

# MOSFET - N-Channel, POWERTRENCH® 100 V, 60 A, 8 mΩ



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

## FDMS86101

### General Description

This N-Channel MOSFET is produced using ON Semiconductor's advanced POWERTRENCH® process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Features

- Max  $r_{DS(on)}$  = 8 mΩ at  $V_{GS} = 10$  V,  $I_D = 13$  A
- Max  $r_{DS(on)}$  = 13.5 mΩ at  $V_{GS} = 6$  V,  $I_D = 9.5$  A
- Advanced Package and Silicon combination for low  $r_{DS(on)}$  and high efficiency
- MSL1 robust package design
- 100% UIL tested
- 100% Rg tested
- These Devices are Pb-Free and are RoHS Compliant

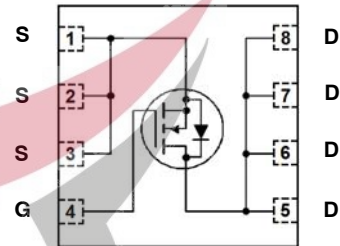
### Applications

- DC-DC Conversion

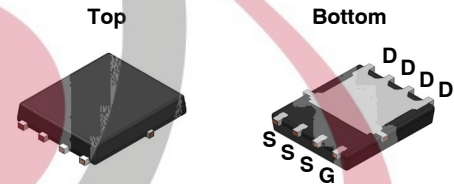
### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current: Continuous, $T_C = 25^\circ\text{C}$ Continuous, $T_A = 25^\circ\text{C}$ (Note 1a) Pulsed	60 12.4 200	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	173	mJ
$P_D$	Power Dissipation: $T_C = 25^\circ\text{C}$ $T_A = 25^\circ\text{C}$ (Note 1a)	104 2.5	W
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

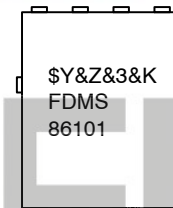


N-Channel MOSFET



Power 56  
(PQFN8)  
CASE 483AE

### MARKING DIAGRAM



$\$Y$  = ON Semiconductor Logo  
 $\&Z$  = Assembly Plant Code  
 $\&3$  = Data Code (Year & Week)  
 $\&K$  = Lot  
 FDMS86101 = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

## PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Quantity
FDMS86101	FDMS86101	Power 56 (PQFN8) (Pb-Free / Halogen Free)	3000/Tape&Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
--------	-----------	----------------	-----	-----	-----	------

## OFF CHARACTERISTICS

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	100			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		66		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$			800	nA
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$			100	nA

## ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	2.0	2.9	4.0	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 13\ \text{A}$		6.3	8	mΩ
		$V_{GS} = 6\ \text{V}$ , $I_D = 9.5\ \text{A}$		8.4	13.5	
		$V_{GS} = 10\ \text{V}$ , $I_D = 13\ \text{A}$ , $T_J = 125^\circ\text{C}$		10.9	14	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 13\ \text{A}$		45		S

## DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$		2255	3000	pF
$C_{oss}$	Output Capacitance			460	610	pF
$C_{rss}$	Reverse Transfer Capacitance			30	45	pF
$R_g$	Gate Resistance		0.1	1.0	3.0	Ω

## SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$ , $I_D = 13\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$		15	27	ns
$t_r$	Rise Time			11	20	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
$t_f$	Fall Time			7	13	ns
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 13\ \text{A}$		39	55	nC
		$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 13\ \text{A}$		22	31	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 40\ \text{V}$ , $I_D = 68\ \text{A}$		9.5		nC
$Q_{gd}$	Gate to Drain "Miller" Charge	$V_{DD} = 40\ \text{V}$ , $I_D = 68\ \text{A}$		10.8		nC

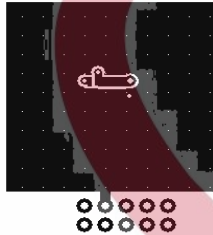
**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 13\text{ A}$ (Note 2)		0.8	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 13\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		56	90	ns
$Q_{rr}$	Reverse Recovery Charge			61	98	nC

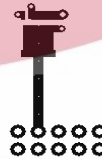
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material.  $R_{\theta CA}$  is determined by the user's board design.

