FAIRCHILD™

Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

April 2016

HUFA76413DK8T_F085

N-Channel Logic Level UltraFET® Power MOSFET

60V, 4.8A, 56mΩ

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

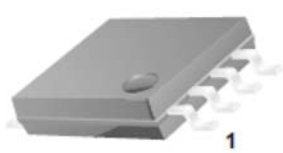
in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching convertors, motor drivers, relay drivers, low-voltage bus switches, and power management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

Features

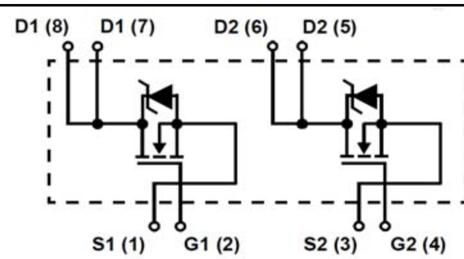
- 150°C Maximum Junction Temperature
- UIS Capability (Single Pulse and Repetitive Pulse)
- Ultra-Low On-Resistance $r_{DS(ON)}$ = 0.049Ω, VGS = 10V
- Ultra-Low On-Resistance $r_{DS(ON)}$ = 0.056Ω, VGS = 5V
- Qualified to AEC Q101
- RoHS Compliant

Applications

- Motor and Load Control
- Powertrain Management



SO-8



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	±16	V
I_D	Drain Current -Continuous (T_C = 25 °C, V_{GS} = 10V)	5.1	A
	-Continuous (T_C = 25 °C, V_{GS} = 5V)	4.8	
	-Continuous (T_C = 125 °C, V_{GS} = 5V, $R_{\theta JA}$ = 228°C/W)	1	
	-Pulsed	Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 1)	260	mJ
P_D	Power Dissipation	2.5	W
	Derate Above 25 °C	0.02	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance Junction to Ambient SO-8 (Note 2)	50	°C/W
	Thermal Resistance Junction to Ambient SO-8 (Note 3)	191	
	Thermal Resistance Junction to Ambient SO-8 (Note 4)	228	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
76413DK8	HUFA76413DK8T_F085	SO-8	330mm	12mm	2500 units

Notes:
1: Starting T_J = 25 °C, L = 20mH, I_{AS} = 5.1A
2: $R_{\theta JA}$ is 50 °C/W when mounted on a 0.5 in^2 copper pad on FR-4 at 1 second.
3: $R_{\theta JA}$ is 191 °C/W when mounted on a 0.027 in^2 copper pad on FR-4 at 1000 seconds.
4: $R_{\theta JA}$ is 228 °C/W when mounted on a 0.006 in^2 copper pad on FR-4 at 1000 seconds.
5: 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°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V		60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 55 V, V_{GS} = 0 V		-	-	1	μA
			T_A = 150 °C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±16 V		-	-	±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1	-	3	V
$r_{DS(on)}$	Static Drain to Source On Resistance	I_D = 5.1 A, V_{GS} = 10 V	-	0.041	0.049	Ω
		I_D = 4.8 A, V_{GS} = 5 V	-	0.048	0.056	
		I_D = 4.8 A, V_{GS} = 5 V, T_A = 150 °C	-	0.091	0.106	

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1MHz		-	620	-	pF
C_{oss}	Output Capacitance			-	180	-	pF
C_{rss}	Reverse Transfer Capacitance			-	30	-	pF
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10 V	V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	18	23	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0 to 5 V		-	10	13	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 to 1 V		-	0.6	0.8	nC
Q_{gs}	Gate to Source Charge			-	1.8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	5	-	nC

