

# MOSFET – N-Channel, POWERTRENCH®

150 V, 169 A, 6.3 mΩ

FDBL86210-F085

## Features

- Typical  $r_{DS(on)}$  = 5 mΩ at  $V_{GS} = 10$  V,  $I_D = 80$  A
- Typical  $Q_{g(tot)}$  = 70 nC at  $V_{GS} = 10$  V,  $I_D = 80$  A
- UIS Capability
- AEC-Q101 Qualified and PPAP Capable
- This Device is Pb-Free and are RoHS Compliant

## Applications

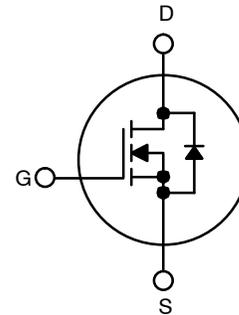
- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Integrated Starter/Alternator
- Primary Switch for 12 V Systems

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

Symbol	Parameter	Ratings	Unit
$V_{DSS}$	Drain to Source Voltage	150	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current – Continuous ( $V_{GS} = 10$ ), $T_C = 25^\circ\text{C}$ (Note 1)	169	A
	Pulsed Drain Current, $T_C = 25^\circ\text{C}$	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)	502	mJ
$P_D$	Power Dissipation	500	W
	Derate Above $25^\circ\text{C}$	3.3	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	0.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Maximum Thermal Resistance Junction to Ambient (Note 3)	43	$^\circ\text{C}/\text{W}$

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 silicon.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.24$  mH,  $I_{AS} = 64$  A,  $V_{DD} = 100$  V during inductor charging and  $V_{DD} = 0$  V during time in avalanche.
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 user's board design. The maximum rating presented here is based on mounting on a 1 in<sup>2</sup> pad of 2oz copper.

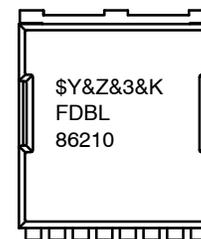


N-Channel



H-PSOF8L  
CASE 100CU

## MARKING DIAGRAM



\$Y = onsemi Logo  
 &Z = Assembly Plant Code  
 &3 = Numeric Date Code  
 &K = Lot Code  
 FDBL86210 = Specific Device Code

## ORDERING INFORMATION

Device	Top Mark	Package	Shipping†
FDBL86210-F085	FDBL86210	H-PSOF8L	2000 Units/ 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.

# FDBL86210–F085

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	150	–	–	V	
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> = 150 V, V <sub>GS</sub> = 0 V	T <sub>J</sub> = 25°C	–	–	1	μA
			T <sub>J</sub> = 175°C (Note 4)	–	–	1	mA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V	–	–	±100	nA	

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.0	2.8	4.0	V	
r <sub>DS(on)</sub>	Drain to Source On Resistance	I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V	T <sub>J</sub> = 25°C	–	5	6.3	mΩ
			T <sub>J</sub> = 175°C (Note 4)	–	14	17.5	mΩ

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	5805	–	pF
C <sub>oss</sub>	Output Capacitance		–	536	–	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	16	–	pF
R <sub>g</sub>	Gate Resistance	f = 1 MHz	–	2.2	–	Ω
Q <sub>g(ToT)</sub>	Total Gate Charge at 10 V	V <sub>GS</sub> = 0 to 10 V	–	70	90	nC
Q <sub>g(th)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0 to 2 V				
Q <sub>gs</sub>	Gate to Source Gate Charge	V <sub>DD</sub> = 75 V, I <sub>D</sub> = 80 A	–	32.5	–	nC
Q <sub>gd</sub>	Gate to Drain “Miller” Charge		–	10	–	nC

### SWITCHING CHARACTERISTICS

t <sub>on</sub>	Turn-On Time	V <sub>DD</sub> = 75 V, I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω	–	–	80	ns
t <sub>d(on)</sub>	Turn-On Delay Time		–	39	–	ns
t <sub>r</sub>	Rise Time		–	30	–	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		–	70	–	ns
t <sub>f</sub>	Fall Time		–	23	–	ns
t <sub>off</sub>	Turn-Off Time		–	–	130	ns

