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# MOSFET – Power, Single, N-Channel

## 100 V, 31.5 mΩ, 21 A



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## Product Preview

### FDD86081-F085

#### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR-Free and are RoHS Compliant

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	100	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	21.4	A
		$T_C = 100^\circ\text{C}$		15.1	
Power Dissipation $R_{\theta JC}$ (Note 1)		$T_C = 25^\circ\text{C}$	$P_D$	31.3	W
		$T_C = 100^\circ\text{C}$		15.6	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	6.7	A
		$T_A = 100^\circ\text{C}$		4.7	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^\circ\text{C}$	$P_D$	3.0	W
		$T_A = 100^\circ\text{C}$		1.5	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$	117	A	
Operating Junction and Storage Temperature		$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)		$I_S$	26	A	
Single Pulse Drain-to-Source Avalanche Energy ( $I_{L(pk)} = 1.2 \text{ A}$ )		$E_{AS}$	202	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

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.

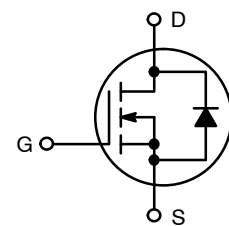
#### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	4.8	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	49.5	

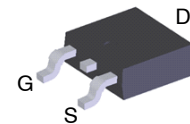
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
100 V	31.5 mΩ @ 10 V	21 A

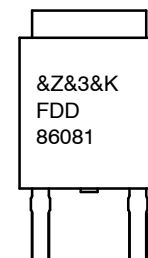


POWER MOSFET



DPAK  
TO-252  
CASE 369AS

#### MARKING DIAGRAM



&Z = Assembly Plant Code  
 &3 = Data Code (Year & Week)  
 &K = Lot  
 FDD86081 = Specific Device Code

#### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# FDD86081-F085

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	100	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>		-	60	-	mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 100 V, T <sub>J</sub> = 25°C	-	-	1	μA
Zero Gate Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V	-	-	±100	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 36 μA	2	3.2	4.5	V
Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>		-	-7.9	-	mV/°C
Drain to Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A	-	26.3	31.5	mΩ

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = 50 V	-	493	-	pF
Output Capacitance	C <sub>oss</sub>		-	323	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	4.2	-	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 50 V, I <sub>D</sub> = 6 A	-	6.8	-	nC
Threshold Gate Charge	Q <sub>g(th)</sub>		-	1	-	
Gate to Source Charge	Q <sub>gs</sub>		-	2.5	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	1.3	-	
Plateau Voltage	V <sub>GP</sub>		-	5.1	-	

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A, R <sub>g</sub> = 6 Ω	-	4.6	-	ns
Turn-On Rise Time	t <sub>r</sub>		-	8.9	-	
Turn-Off Delay Time	t <sub>d(OFF)</sub>		-	7.6	-	
Turn-Off Fall Time	t <sub>f</sub>		-	5.1	-	

### DRAIN-SOURCE DIODE CHARACTERISTICS

Source to Drain Diode Voltage	V <sub>SD</sub>	I <sub>SD</sub> = 6 A, V <sub>GS</sub> = 0 V	-	0.84	1.2	V
Reverse Recovery Time	T <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>SD</sub> /dt = 100 A/μs, I <sub>S</sub> = 6 A	-	31.6	-	ns
Charge Time	t <sub>a</sub>		-	16.4	-	
Discharge Time	t <sub>b</sub>		-	15.2	-	
Reverse Recovery Charge	Q <sub>RR</sub>		-	23.5	-	

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.

