



March 2015

FDD6637

35V P-Channel PowerTrench[®] MOSFET

General Description

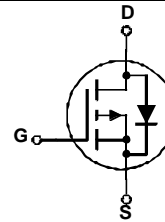
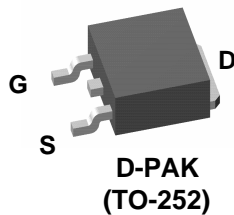
This P-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench technology to deliver low R_{DS(on)} and optimized Bvdss capability to offer superior performance benefit in the applications.

Applications

- Inverter
- Power Supplies

Features

- -55 A, -35 V R_{DS(ON)} = 11.6 mΩ @ V_{GS} = -10 V
R_{DS(ON)} = 18 mΩ @ V_{GS} = -4.5 V
- High performance trench technology for extremely low R_{DS(ON)}
- RoHS Compliant



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	-35	V
V _{DS(Avalanche)}	Drain-Source Avalanche Voltage (maximum) (Note 4)	-40	V
V _{GSS}	Gate-Source Voltage	±25	V
I _D	Continuous Drain Current @T _C =25°C (Note 3) @T _A =25°C (Note 1a) Pulsed (Note 1a)	-55	A
		-13	
		-100	
P _D	Power Dissipation @T _C =25°C (Note 3) @T _A =25°C (Note 1a) @T _A =25°C (Note 1b)	57	W
		3.1	
		1.3	
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	2.2	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	40	
R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1b)	96	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape width	Quantity
FDD6637	FDD6637	D-PAK (TO-252)	13"	16mm	2500 units

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings						
E_{AS}	Drain-Source Avalanche Energy (Single Pulse)	$V_{DD} = -35\text{ V}$, $I_D = -11\text{ A}$, $L=1\text{mH}$		61		mJ
I_{AS}	Drain-Source Avalanche Current			-14		A
Off Characteristics (Note 2)						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = -250\ \mu\text{A}$	-35			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -28\text{ V}$, $V_{GS} = 0\text{ V}$			-1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 25\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = -250\ \mu\text{A}$	-1	-1.6	-3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$ $V_{GS} = -4.5\text{ V}$, $I_D = -11\text{ A}$ $V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$, $T_J=125^\circ\text{C}$		9.7 14.4 14.7	11.6 18 19	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}$, $I_D = -14\text{ A}$		35		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		2370		pF
C_{oss}	Output Capacitance			470		pF
C_{rss}	Reverse Transfer Capacitance			250		pF
R_G	Gate Resistance	$f = 1.0\text{ MHz}$		3.6		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -20\text{ V}$, $I_D = -1\text{ A}$, $V_{GS} = -10\text{ V}$, $R_{GEN} = 6\ \Omega$		18	32	ns
t_r	Turn-On Rise Time			10	20	ns
$t_{d(off)}$	Turn-Off Delay Time			62	100	ns
t_f	Turn-Off Fall Time			36	58	ns
Q_g	Total Gate Charge, $V_{GS} = -10\text{V}$	$V_{DS} = -20\text{ V}$, $I_D = -14\text{ A}$		45	63	nC
Q_g	Total Gate Charge, $V_{GS} = -5\text{V}$			25	35	nC
Q_{gs}	Gate-Source Charge			7		nC
Q_{gd}	Gate-Drain Charge			10		nC

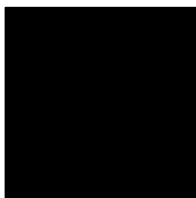
Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Diode Characteristics						
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -14\text{ A}$ (Note 2)		-0.8	-1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = -14\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$		28		ns
Q_{rr}	Diode Reverse Recovery Charge			15		nC

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) $R_{\theta JA} = 40^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $R_{\theta JA} = 96^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width < $300\mu\text{s}$, Duty Cycle < 2.0%

- Maximum current is calculated as:
$$\sqrt{\frac{P_D}{R_{DS(ON)}}}$$

where P_D is maximum power dissipation at $T_C = 25^\circ\text{C}$ and $R_{DS(on)}$ is at $T_{J(max)}$ and $V_{GS} = 10\text{V}$. Package current limitation is 21A

- BV(avalanche) Single-Pulse rating is guaranteed if device is operated within the UIS SOA boundary of the device.

