

# FCH76N60NF

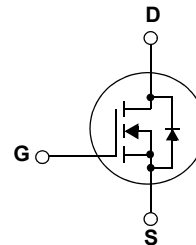
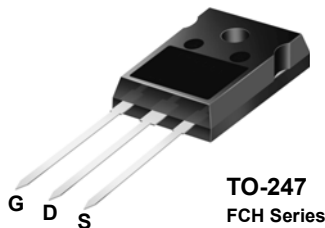
## 600V N-Channel MOSFET, FRFET

### Features

- $R_{DS(on)} = 28.7m\Omega$  (Typ.)@  $V_{GS} = 10V, I_D = 38A$
- Ultra Low Gate Charge (Typ.  $Q_g = 230nC$ )
- Low Effective Output Capacitance
- 100% Avalanche Tested
- RoHS Compliant

### Description

The SupreMOS MOSFET, Fairchild's next generation of high voltage super-junction MOSFETs, employs a deep trench filling process that differentiates it from preceding multi-epi based technologies. By utilizing this advanced technology and precise process control, SupreMOS provides world class  $R_{sp}$ , superior switching performance and ruggedness. This SupreMOS MOSFET fits the industry's AC-DC SMPS requirements for PFC, server/telecom power, FPD TV power, ATX power, and industrial power applications.



### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Conditions	Ratings	Units
$V_{DSS}$	Drain to Source Voltage		600	V
$V_{GSS}$	Gate to Source Voltage		$\pm 30$	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ C$ )	72.8	A
		-Continuous ( $T_C = 100^\circ C$ )	46	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	218	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	7381	mJ
$I_{AR}$	Avalanche Current		24.3	A
$E_{AR}$	Repetitive Avalanche Energy		5.43	mJ
dv/dt	MOSFET dv/dt Ruggedness		100	V/ns
	Peak Diode Recovery dv/dt	(Note 3)	50	
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	543	W
		- Derate above $25^\circ C$	4.34	W/ $^\circ C$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	$^\circ C$

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.23	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH76N60NF	FCH76N60NF	TO-247	-	-	30

## 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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}, T_C = 25^\circ\text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{mA}$ , Referenced to $25^\circ\text{C}$	-	0.73	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 480\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 480\text{V}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$	-	-	10 100	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 38\text{A}$	-	28.7	38.0	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{V}, I_D = 38\text{A}$	-	92	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	8305	11045	pF
$C_{oss}$	Output Capacitance		-	361	480	pF
$C_{riss}$	Reverse Transfer Capacitance		-	3.3	5.0	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	192	-	pF
$C_{oss,eff.}$	Effective Output Capacitance	$V_{DS} = 0\text{V to } 380\text{V}, V_{GS} = 0\text{V}$	-	896	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{V}, I_D = 38\text{A},$ $V_{GS} = 10\text{V}$ (Note 4)	-	230	300	nC
$Q_{gs}$	Gate to Source Gate Charge		-	44	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	95	-	nC
ESR	Equivalent Series Resistance(G-S)	Drain Open	-	1.2	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{V}, I_D = 38\text{A}$ $R_G = 4.7\Omega$ (Note 4)	-	51	112	ns
$t_r$	Turn-On Rise Time		-	44	98	ns
$t_{d(off)}$	Turn-Off Delay Time		-	213	436	ns
$t_f$	Turn-Off Fall Time		-	43	96	ns

### Drain-Source Diode Characteristics

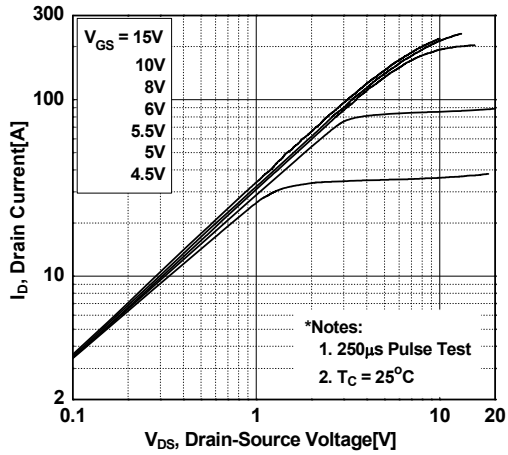
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	76	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	228	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 38\text{A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 38\text{A}$	-	200	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	1.8	-	$\mu\text{C}$

