

# FDBL9403L-F085

## Single N-Channel Power MOSFET

40 V, 240 A, 0.72 mΩ

### Features

- Small Footprint (TOLL) for Compact Design
- 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			$V_{DSS}$	40	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^{\circ}\text{C}$	$I_D$	240	A
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^{\circ}\text{C}$	$P_D$	357.1	W
		$T_C = 100^{\circ}\text{C}$		178.6	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_C = 25^{\circ}\text{C}$	$I_D$	53.3	A
		$T_C = 100^{\circ}\text{C}$		37.7	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_C = 25^{\circ}\text{C}$	$P_D$	3.5	W
		$T_C = 100^{\circ}\text{C}$		1.7	
Pulsed Drain Current	$T_C = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$		$I_{DM}$	2113	A
Operating Junction and Storage Temperature Range			$T_J$ , $T_{stg}$	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)			$I_S$	100	A
Single Pulse Drain-to-Source Avalanche Energy ( $I_{L(pk)} = 79\text{ A}$ , $L = 0.2\text{ mH}$ )			$E_{AS}$	624	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.

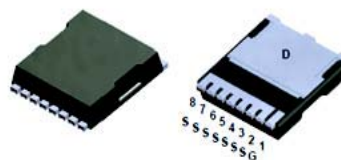
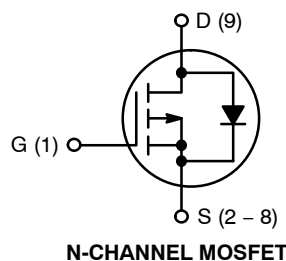
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Current is limited by bondwire configuration.
2. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
3. Maximum current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



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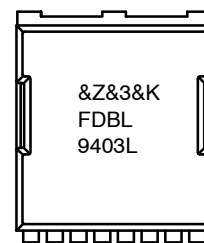
[www.onsemi.com](http://www.onsemi.com)

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	0.72 mΩ @ 10 V	80 A
	0.98 mΩ @ 4.5 V	



H-PSOF8L  
CASE 100CU

### MARKING DIAGRAM



&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FDBL9403L	= Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

Table 1. THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State	0.42	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 4)	43	

4. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.

Table 2. ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$  unless otherwise noted)

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

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	40	–	–	V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient		–	22.5	–	mV/ $^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 40\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_J = 25^{\circ}\text{C}$ $V_{DS} = 40\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_J = 175^{\circ}\text{C}$	–	–	1	$\mu\text{A}$ mA
$I_{GSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 0\ \text{V}$ , $V_{GS} = \pm 20\ \text{V}$	–	–	$\pm 100$	nA

**ON CHARACTERISTICS** (Note 5)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	1	1.75	3	V
$V_{GS(th)}/T_J$	Threshold Temperature Coefficient		–	–5.6	–	mV/ $^{\circ}\text{C}$
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 80\ \text{A}$	–	0.59	0.72	m $\Omega$
		$V_{GS} = 4.5\ \text{V}$ , $I_D = 40\ \text{A}$	–	0.76	0.98	

**CHARGES, CAPACITANCES & GATE RESISTANCE**

$C_{iss}$	Input Capacitance	$V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{DS} = 20\ \text{V}$	–	14100	–	pF
$C_{oss}$	Output Capacitance		–	4070	–	
$C_{rss}$	Reverse Transfer Capacitance		–	300	–	
$R_g$	Gate Resistance	$V_{GS} = 0.5\ \text{V}$ , $f = 1\ \text{MHz}$	–	3.3	–	$\Omega$
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = 4.5\ \text{V}$ , $V_{DS} = 32\ \text{V}$ , $I_D = 80\ \text{A}$	–	97	–	nC
		$V_{GS} = 10\ \text{V}$ , $V_{DS} = 32\ \text{V}$ , $I_D = 80\ \text{A}$	–	203	–	
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 0\ \text{V}$ to $1\ \text{V}$	–	13	–	
$Q_{gs}$	Gate-to-Source Gate Charge	$V_{DD} = 32\ \text{V}$ , $I_D = 80\ \text{A}$	–	40	–	
$Q_{gd}$	Gate-to-Drain "Miller" Charge		–	27	–	
$V_{GP}$	Plateau Voltage		–	3	–	V