Typical Characteristics

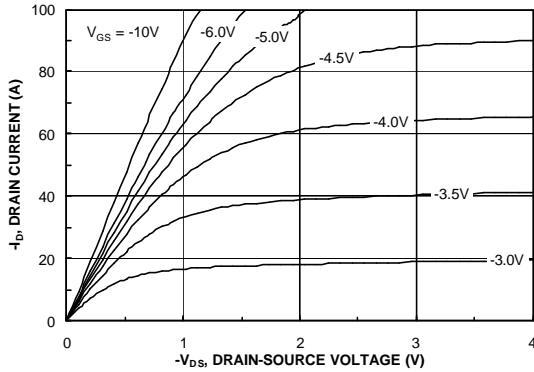


Figure 1. On-Region Characteristics

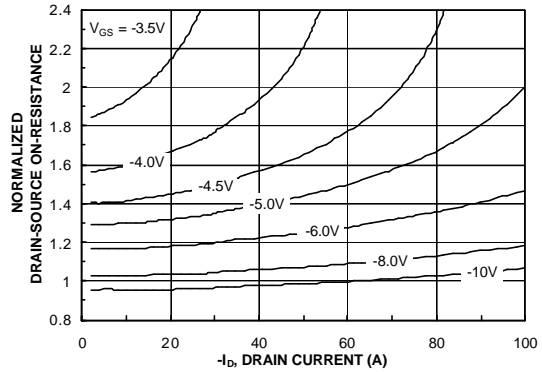


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

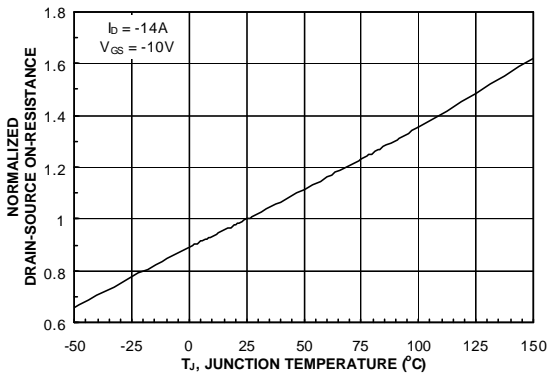


Figure 3. On-Resistance Variation with Temperature

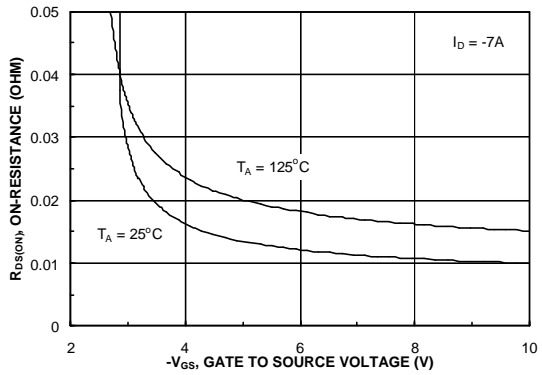


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

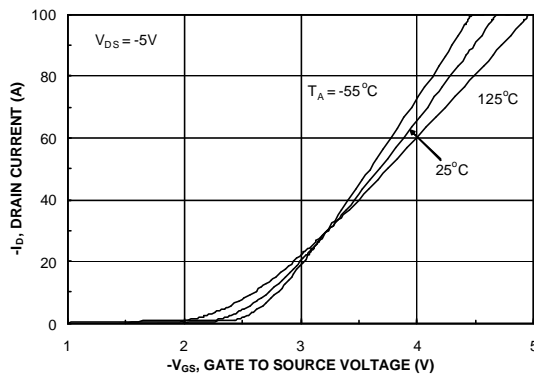


Figure 5. Transfer Characteristics

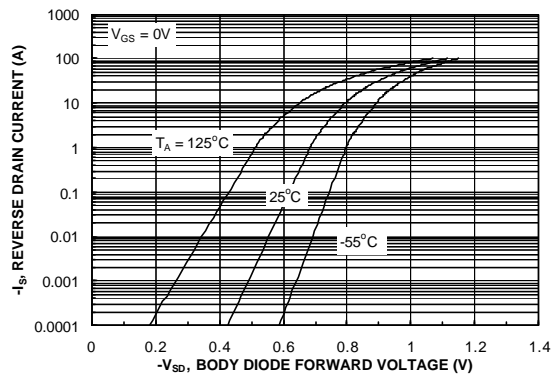


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

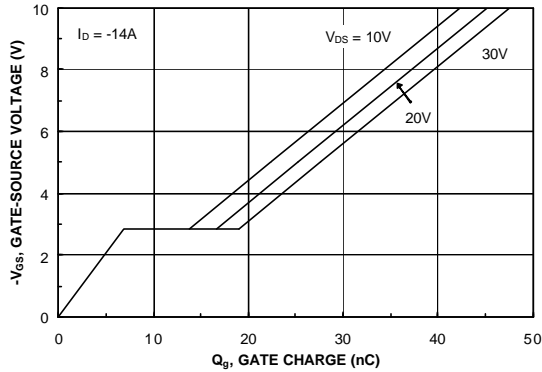


Figure 7. Gate Charge Characteristics

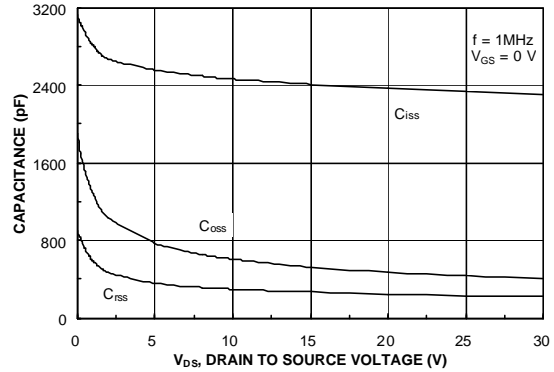


