-	10 100	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 12.5\text{ A}$	-	0.107	0.125	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 12.5\text{ A}$	-	-	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$	-	2520	3352	pF
C_{oss}	Output Capacitance		-	103	137	pF
C_{rss}	Reverse Transfer Capacitance		-	3.2	5	pF
C_{oss}	Output Capacitance	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	55	-	pF
$C_{oss\text{eff}}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	-	262	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{ V}, I_D = 12.5\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4)	-	57	74	nC
Q_{gs}	Gate to Source Gate Charge		-	10	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	18	-	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open, $f = 1\text{ MHz}$	-	1	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{ V}, I_D = 12.5\text{ A}$ $R_G = 4.7\ \Omega$ (Note 4)	-	21	52	ns
t_r	Turn-On Rise Time		-	22	54	ns
$t_{d(off)}$	Turn-Off Delay Time		-	68	146	ns
t_f	Turn-Off Fall Time		-	5	20	ns

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	25	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	75	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 12.5\text{ A}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 12.5\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$	-	370	-	ns
Q_{rr}	Reverse Recovery Charge		-	7	-	μC

Notes:

- Repetitive Rating: Pulse width limited by maximum junction temperature
- $I_{AS} = 8.3\text{ A}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
- $I_{SD} \leq 25\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq 380\text{ V}$, Starting $T_J = 25^\circ\text{C}$
- Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

