MOSFET - Power, Single P-Channel POWERTRENCH®
-40 V, -100 A, 4.4 mΩ

FDD9507L-F085

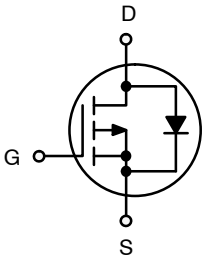
ON Semiconductor®

www.onsemi.com

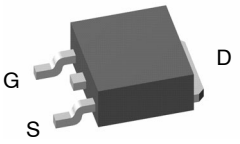
Features
- Typical $R_{DS(on)}$ = 3.3 mΩ at V_{GS} = −10 V, I_D = −80 A
- Typical $G_{g(tot)}$ = 110 nC at V_{GS} = −10 V, I_D = −80 A
- UIS Capability
- Qualified to AEC Q101
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Electrical Power Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- Primary Switch for 12 V Systems

V_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
−40 V	4.4 mΩ @ −10 V	−100 A

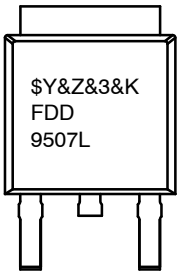


P-CHANNEL MOSFET



DPAK3 (TO−252)
CASE 369AS

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FDD9507L	= Specific Device Code

ORDERING INFORMATION
See detailed ordering and shipping information on page 6 of this data sheet.

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage	−40	V
V_{GS}	Gate-to-Source Voltage	±16	V
I_D	Drain Current − Continuous, (V_{GS} = −10 V) T_C = 25°C (Note 1)	−100	A
	Pulsed Drain Current, T_C = 25°C	(See Figure 4)	A
E_{AS}	Single Pulse Avalanche Energy (Note 2)	259	mJ
P_D	Power Dissipation	227	W
	Derate Above 25°C	1.52	W/°C
T_J, T_{STG}	Operating and Storage Temperature	−55 to +175	°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.
1. Current is limited by bondwire configuration.
2. Starting T_J = 25°C, L = 0.1 mH, I_{AS} = −72 A, V_{DD} = −40 V during inductor charging and V_{DD} = 0 V during time in avalanche.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.66	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 3)	52	

3. $R_{\theta JA}$ 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 $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in^2 pad of 2oz copper.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain-to-Source Breakdown Voltage	I_D = −250 μA, V_{GS} = 0 V	−40	–	–	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS} = −40 V, V_{GS} = 0 V T_J = 25°C T_J = 175°C (Note 4)	 – –	 – –	 1 1	 μA mA
I_{GSS}	Gate-to-Source Leakage Current	V_{GS} = ±16 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	−1	−2	−3	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = −4.5 V, I_D = −80 A, T_J = 25°C	–	4.9	7.2	mΩ
		V_{GS} = −10 V, I_D = −80 A T_J = 25°C T_J = 175°C (Note 4)	 – –	 3.3 5.3	 4.4 7.1	
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −20 V, V_{GS} = 0 V, f = 1 MHz	–	6250	–	pF
C_{oss}	Output Capacitance		–	2640	–	pF
C_{rss}	Reverse Transfer Capacitance		–	61	–	pF
R_g	Gate Resistance	f = 1 MHz	–	19.3	–	Ω
$Q_{g(tot)}$	Total Gate Charge	V_{GS} = 0 V to −10 V, V_{DD} = −20 V, I_D = −80 A	–	100	130	nC
$Q_{g(-4.5)}$	Total Gate Charge	V_{GS} = 0 V to −4.5 V, V_{DD} = −20 V, I_D = −80 A	–	46	–	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{GS} = 0 V to −2 V, V_{DD} = −20 V, I_D = −80 A	–	13	–	nC
Q_{gs}	Gate to Source Charge	V_{DD} = −20 V, I_D = −80 A	–	22	–	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = −20 V, I_D = −80 A	–	13	–	nC
SWITCHING CHARACTERISTICS						
t_{on}	Turn-On Time	V_{DD} = −20 V, I_D = −80 A, V_{GS} = −10 V, R_{GEN} = 6 Ω	–	–	21	ns
$t_{d(on)}$	Turn-On Delay		–	10	–	ns
t_r	Rise Time		–	6	–	ns
$t_{d(off)}$	Turn-Off Delay		–	400	–	ns
t_f	Fall Time		–	132	–	ns
t_{off}	Turn-Off Time		–	–	710	ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	I_{SD} = −80 A, V_{GS} = 0 V	–	−0.9	−1.3	V
		I_{SD} = −40 A, V_{GS} = 0 V	–	−0.85	−1.2	
t_{rr}	Reverse Recovery Time	I_F = −80 A, dI_{SD}/dt = 100 A/μs	–	87	113	ns
Q_{rr}	Reverse Recovery Charge		–	115	150	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.

