

# FCU900N60Z

## 600V N-Channel MOSFET

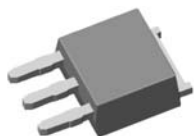
### Features

- 675V @ $T_J = 150^\circ\text{C}$
- Max.  $R_{DS(on)} = 900\text{m}\Omega$
- Ultra Low Gate Charge (Typ.  $Q_g = 13\text{nC}$ )
- Low Effective Output Capacitance (Typ.  $C_{oss-eff} = 49\text{pF}$ )
- 100% Avalanche Tested
- ESD Improved Capacity

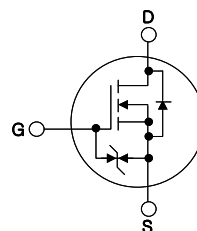
### Description

SuperFET®II is, Fairchild's proprietary, new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.

This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme  $dv/dt$  rate and higher avalanche energy. Consequently, SuperFET®II is very suitable for various AC/DC power conversion in switching mode operation for system miniaturization and higher efficiency.



I-PAK



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

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain to Source Voltage	600	V
$V_{GSS}$	Gate to Source Voltage	-DC	$\pm 20$
		-AC ( $f > 1\text{Hz}$ )	$\pm 30$
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	4.5
		-Continuous ( $T_C = 100^\circ\text{C}$ )	2.8
$I_{DM}$	Drain Current - Pulsed (Note 1)	13.5	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	47.5	mJ
$I_{AR}$	Avalanche Current (Note 1)	1	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	0.52	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	20	V/ns
	MOSFET $dv/dt$	100	
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	52	W
		- Derate above $25^\circ\text{C}$	0.42
$T_J, T_{STG}$	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	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	100	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCU900N60Z	FCU900N60Z	I-PAK	-	-	75

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	625	-	-	V
		$I_D = 1\text{mA}, V_{GS} = 0\text{V}, T_J = 150^\circ\text{C}$	675	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.72	-	V/ $^\circ\text{C}$
BV <sub>DS</sub>	Drain to Source Avalanche Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 4.5\text{A}$	-	700	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 600\text{V}, T_C = 125^\circ\text{C}$	-	-	10	$\mu\text{A}$
I <sub>GSS</sub>	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 10$	$\mu\text{A}$

### On Characteristics

V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	-	3.5	V
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 2.3\text{A}$	-	0.82	0.90	$\Omega$
g <sub>FS</sub>	Forward Transconductance	$V_{DS} = 20\text{V}, I_D = 2.3\text{A}$ (Note 4)	-	4.6	-	S

### Dynamic Characteristics

C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	534	710	pF
C <sub>oss</sub>	Output Capacitance		-	399	530	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	19.7	30	pF
C <sub>oss</sub>	Output Capacitance	$V_{DS} = 380\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$	-	11.1	-	pF
C <sub>oss eff.</sub>	Effective Output Capacitance	$V_{DS} = 0\text{V to } 480\text{V}, V_{GS} = 0\text{V}$	-	48.6	-	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	$V_{DS} = 380\text{V}, I_D = 2.3\text{A}$ $V_{GS} = 10\text{V}$ (Note 4)	-	13.1	17	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		-	2.2	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		-	4.5	-	nC
ESR	Equivalent Series Resistance	Drain open	-	2.4	-	$\Omega$

### Switching Characteristics

t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD} = 380\text{V}, I_D = 2.3\text{A}$ $V_{GS} = 10\text{V}, R_G = 4.7\Omega$ (Note 4)	-	10.9	32	ns
t <sub>r</sub>	Turn-On Rise Time		-	5.3	21	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	33.6	77	ns
t <sub>f</sub>	Turn-Off Fall Time		-	11.9	34	ns