Switching Characteristics (V_{GS}=5V)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t_{on}	Turn-On Time	V_{DD} = 30 V, I_D = 1.0 A, V_{GS} = 5 V, R_{GS} = 16 Ω	-	-	44	ns
$t_{d(on)}$	Turn-On Delay Time		-	10	-	ns
t_r	Rise Time		-	19	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	45	-	ns
t_f	Fall Time		-	27	-	ns
t_{off}	Turn-Off Time		-	-	108	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	I_{SD} = 4.8 A	-	-	1.25	V
		I_{SD} = 2.4 A	-	-	1.0	
t_{rr}	Reverse Recovery Time	I_{SD} = 4.8 A, dI_{SD}/dt = 100 A/μs	-	-	43	ns
Q_{rr}	Reverse Recovery Charge		-	-	55	nC

Typical Characteristics T_J = 25°C unless otherwise noted

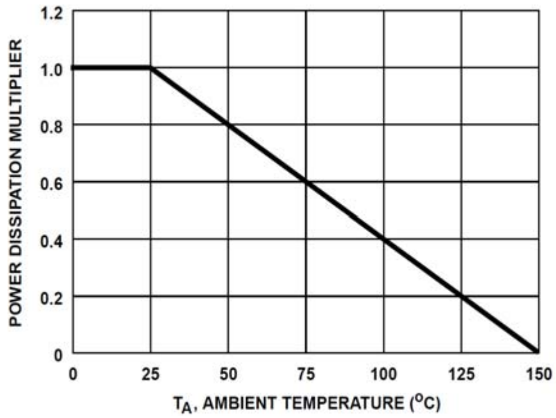


Figure 1. Normalized Power Dissipation vs. Ambient Temperature

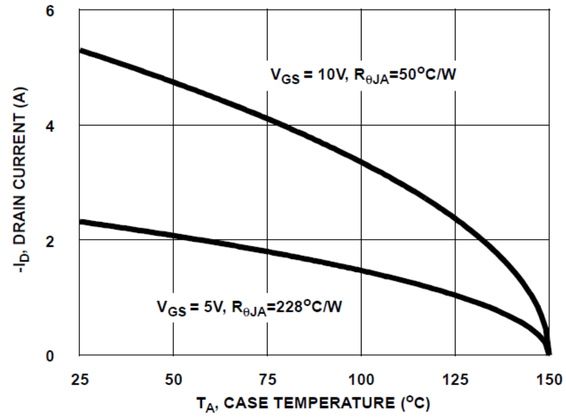


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

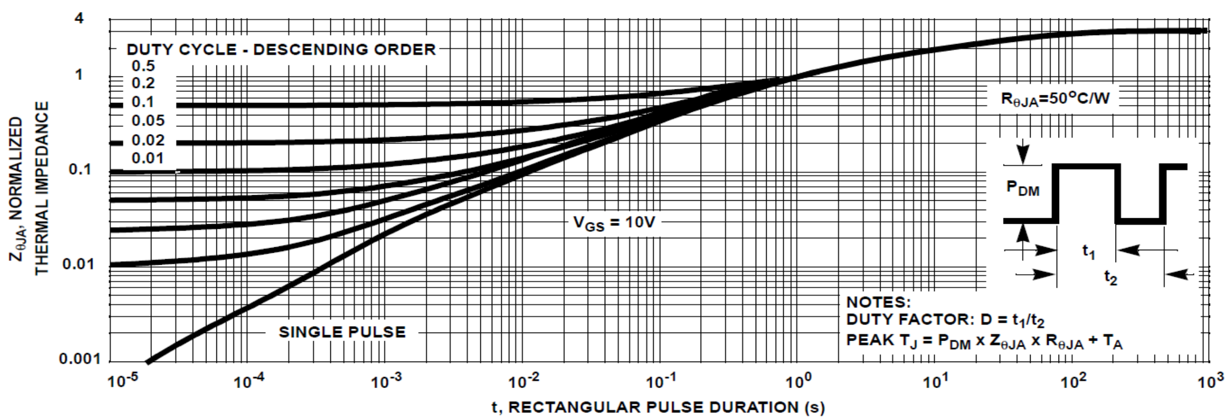


Figure 3. Normalized Maximum Transient Thermal Impedance

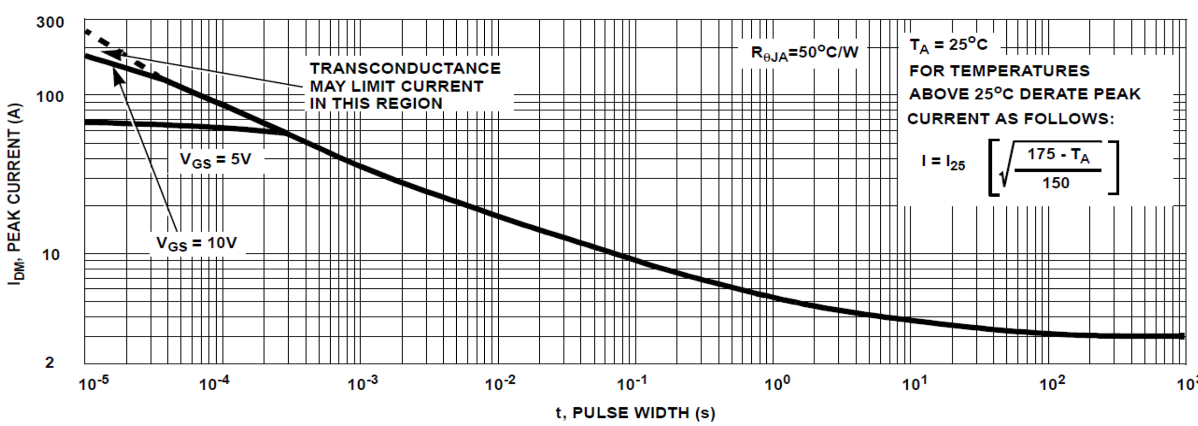


Figure 4. Peak Current Capability

Typical Characteristics T_J = 25°C unless otherwise noted