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

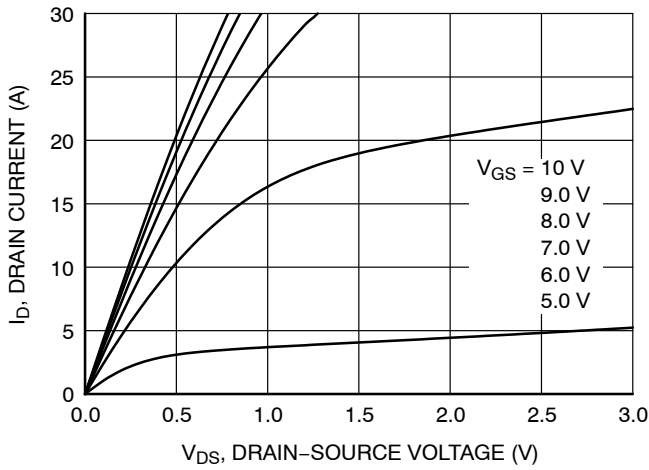


Figure 1. On-Region Characteristics

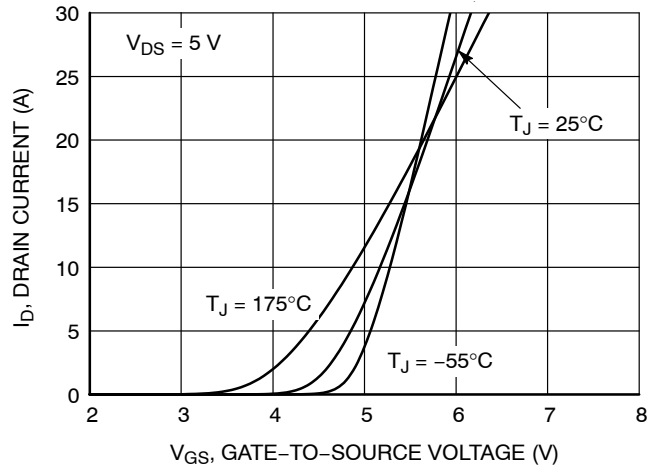


Figure 2. Transfer Characteristics

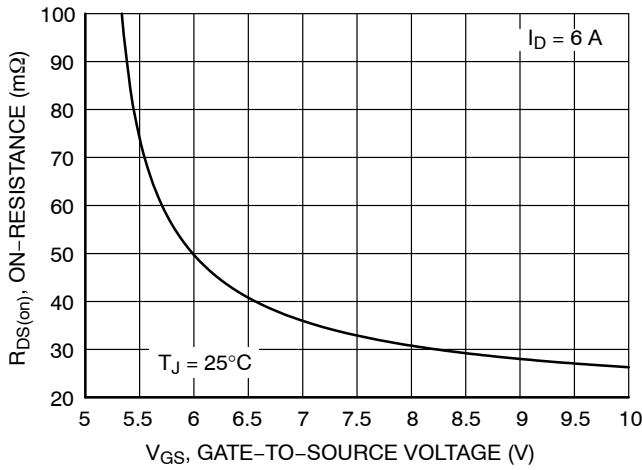


Figure 3. On-Resistance vs.  $V_{GS}$

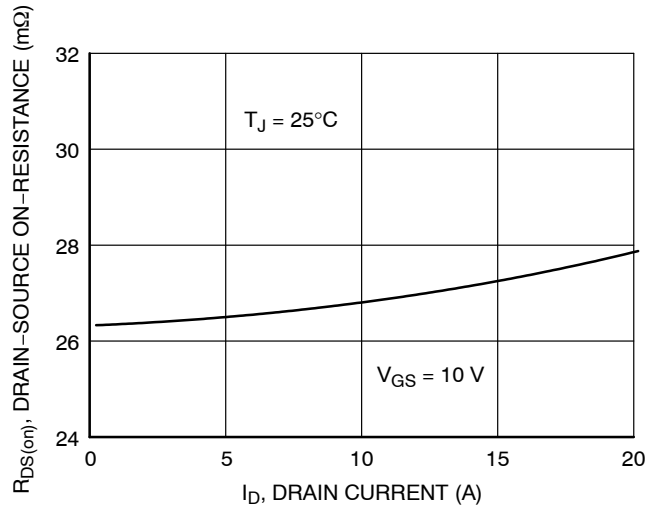


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