### DRAIN-SOURCE DIODE CHARACTERISTIC

V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 80 A, V <sub>GS</sub> = 0 V	–	–	1.25	V
		I <sub>SD</sub> = 40 A, V <sub>GS</sub> = 0 V	–	–	1.2	V
T <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 80 A, dI <sub>SD</sub> /dt = 100 A/μs, V <sub>DD</sub> = 120 V	–	108	125	ns
Q <sub>rr</sub>	Reverse Recovery Charge		–	323	467	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<sub>J</sub> = 175°C. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

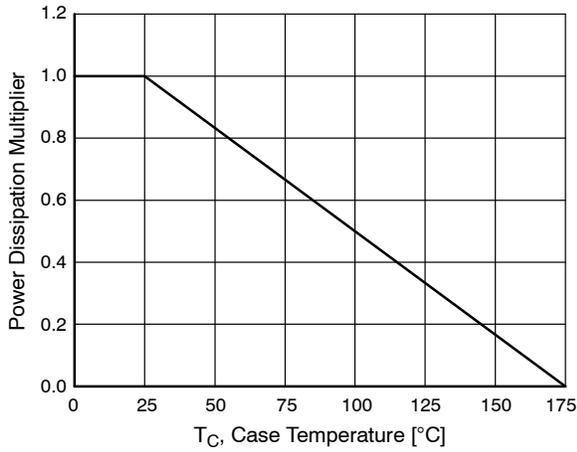