**SWITCHING CHARACTERISTICS**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\ \text{V}$ , $I_D = 80\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$	–	21	–	ns
$t_r$	Turn-On Rise Time		–	42	–	
$t_{d(off)}$	Turn-Off Delay Time		–	288	–	
$t_f$	Turn-Off Fall Time		–	101	–	

**DRAIN-SOURCE DIODE CHARACTERISTICS**

$V_{SD}$	Source-to-Drain Diode Voltage	$I_{SD} = 80\ \text{A}$ , $V_{GS} = 0\ \text{V}$	–	0.79	1.25	V
		$I_{SD} = 40\ \text{A}$ , $V_{GS} = 0\ \text{V}$	–	0.75	1.2	
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\ \text{V}$ , $dI_{SD}/dt = 100\ \text{A}/\mu\text{s}$ , $I_S = 80\ \text{A}$	–	96	–	ns
$t_a$	Charge Time		–	46	–	
$t_b$	Discharge Time		–	50	–	
$Q_{rr}$	Reverse Recovery Charge		–	130	–	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.

5. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

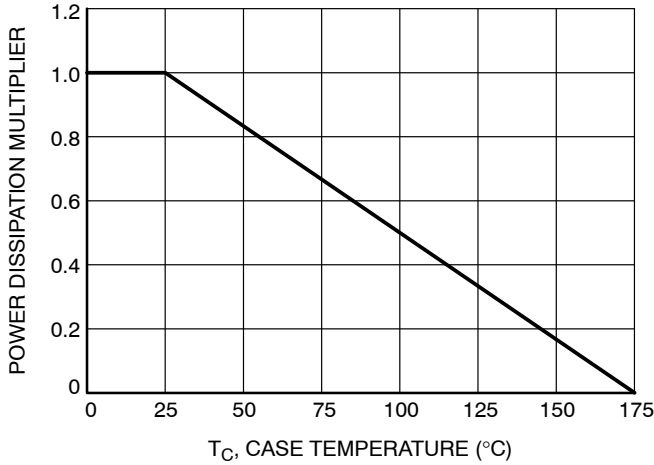


Figure 1. Normalized Power Dissipation vs. Case Temperature