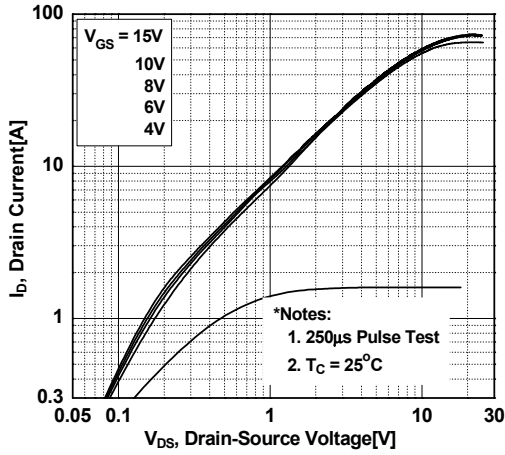


Figure 2. Transfer Characteristics

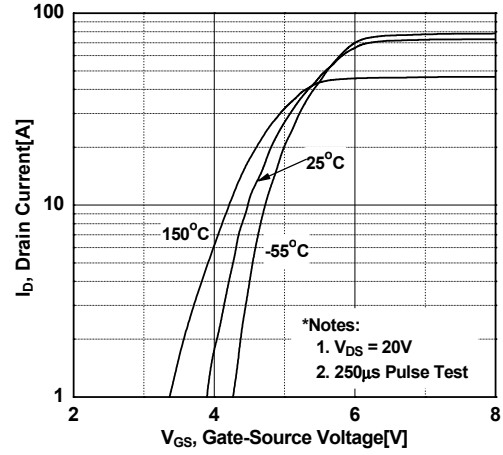


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

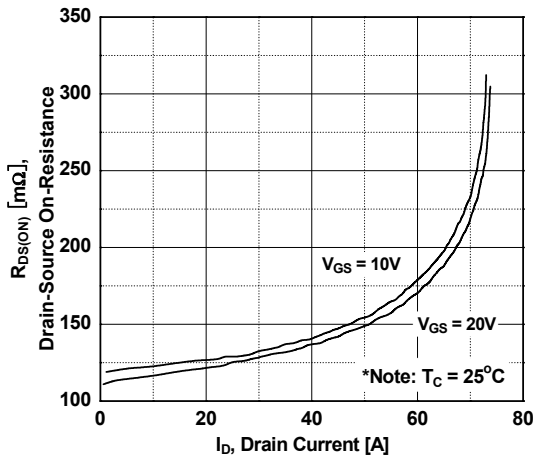


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

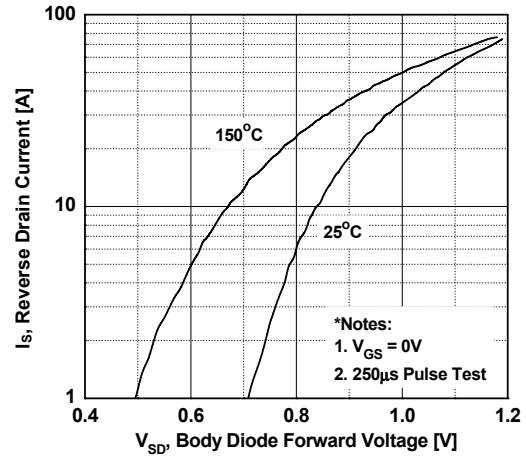


Figure 5. Capacitance Characteristics

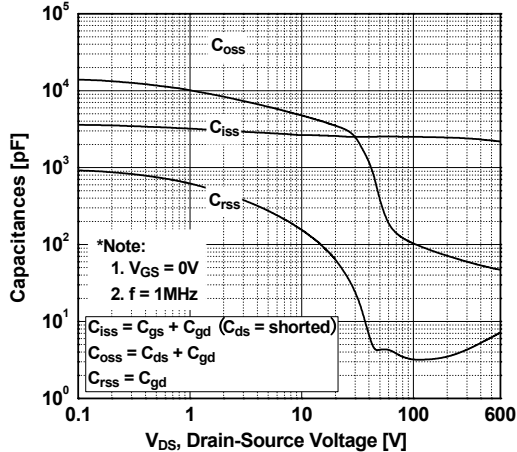
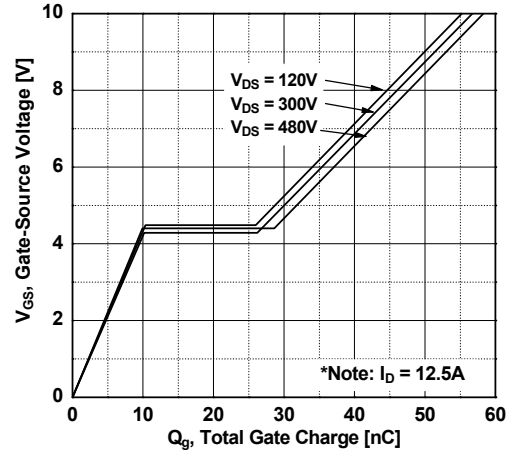