Figure 8. Capacitance Characteristics

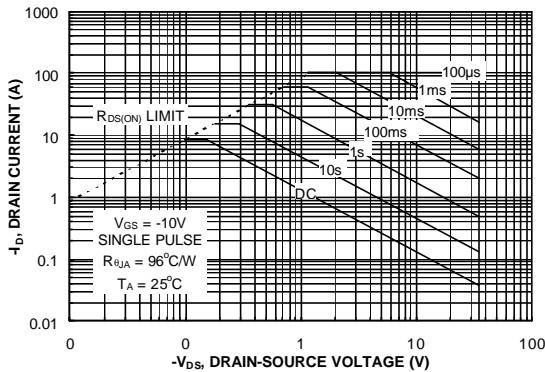


Figure 9. Maximum Safe Operating Area

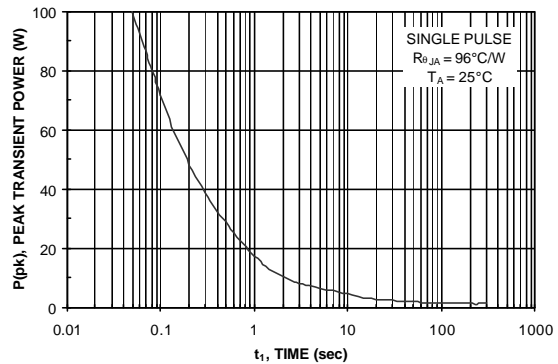


Figure 10. Single Pulse Maximum Power Dissipation

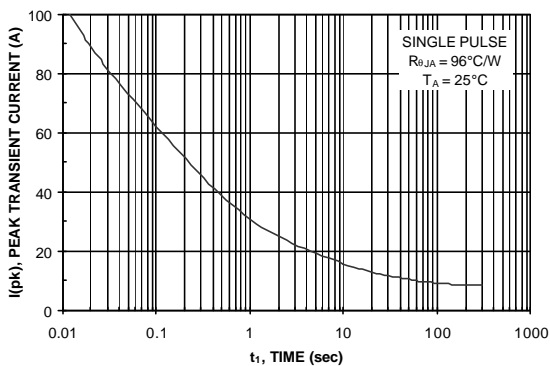


Figure 11. Single Pulse Maximum Peak Current

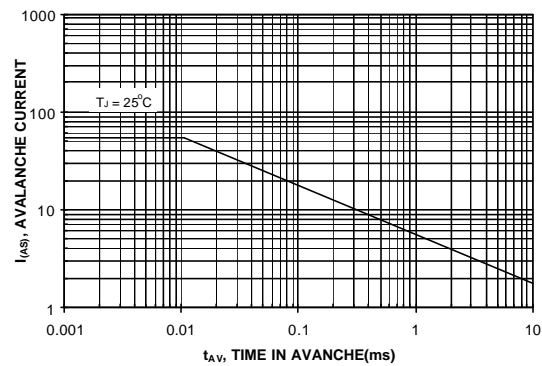


Figure 12. Unclamped Inductive Switching Capability

Typical Characteristics

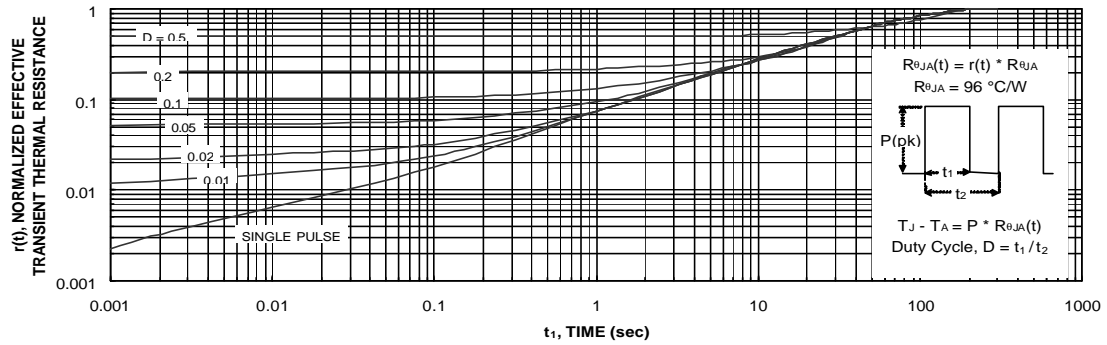


Figure 13. Transient Thermal Response Curve

Thermal characterization performed using the conditions described in Note 1b.
 Transient thermal response will change depending on the circuit board design.