## NOTES:



a. 50 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.  
 3.  $E_{AS}$  of 173 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = 34\text{ A}$ ,  $V_{DD} = 75\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 49\text{ A}$ .

**TYPICAL CHARACTERISTICS**

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

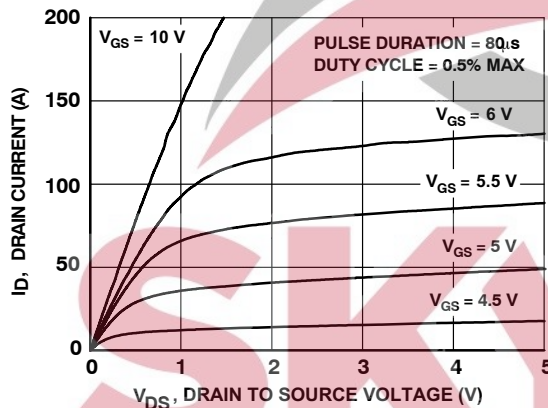


Figure 1. On Region Characteristics

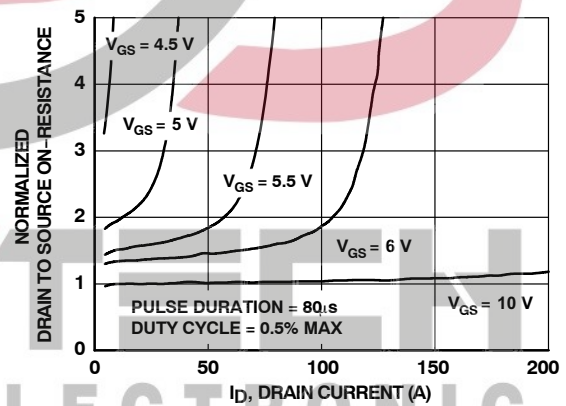


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

## TYPICAL CHARACTERISTICS (continued)

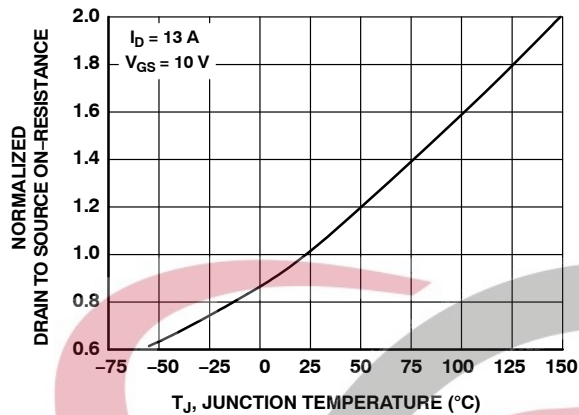
(T<sub>J</sub> = 25°C unless otherwise noted)