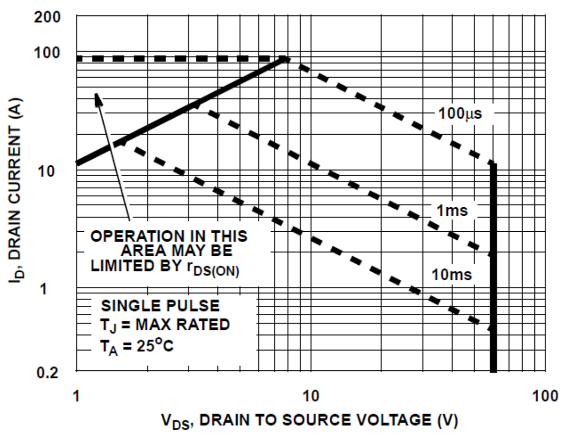


Figure 5. Forward Bias Safe Operating Area

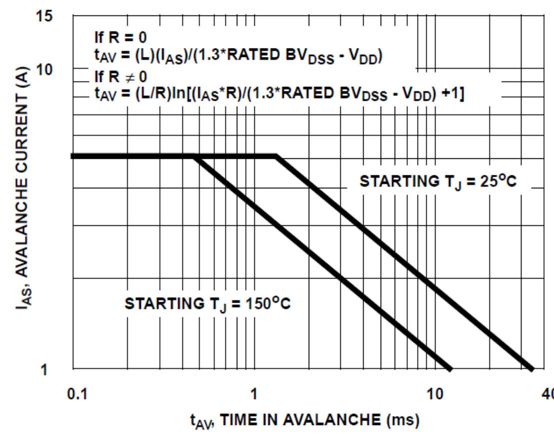


Figure 6. Unclamped Inductive Switching Capability

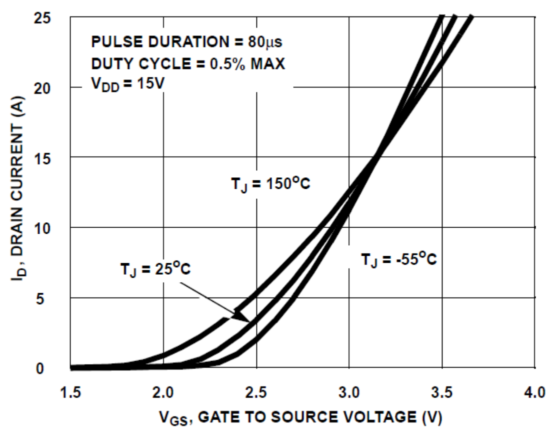


Figure 7. Transfer Characteristics

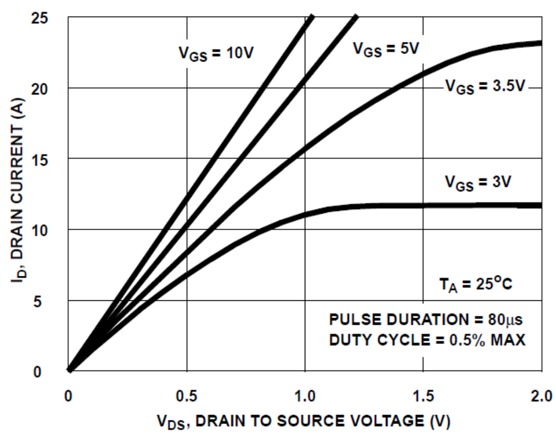


Figure 8. Saturation Characteristics

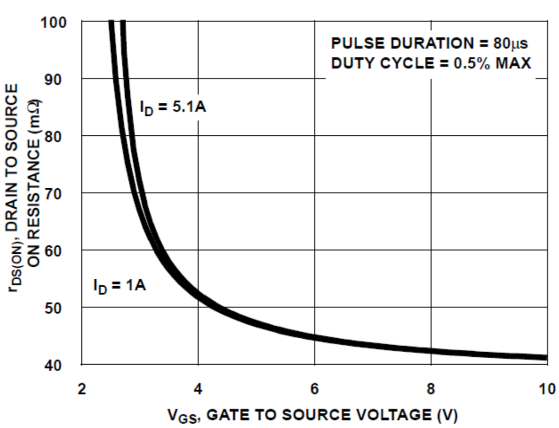


Figure 9. Drain to Source On Resistance vs. Gate Voltage and Drain Current

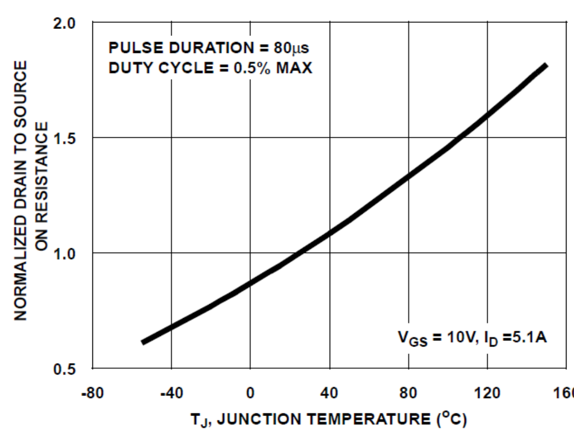


Figure 10. Normalized Drain to Source On Resistance vs. Junction Temperature