Test Circuits and Waveforms

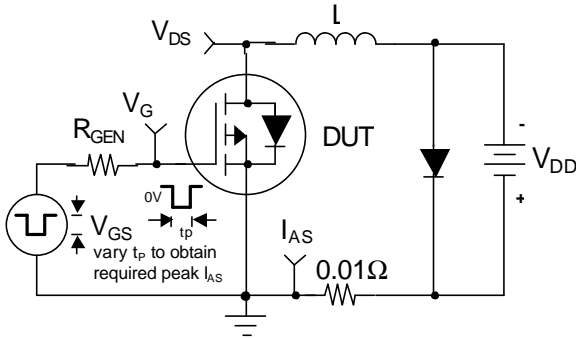


Figure 14. Unclamped Inductive Load Test Circuit

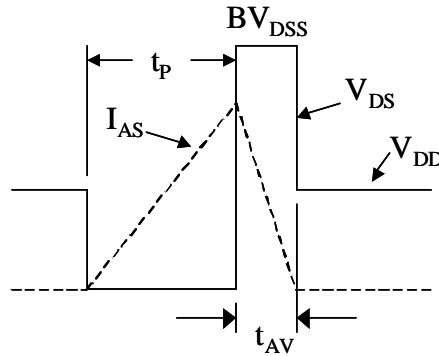


Figure 15. Unclamped Inductive Waveforms

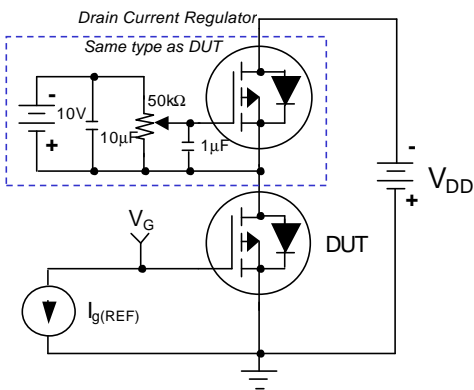


Figure 16. Gate Charge Test Circuit

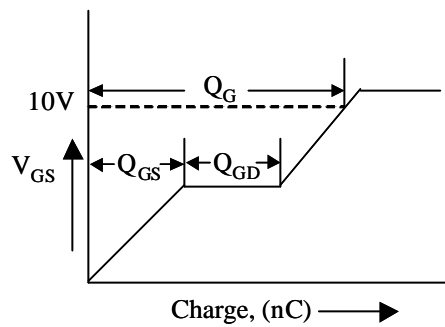


Figure 17. Gate Charge Waveform

