

HUFA76407DK8T_F085

Dual N-Channel Logic Level UltraFET® Power MOSFET 60 V, 3.5 A, 105 mΩ

General Description

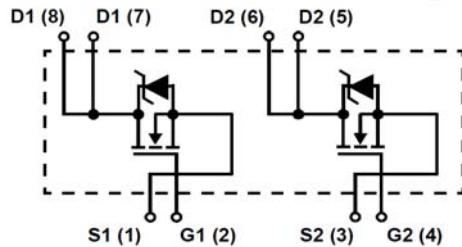
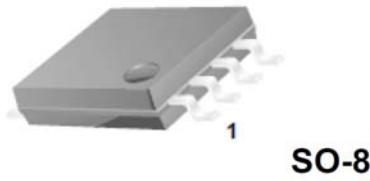
These N-Channel power MOSFETs are manufactured using the innovative UltraFET® process. This advanced process technology achieves the lowest possible onresistance per silicon area, resulting in outstanding performance. This device is capable of withstanding high energy

in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching convertors, motor drivers, relay drivers, low-voltage bus switches, and power management in portable and battery-operated products.



Features

- Ultra-Low On-Resistance $r_{DS(on)} = 0.090\Omega$ at $V_{GS} = 10\text{ V}$
- Ultra-Low On-Resistance $r_{DS(on)} = 0.105\Omega$ at $V_{GS} = 5\text{ V}$
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- Transient Thermal Impedance Curve vs Board Mounting Area
- Switching Time vs R_{GS} Curves
- Qualified to AEC Q101
- RoHS Compliant



MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	60	V
V_{DRG}	Drain to Gate Voltage ($R_{GS} = 20\text{k}\Omega$)	60	V
V_{GS}	Gate to Source Voltage	± 16	V
I_D	Drain Current -Continuous ($T_A = 25\text{ °C}$, $V_{GS} = 5\text{V}$)	3.5	A
	-Continuous ($T_A = 25\text{ °C}$, $V_{GS} = 10\text{V}$) (Figure 2)	3.8	
	-Continuous ($T_A = 100\text{ °C}$, $V_{GS} = 5\text{V}$)	1	
	-Continuous ($T_A = 100\text{ °C}$, $V_{GS} = 4.5\text{V}$) (Figure 2)	1	
I_{DM}	Drain Current -Pulsed	Figure 4	
UIS	Pulsed Avalanche Rating	Figures 6, 17, 18	
P_D	Power Dissipation	2.5	W
	Derate Above 25 °C	20	$\text{mW}/\text{°C}$
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C
T_L	Temperature for Soldering - Leads at 0.063in (1.6mm) from Case for 10s	300	°C
T_{pkg}	Temperature for Soldering - Package Body for 10s, See Techbrief TB334	260	°C

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
76407DK8	HUFA76407DK8T_F085	SO-8	330mm	12mm	2500 units

Notes:

1. $T_J = 25\text{ °C}$ to 125 °C.
2. 50°C/W measured using FR-4 board with 0.76 in² (490.3 mm²) copper pad at 1second.
3. 228°C/W measured using FR-4 board with 0.006 in² (3.87 mm²) copper pad at 1000 seconds.
4. A suffix as "...F085P" has been temporarily introduced in order to manage a double source strategy as Fairchild has officially announced in Aug 2014.

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

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off Characteristics							
BV _{DSS}	Drain to Source Breakdown Voltage $V_{GS} = 0\text{ V}$	$I_D = 250\text{ }\mu\text{A}$	(Figure 12)	60	-	-	V
		$T_A = -40^\circ\text{C}$ (Figure 12)		55	-	-	
I _{DSS}	Zero Gate Voltage Drain Current $V_{GS} = 0\text{ V}$	$V_{DS} = 55\text{ V}$,		-	-	1	μA
			$T_A = 150^\circ\text{C}$	-	-	250	
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 16\text{ V}$		-	-	± 100	nA