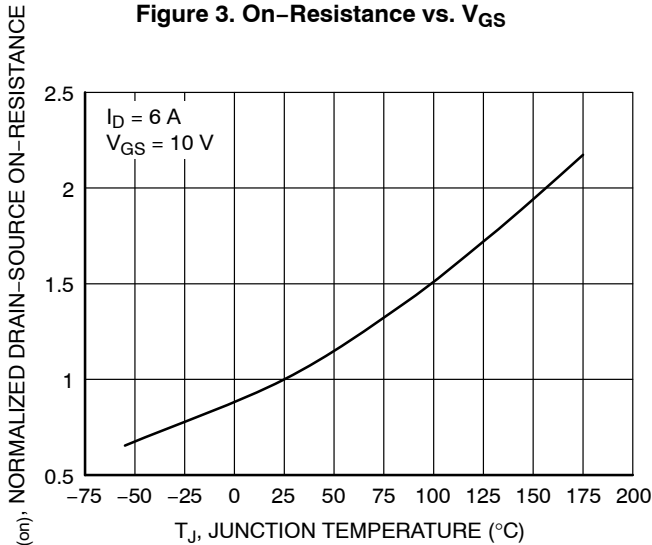


Figure 5. On-Resistance Variation with Temperature

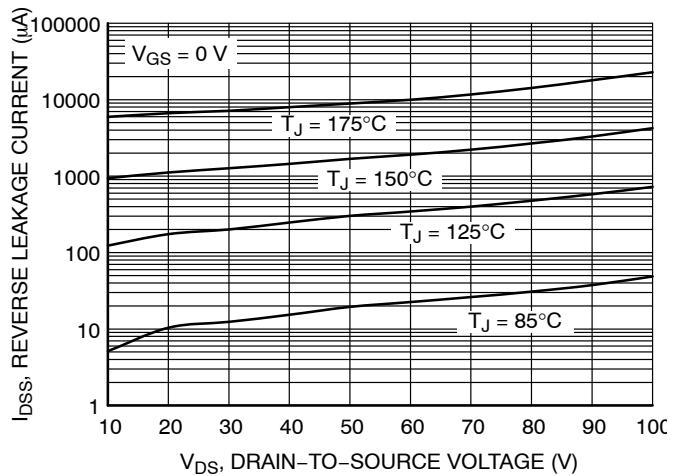


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

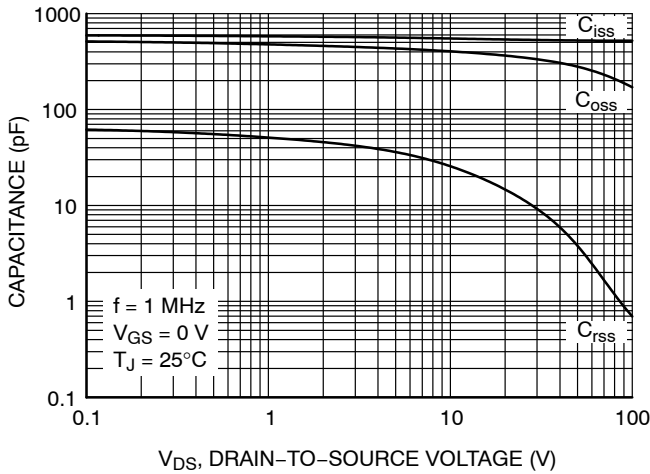


Figure 7. Capacitance Variation

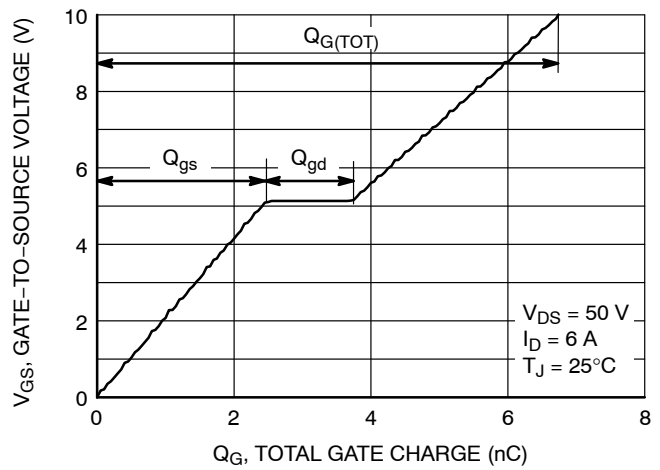


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