#### Notes:

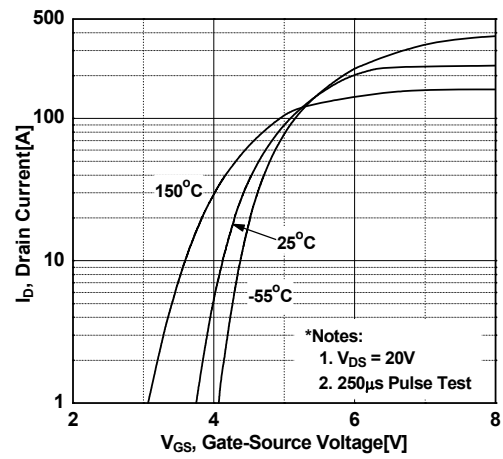
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 24.3\text{A}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 72.8\text{A}, di/dt \leq 1200\text{A}/\mu\text{s}, V_{DD} \leq 380\text{V}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

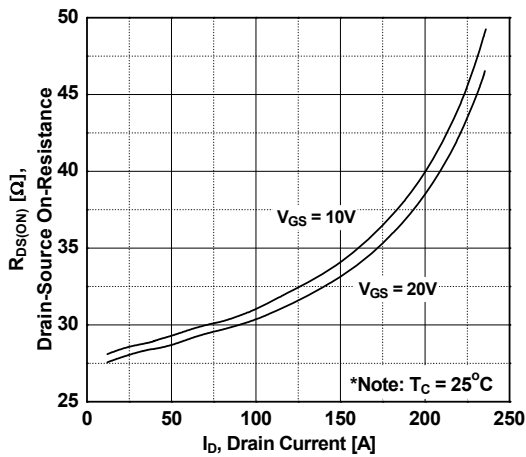
**Figure 1. On-Region Characteristics**



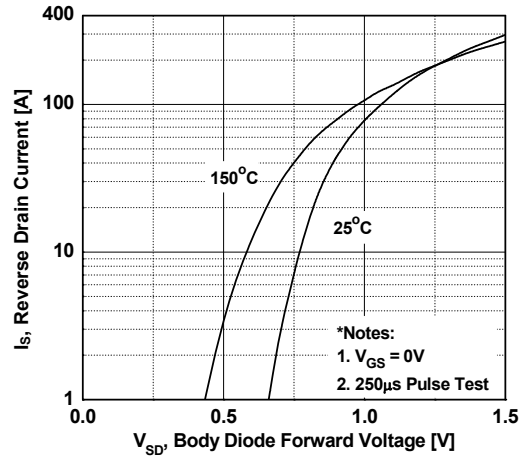
**Figure 2. Transfer Characteristics**



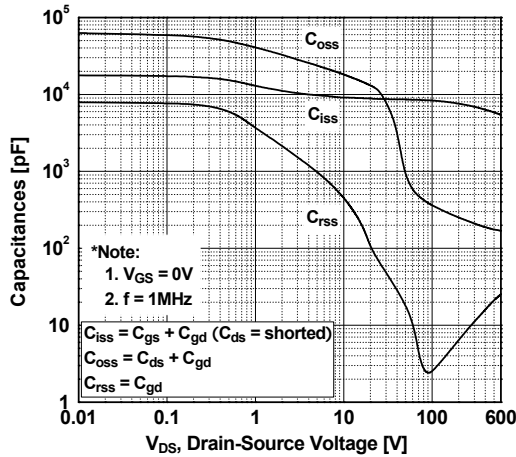
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



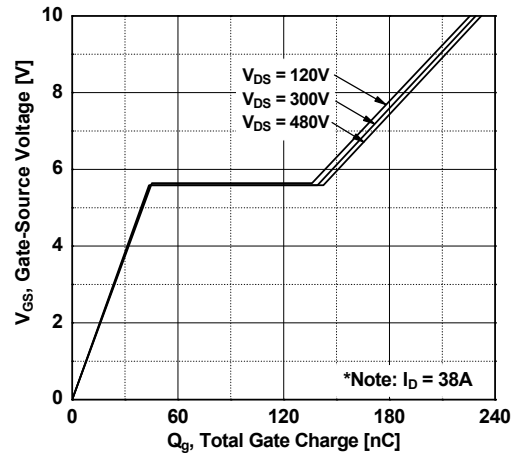
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