### Drain-Source Diode Characteristics

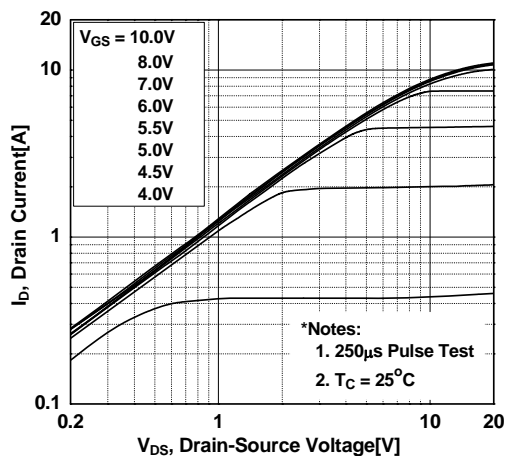
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current	-	-	4.5	A	
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current	-	-	13.5	A	
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 2.3\text{A}$	-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 2.3\text{A}$	-	156	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	1.3	-	nC

#### Notes:

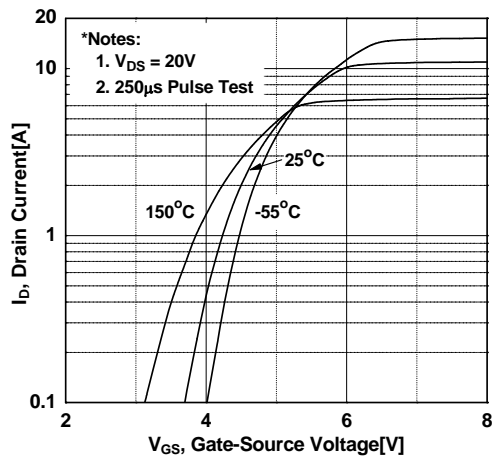
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 1.0\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 2.3\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature

## Typical Performance Characteristics

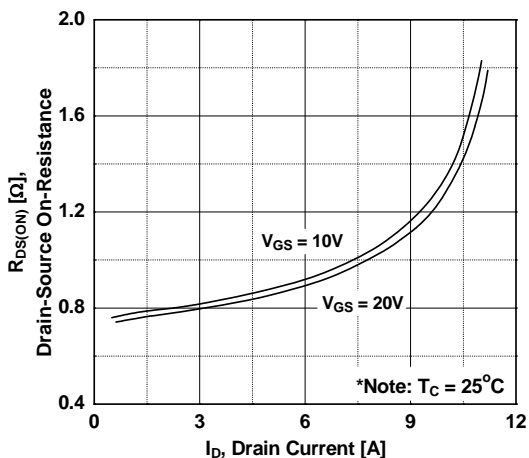
**Figure 1. On-Region Characteristics**



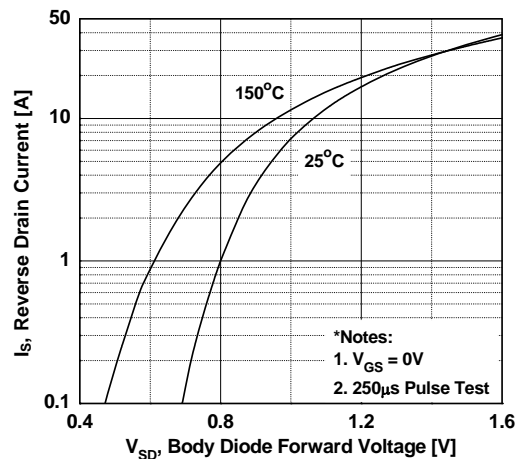
**Figure 2. Transfer Characteristics**



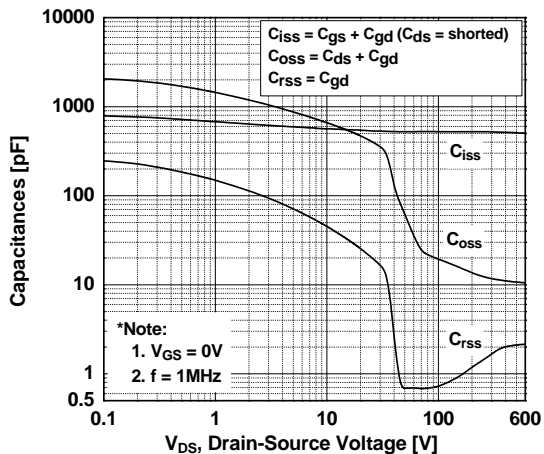
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