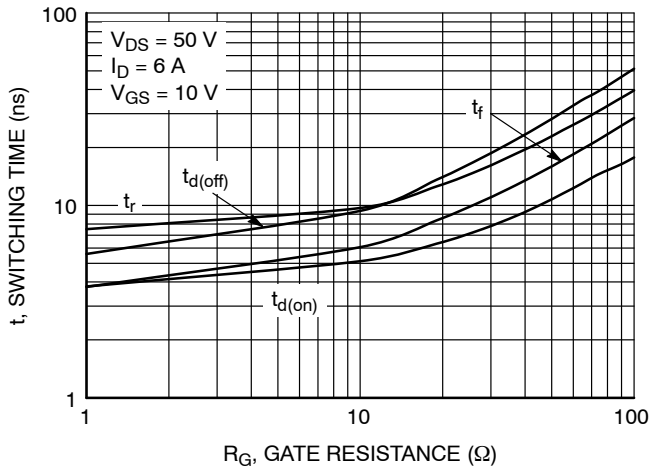


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

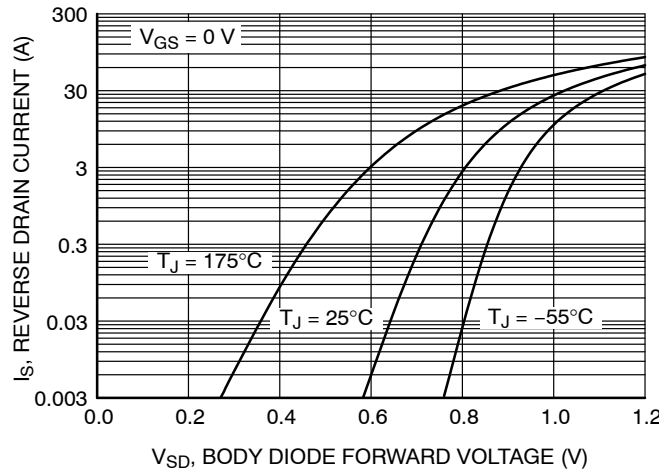


Figure 10. Diode Forward Voltage vs. Current

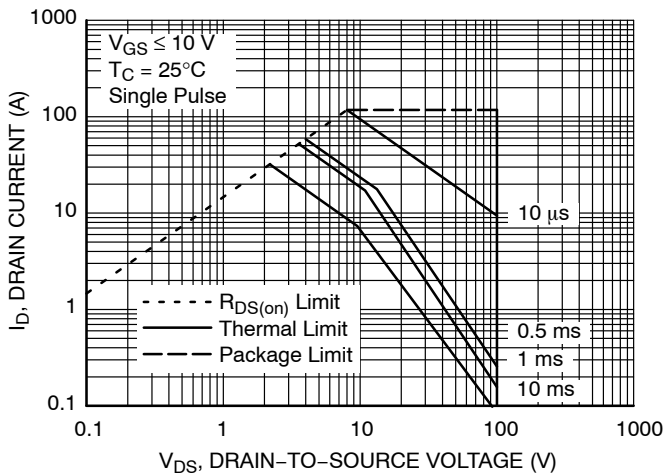


Figure 11. Maximum Forward Bias Safe Operating Area

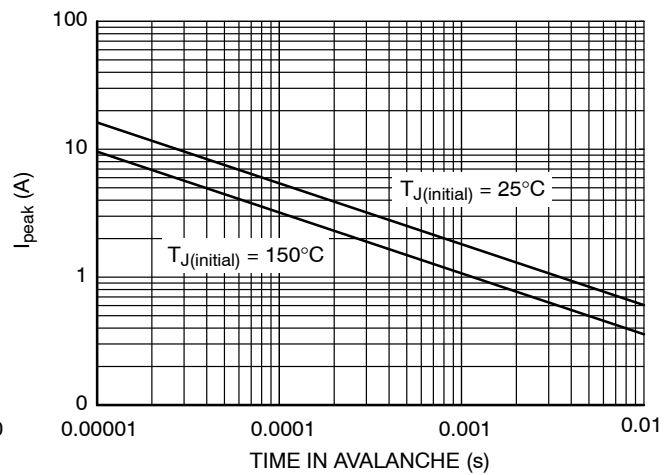


Figure 12. Avalanche Characteristics