Typical Characteristics T_J = 25°C unless otherwise noted

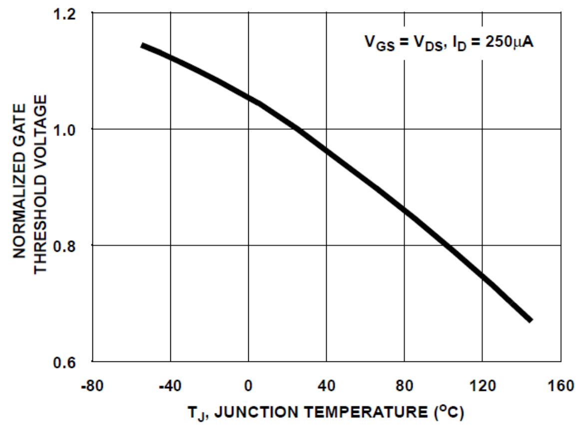


Figure 11. Normalized Gate Threshold Voltage vs. Junction Temperature

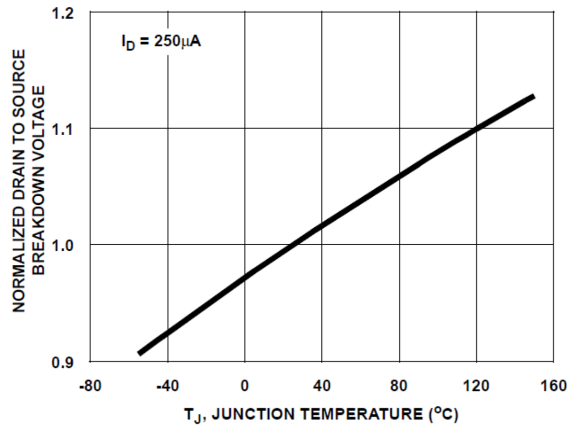


Figure 12. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

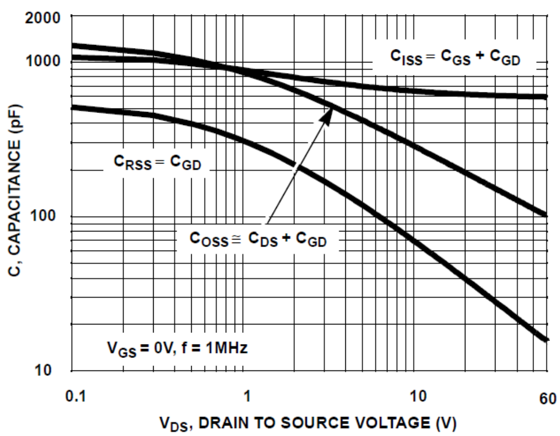


Figure 13. Capacitance vs. Drain to Source Voltage

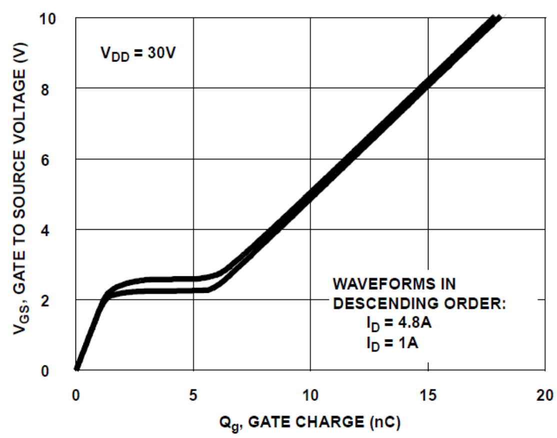


Figure 14. Gate Charge Waveforms for Constant Gate Currents

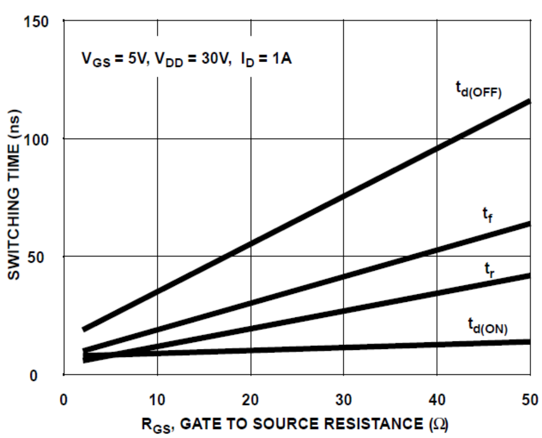