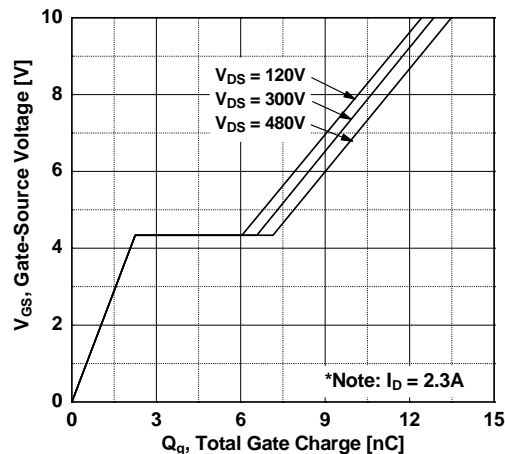
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

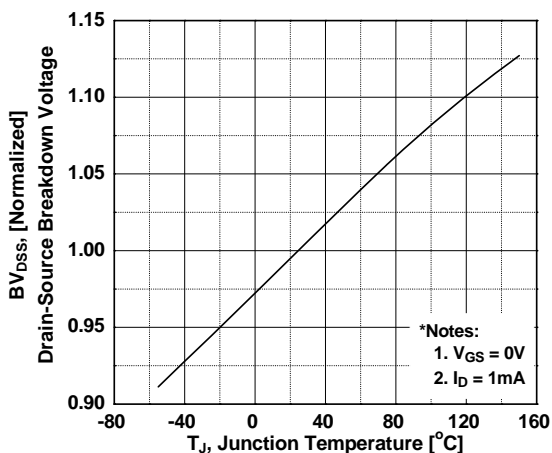


**Figure 6. Gate Charge Characteristics**

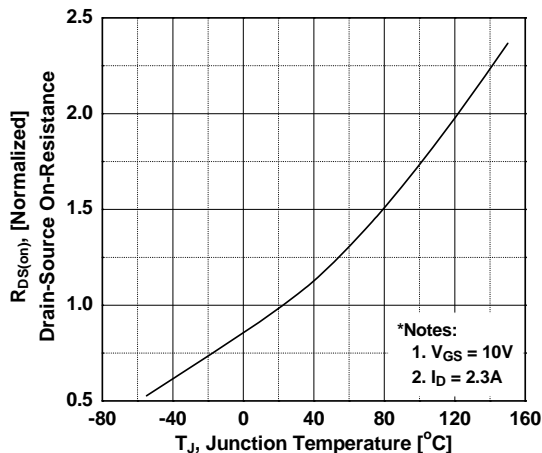


**Typical Performance Characteristics** (Continued)

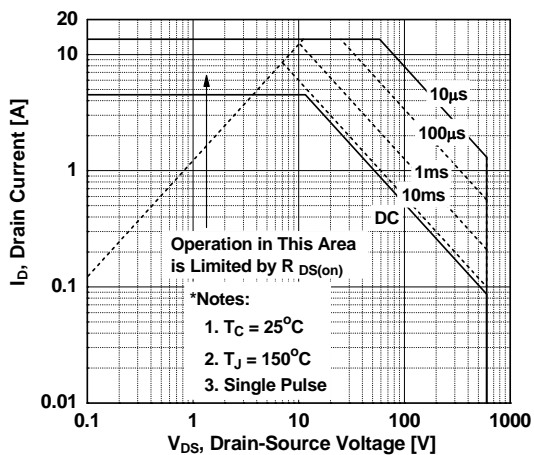
**Figure 7. Breakdown Voltage Variation vs. Temperature**