Figure 1. Normalized Power Dissipation vs. Case Temperature

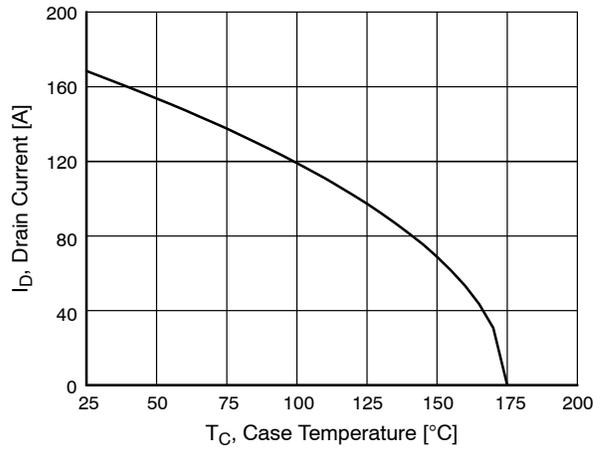


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

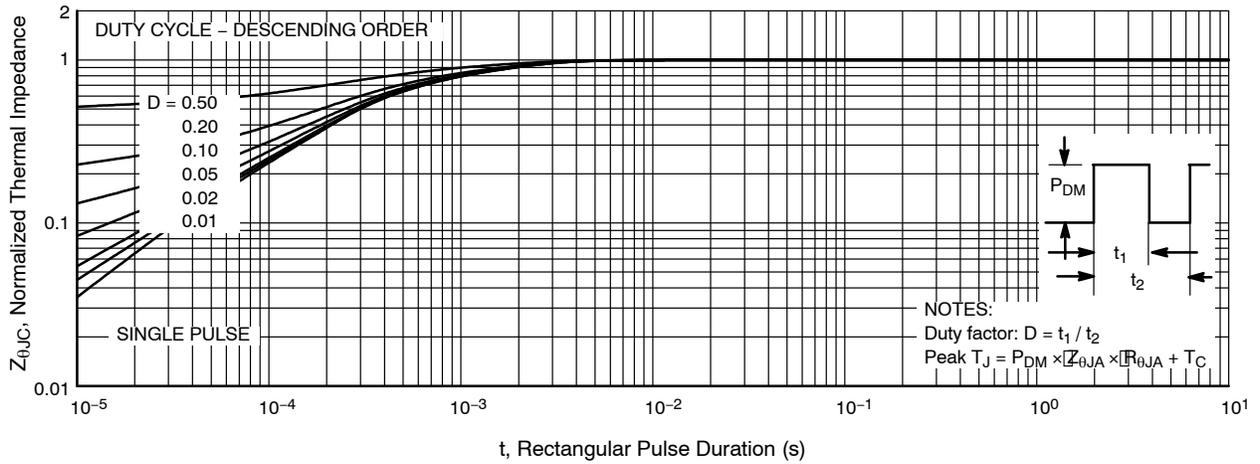


Figure 3. Normalized Maximum Transient Thermal Impedance

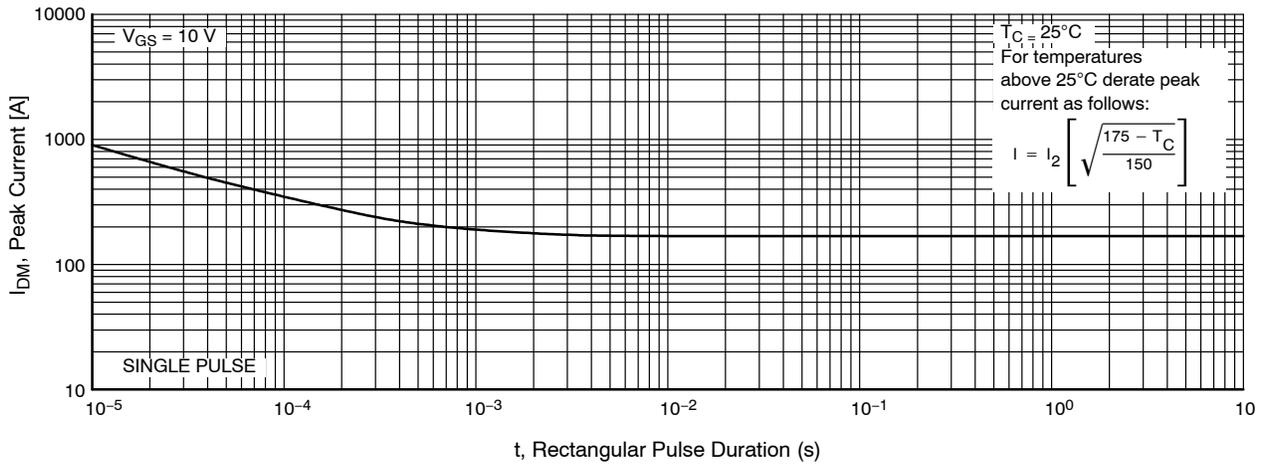


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

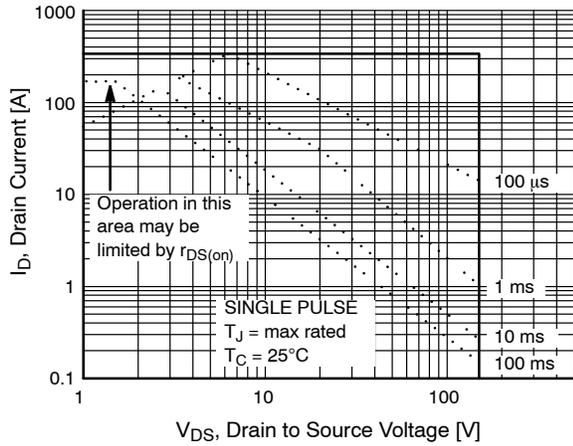
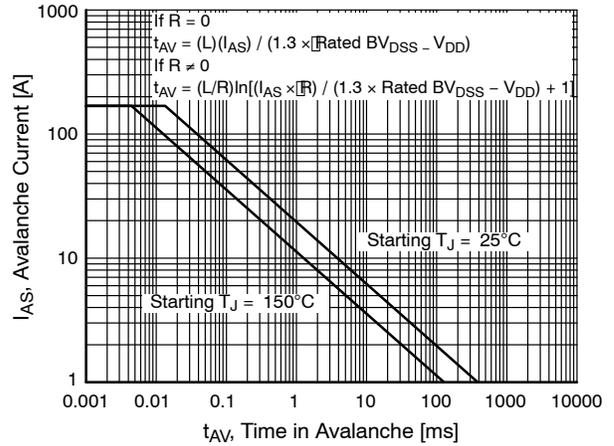


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to onsemi Application Notes [AN7514](#) and [AN7515](#).