4. The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

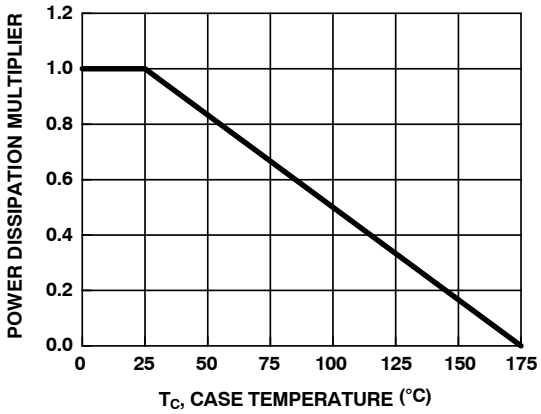


Figure 1. Normalized Power Dissipation vs. Case Temperature

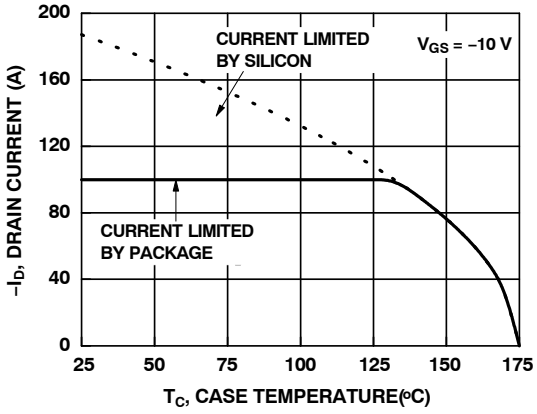


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

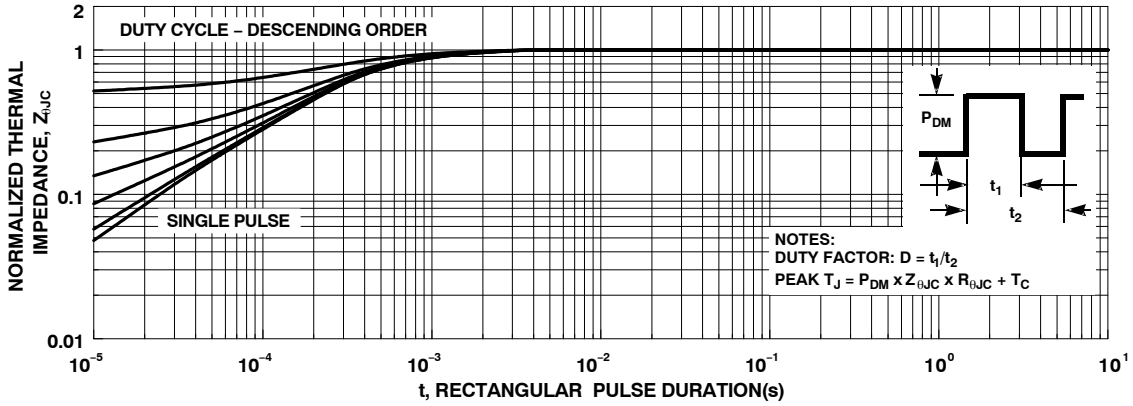


Figure 3. Normalized Maximum Transient Thermal Impedance

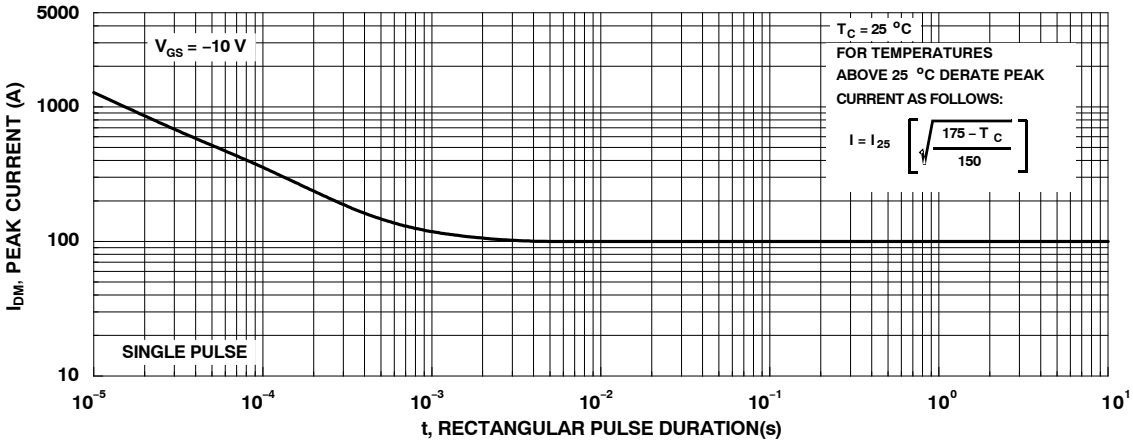


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

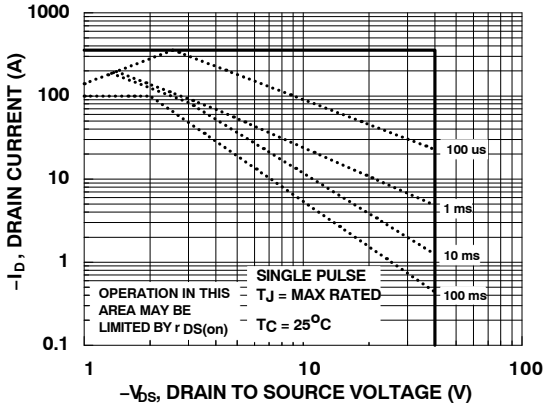


Figure 5. Forward Bias Safe Operating Area

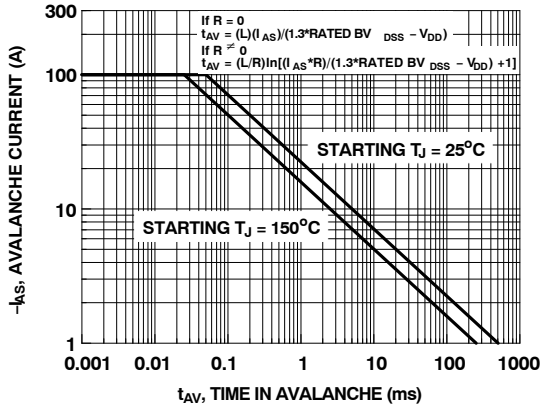


Figure 6. Unclamped Inductive Switching Capability

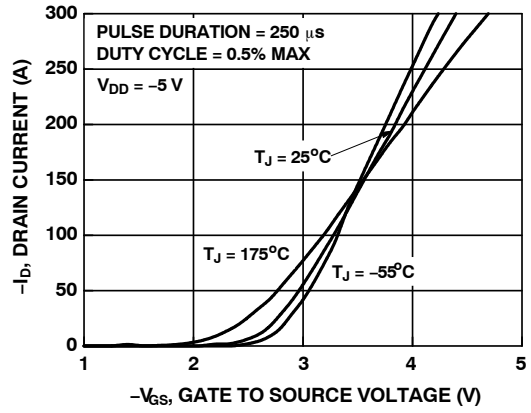


Figure 7. Transfer Characteristics

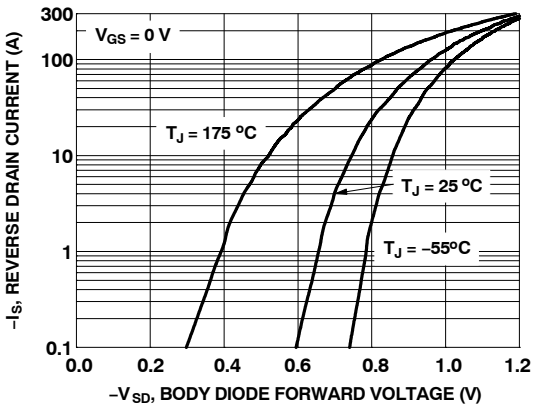