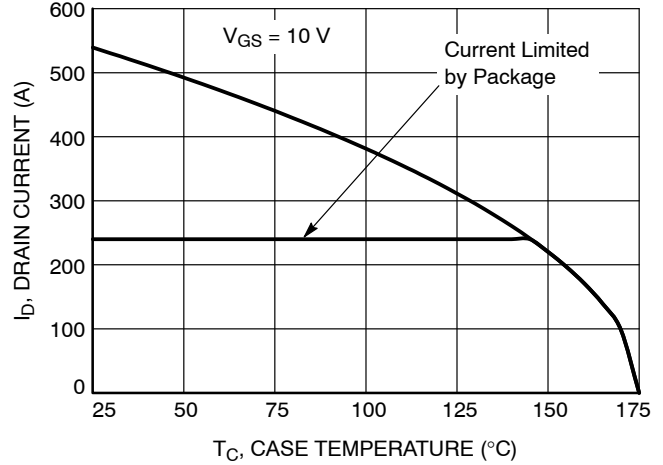


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

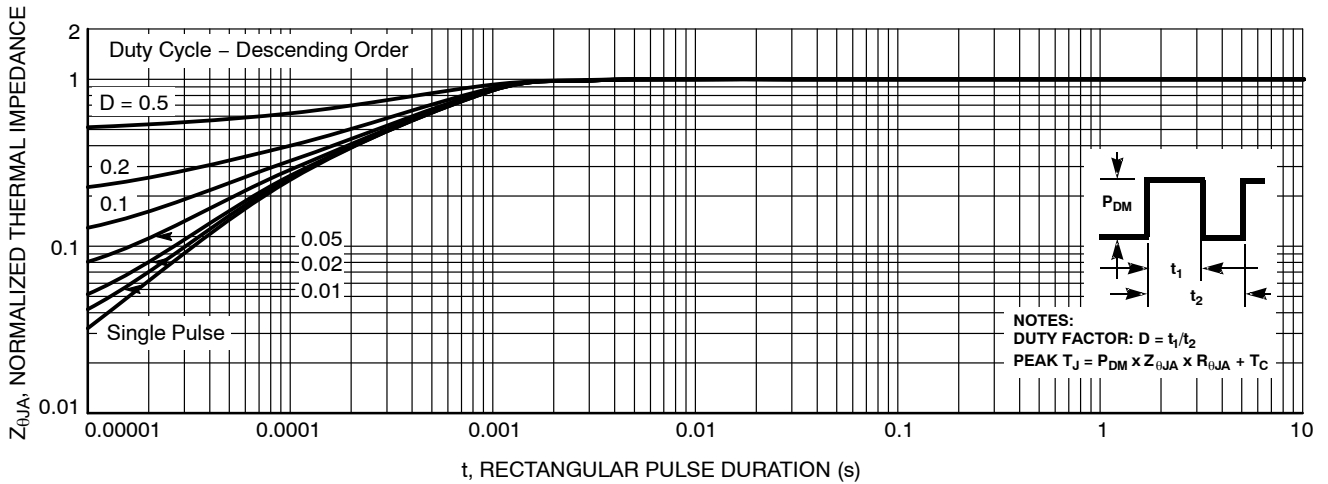


Figure 3. Normalized Maximum Transient Thermal Impedance

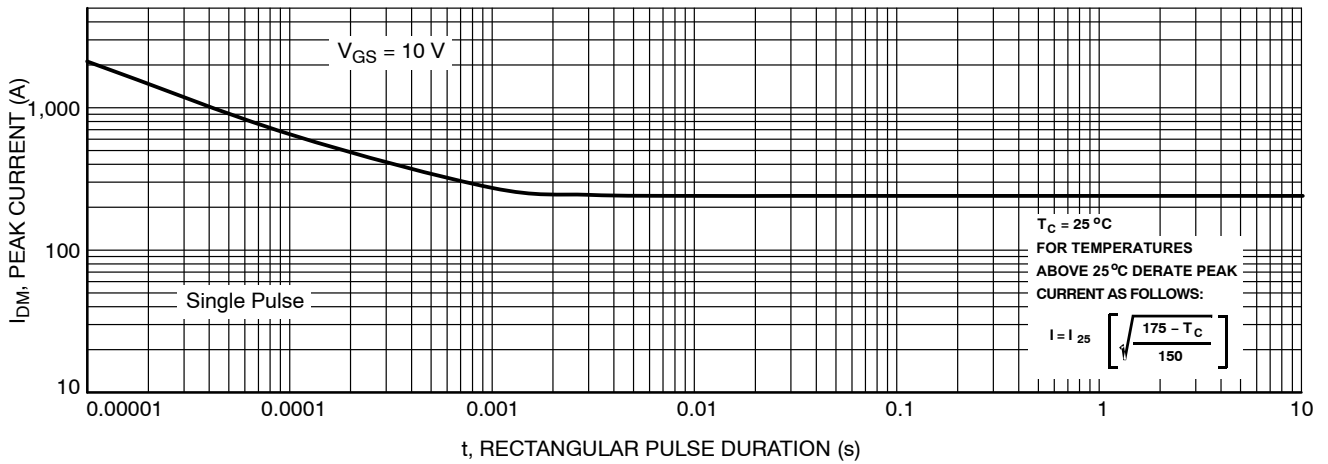


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

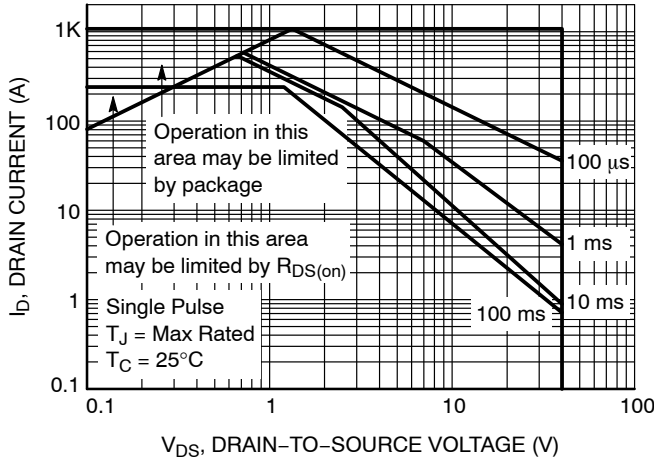


Figure 5. Forward Bias Safe Operating Area

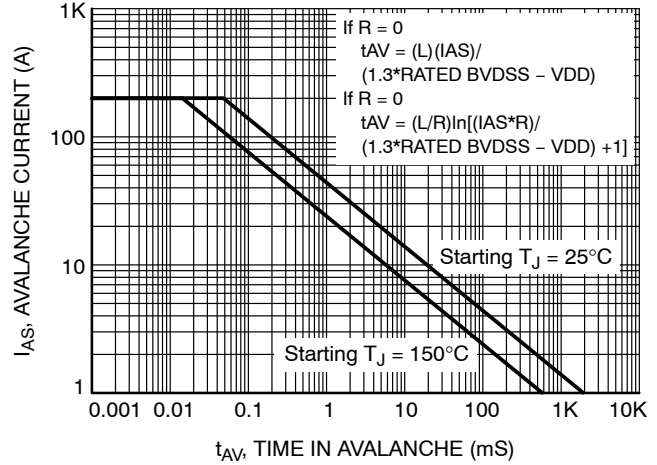


Figure 6. Unclamped Inductive Switching Capability