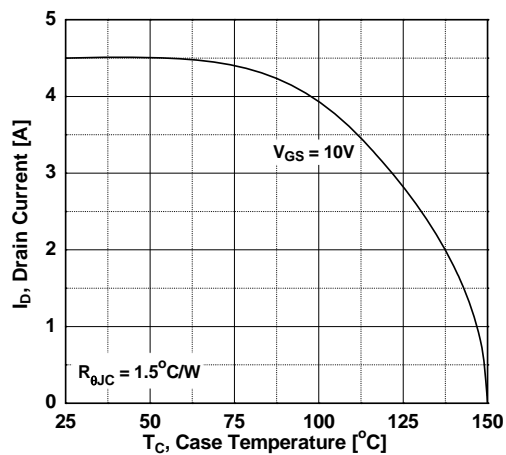
**Figure 8. On-Resistance Variation vs. Temperature**



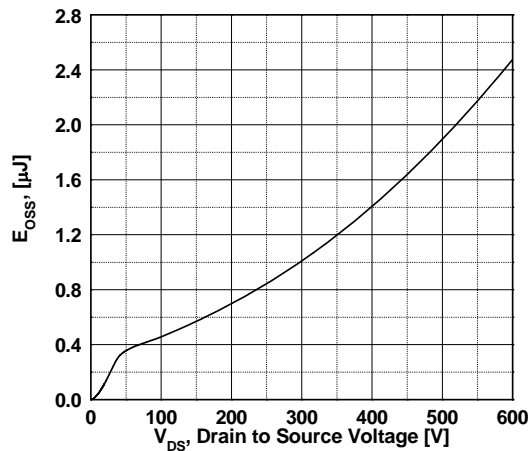
**Figure 9. Maximum Safe Operating Area vs. Case Temperature**