Figure 6. Unclamped Inductive Switching Capability

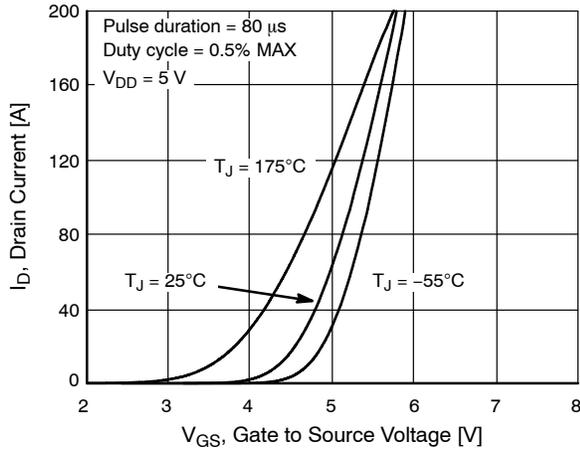


Figure 7. Transfer Characteristics

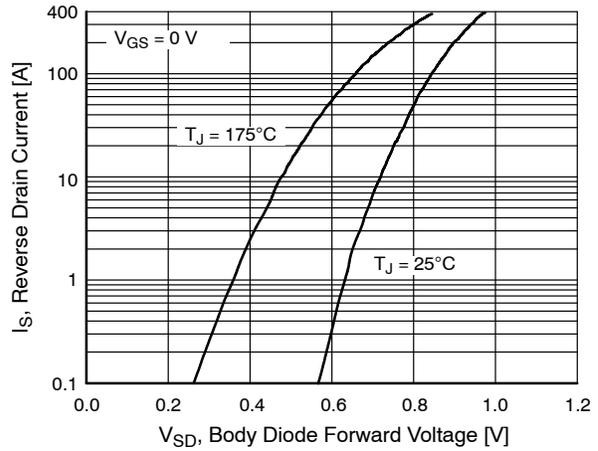


Figure 8. Forward Diode Characteristics

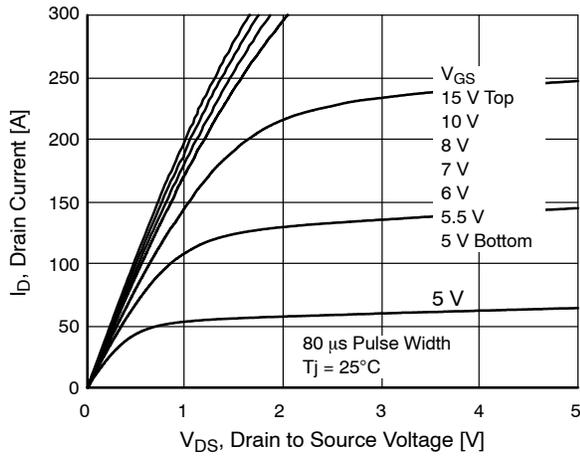


Figure 9. Saturation Characteristics

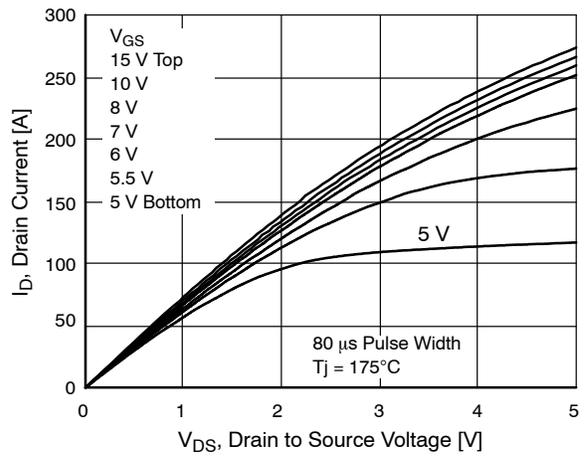


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

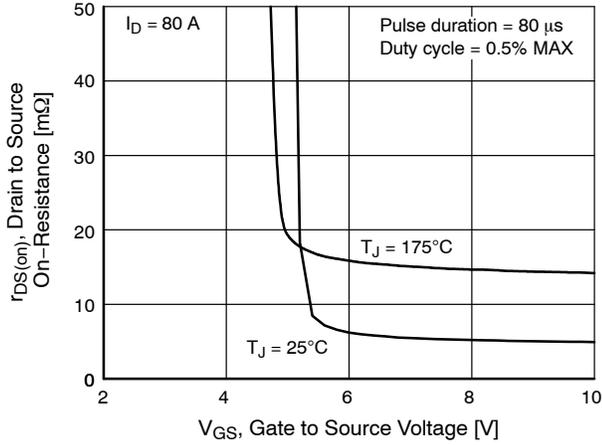


Figure 11.  $R_{DS(on)}$  vs. Gate Voltage

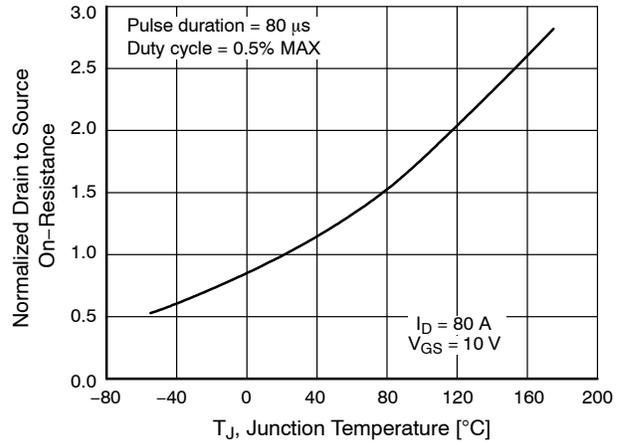


Figure 12. Normalized  $R_{DS(on)}$  vs. Junction Temperature

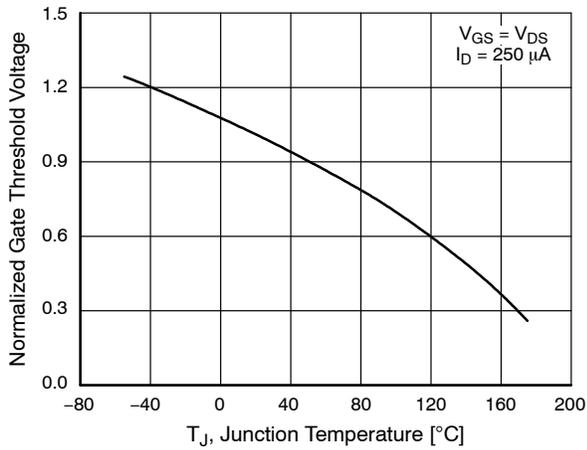