TYPICAL CHARACTERISTICS

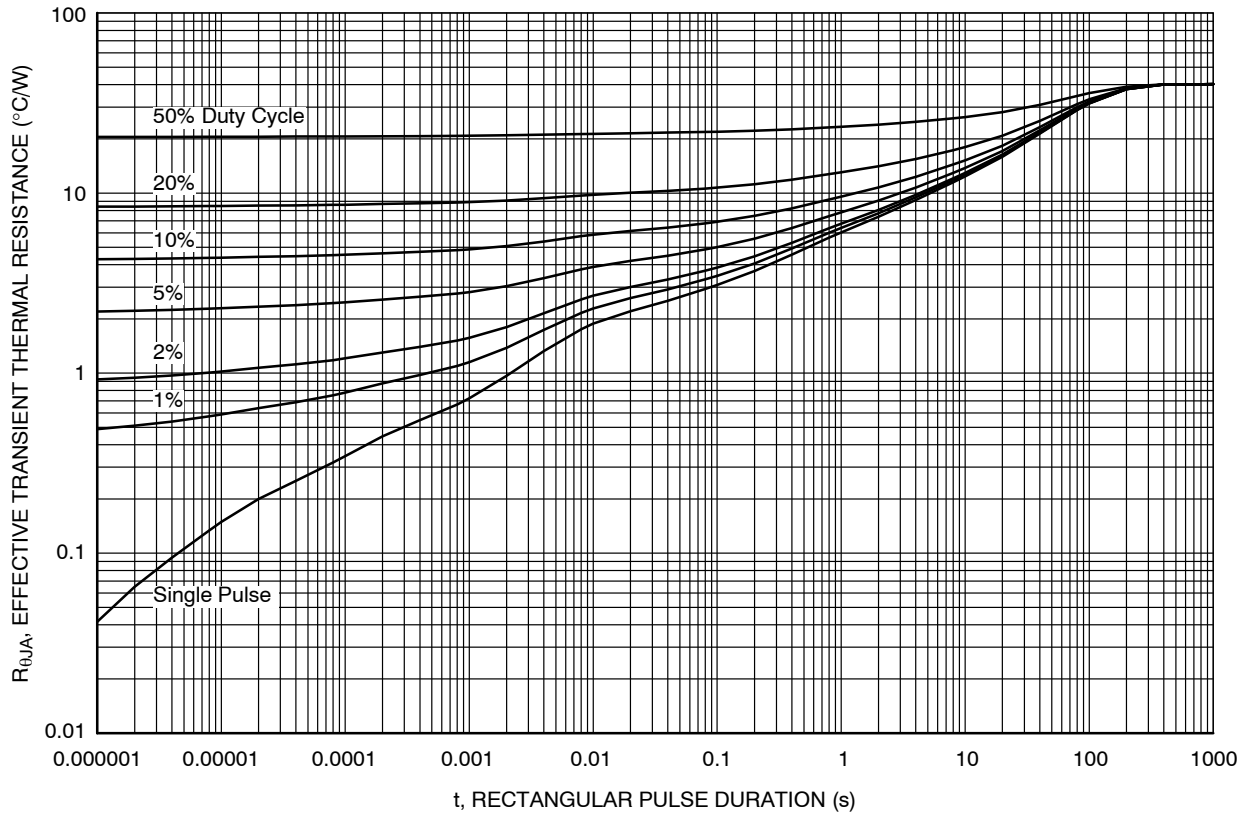


Figure 13. Thermal Response

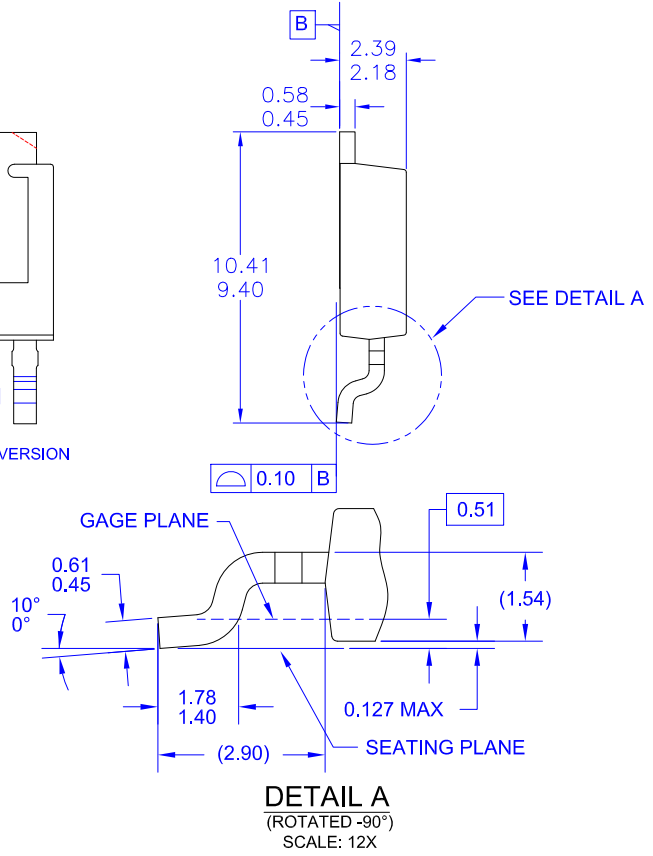
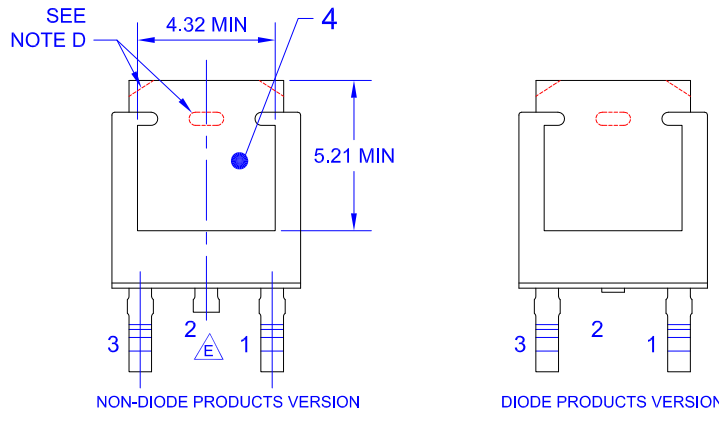
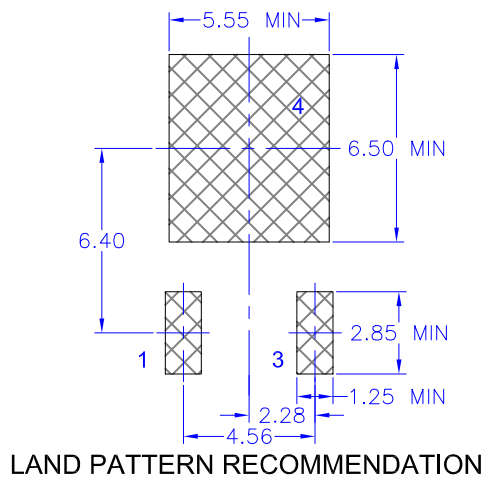
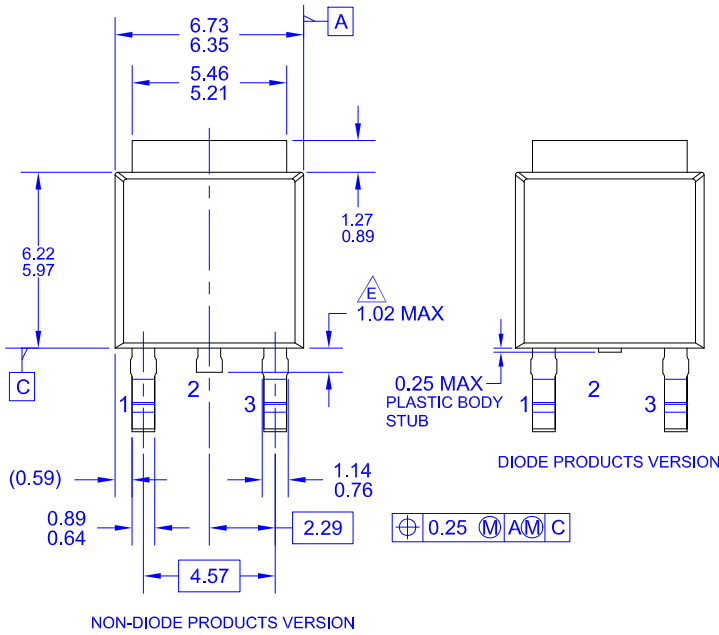
DEVICE ORDERING INFORMATION

Device	Marking	Package	Reel Size	Tape Width	Shipping†
FDD86081-F085	FDD86081	DPAK (TO-252) (Pb-Free)	13"	16 mm	2500 / 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.

PACKAGE DIMENSIONS

DPAK3 (TO-252 3 LD)  
CASE 369AS  
ISSUE O



- 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.  
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 G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.

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