**Figure 10. Maximum Drain Current**

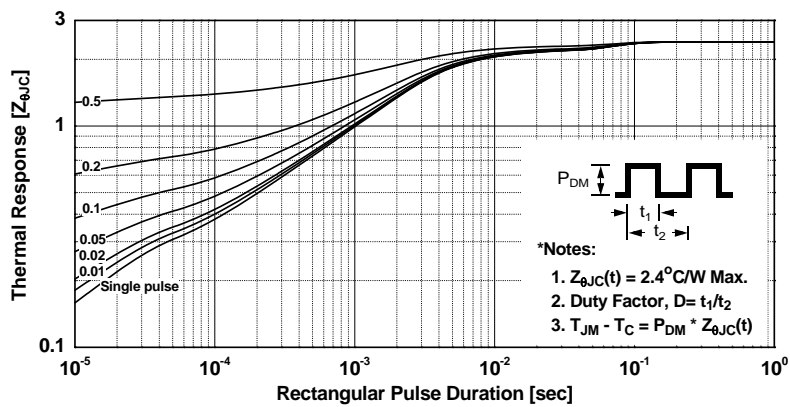


**Figure 11. Eoss vs. Drain to Source Voltage**

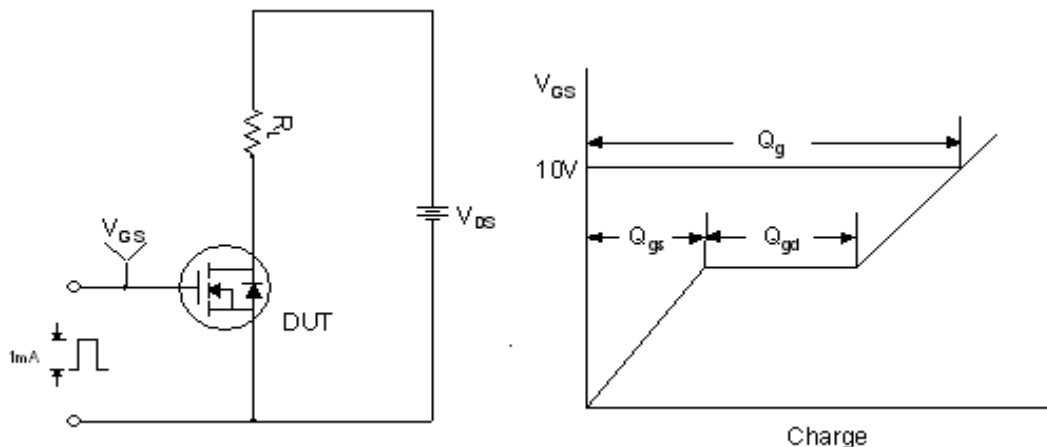


Typical Performance Characteristics (Continued)

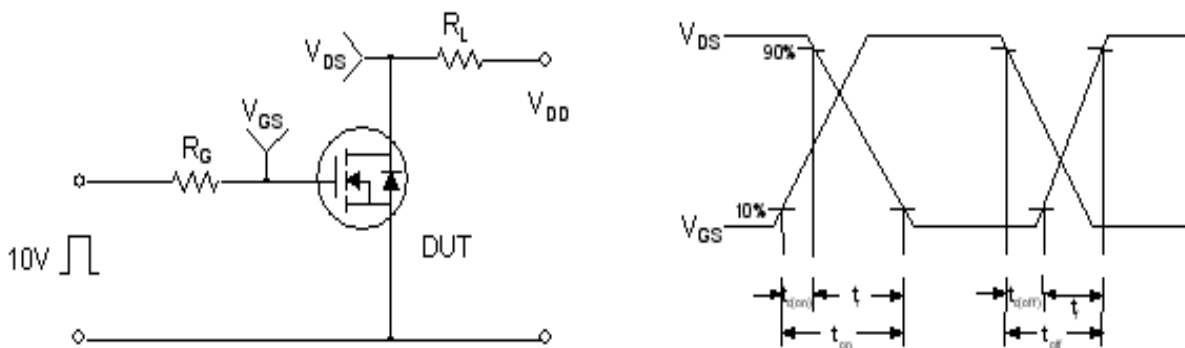
Figure 12. Transient Thermal Response Curve