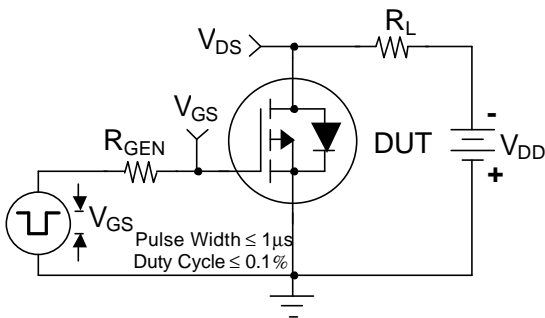


Figure 18. Switching Time Test Circuit

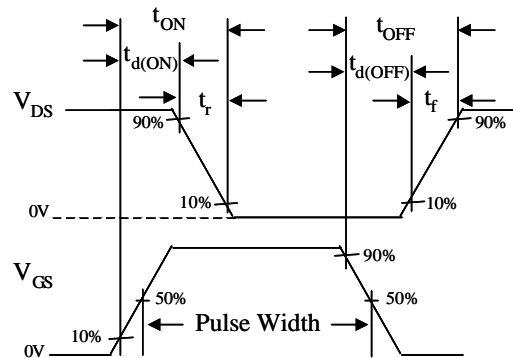
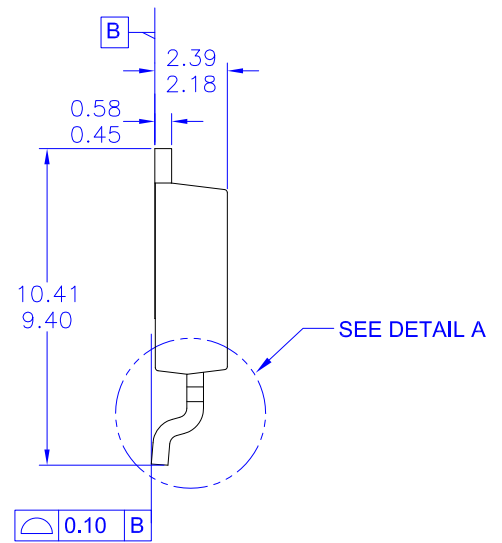
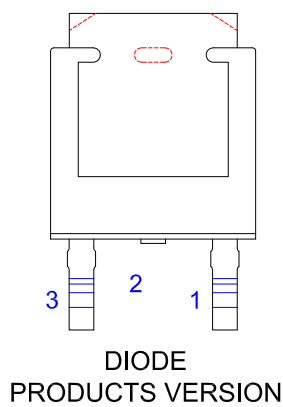
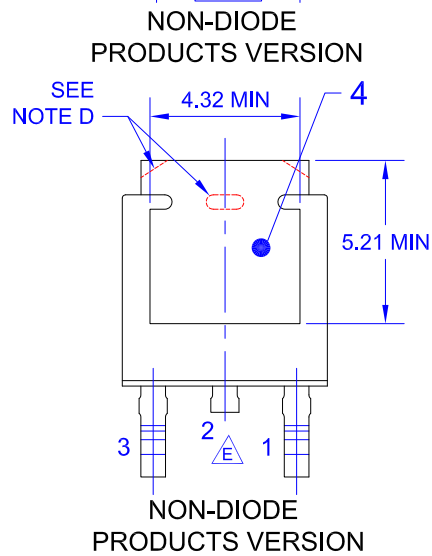
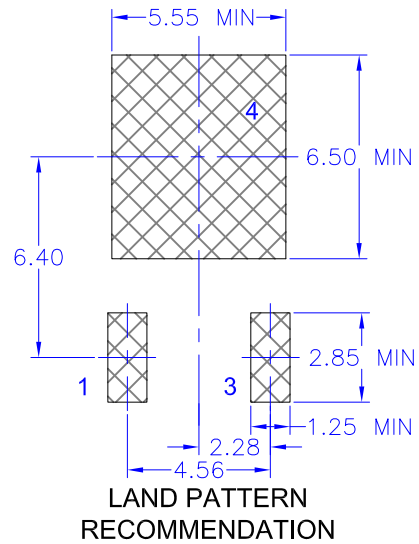
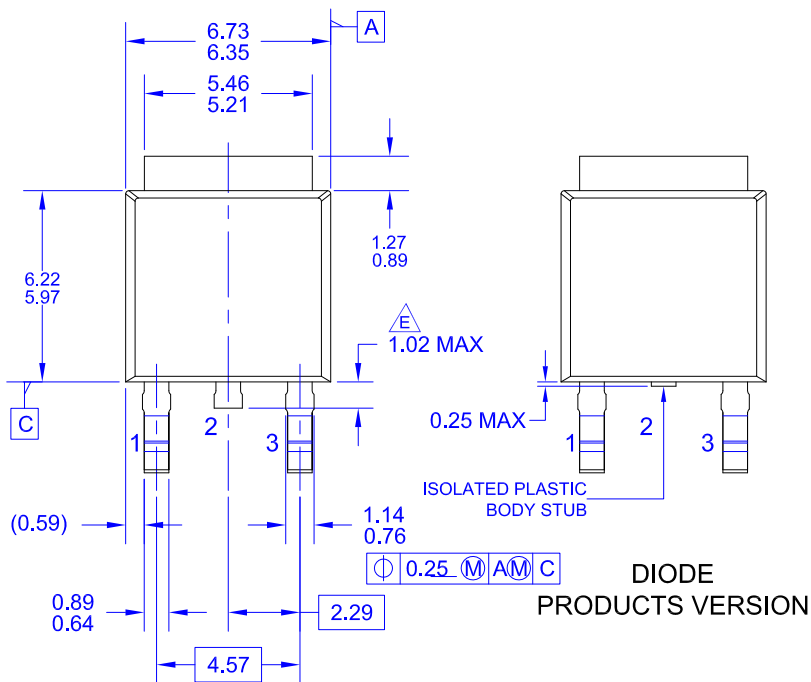
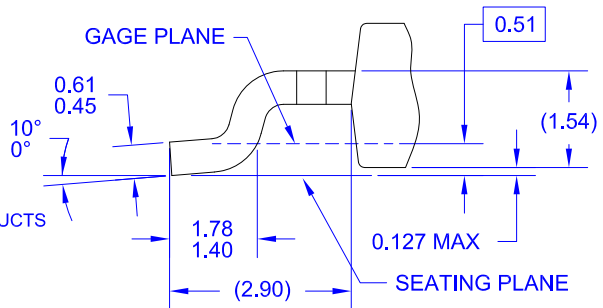