On Characteristics

V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$ (Figure 11)	1	-	3	V
r _{DS(on)}	Static Drain to Source On Resistance	$I_D = 3.8\text{ A}$, $V_{GS} = 10\text{ V}$ (Figure 9,10)	-	0.075	0.090	Ω
		$I_D = 1.0\text{ A}$, $V_{GS} = 5\text{ V}$ (Figure 9)	-	0.088	0.105	
		$I_D = 1.0\text{ A}$, $V_{GS} = 4.5\text{ V}$ (Figure 9)	-	0.092	0.110	

Thermal Characteristics

R _{θJA}	Thermal Resistance Junction to Ambient	0.76in ² (490.3mm ²) Pad (Note 2)	-	-	50	°C/W
		0.027in ² (17.4mm ²) Pad (Figure 23)	-	-	191	
		0.006in ² (3.87mm ²) Pad (Figure 23)	-	-	228	

Switching Characteristics ($V_{GS}=4.5\text{V}$)

t _{on}	Turn-On Time	$V_{DD} = 30\text{ V}$, $I_D = 1.0\text{ A}$, $V_{GS} = 4.5\text{ V}$, $R_{GS} = 27\text{ }\Omega$ (Figure 15, 21, 22)	-	-	57	ns
t _{d(on)}	Turn-On Delay Time		-	8	-	ns
t _r	Rise Time		-	30	-	ns
t _{d(off)}	Turn-Off Delay Time		-	25	-	ns
t _f	Fall Time		-	25	-	ns
t _{off}	Turn-Off Time		-	-	75	ns

Switching Characteristics ($V_{GS}=10\text{V}$)

t _{on}	Turn-On Time	$V_{DD} = 30\text{ V}$, $I_D = 3.8\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GS} = 30\text{ }\Omega$ (Figure 16, 21, 22)	-	-	24	ns
t _{d(on)}	Turn-On Delay Time		-	5	-	ns
t _r	Rise Time		-	11	-	ns
t _{d(off)}	Turn-Off Delay Time		-	46	-	ns
t _f	Fall Time		-	31	-	ns
t _{off}	Turn-Off Time		-	-	116	ns

Gate Charge Characteristics

Q _{g(TOT)}	Total Gate Charge	$V_{GS} = 0\text{ to }10\text{ V}$	$V_{DD} = 30\text{ V}$, $I_D = 1.0\text{ A}$, $I_{g(\text{REF})} = 1.0\text{ mA}$, (Figure 14, 19, 20)	-	9.4	11.2	nC
Q _{g(5)}	Gate Charge at 5V	$V_{GS} = 0\text{ to }5\text{ V}$		-	5.3	6.4	nC
Q _{g(TH)}	Threshold Gate Charge	$V_{GS} = 0\text{ to }1\text{ V}$		-	0.42	0.5	nC
Q _{gs}	Gate to Source Charge			-	1.05	-	nC
Q _{gd}	Gate to Drain "Miller" Charge			-	2.4	-	nC

Dynamic Characteristics

C _{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{MHz}$, (Figure 13)	-	330	-	pF
C _{oss}	Output Capacitance		-	100	-	pF
C _{rss}	Reverse Transfer Capacitance		-	18	-	pF

Drain-Source Diode Characteristics

V _{SD}	Source to Drain Diode Forward Voltage	$I_{SD} = 3.8\text{ A}$	-	-	1.25	V
		$I_{SD} = 1.0\text{ A}$	-	-	1.00	
t _{rr}	Reverse Recovery Time	$I_F = 1.0\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	-	48	ns
			-	-	89	nC