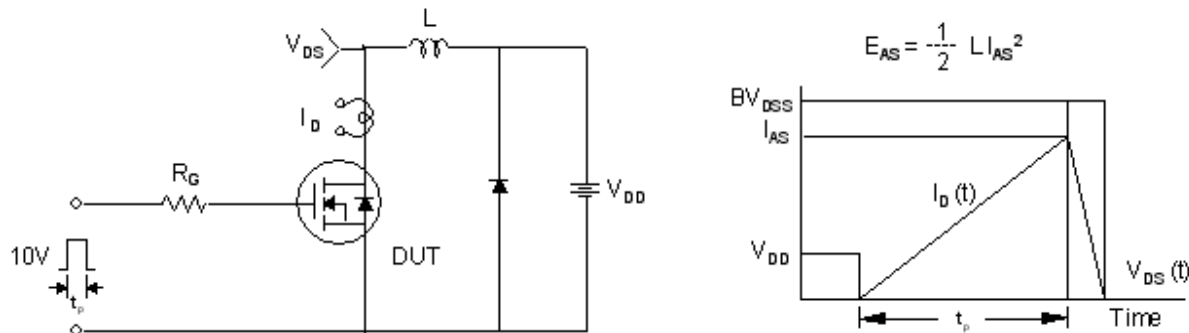
**Gate Charge Test Circuit & Waveform**



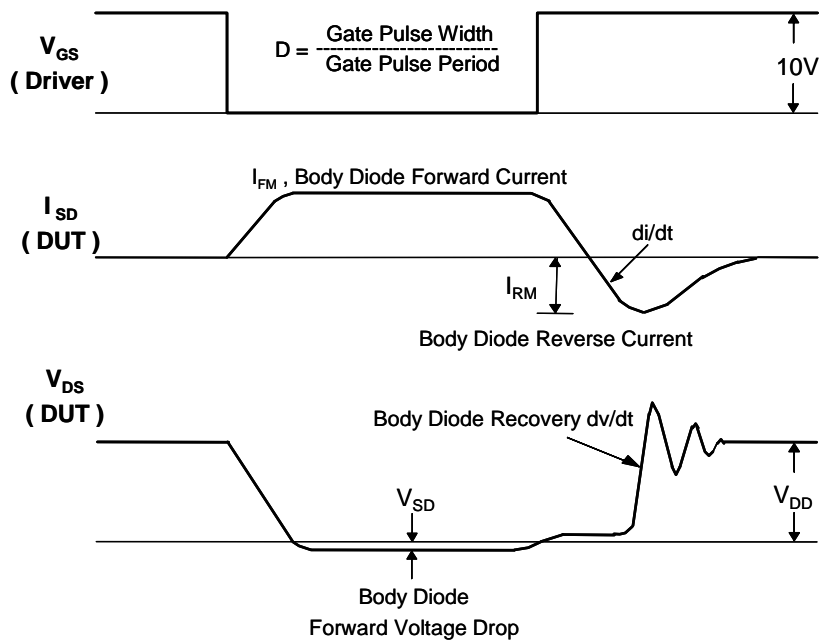
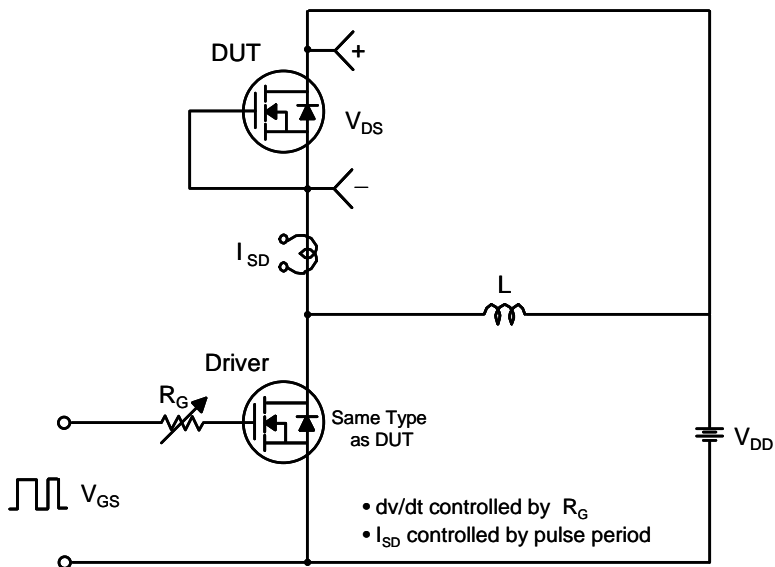
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