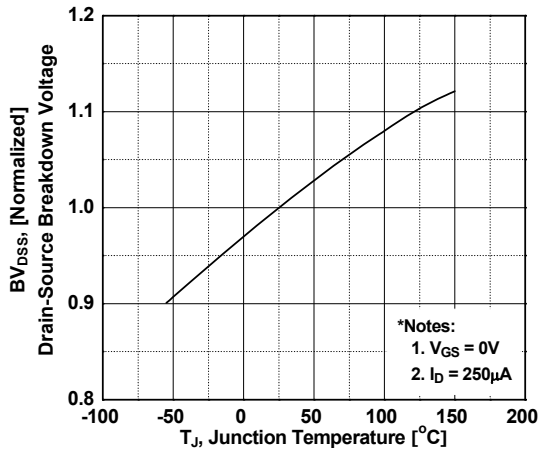


Figure 8. On-Resistance Variation vs. Temperature

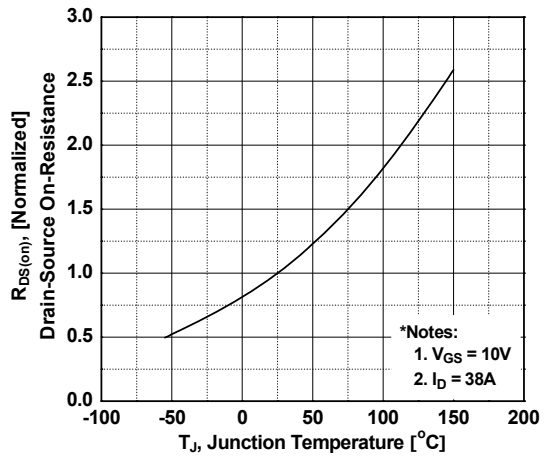


Figure 9. Maximum Safe Operating Area

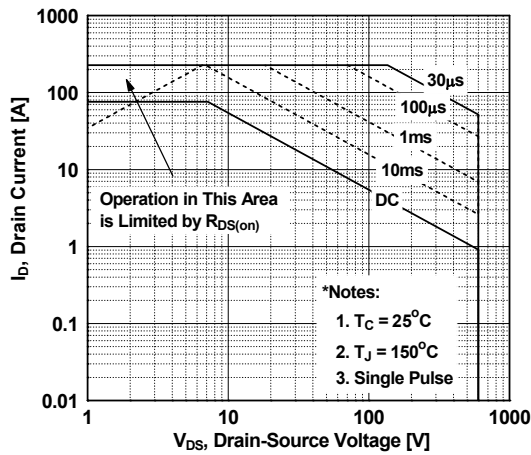