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

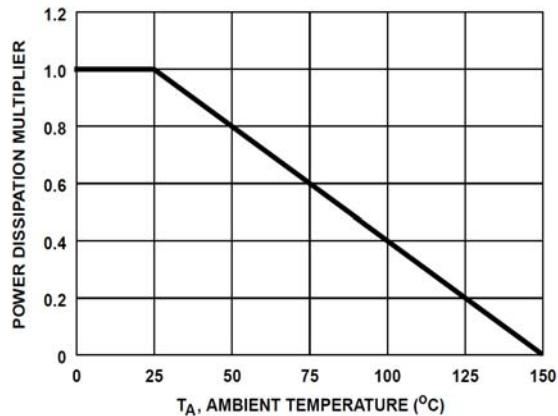


Figure 1. NORMALIZED POWER DISSIPATION vs. AMBIENT TEMPERATURE

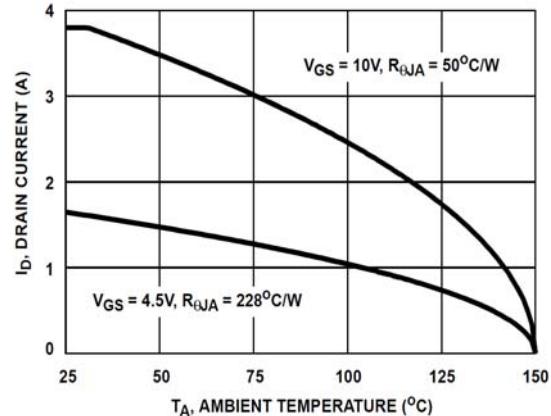


Figure 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs. AMBIENT TEMPERATURE