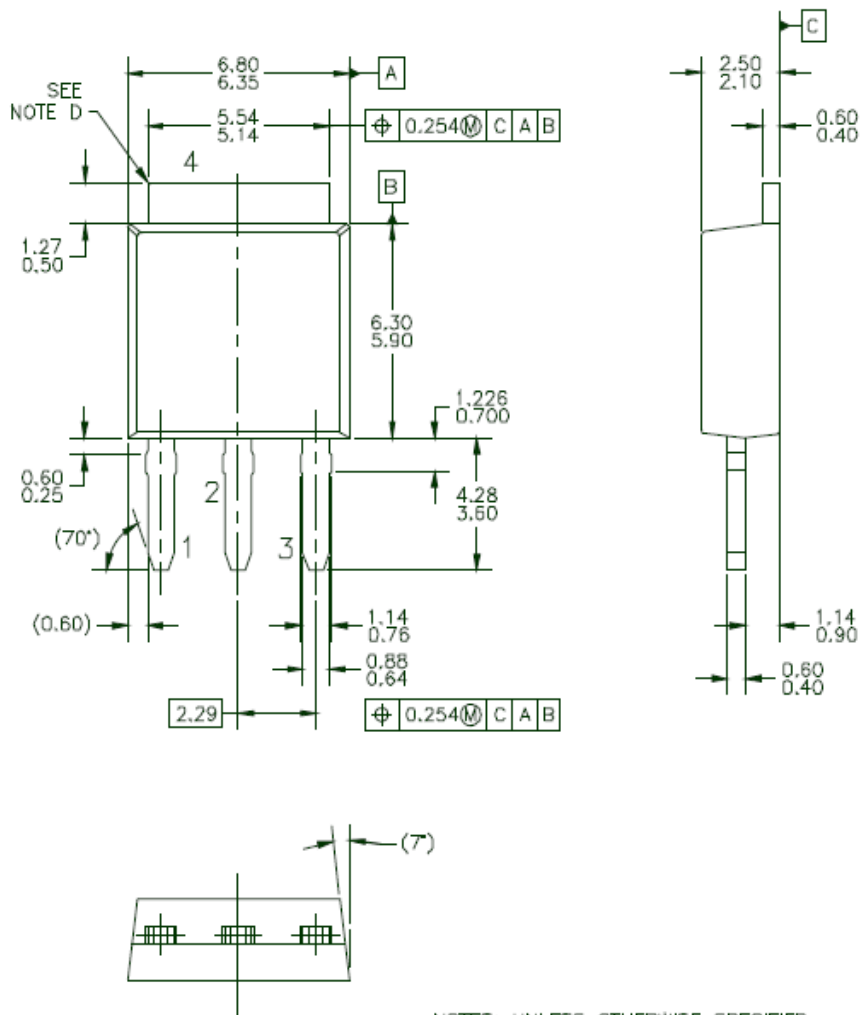


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

### I-PAK (Short Lead)



NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) PACKAGE BODY REFERENCE: JEDEC, TO-251, ISSUE D, VARIATION AA, DATED JUNE 2002.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
- E) DRAWING FILE NAME: T0251B03\_3

Dimensions in Millimeters



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- |   |   |   |   |
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| AccuPower™  | FRFET®  | PowerXST™   | the power®  |
| AX-CAPT™*   | Global Power Resource <sup>SM</sup>             | Programmable Active Droop™  | franchise   |
| BitSiC®   | Green Bridge™                                   | QFET®   | TinyBoost™  |
| Build it Now™   | Green FPS™                                      | QS™   | TinyBuck™   |
| CorePLUS™   | Green FPS™ e-Series™                            | Quiet Series™   | TinyCalc™   |
| CorePOWER™  | Gmax™   | RapidConfigure™   | TinyLogic®  |
| CROSSVOL™   | GTO™  | TM  | TINYOPTO™   |
| CTL™  | IntelliMAX™                                     |  | TinyPower™  |
| Current Transfer Logic™   | ISOPLANAR™                                      | Saving our world, 1mW/W/kW at a time™   | TinyPWM™  |
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|  | MicroPak2™                                      | STEALTH™  |  |
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| Fairchild Semiconductor®  | MotionMax™                                      | SuperSOT™-3   | Ultra FRFET™  |
| FACT Quiet Series™  | Motion-SPM™                                     | SuperSOT™-6   | UniFET™   |
| FACT®   | mWSaver™  | SuperSOT™-8   | VCX™  |
| FAST®   | OptoHiT™  | SupreMOS®   | VisualMax™  |
| FastvCore™  | OPTOLOGIC®                                      | SyncFET™  | VoltagePlus™  |
| FETBench™   | OPTOPLANAR®                                     | Sync-Lock™  | XS™   |
| FlashWriter®*   |   |  |   |
| FPS™  |   |   |   |

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