Note: Refer to ON Semiconductor Application Notes AN7514 and AN7515

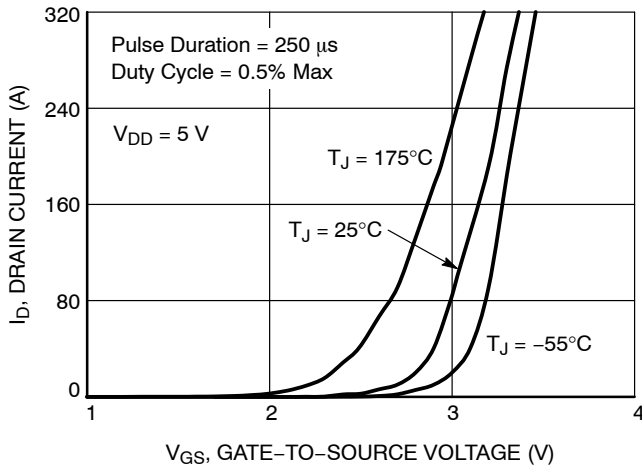


Figure 7. Transfer Characteristics

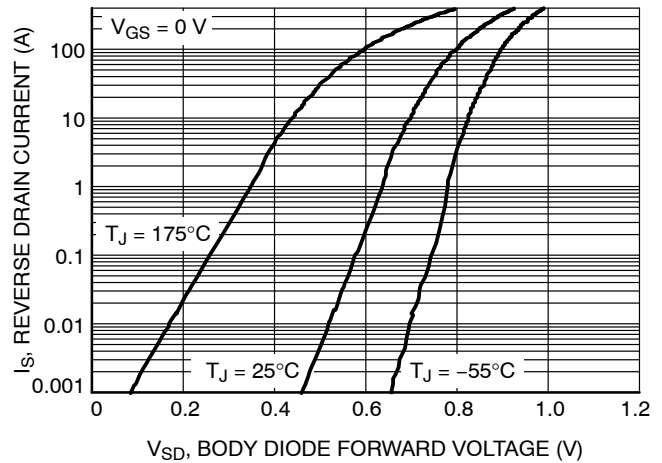


Figure 8. Forward Diode Characteristics

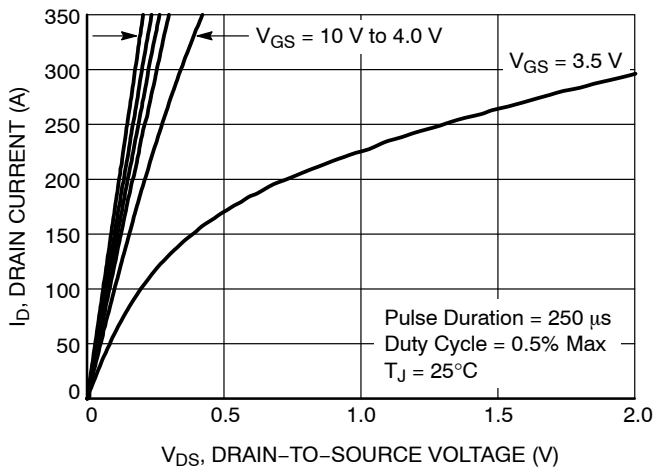


Figure 9. Saturation Characteristics

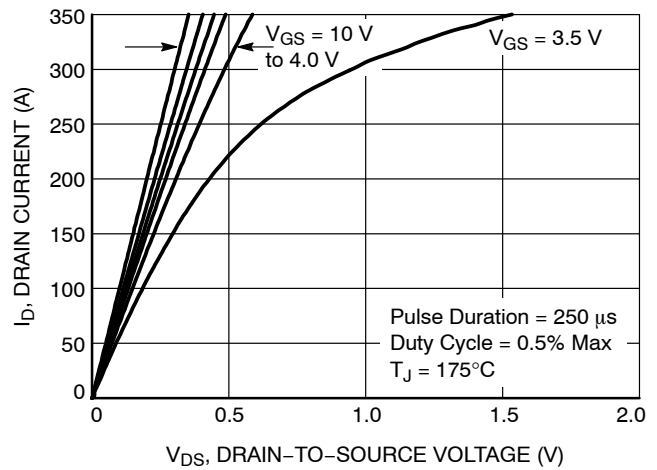


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

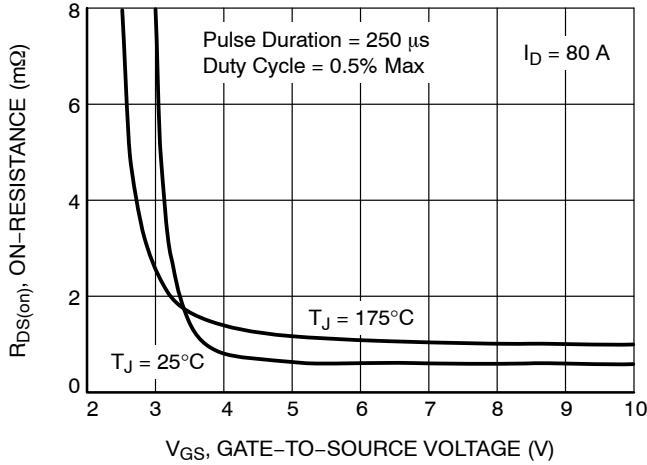