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

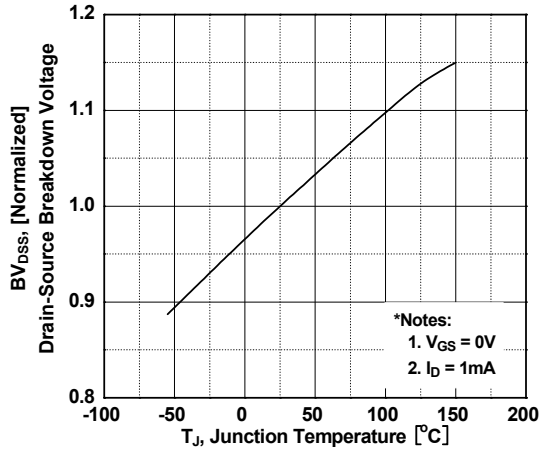


Figure 8. On-Resistance Variation vs. Temperature

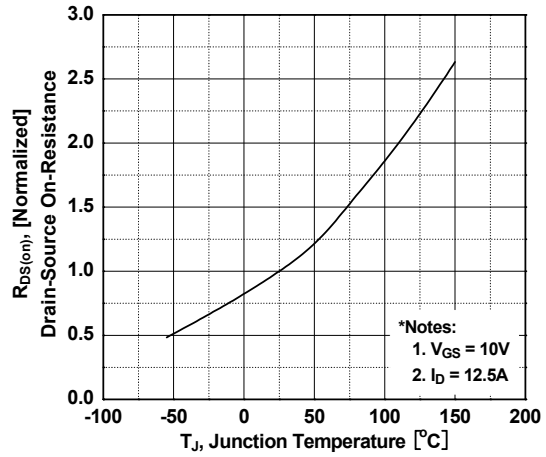


Figure 9. Maximum Safe Operating Area

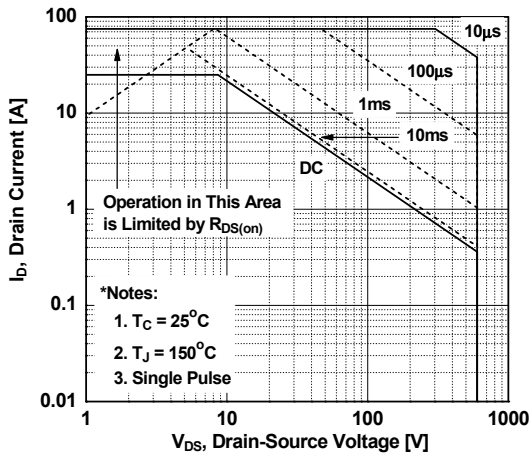


Figure 10. Maximum Drain Current vs. Case Temperature

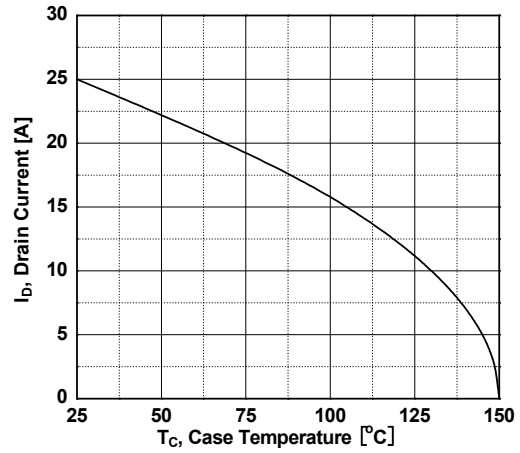
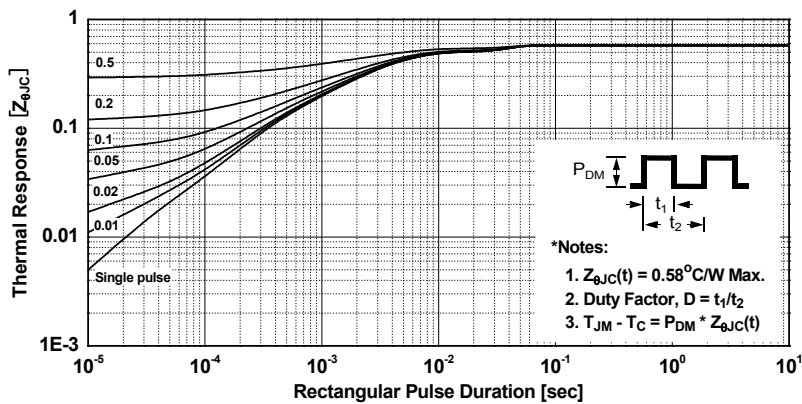
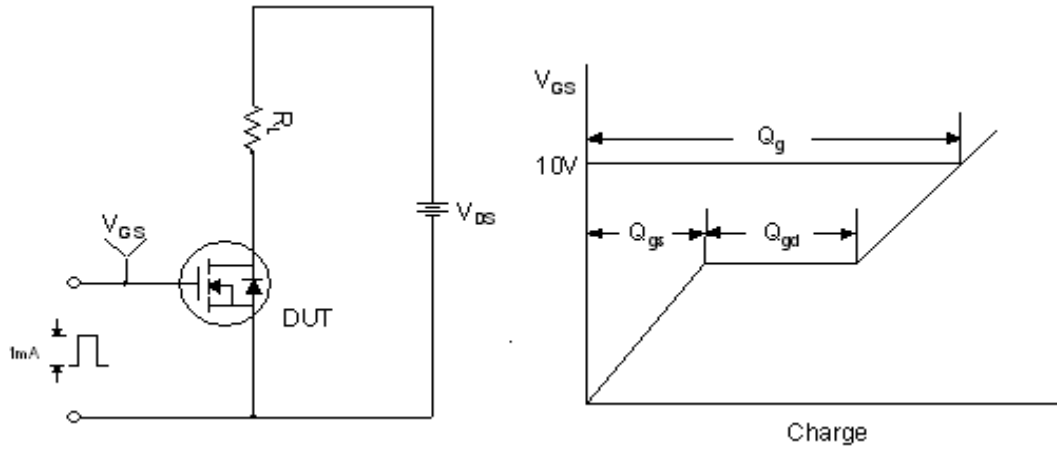


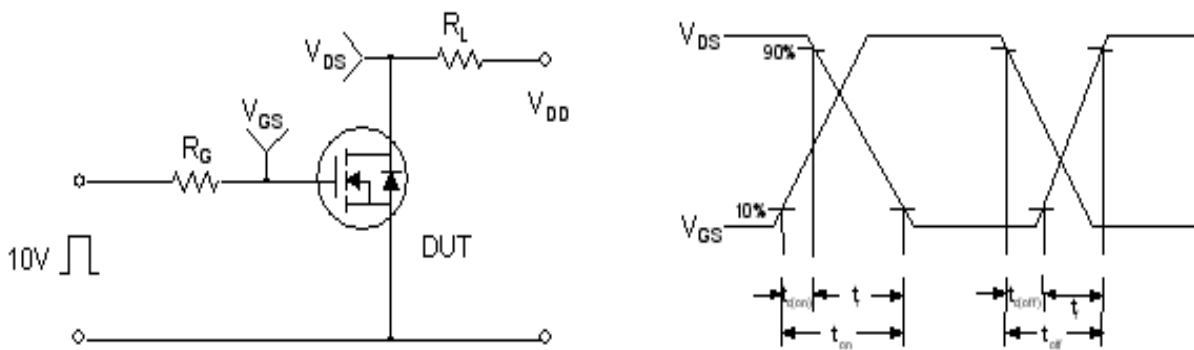
Figure 11. Transient Thermal Response Curve