Figure 10. Maximum Drain Current vs. Case Temperature

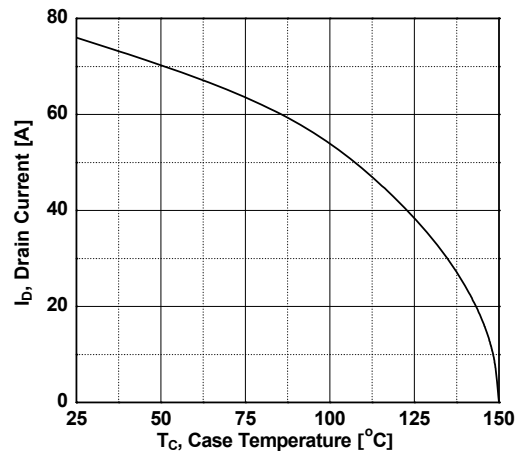
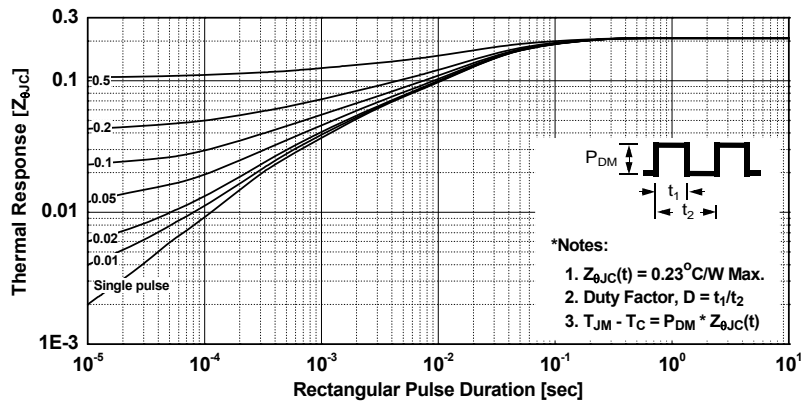
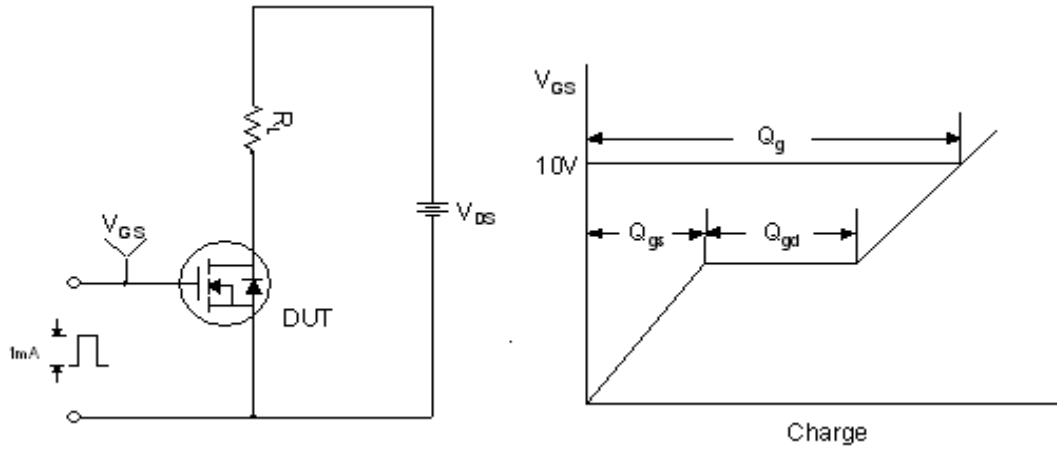


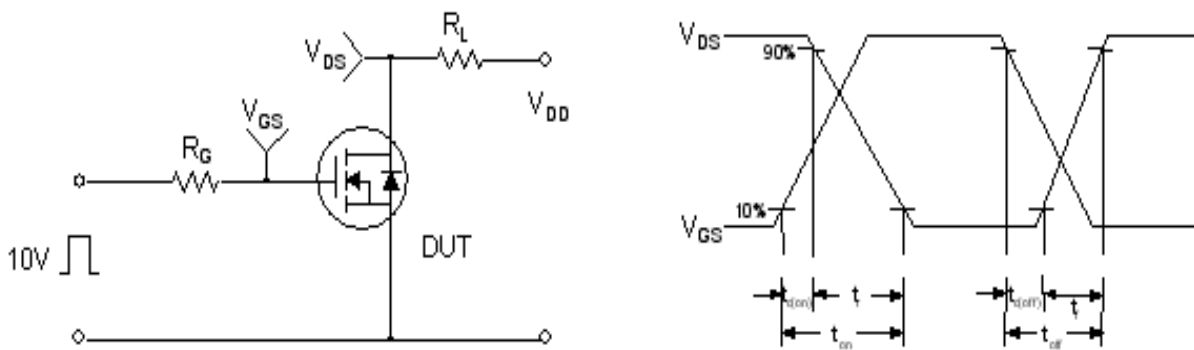
Figure 11. Transient Thermal Response Curve