Figure 8. Forward Diode Characteristics

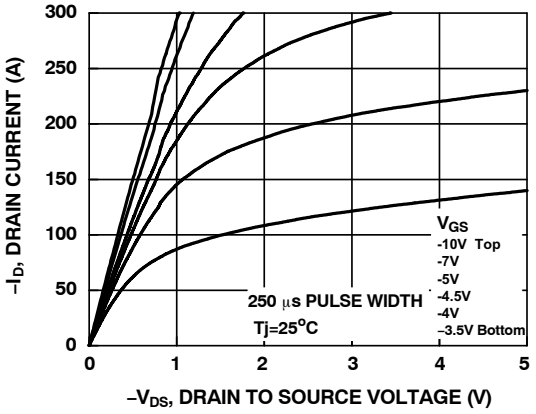


Figure 9. Saturation Characteristics

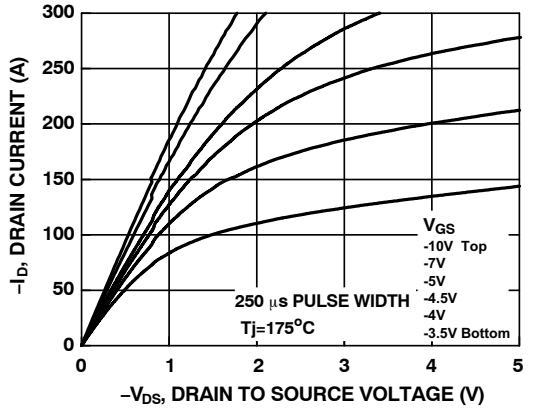


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

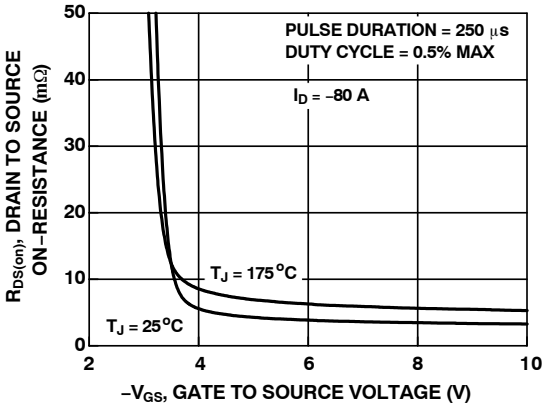


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

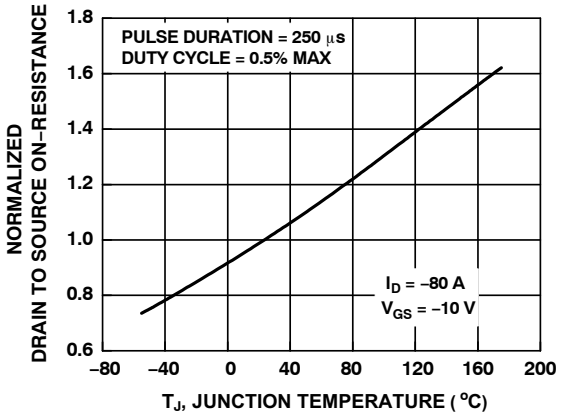


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

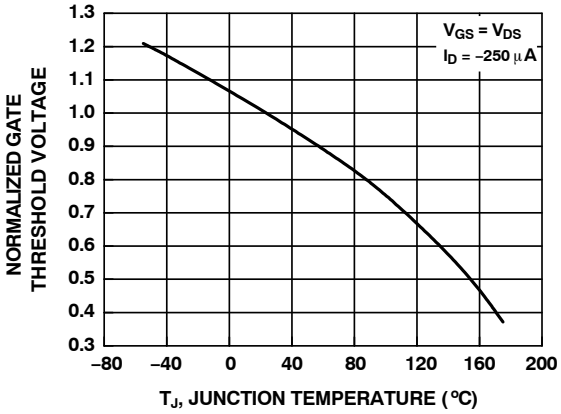


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

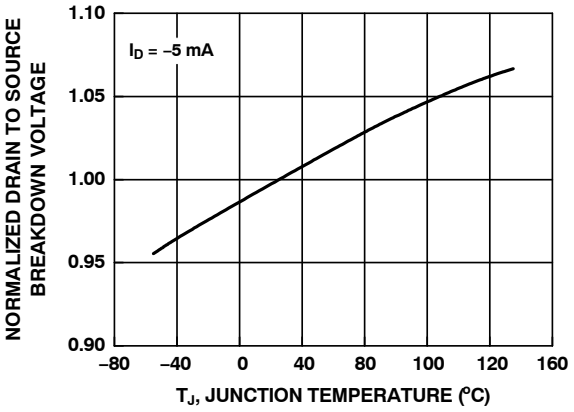


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

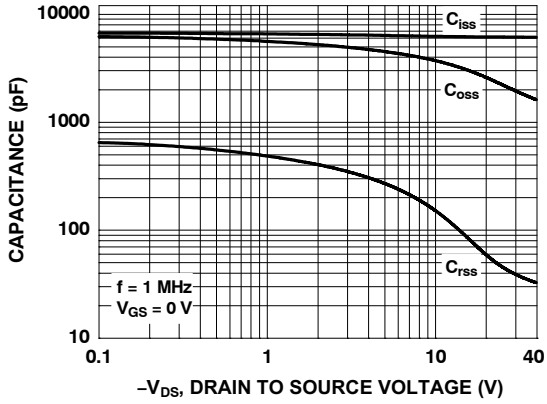


Figure 15. Capacitance vs. Drain to Source Voltage

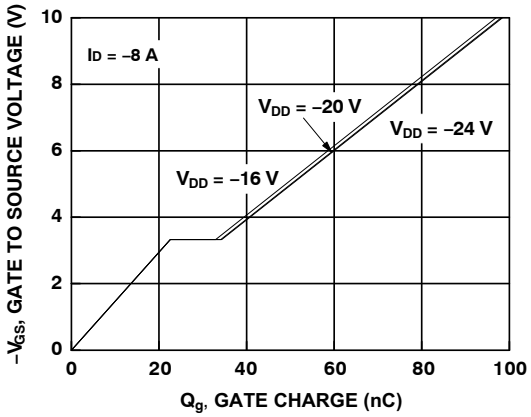