Figure 3. Normalized On Resistance vs. Junction Temperature

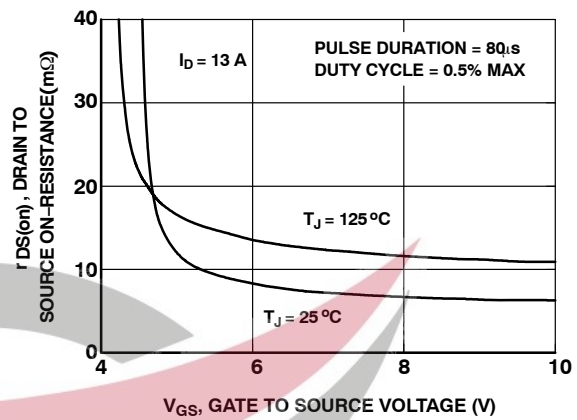


Figure 4. On-Resistance vs. Gate to Source Voltage

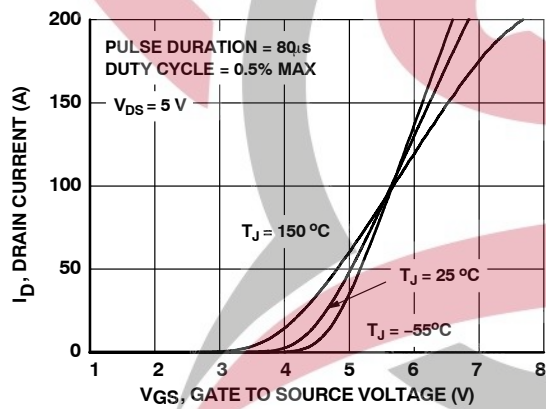


Figure 5. Transfer Characteristics

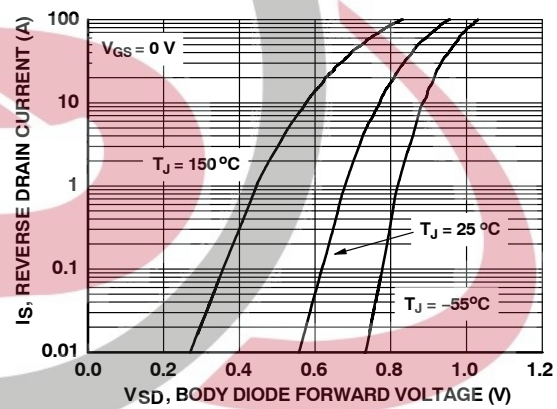


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

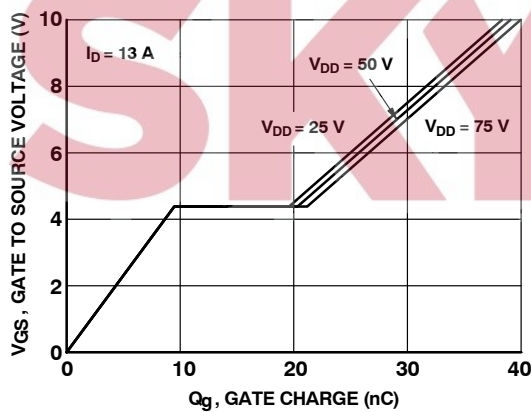


Figure 7. Gate Charge Characteristics

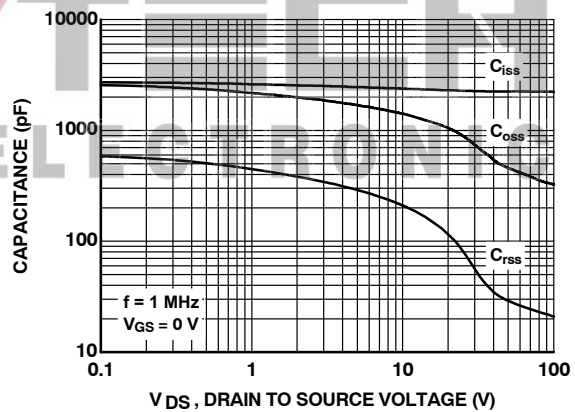


Figure 8. Capacitance vs. Drain to Source Voltage



## TYPICAL CHARACTERISTICS (continued)

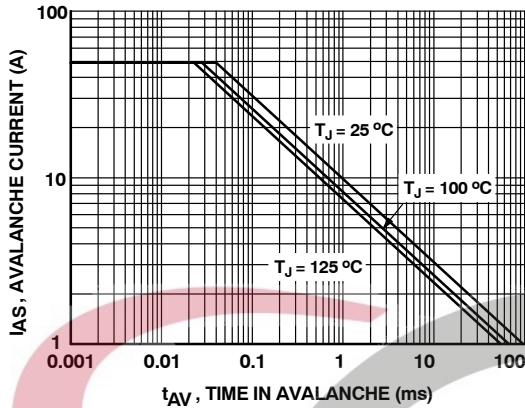
(T<sub>J</sub> = 25 °C unless otherwise noted)