Figure 11.  $R_{DS(on)}$  vs. Gate Voltage

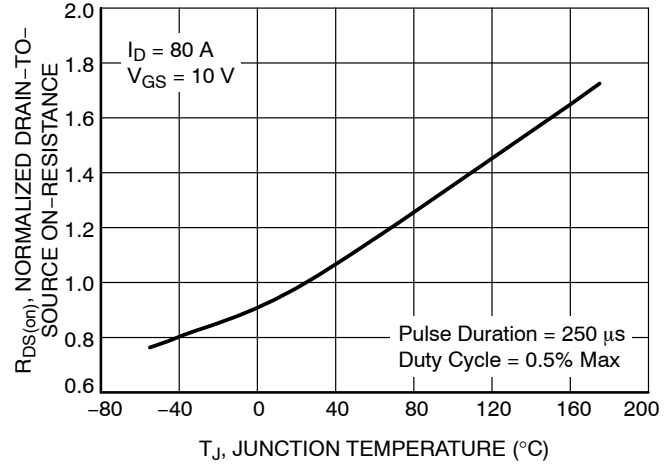


Figure 12. Normalized  $R_{DS(on)}$  vs. Junction Temperature

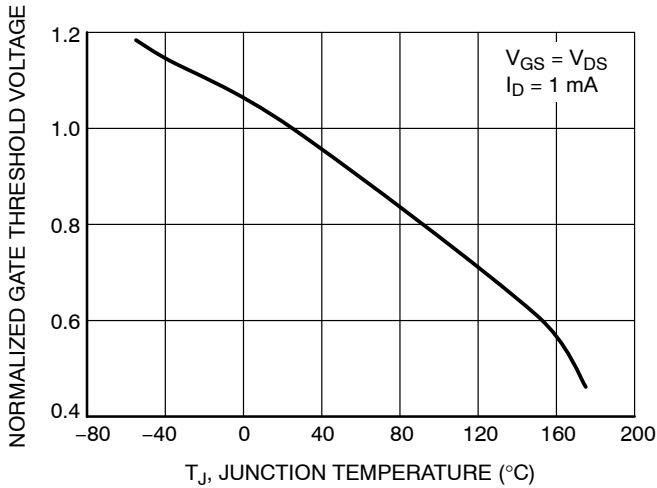


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

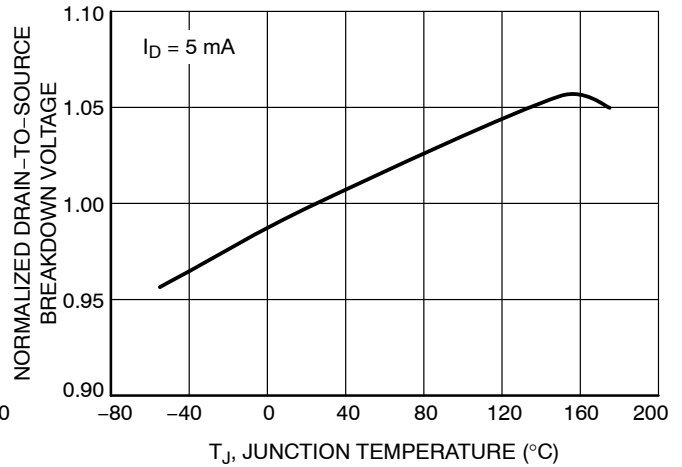


Figure 14. Normalized Drain-to-Source Breakdown Voltage vs. Junction Temperature

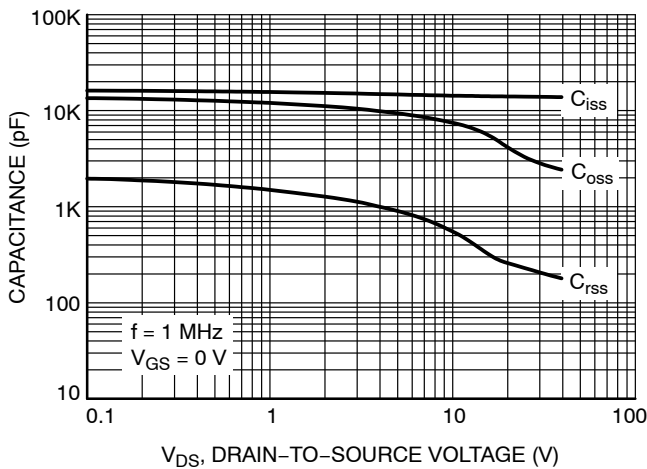


Figure 15. Capacitance vs. Drain-to-Source Voltage