Figure 19. Switching Time Waveforms



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
- E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
- F) DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.
- H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11



DETAIL A
(ROTATED -90°)
SCALE: 12X





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™ | F-PFS™ | OPTOPLANAR® | SYSTEM GENERAL® |
| AttitudeEngine™ | FRFET® | Power Supply WebDesigner™ | TinyBoost® |
| Awinda® | Global Power Resource SM | PowerTrench® | TinyBuck® |
| AX-CAP®* | GreenBridge™ | PowerXS™ | TinyCalc™ |
| BitSiC™ | Green FPS™ | Programmable Active Droop™ | TinyLogic® |
| Build it Now™ | Green FPS™ e-Series™ | QFET® | TINYOPTO™ |
| CorePLUS™ | Gmax™ | QS™ | TinyPower™ |
| CorePOWER™ | GTO™ | Quiet Series™ | TinyPWM™ |
| CROSSVOL™ | IntelliMAX™ | RapidConfigure™ | TinyWire™ |
| CTL™ | ISOPLANAR™ | Saving our world, 1mW/W/kW at a time™ | TranSiC™ |
| Current Transfer Logic™ | Making Small Speakers Sound Louder and Better™ | SignalWise™ | TriFault Detect™ |
| DEUXPEED® | MegaBuck™ | SmartMax™ | TRUECURRENT®* |
| Dual Cool™ | MICROCOUPLER™ | SMART START™ | μSerDes™ |
| EcoSPARK® | MicroFET™ | Solutions for Your Success™ | UHC® |
| EfficientMax™ | MicroPak™ | SPM® | Ultra FRFET™ |
| ESBC™ | MicroPak2™ | STEALTH™ | UniFET™ |
| F [®] | MillerDrive™ | SuperFET® | VCX™ |
| Fairchild® | MotionMax™ | SuperSOT™-3 | VisualMax™ |
| Fairchild Semiconductor® | MotionGrid® | SuperSOT™-6 | VoltagePlus™ |
| FACT Quiet Series™ | MTi® | SuperSOT™-8 | XST™ |
| FACT® | MTx® | SupreMOS® | Xsens™ |
| FastvCore™ | MVN® | SyncFET™ | 仙童® |
| FETBench™ | mWSaver® | Sync-Lock™ | |
| FPS™ | OptoHiT™ | | |
| | OPTOLOGIC® | | |

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I77