

# FCH47N60N

## N-Channel MOSFET

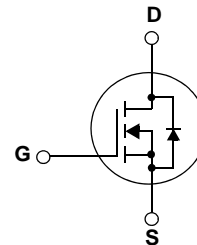
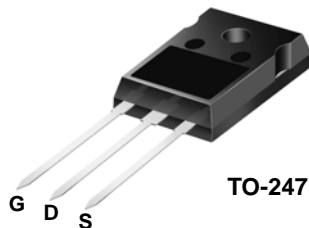
600V, 47A, 62mΩ

### Features

- 650V @T<sub>J</sub> = 150°C
- R<sub>DS(on)</sub> = 51.5mΩ (Typ.)@ V<sub>GS</sub> = 10V, I<sub>D</sub> = 23.5 A
- Ultra Low Gate Charge (Typ. Q<sub>g</sub> = 115nC)
- 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<sub>sp</sub>, 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<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain to Source Voltage	600	V
V <sub>GSS</sub>	Gate to Source Voltage	±30	V
I <sub>D</sub>	Drain Current	-Continuous (T <sub>C</sub> = 25°C)	47
		-Continuous (T <sub>C</sub> = 100°C)	29.7
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)	141
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	3068
I <sub>AR</sub>	Avalanche Current		15.7
E <sub>AR</sub>	Repetitive Avalanche Energy		3.7
dv/dt	MOSFET dv/dt Ruggedness		100
	Peak Diode Recovery dv/dt (Note 3)		20
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C)	368
		- Derate above 25°C	2.94
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	0.34	°C/W
R <sub>θCS</sub>	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH47N60N	FCH47N60N	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 $25^\circ\text{C}$	-	0.78	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 480\text{V}$ , $V_{GS} = 0\text{V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 480\text{V}$ , $V_{GS} = 0\text{V}$ , $T_C = 125^\circ\text{C}$	-	-	100	
$I_{GSS}$	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	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	2	-	4	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 23.5\text{A}$		51.5	62.0	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{V}$ , $I_D = 23.5\text{A}$		56		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	5037	6700	pF
$C_{oss}$	Output Capacitance		-	200	270	pF
$C_{rss}$	Reverse Transfer Capacitance		-	2.5	4.0	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	108		pF
$C_{oss\text{eff.}}$	Effective Output Capacitance	$V_{DS} = 0\text{V to } 380\text{V}$ , $V_{GS} = 0\text{V}$	-	511		pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{V}$ , $I_D = 23.5\text{A}$ , $V_{GS} = 10\text{V}$ (Note 4)	-	115	151	nC
$Q_{gs}$	Gate to Source Gate Charge		-	21		nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	34		nC
ESR	Equivalent Series Resistance(G-S)	Drain Open	-	0.9		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{V}$ , $I_D = 23.5\text{A}$ $R_{GEN} = 4.7\Omega$ (Note 4)	-	11	32	ns
$t_r$	Turn-On Rise Time		-	9	28	ns
$t_{d(off)}$	Turn-Off Delay Time		-	135	280	ns
$t_f$	Turn-Off Fall Time		-	22	54	ns

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current	-	-	47	A	
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current	-	-	141	A	
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 23.5A	-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 23.5A dI <sub>F</sub> /dt = 100A/μs	-	495	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	12	-	μC

#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 15.7\text{A}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 47\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq 380\text{V}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