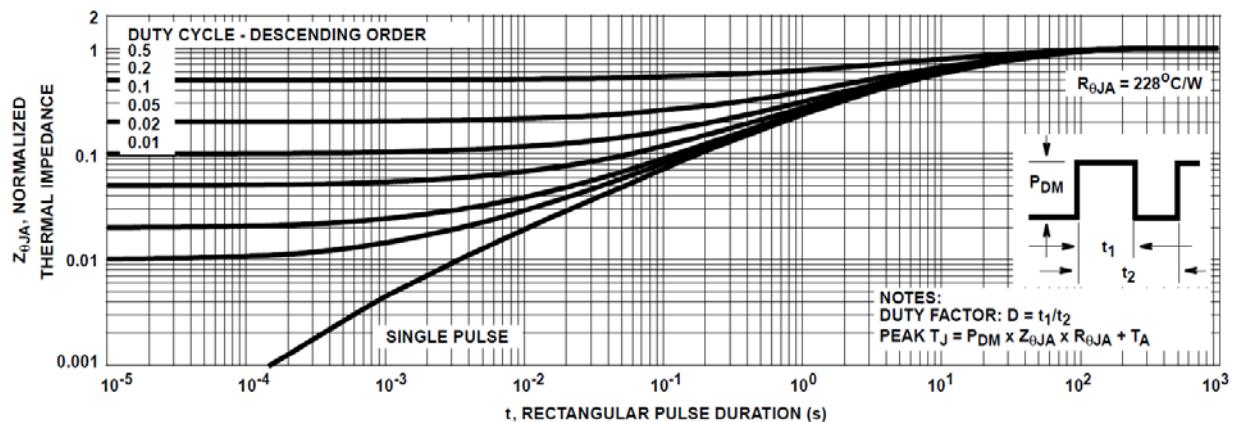


Figure 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

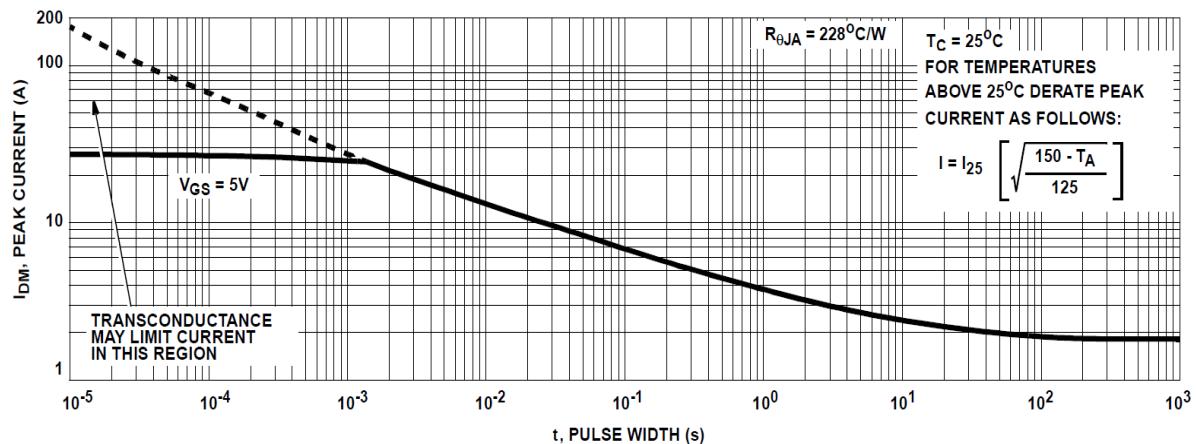


Figure 4. PEAK CURRENT CAPABILITY

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

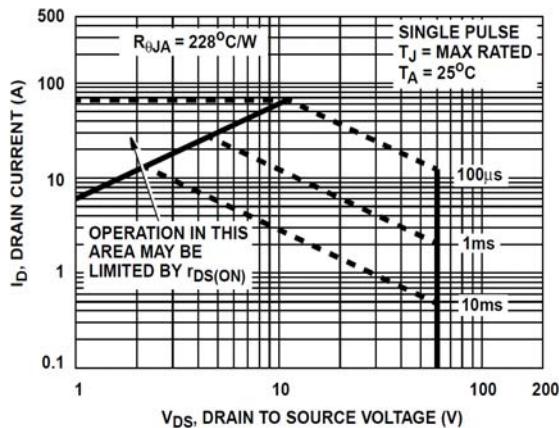


Figure 5. FORWARD BIAS SAFE OPERATING AREA

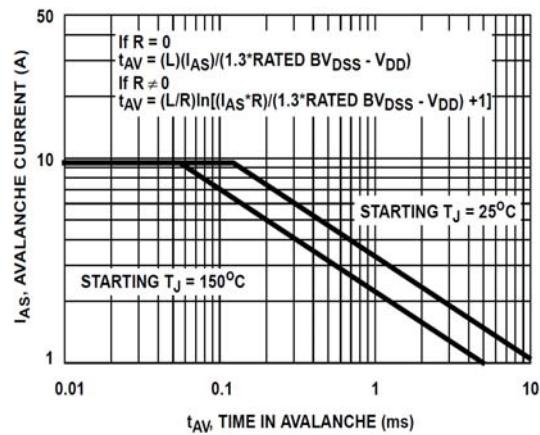


Figure 6. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

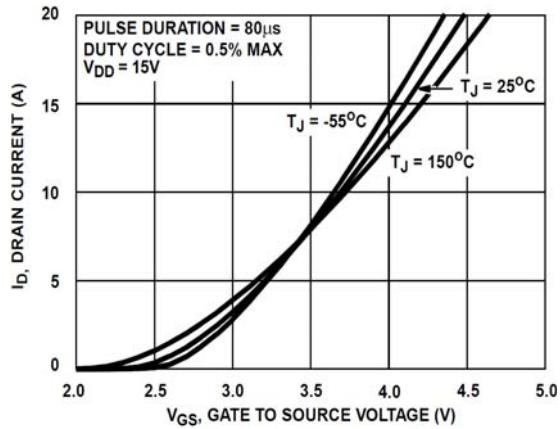