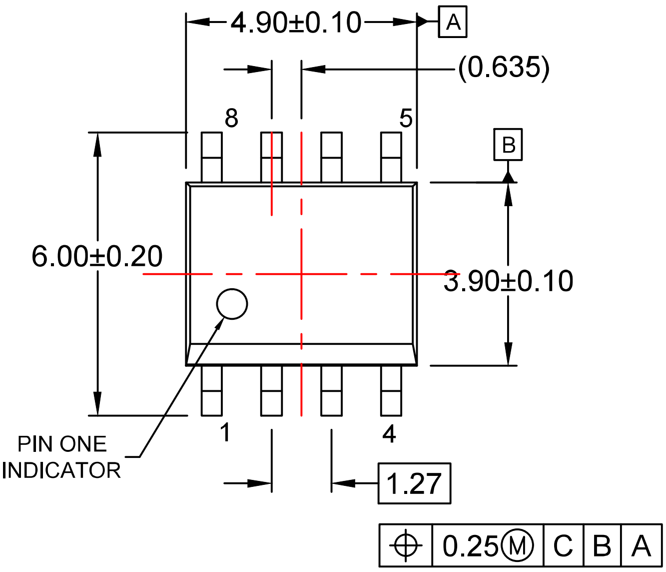
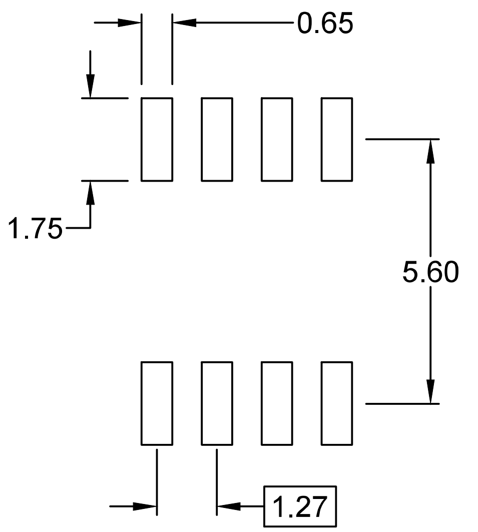
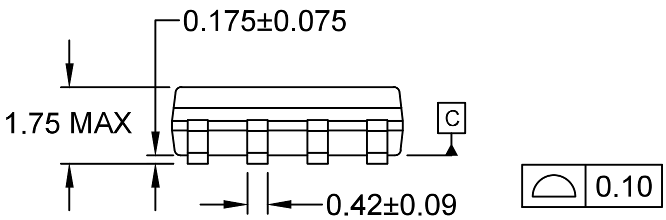


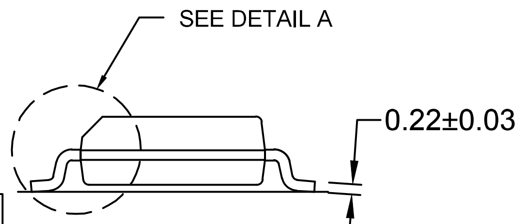
Figure 15. Switching Time vs Gate Resistance



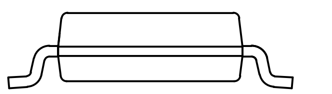


LAND PATTERN RECOMMENDATION

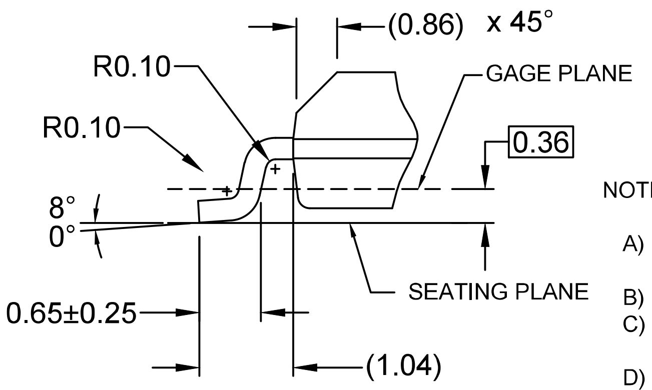




OPTION A - BEVEL EDGE



OPTION B - NO BEVEL EDGE



DETAIL A

SCALE: 2:1

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 FILENAME: M08Arev16

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative