

FDI030N06

N-Channel PowerTrench® MOSFET

60 V, 193 A, 3.2 mΩ

Features

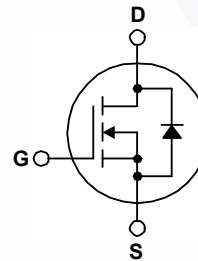
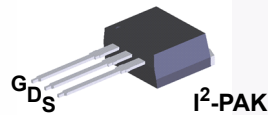
- $R_{DS(on)} = 2.6 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Renewable System



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

Symbol	Parameter	FDI030N06	Unit
V_{DSS}	Drain to Source Voltage	60	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited)	193*
		- Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited)	136*
		- Continuous ($T_C = 25^\circ\text{C}$, Package Limited)	120
I_{DM}	Drain Current	- Pulsed (Note 1)	772 A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1434 mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6 V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	231 W
		- Derate Above 25°C	1.54 W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

Thermal Characteristics

Symbol	Parameter	FDI030N06	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDI030N06	FDI030N06	I ² -PAK	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

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

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$, $T_C = 25^\circ\text{C}$	60	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 1\ \text{mA}$, Referenced to 25°C	-	0.05	-	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48\ \text{V}$, $V_{GS} = 0\ \text{V}$	-	-	1	μA
		$V_{DS} = 48\ \text{V}$, $T_C = 150^\circ\text{C}$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 75\ \text{A}$	-	2.6	3.2	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 75\ \text{A}$	-	154	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	-	7380	9815	pF
C_{oss}	Output Capacitance		-	1095	1455	pF
C_{rss}	Reverse Transfer Capacitance		-	415	625	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 48\ \text{V}$, $I_D = 75\ \text{A}$, $V_{GS} = 10\ \text{V}$	-	116	151	nC
Q_{gs}	Gate to Source Gate Charge		-	40	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	35	-

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\ \text{V}$, $I_D = 75\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 4.7\ \Omega$	-	39	87	ns
t_r	Turn-On Rise Time		-	178	366	ns
$t_{d(off)}$	Turn-Off Delay Time		-	54	118	ns
t_f	Turn-Off Fall Time		(Note 4)	-	33	76

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	193	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	772	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_{SD} = 75\ \text{A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\ \text{V}$, $I_{SD} = 75\ \text{A}$, $di_F/dt = 100\ \text{A}/\mu\text{s}$	-	46	-	ns
Q_{rr}	Reverse Recovery Charge		-	50	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $L = 0.51\ \text{mH}$, $I_{AS} = 75\ \text{A}$, $V_{DD} = 50\ \text{V}$, $R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 75\ \text{A}$, $di/dt \leq 450\ \text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