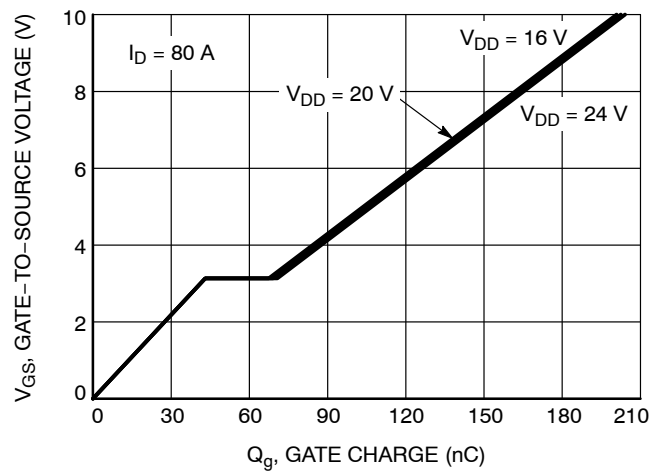
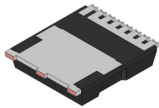


Figure 16. Gate Charge vs. Gate-to-Source Voltage

## FDBL9403L-F085

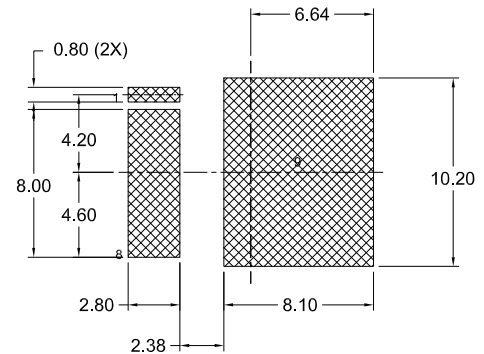
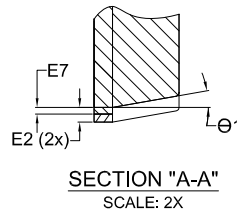
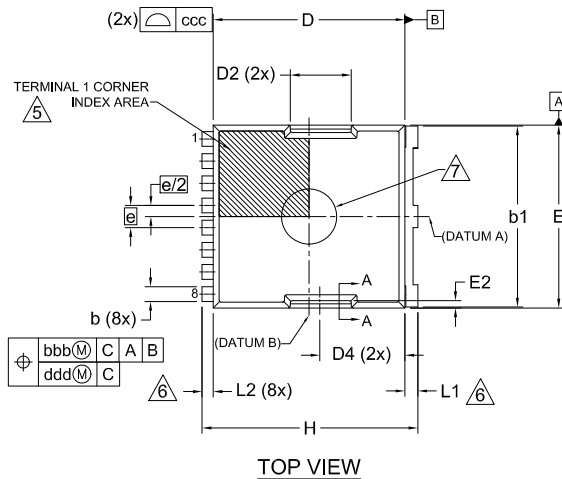
### PACKAGE MARKING AND ORDERING INFORMATION

Device	Marking	Package	Reel Size	Tape Width	Quantity
FDBL9403L-F085	FDBL9403L	H-PSOF8L (Pb-Free / Halogen Free)	13"	24 mm	2000 Units