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

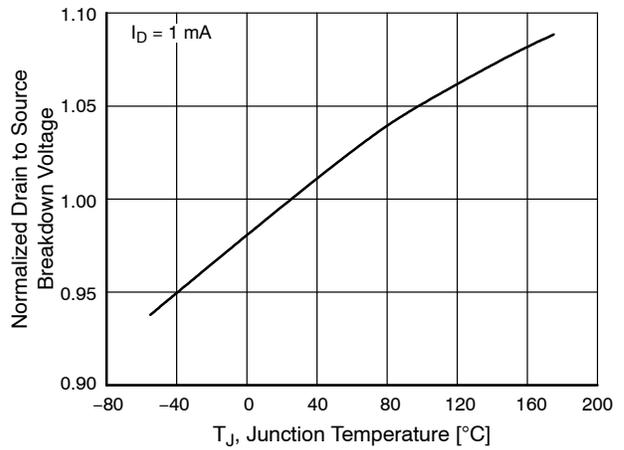


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

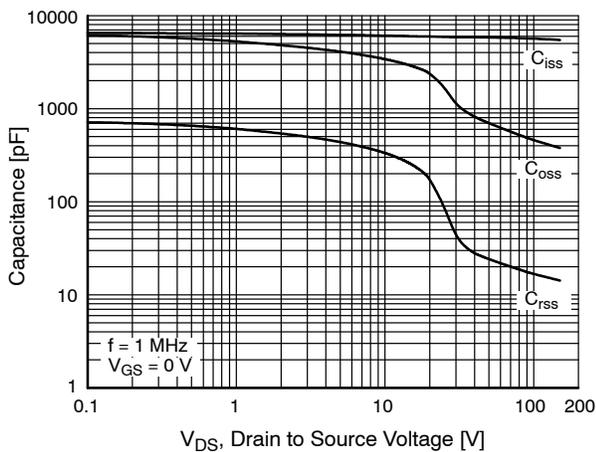


Figure 15. Capacitance vs. Drain to Source Voltage

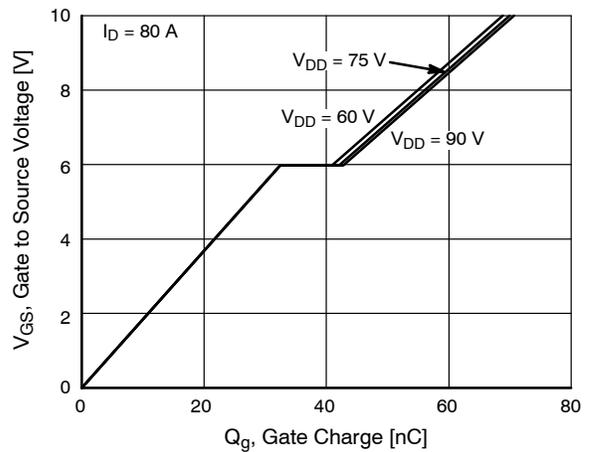
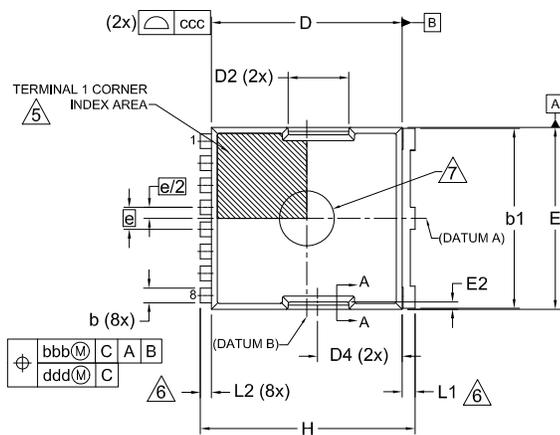


Figure 16. Gate Charge vs. Gate to Source Voltage

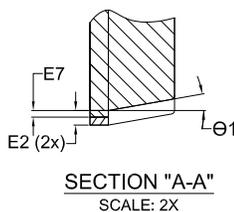


H-PSOF8L 11.68x9.80x2.30, 1.20P  
CASE 100CU  
ISSUE F

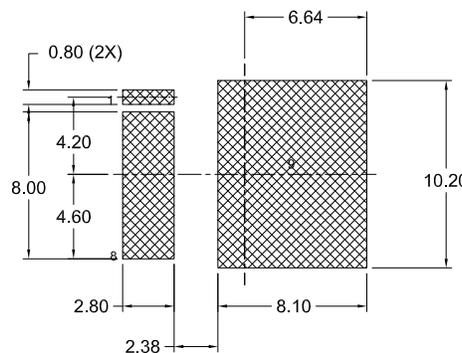
DATE 30 JUL 2024



TOP VIEW

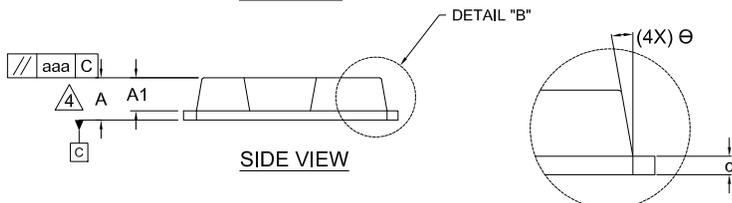


SECTION "A-A"  
SCALE: 2X



LAND PATTERN  
RECOMMENDATION