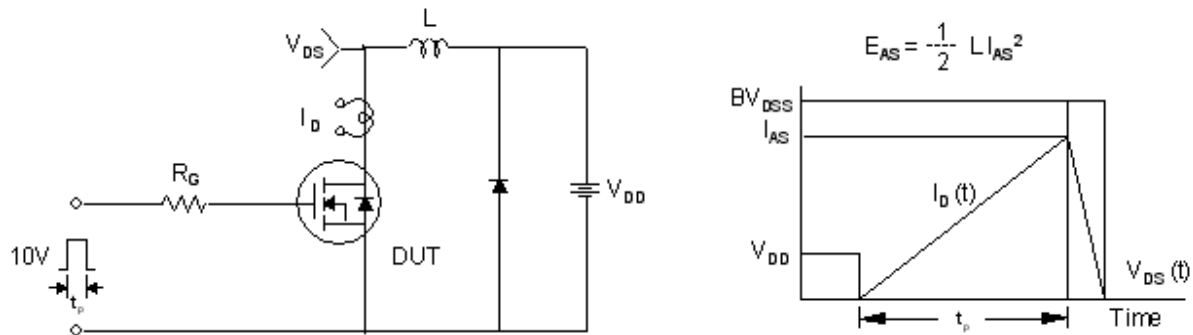
**Gate Charge Test Circuit & Waveform**



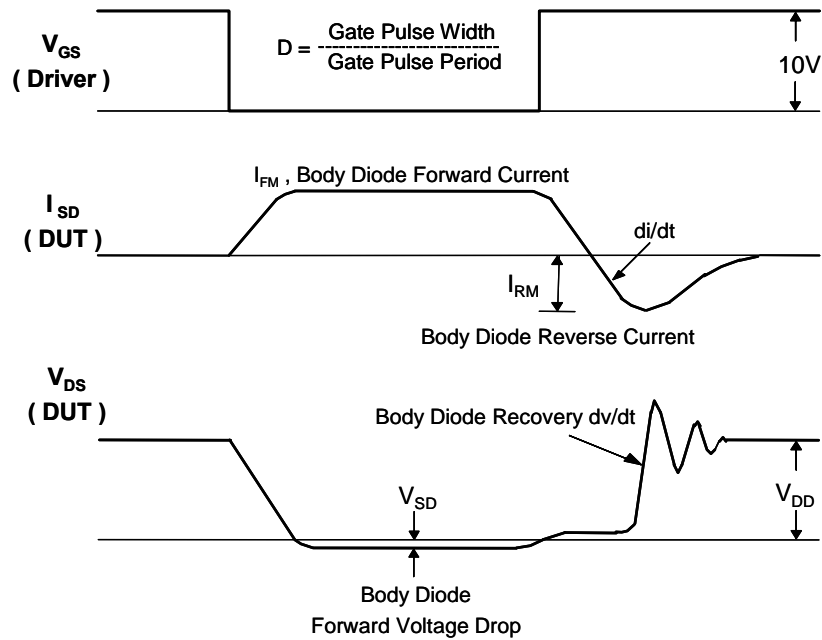
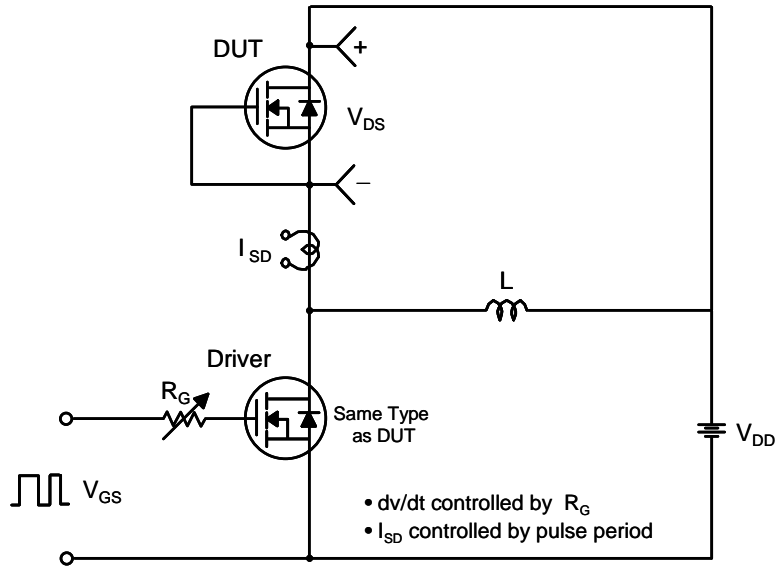
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