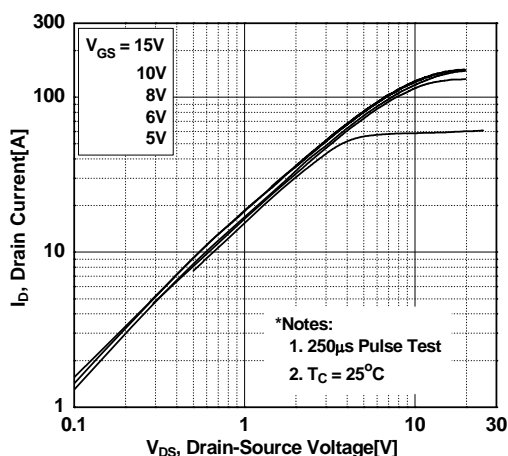


Figure 2. Transfer Characteristics

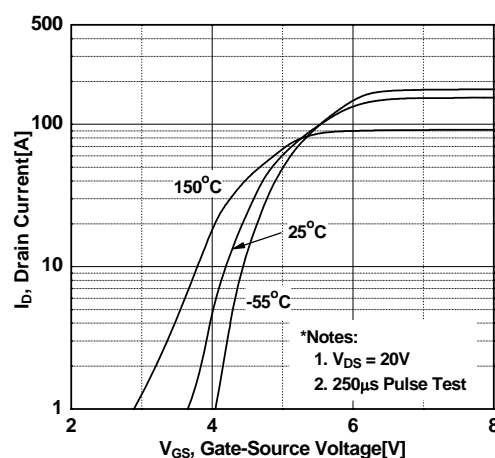


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

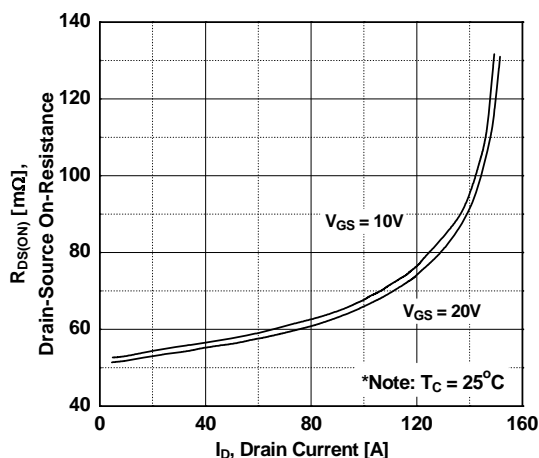


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

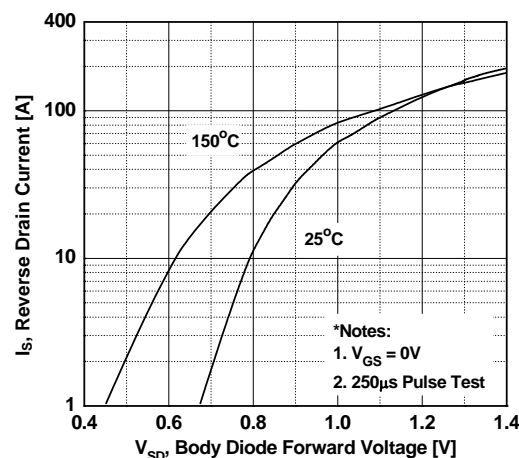


Figure 5. Capacitance Characteristics

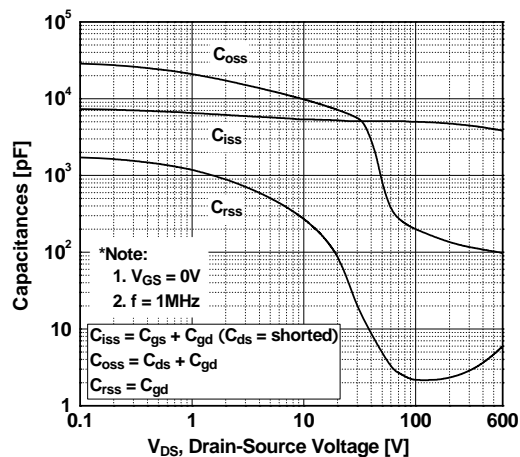
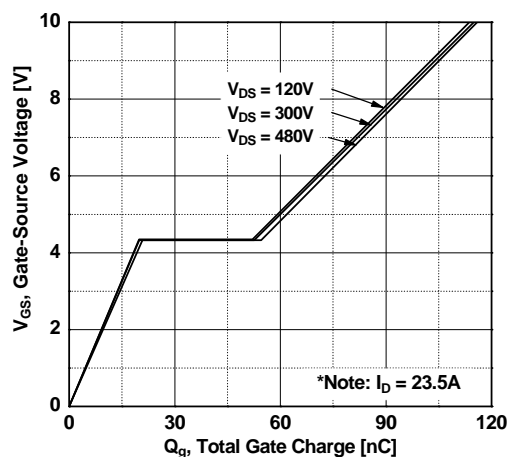
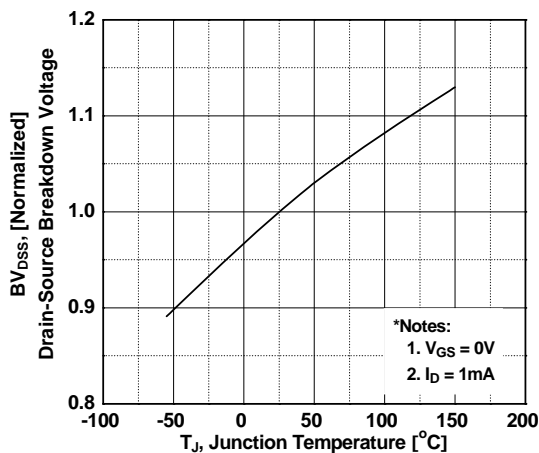