Figure 7. TRANSFER CHARACTERISTICS

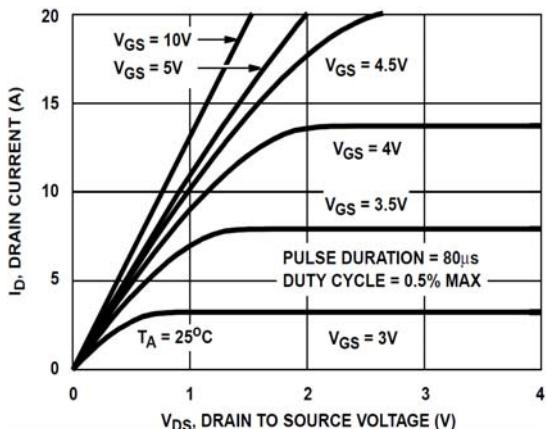


Figure 8. SATURATION CHARACTERISTICS

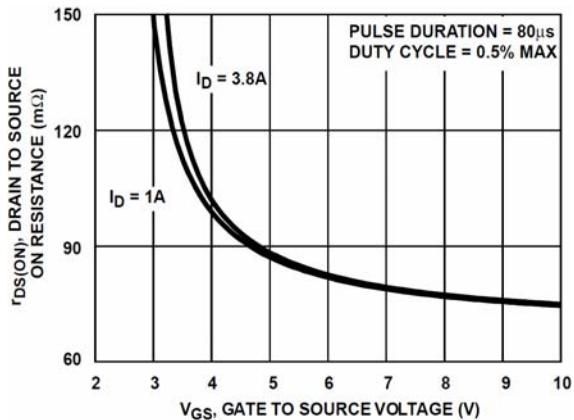


Figure 9. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

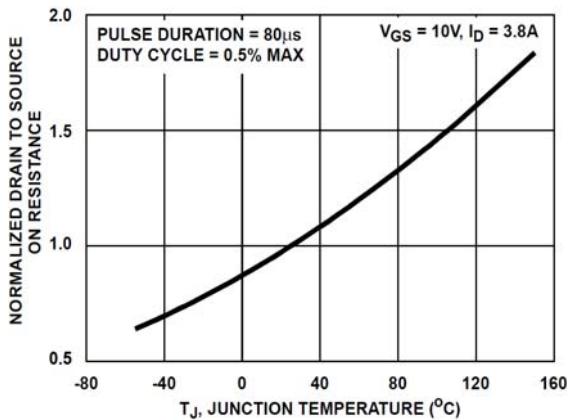


Figure 10. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

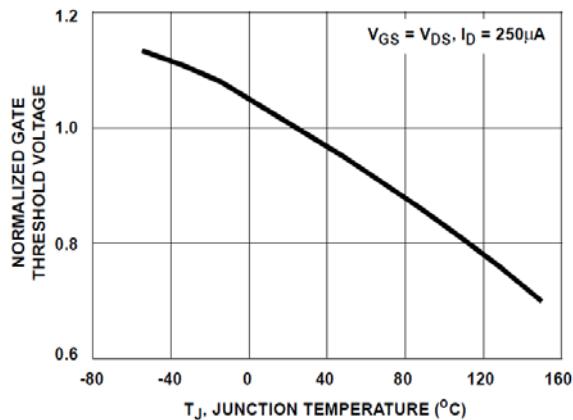


Figure 11. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

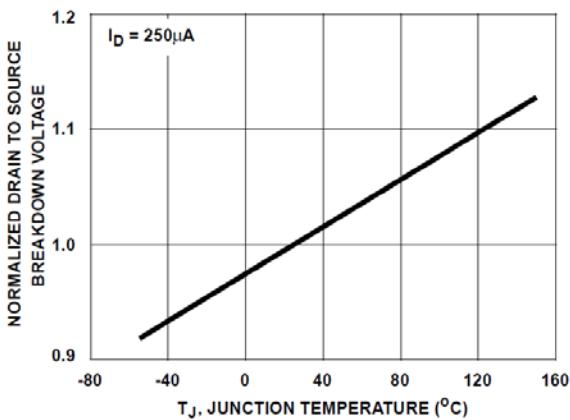