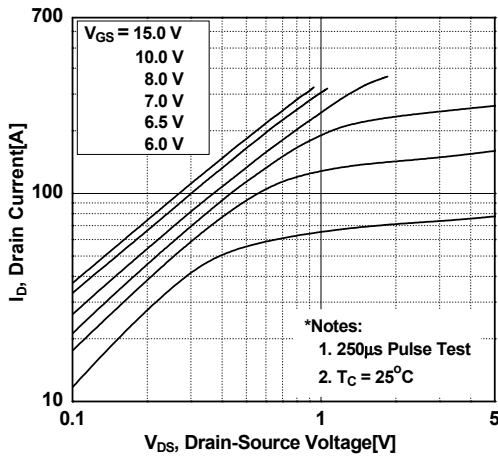


Figure 2. Transfer Characteristics

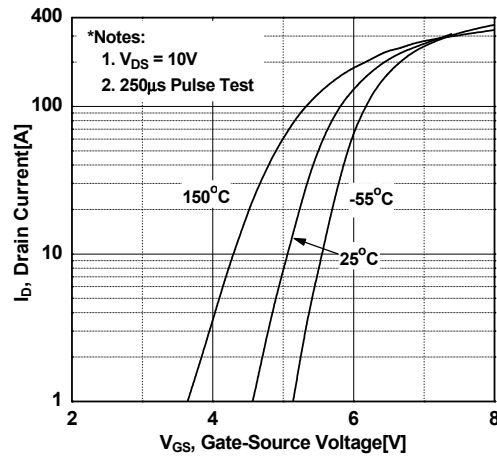


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

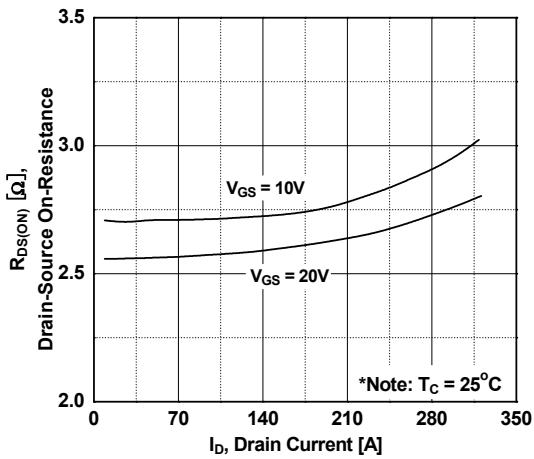


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

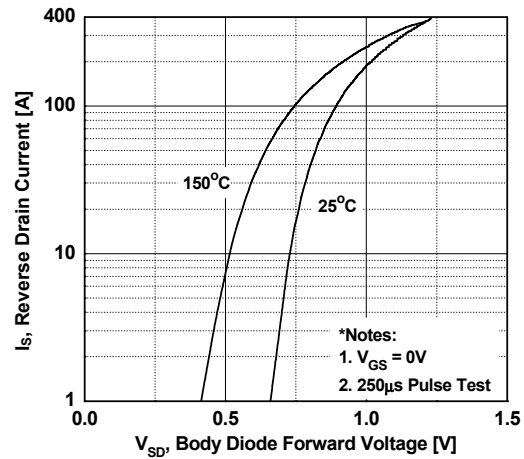


Figure 5. Capacitance Characteristics

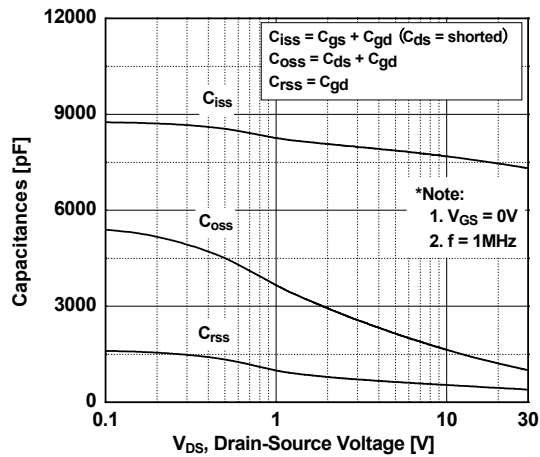
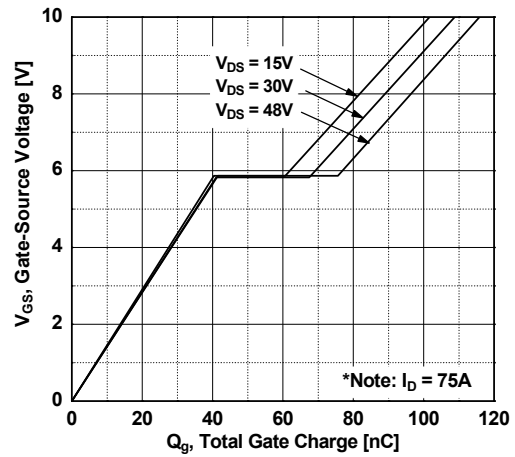