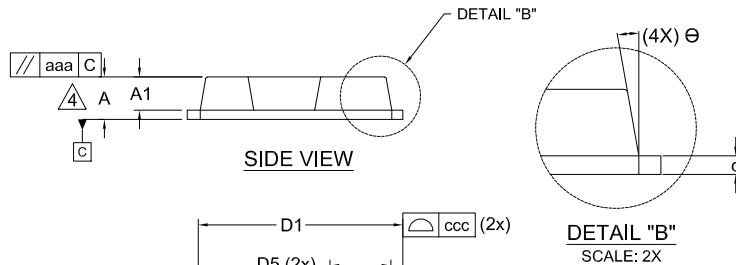


H-PSOF8L 11.68x9.80x2.30, 1.20P  
CASE 100CU  
ISSUE F

DATE 30 JUL 2024

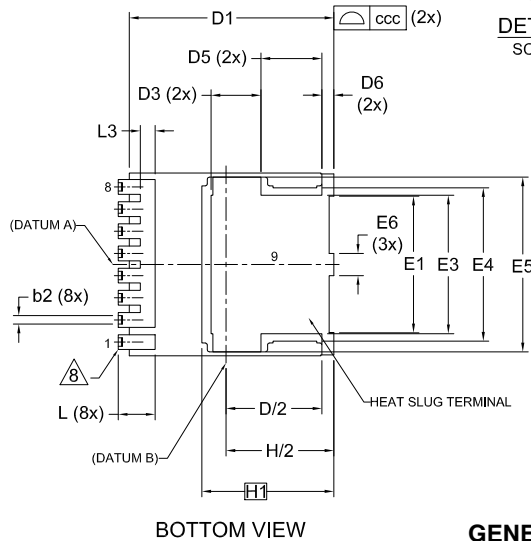


\*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.



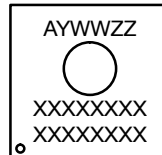
NOTES:

1. PACKAGE STANDARD REFERENCE: JEDEC MO-299, ISSUE B.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
3. "e" REPRESENTS THE TERMINAL PITCH.
4. THIS DIMENSION INCLUDES ENCAPSULATION THICKNESS "A1", AND PACKAGE BODY THICKNESS, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL OR CHIP CAPACITORS. AN INTEGRAL HEATSLUG IS NOT CONSIDERED AS ATTACHED FEATURE.
5. A VISUAL INDEX FEATURE MUST BE LOCATED WITHIN THE HATCHED AREA.
6. DIMENSIONS b1, L1, L2 APPLY TO PLATED TERMINALS.
7. THE LOCATION AND SIZE OF EJECTOR MARKS ARE OPTIONAL.
8. THE LOCATION AND NUMBER OF FUSED LEADS ARE OPTIONAL.



GENERIC  
MARKING DIAGRAM\*

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



\*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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
A1	1.70	1.80	1.90
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b2	0.35	0.45	0.55
c	0.40	0.50	0.60
D	10.28	10.38	10.48
D/2	5.09	5.19	5.29
D1	10.98	11.08	11.18
D2	3.20	3.30	3.40
D3	2.60	2.70	2.80
D4	4.45	4.55	4.65
D5	3.20	3.30	3.40
D6	0.55	0.65	0.75
E	9.80	9.90	10.00
E1	7.30	7.40	7.50
E2	0.30	0.40	0.50
E3	7.40	7.50	7.60
E4	8.20	8.30	8.40

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
E5	9.36	9.46	9.56
E6	1.10	1.20	1.30
E7	0.15	0.18	0.21
e	1.20 BSC		
e/2	0.60 BSC		
H	11.58	11.68	11.78
H/2	5.74	5.84	5.94
H1	7.15 BSC		
L	1.90	2.00	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	0.70	0.80	0.90
Θ	10° REF		
Θ1	10° REF		
aaa	0.20		
bbb	0.25		
ccc	0.20		
ddd	0.20		
eee	0.10		

DOCUMENT NUMBER: 98AON13813G

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DESCRIPTION: H-PSOF8L 11.68x9.80x2.30, 1.20P

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