Figure 6. Gate Charge Characteristics

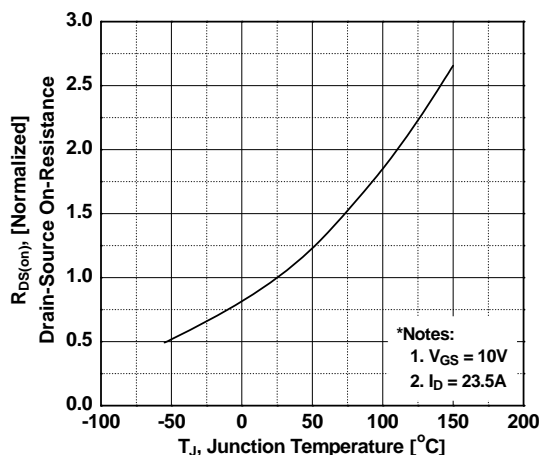


# Typical Performance Characteristics (Continued)

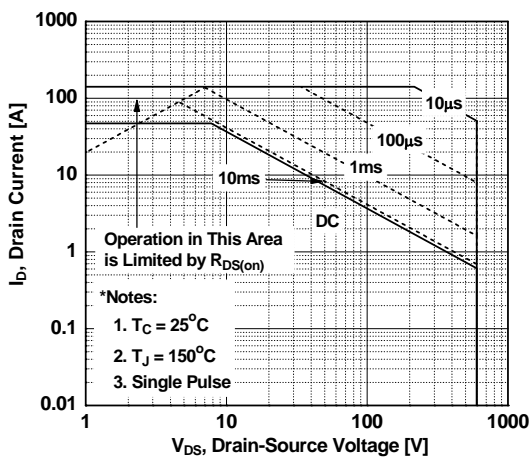
**Figure 7. Breakdown Voltage Variation vs. Temperature**



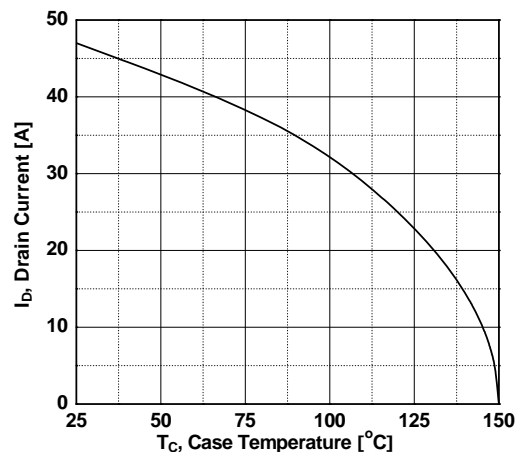
**Figure 8. On-Resistance Variation vs. Temperature**



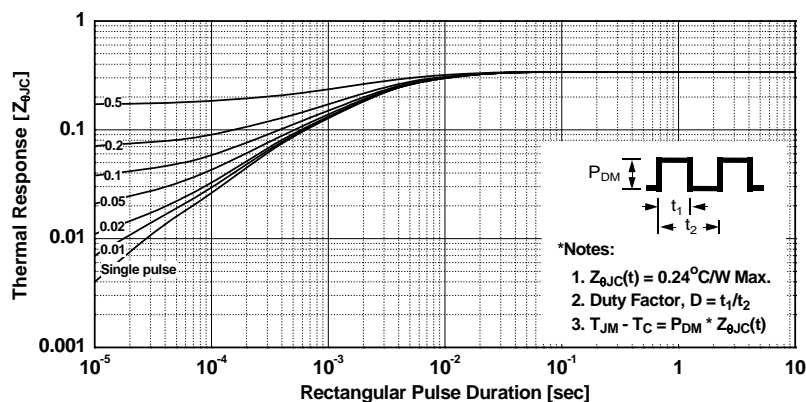
**Figure 9. Maximum Safe Operating Area**



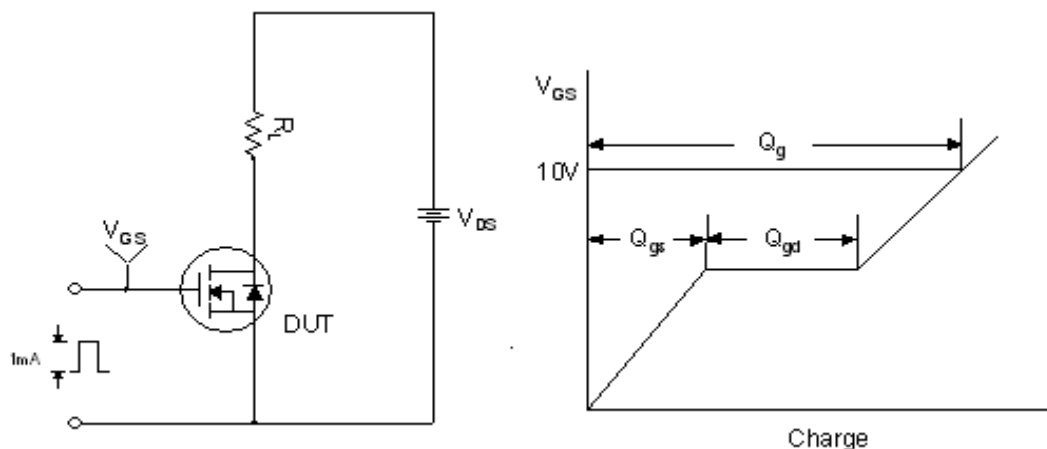
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**



Gate Charge Test Circuit & Waveform



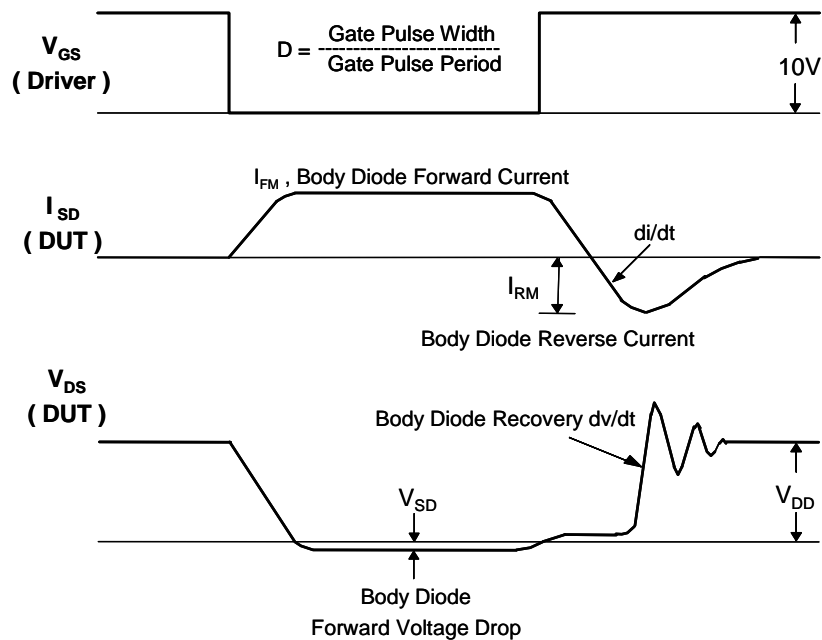
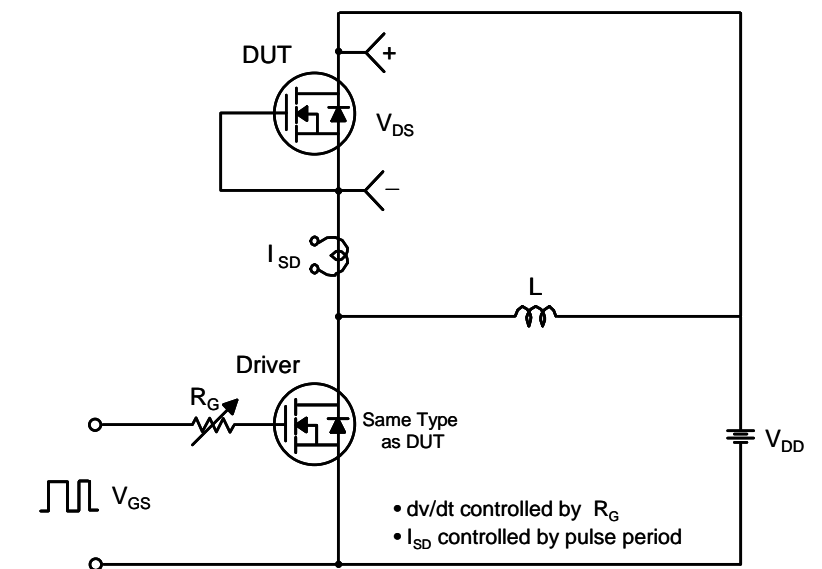
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

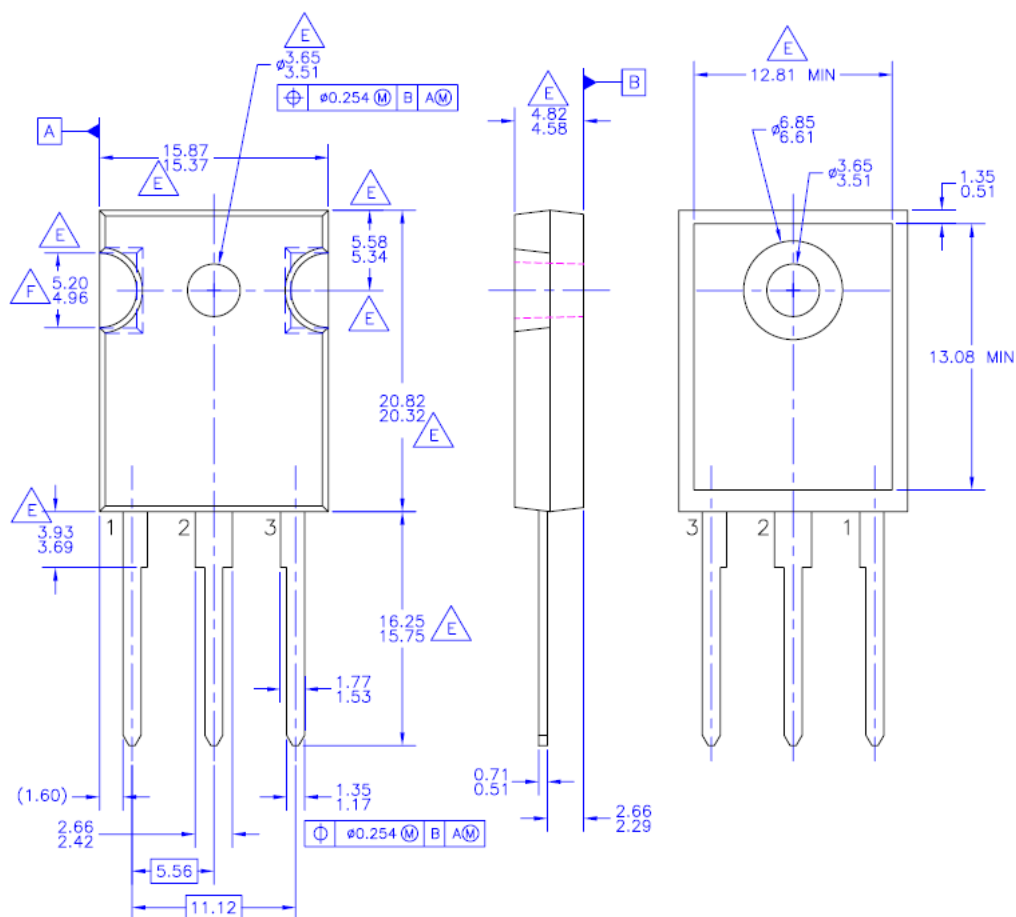


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

TO-247



NOTES: UNLESS OTHERWISE SPECIFIED

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 F. NOTCH MAY BE SQUARE

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