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

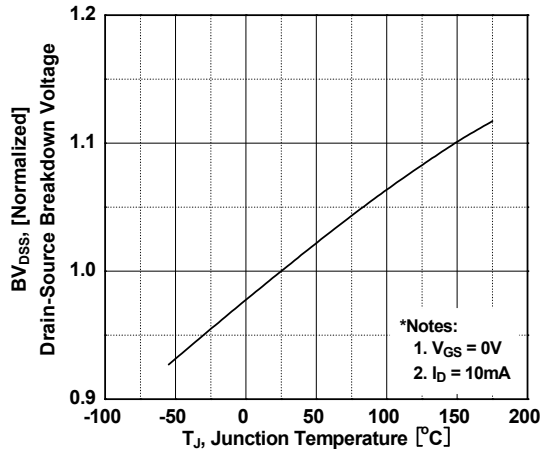


Figure 8. On-Resistance Variation vs. Temperature

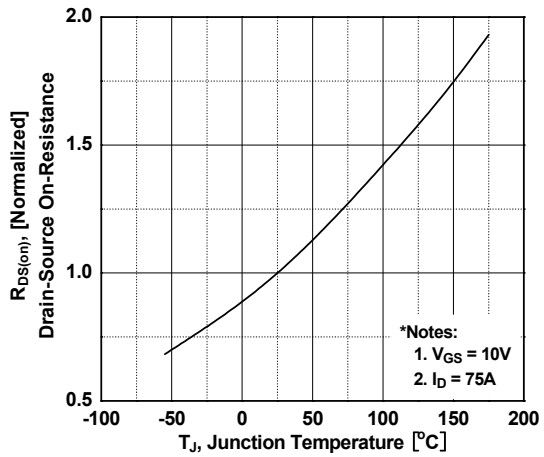


Figure 9. Maximum Safe Operating Area

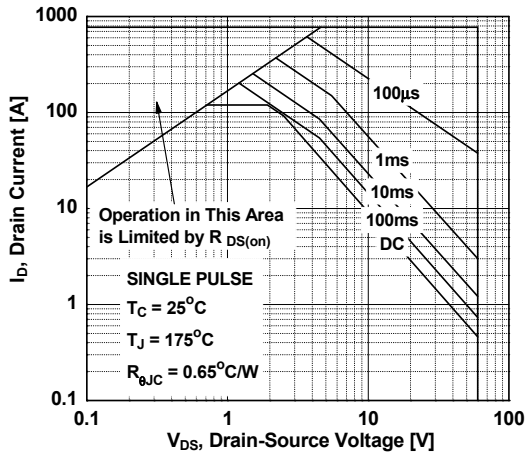


Figure 10. Maximum Drain Current vs. Case Temperature

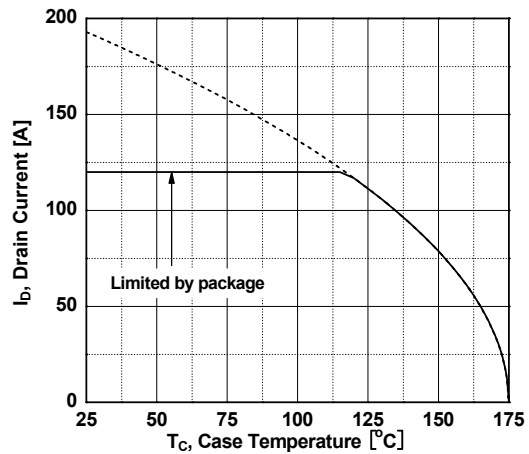
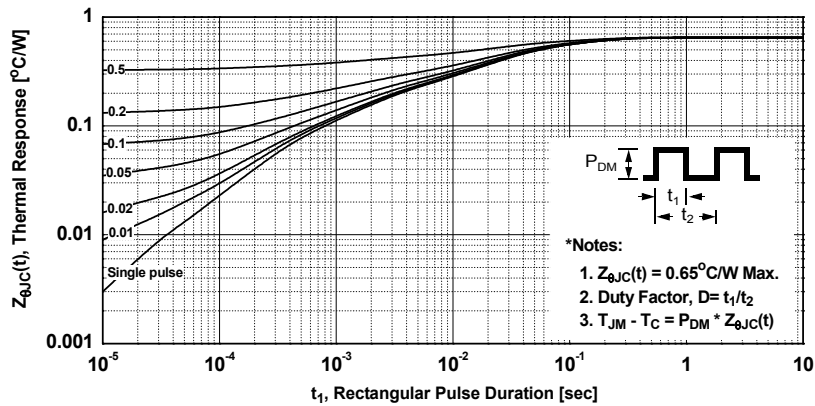