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

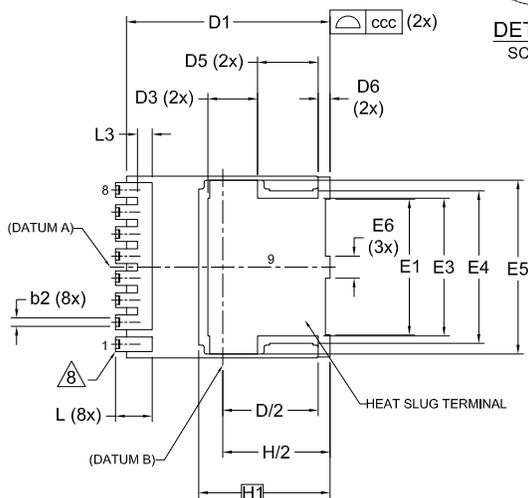


SIDE VIEW

DETAIL "B"  
SCALE: 2X

NOTES:

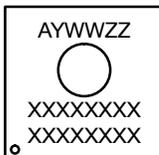
1. PACKAGE STANDARD REFERENCE: JEDEC MO-299, ISSUE B.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
3. "e" REPRESENTS THE TERMINAL PITCH.
4. THIS DIMENSION INCLUDES ENCAPSULATION THICKNESS "A1", AND PACKAGE BODY THICKNESS, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL OR CHIP CAPACITORS. 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.



BOTTOM VIEW

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		

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