Figure 12. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

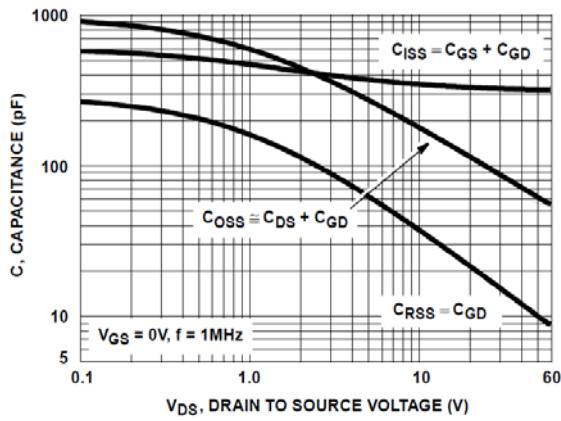


Figure 13. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE

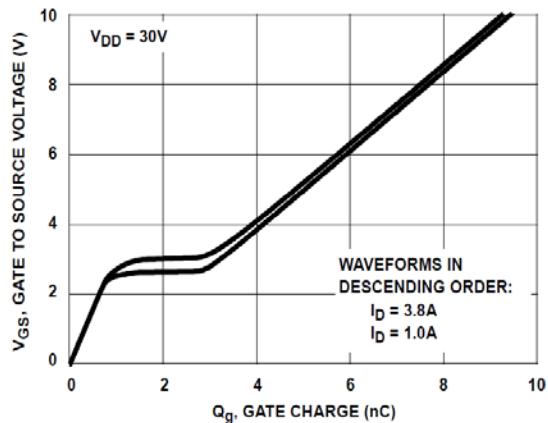


Figure 14. GATE CHARGE WAVEFORMS FOR CONSTANT GATE CURRENT

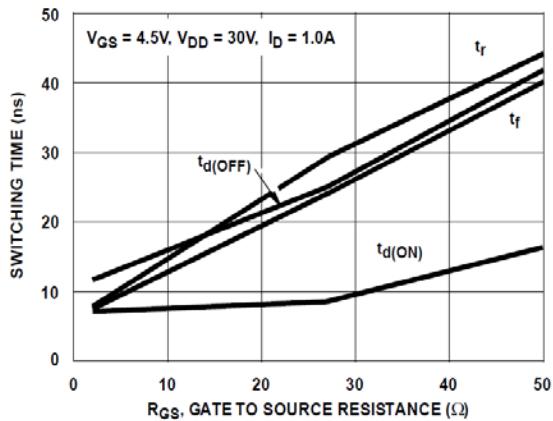


Figure 15. SWITCHING TIME vs GATE RESISTANCE

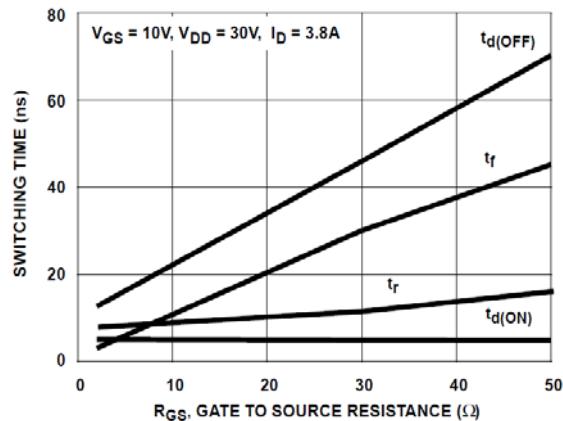
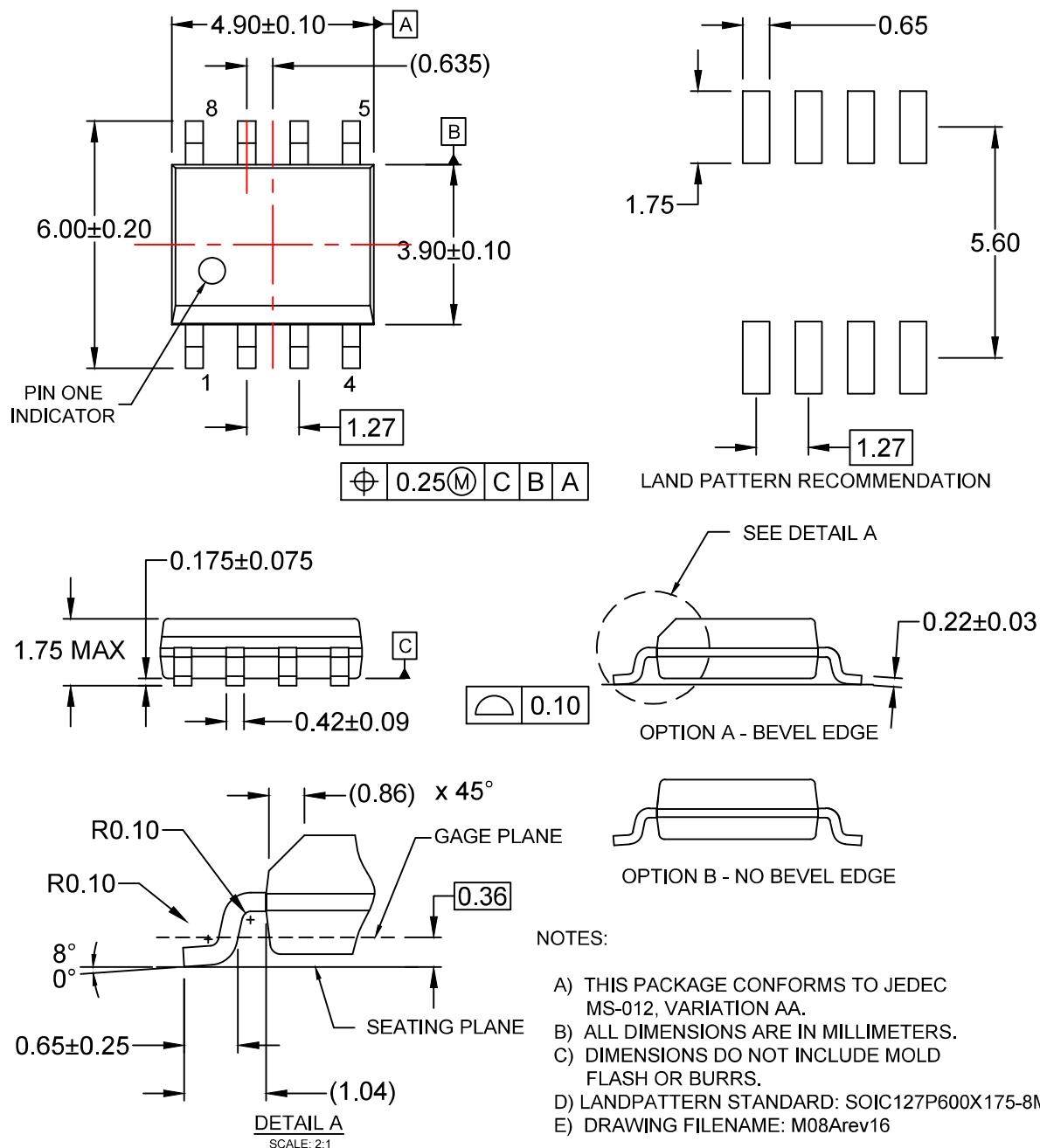