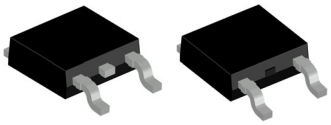


Figure 16. Gate Charge vs. Gate to Source Voltage

ORDERING INFORMATION

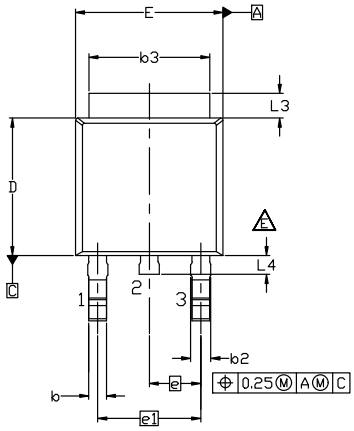
Device	Marking	Package	Reel Size	Tape Width	Quantity
FDD9507L−F085	FDD9507L	DPAK3 (TO−252) (Pb-Free / Halogen Free)	13″	16 mm	2500 Units

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

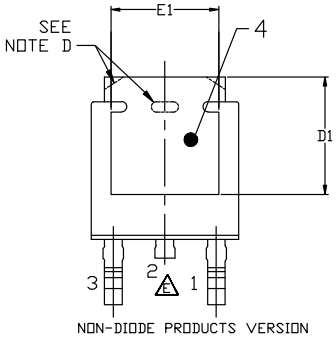


DPAK3 6.10x6.54x2.29, 4.57P
CASE 369AS
ISSUE B

DATE 20 DEC 2023

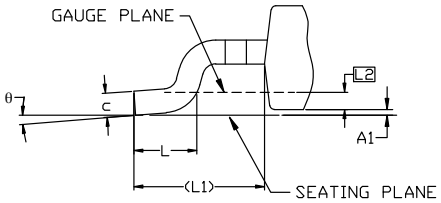


NON-DIODE PRODUCTS VERSION



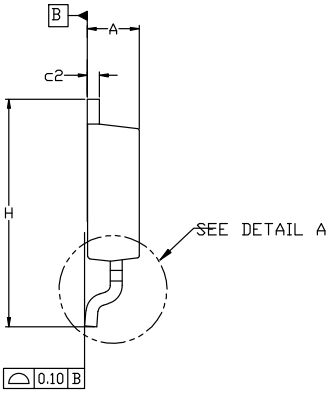
NON-DIODE PRODUCTS VERSION

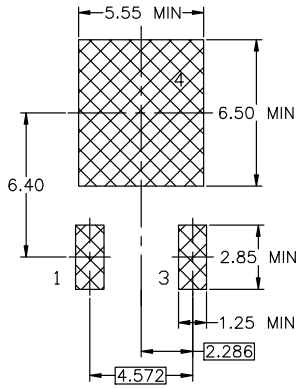
NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE F, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2018.
D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX PLASTIC BODY STUB WITHOUT CENTER LEAD.
F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.



DETAIL A
(ROTATED -90°)
SCALE: 12X

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	–	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	---	---
E	6.35	6.54	6.73
E1	4.32	---	---
e	2.286 BSC		
e1	4.572 BSC		
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90 REF		
L2	0.51 BSC		
L3	0.89	1.08	1.27
L4	---	---	1.02
θ	0°	---	10°





LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

DOCUMENT NUMBER:	**98AON13810G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**DPAK3 6.10x6.54x2.29, 4.57P**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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