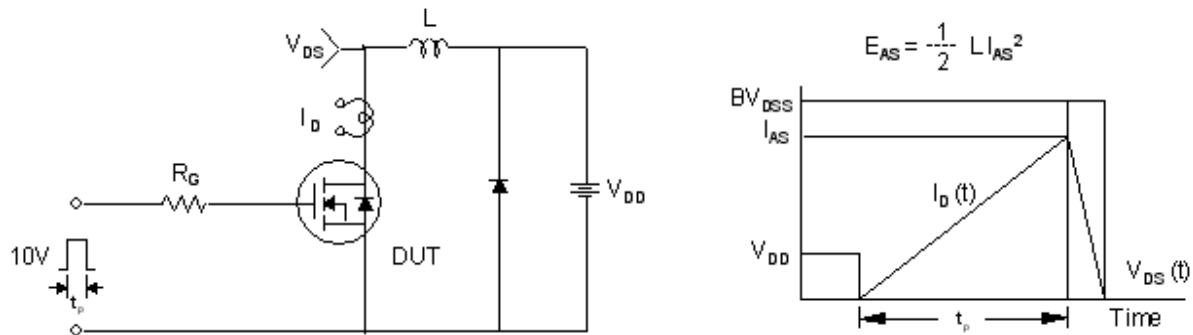
Gate Charge Test Circuit & Waveform



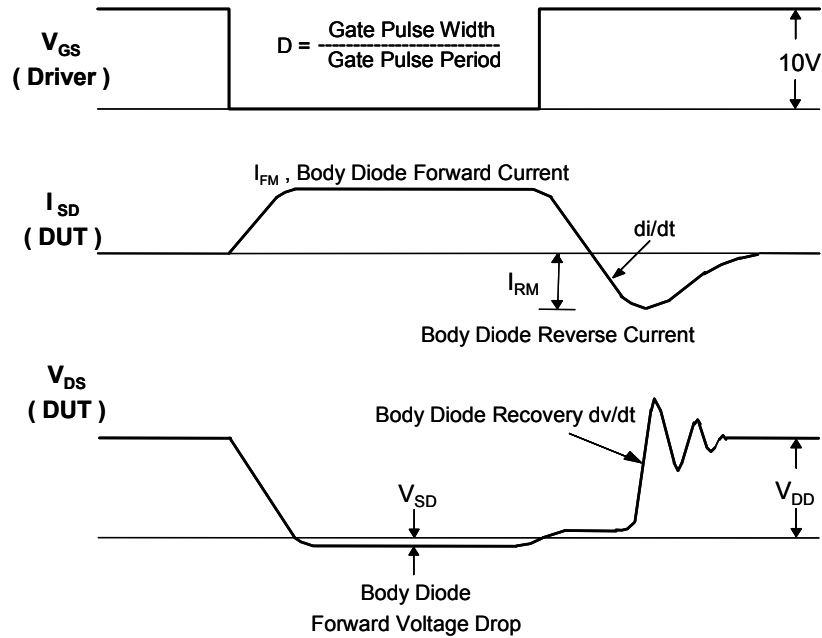
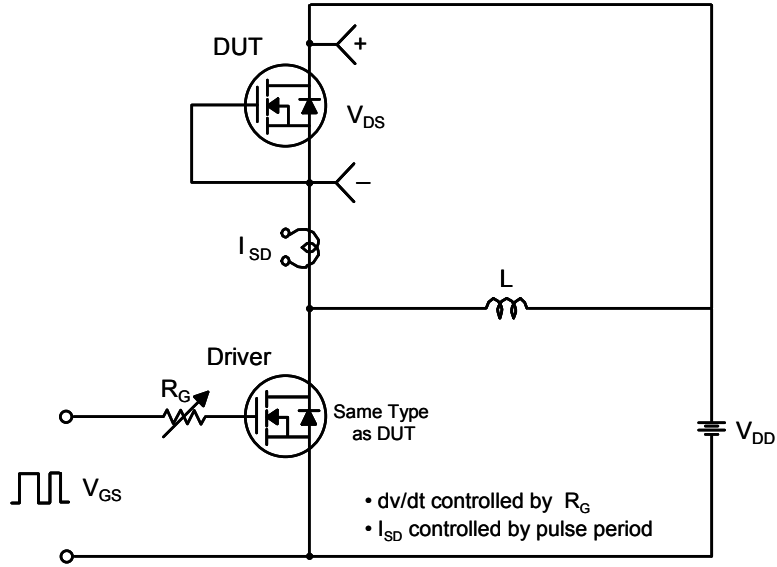
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