Figure 16. SWITCHING TIME vs GATE RESISTANCE



NOTES:

- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M
- E) DRAWING FILE ENAME: M08Arev16

FAIRCHILD



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™
 AttitudeEngine™
 Awinda®
 AX-CAP®*
 BitSiC™
 Build it Now™
 CorePLUS™
 CorePOWER™
 CROSSVOLT™
 CTL™
 Current Transfer Logic™
 DEUXPEED®
 Dual Cool™
 EcosPARK®
 EfficientMax™
 ESBG™
 F®
 Fairchild®
 Fairchild Semiconductor®
 FACT Quiet Series™
 FACT®
 FastvCore™
 FETBench™
 FPS™
 F-PFS™
 FRFET®
 Global Power Resource™
 GreenBridge™
 Green FPS™
 Green FPS™ e-Series™
 Gmax™
 GTO™
 IntelliMAX™
 ISOPLANAR™
 Making Small Speakers Sound Louder and Better™
 MegaBuck™
 MICROCOUPLER™
 MicroFET™
 MicroPak™
 MicroPak2™
 MillerDrive™
 MotionMax™
 MotionGrid™
 MTI®
 MTx®
 MVN®
 mWSaver®
 OptoHi™
 OPTOLOGIC®

OPTOPLANAR®
 Power Supply WebDesigner™
 PowerTrench®
 PowerXST™
 Programmable Active Droop™
 QFET®
 QS™
 Quiet Series™
 RapidConfigure™
 Saving our world, 1mW/W/kW at a time™
 SignalWise™
 SmartMax™
 SMART START™
 Solutions for Your Success™
 SPM®
 STEALTH™
 SuperFET®
 SuperSOT™-3
 SuperSOT™-6
 SuperSOT™-8
 SupreMOS®
 SyncFET™
 Sync-Lock™

SYSTEM GENERAL®
 TinyBoost®
 TinyBuck®
 TinyCalc™
 TinyLogic®
 TINYOPTO™
 TinyPower™
 TinyPWM™
 TinyWire™
 TranSiC™
 TriFault Detect™
 TRUECURRENT®*
 μSerDes™
 UHC®
 Ultra FRFET™
 UniFET™
 VCX™
 VisualMax™
 VoltagePlus™
 XS™
 Xsens™
 仙童®

* 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