Figure 9. Unclamped Inductive Switching Capability

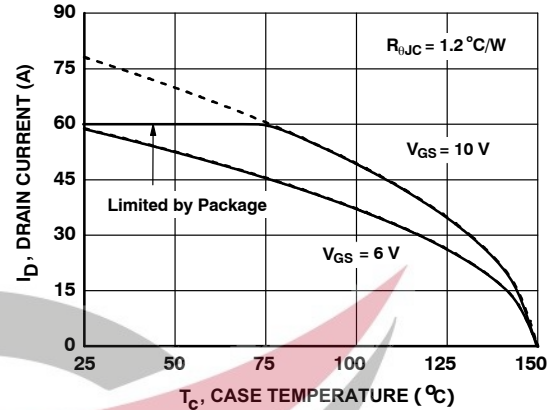


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

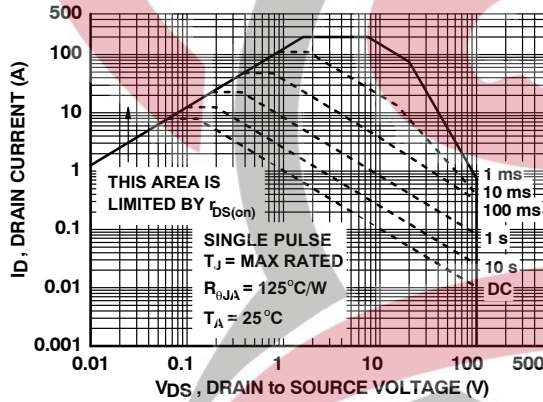


Figure 11. Forward Bias Safe Operating Area

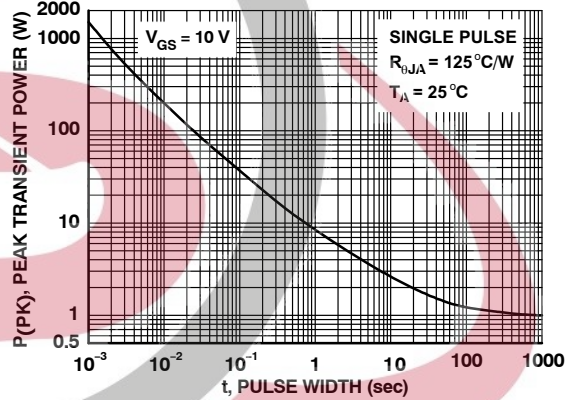


Figure 12. Single Pulse Maximum Power Dissipation

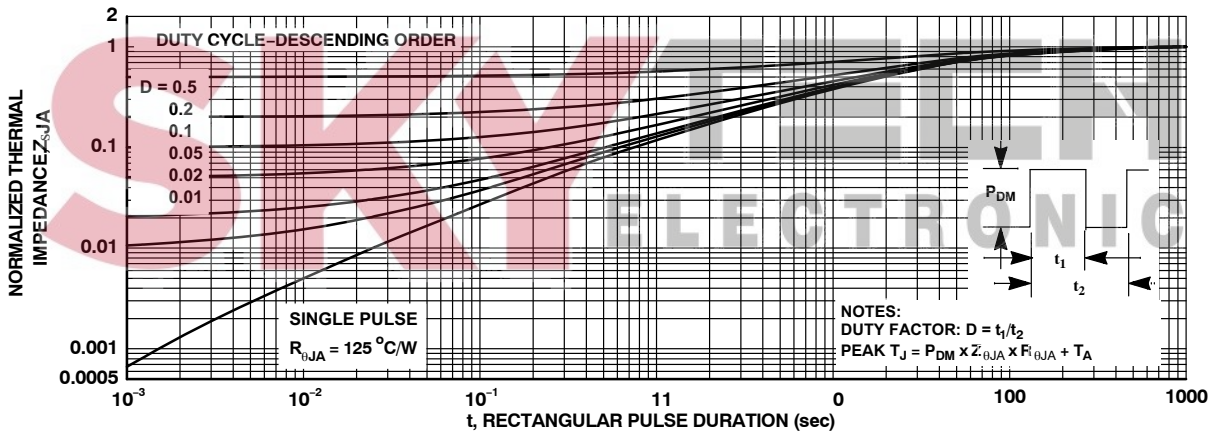
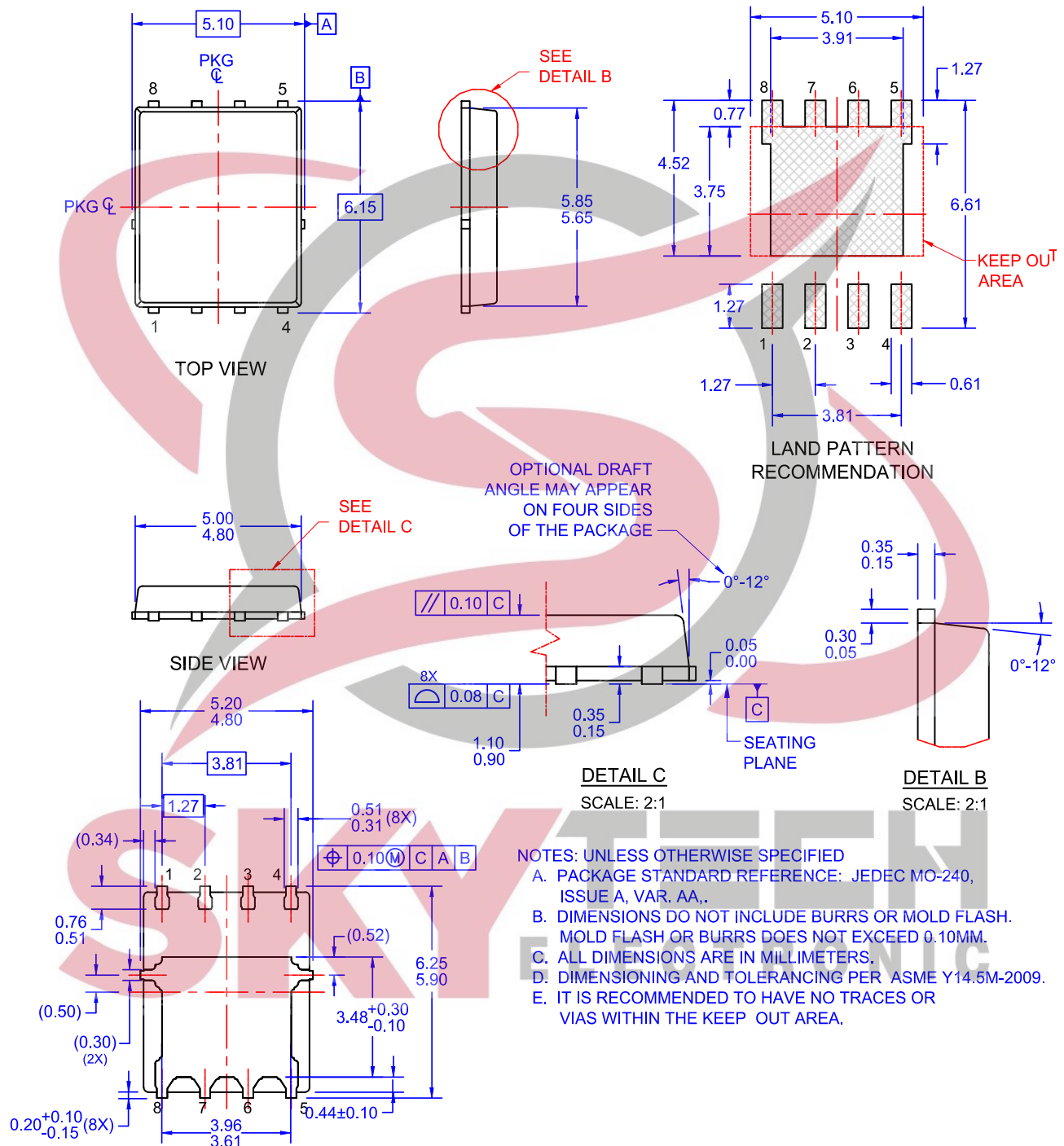


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

**PQFN8 5X6, 1.27P**  
**CASE 483AE**  
**ISSUE A**


DATE 27 SEP 2017



<b>DOCUMENT NUMBER:</b>	<b>98AON13655G</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>PQFN8 5X6, 1.27P</b>	<b>PAGE 1 OF 1</b>

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.



ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### PUBLICATION ORDERING INFORMATION

##### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

##### TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative



# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ON Semiconductor:](#)

[FDMS86101](#) [FDMS86101E](#)

