

FCH47N60N

N-Channel SupreMOS® MOSFET

600 V, 47 A, 62 mΩ

Features

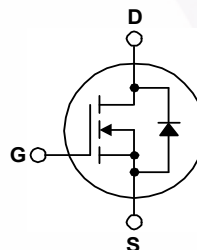
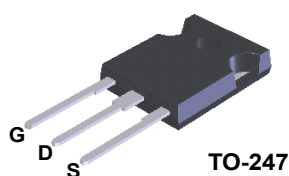
- 650 V @ $T_J = 150^\circ\text{C}$
- $R_{DS(on)} = 51.5\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10\text{ V}$, $I_D = 23.5\text{ A}$
- Ultra Low Gate Charge (Typ. $Q_g = 115\text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 511\text{ pF}$)
- 100% Avalanche Tested
- RoHS Compliant

Application

- 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 differentiates it from the conventional SJ MOSFETs. This advanced technology and precise process control provides 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.



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

Symbol	Parameter	FCH47N60N	Unit
V_{DSS}	Drain to Source Voltage	600	V
V_{GSS}	Gate to Source Voltage	± 30	V
I_D	Drain Current	47	A
	- Continuous ($T_C = 25^\circ\text{C}$)		
	- Continuous ($T_C = 100^\circ\text{C}$)	29.7	
I_{DM}	Drain Current	141 (Note 1)	A
E_{AS}	Single Pulsed Avalanche Energy	3068 (Note 2)	mJ
I_{AR}	Avalanche Current	15.7 (Note 1)	A
E_{AR}	Repetitive Avalanche Energy	3.7 (Note 1)	mJ
dv/dt	MOSFET dv/dt	100	V/ns
	Peak Diode Recovery dv/dt	20 (Note 3)	V/ns
P_D	Power Dissipation	368 ($T_C = 25^\circ\text{C}$)	W
	- Derate above 25°C	2.94	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FCH47N60N	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.34	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH47N60N	FCH47N60N	TO-247	Tube	N/A	N/A	30 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	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$, $T_C = 25^\circ\text{C}$	600	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{ mA}$, Referenced to 25°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	μA
		$V_{DS} = 480\text{ V}$, $V_{GS} = 0\text{ V}$, $T_C = 125^\circ\text{C}$	-	-	100	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{ V}$, $V_{DS} = 0\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	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
$C_{oss(eff.)}$	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)	$f = 1\text{ MHz}$	-	0.9	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{ V}$, $I_D = 23.5\text{ A}$ $R_G = 4.7\text{ }\Omega$ (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 _S	Maximum Continuous Drain to Source Diode Forward Current	-	-	47	A	
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	141	A	
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 23.5 A	-	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 23.5 A	-	495	-	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt = 100 A/μs	-	12	-	μC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $I_{AS} = 15.7\text{ A}$, $R_G = 25\text{ }\Omega$, 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

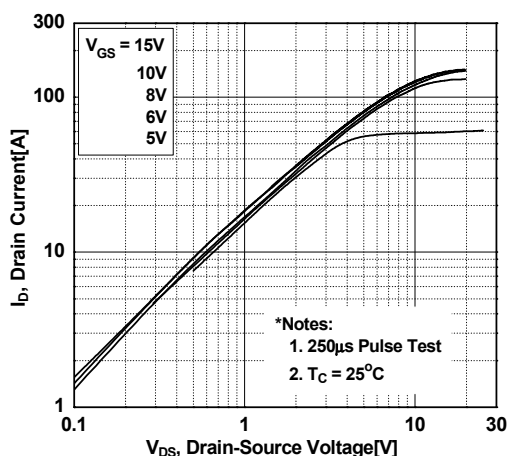


Figure 2. Transfer Characteristics

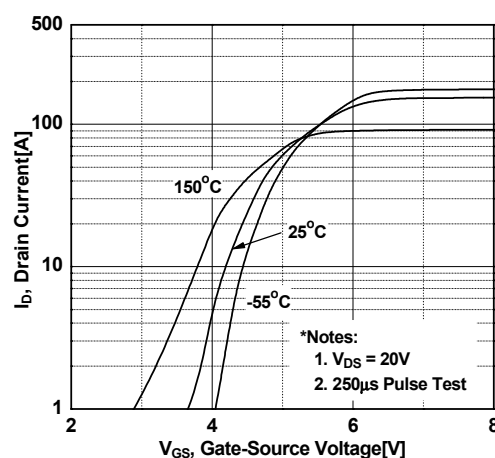


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

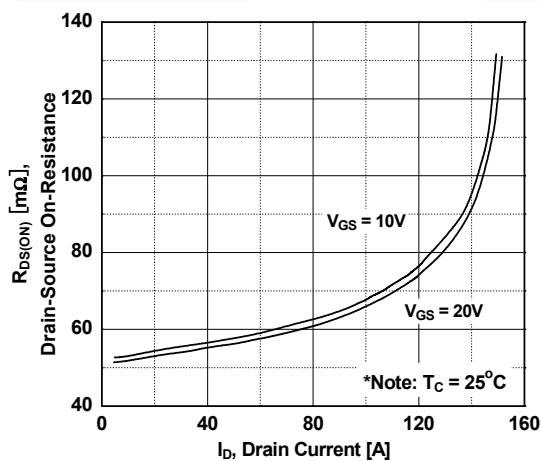


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

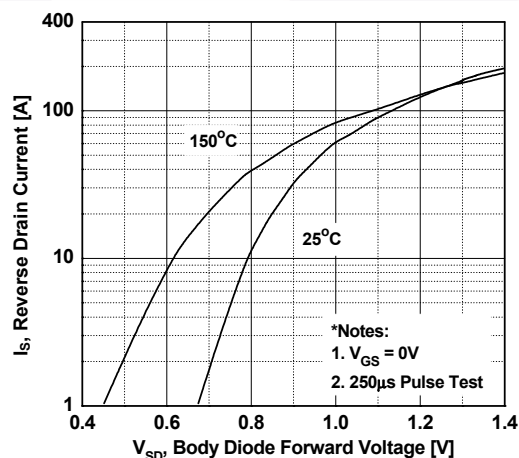


Figure 5. Capacitance Characteristics

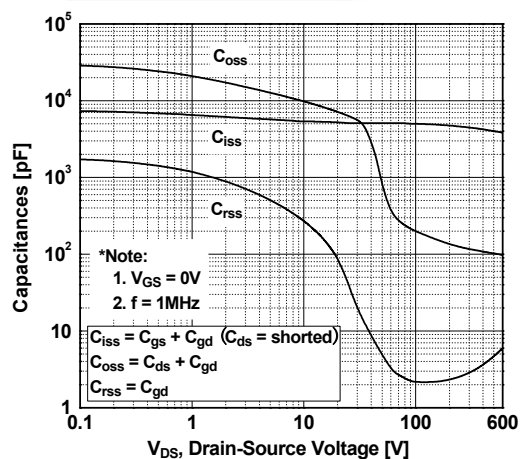
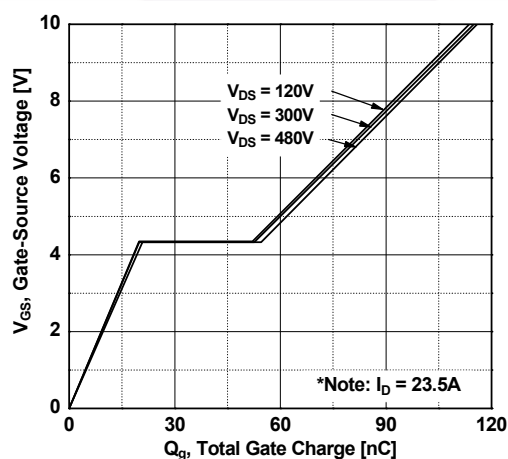


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

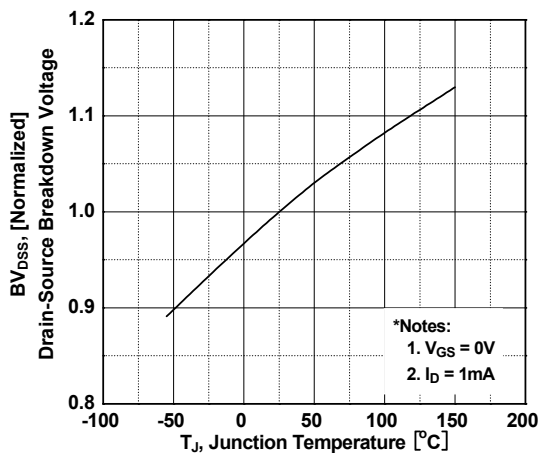


Figure 8. On-Resistance Variation vs. Temperature

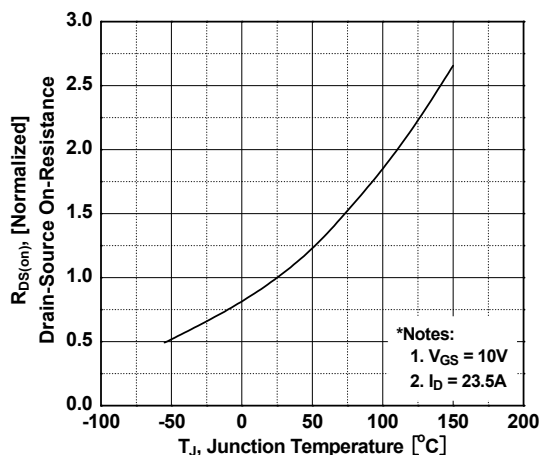


Figure 9. Maximum Safe Operating Area

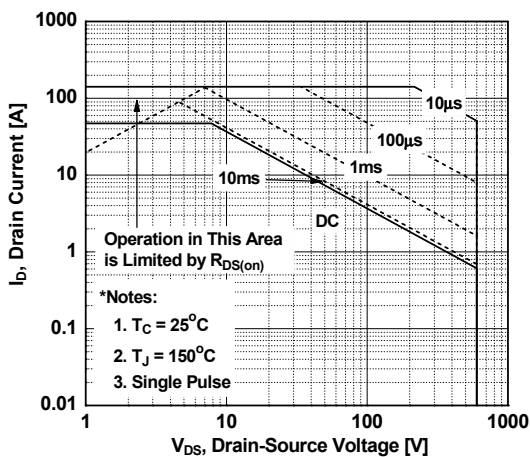


Figure 10. Maximum Drain Current vs. Case Temperature

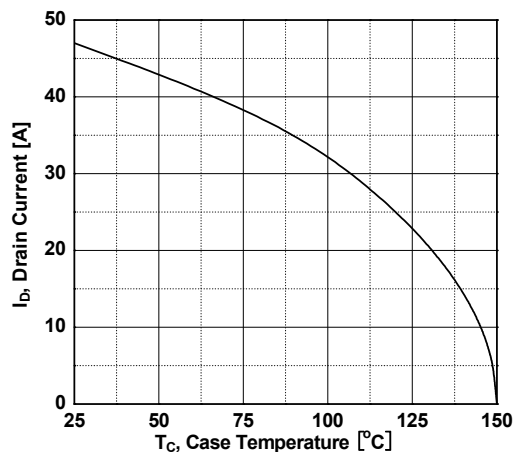
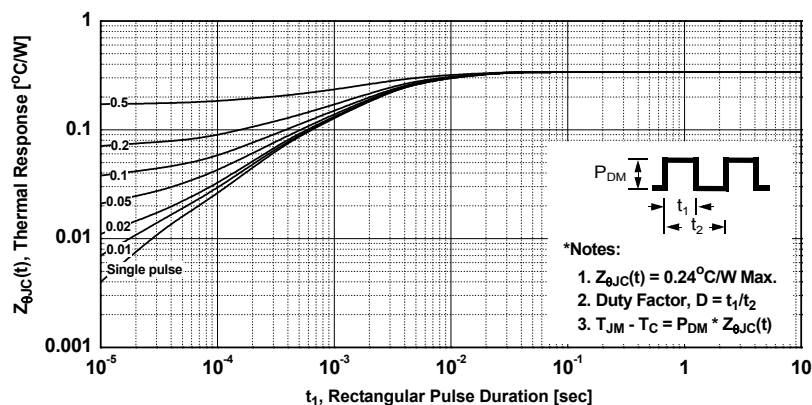


Figure 11. Transient Thermal Response Curve



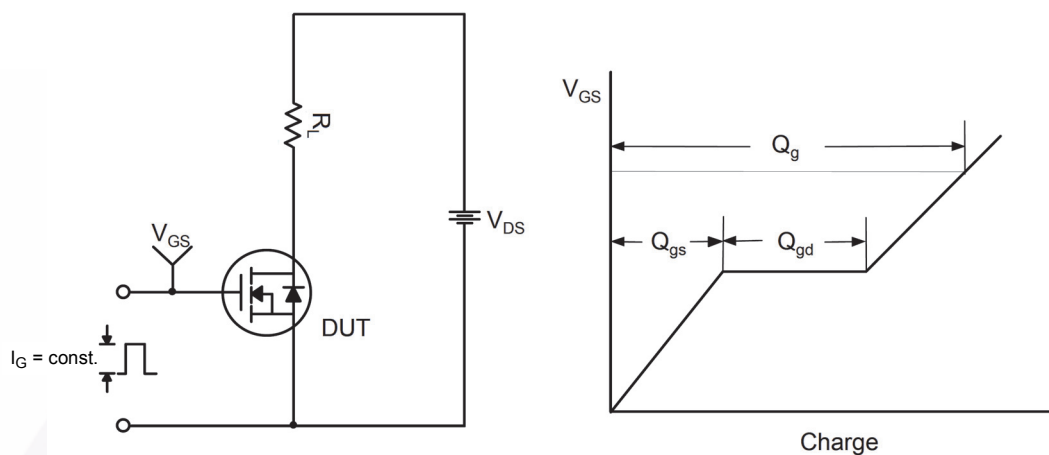


Figure 12. Gate Charge Test Circuit & Waveform

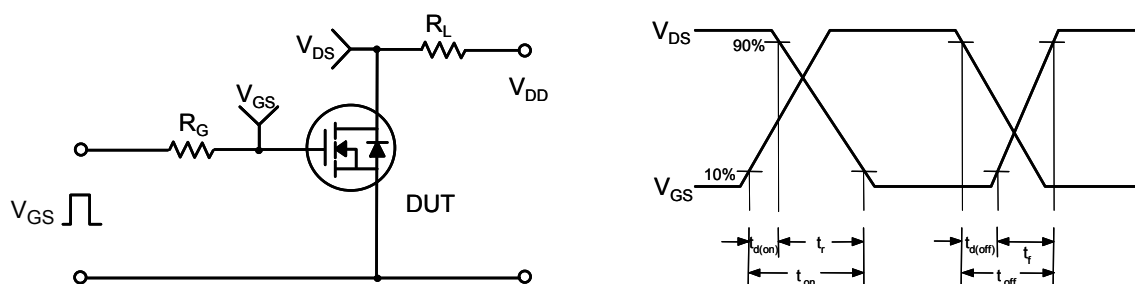


Figure 13. Resistive Switching Test Circuit & Waveforms

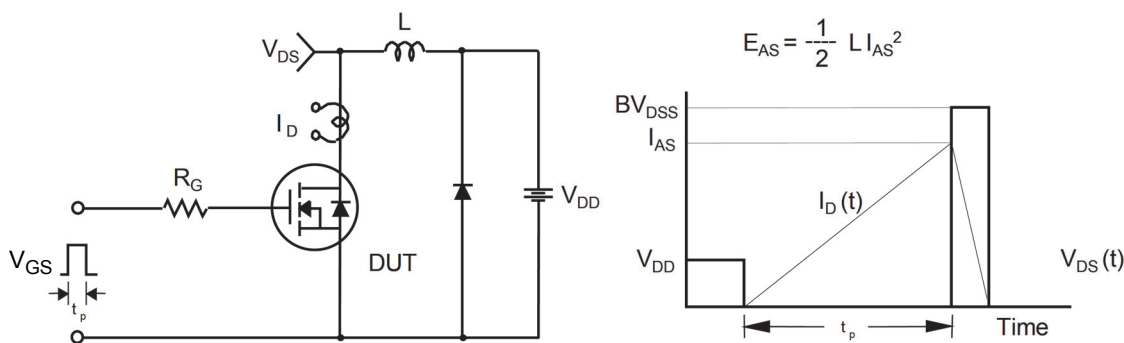
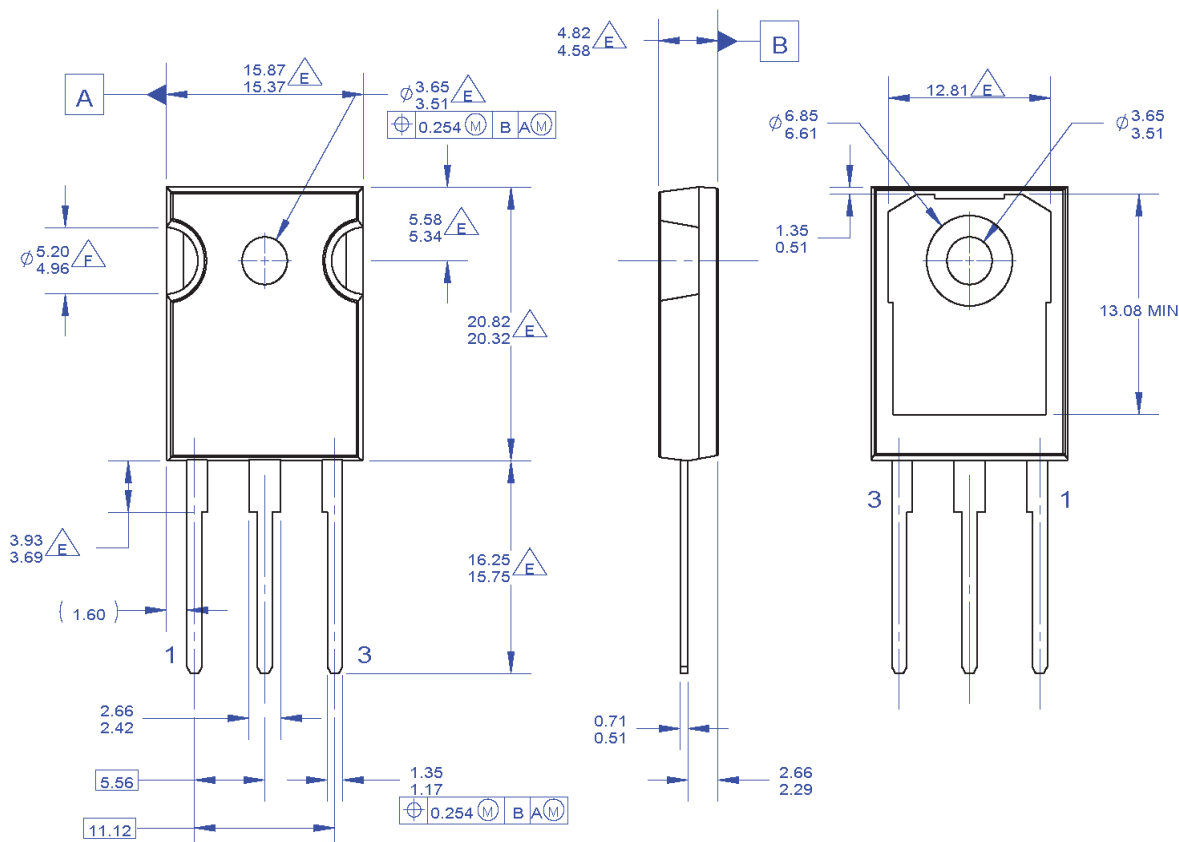


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

Mechanical Dimensions



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

$\triangle E$ DOES NOT COMPLY JEDEC STANDARD VALUE

$\triangle F$ NOTCH MAY BE SQUARE

G. DRAWING FILENAME: MKT-TO247A03_REV03

Figure 16. TO-247, Molded, 3-Lead, Jedec Variation AB

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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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