Figure 11. Transient Thermal Response Curve



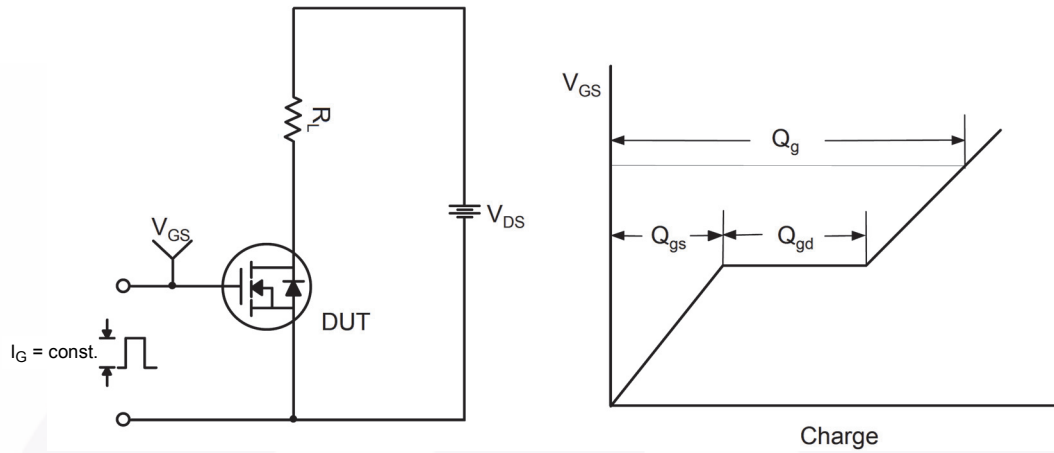


Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

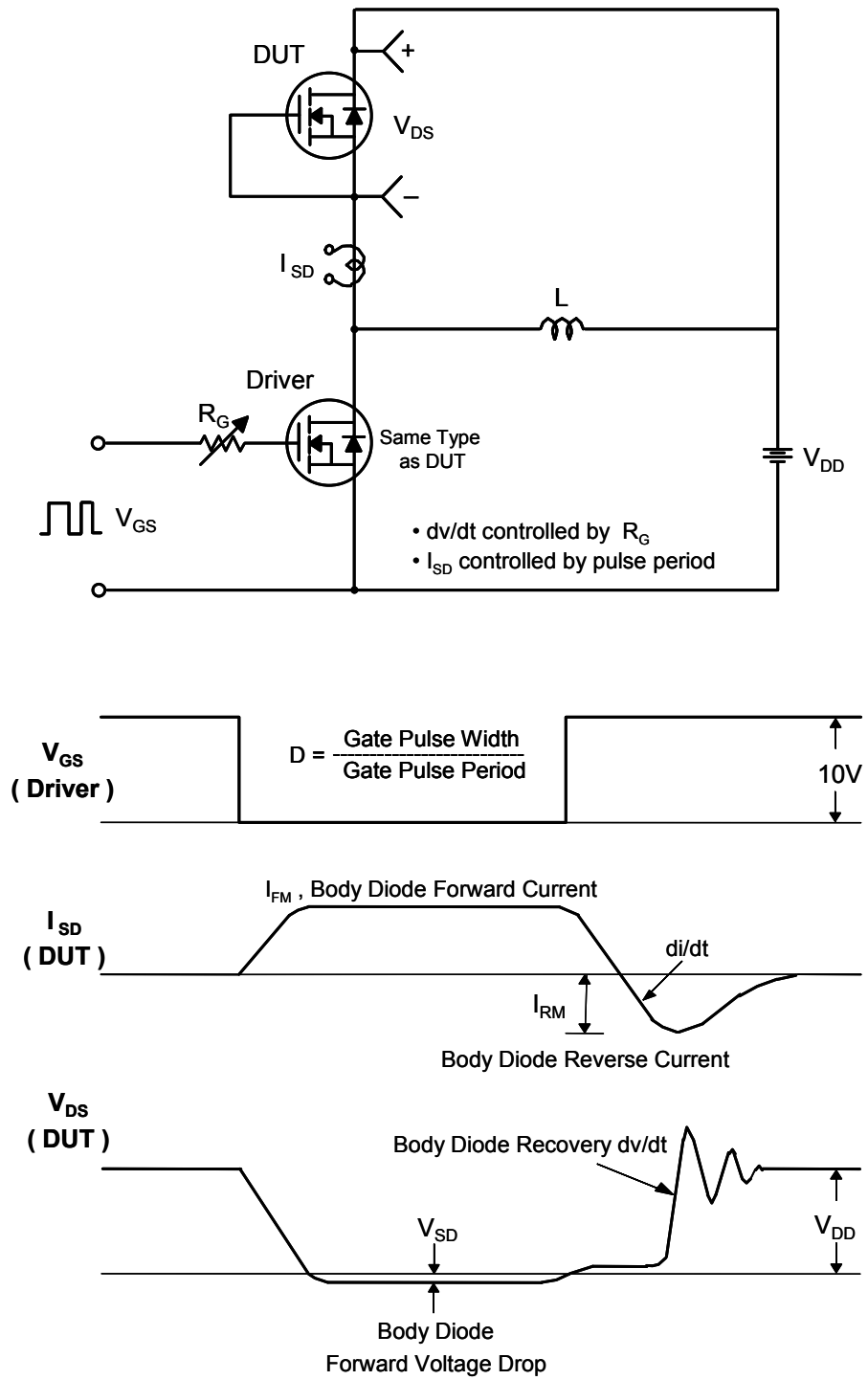
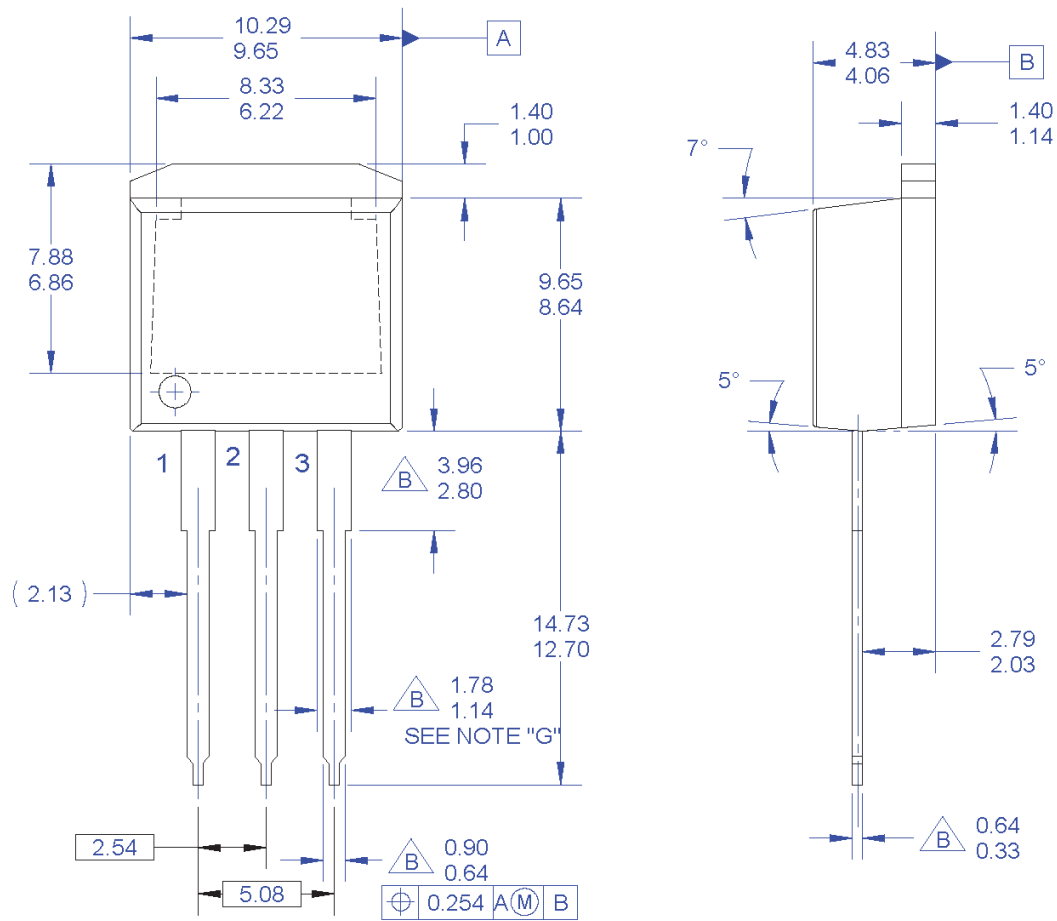


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO TO262 JEDEC VARIATION AA.
- Δ 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 F102 DEVICE = 1.35 MAX.
- H. DRAWING FILE NAME: TO262A03REV5

Figure 16. TO262 (I²PAK), Molded, 3-Lead, Jedec Variation AA

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