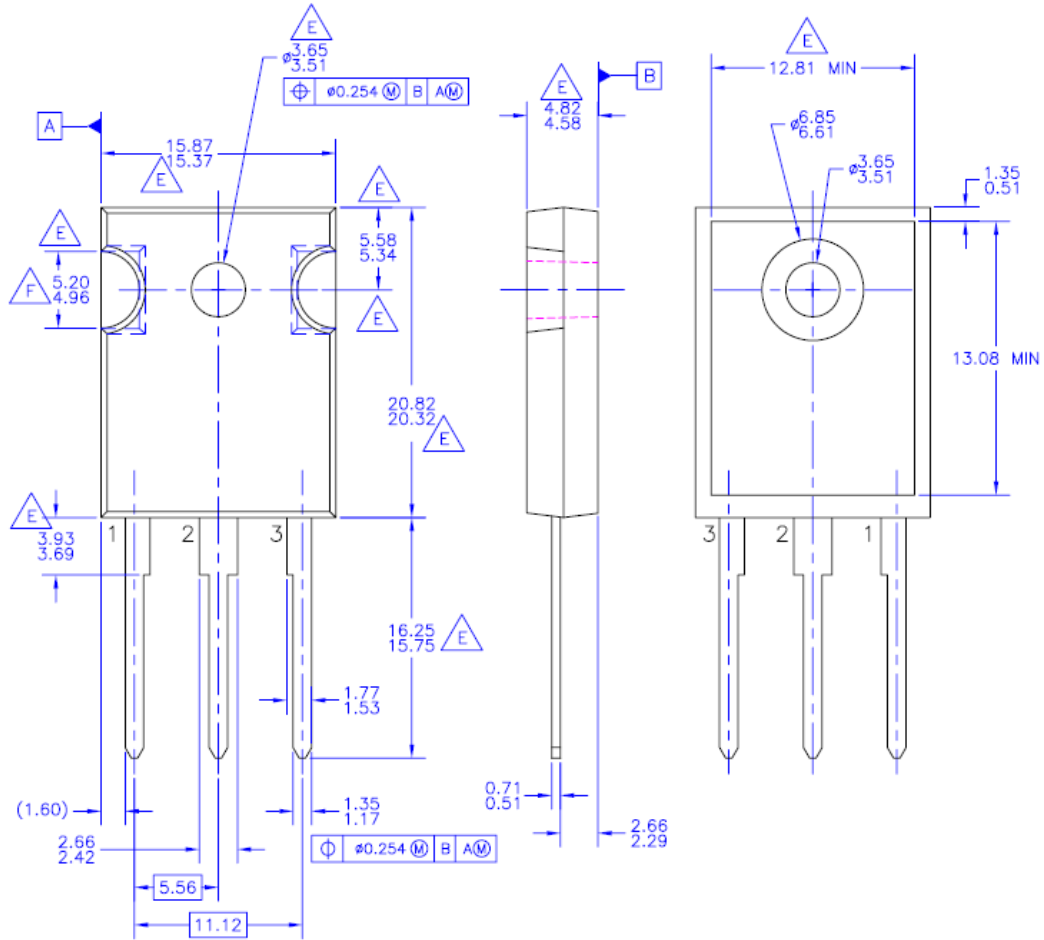


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**TO-247-3L**






- NOTES; UNLESS OTHERWISE SPECIFIED
- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
  - B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
  - C. ALL DIMENSIONS ARE IN MILLIMETERS.
  - D. DRAWING CONFORMS TO ASME Y14.5 - 1994
- E** DOES NOT COMPLY JEDEC STANDARD VALUE
- F** NOTCH MAY BE SQUARE
- G. DRAWING FILENAME: MKT-TO247A03\_REV02

Dimensions in Millimeters



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| CorePLUS™                | Green FPS™                          | QFET®  | <b>power</b> ®  |
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| FETBench™                |                                     | SyncFET™   | VCX™  |
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|                          | Power-SPM™                          |  |   |

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