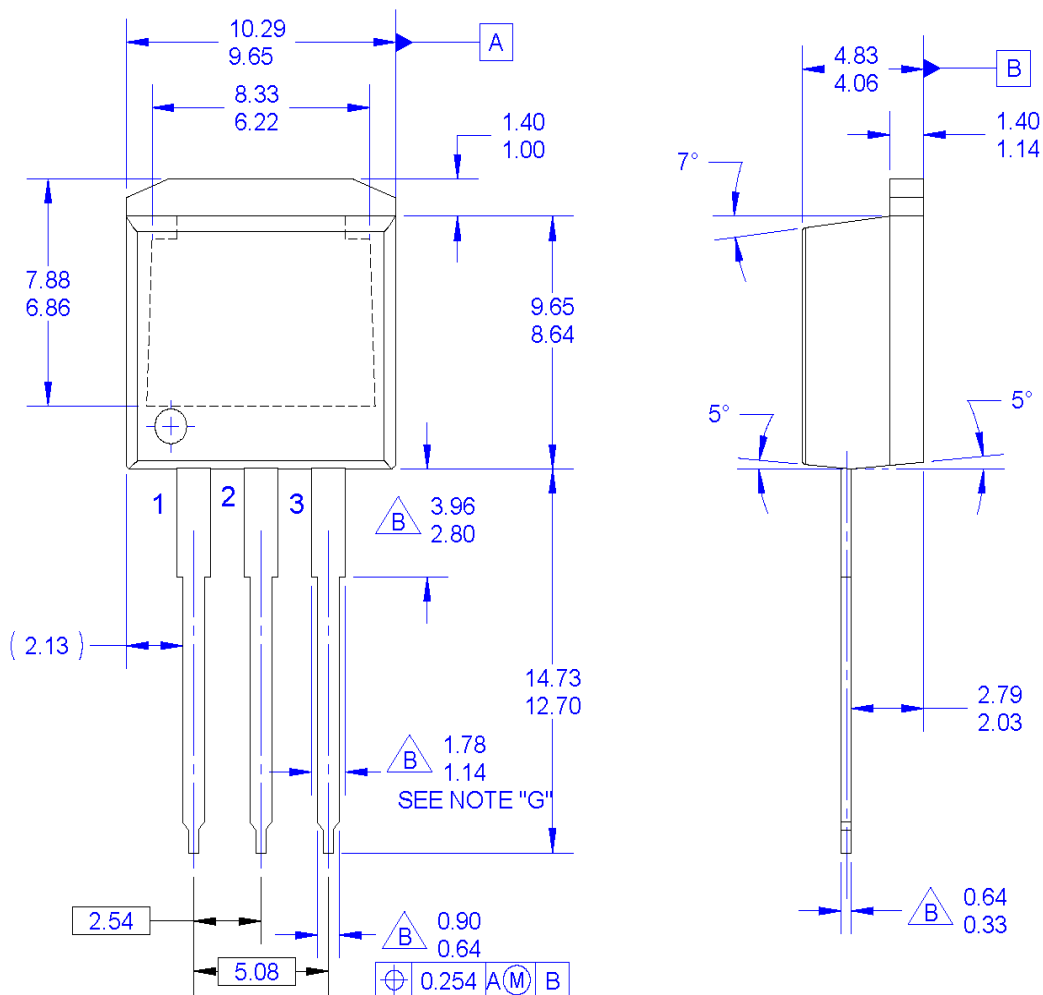


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-262-3L



NOTES:

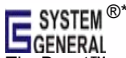



- A. EXCEPT WHERE NOTED CONFORMS TO TO262 JEDEC VARIATION AA.
- $\triangle B$. DOES NOT COMPLY JEDEC STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ANSI Y14.5-1994.
- F. LOCATION OF PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF PACKAGE)
- G. MAXIMUM WIDTH FOR F-102 DEVICE = 1.35 MAX.
- H. DRAWING FILE NAME: TO262A03REV5

Dimensions in Millimeters



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