

# ON Semiconductor

## Is Now

The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a white vertical bar, and a small orange triangle is positioned above the top right of the "i". A small "TM" trademark symbol is located to the right of the "i".

To learn more about onsemi™, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

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# MOSFET, N-Channel, POWERTRENCH<sup>®</sup>

80 V, 80 A, 4.5 mΩ



**ON Semiconductor<sup>®</sup>**

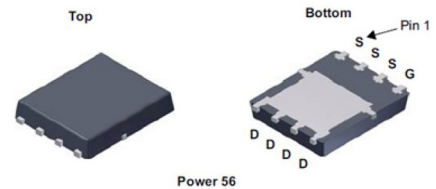
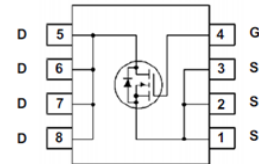
[www.onsemi.com](http://www.onsemi.com)

## Features

- Typical  $R_{DS(on)} = 3.7\text{ m}\Omega$  at  $V_{GS} = 10\text{ V}$ ,  $I_D = 80\text{ A}$
- Typical  $Q_{g(tot)} = 57\text{ nC}$  at  $V_{GS} = 10\text{ V}$ ,  $I_D = 80\text{ A}$
- UIS Capability
- Wetable Flanks for Automatic Optical Inspection (AOI)
- AEC-Q101 Qualified and PPAP Capable
- This Device is Pb-Free and is RoHS Compliant

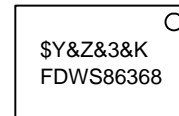
## Applications

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



**DFN8 5.1x6.3, 1.27P  
CASE 506DW**

## MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FDWS86368	= Specific Device Code

## ORDERING INFORMATION

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

# FDWS86368–F085

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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-to-Source Voltage	80	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Drain Current –Continuous ( $V_{GS} = 10\text{ V}$ ) (Note 1) $T_C = 25^\circ\text{C}$	80	A
	–Pulsed $T_C = 25^\circ\text{C}$	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)	82	mJ
$P_D$	Power Dissipation	214	W
	Derate Above $25^\circ\text{C}$	1.43	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	0.7	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient (Note 3)	50	$^\circ\text{C}/\text{W}$

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 bondwire configuration.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 40\ \mu\text{H}$ ,  $I_{AS} = 64\ \text{A}$ ,  $V_{DD} = 80\ \text{V}$  during inductor charging and  $V_{DD} = 0\ \text{V}$  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 board design. The maximum rating presented here is based on mounting on a  $1\ \text{in}^2$  pad of 2 oz copper.

## PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Shipping <sup>†</sup>
FDWS86368	FDWS86368–F085	DFN8 5.1x6.3, 1.27P (Pb-Free)	3000 units / Tape & Reel

<sup>†</sup>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

# FDWS86368–F085

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

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

$B_{VDSS}$	Drain-to-Source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0 \text{ V}$	80			V
$I_{DSS}$	Drain-to-Source Leakage Current	$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 25^\circ\text{C}$			1	$\mu\text{A}$
		$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ\text{C}$ (Note 4)			1	$\text{mA}$
$I_{GSS}$	Gate-to-Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$			$\pm 100$	$\text{nA}$

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250 \mu\text{A}$	2.0	3.0	4.0	V
$R_{DS(on)}$	Drain to Source On Resistance	$I_D = 80 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $T_J = 25^\circ\text{C}$		3.7	4.5	$\text{m}\Omega$
		$I_D = 80 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $T_J = 175^\circ\text{C}$ (Note 4)		7.4	9.0	

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$			4350		$\text{pF}$
$C_{oss}$	Output Capacitance				636		$\text{pF}$
$C_{rss}$	Reverse Transfer Capacitance				20		$\text{pF}$
$R_g$	Gate Resistance	$f = 1 \text{ MHz}$			2.5		$\Omega$
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to $10 \text{ V}$	$V_{DD} = 64 \text{ V}$ , $I_D = 80 \text{ A}$		57	75	$\text{nC}$
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 0 \text{ V}$ to $2 \text{ V}$			8		$\text{nC}$
$Q_{gs}$	Gate-to-Source Gate Charge				23		$\text{nC}$
$Q_{gd}$	Gate-to-Drain "Miller" Charge				11		$\text{nC}$

### SWITCHING CHARACTERISTICS

$t_{on}$	Turn-On Time	$V_{DD} = 40 \text{ V}$ , $I_D = 80 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$			60	$\text{ns}$
$t_{d(on)}$	Turn-On Delay			23		$\text{ns}$
$t_r$	Rise Time			22		$\text{ns}$
$t_{d(off)}$	Turn-Off Delay			32		$\text{ns}$
$t_f$	Fall Time			13		$\text{ns}$
$t_{off}$	Turn-Off Time				59	$\text{ns}$

### DRAIN-SOURCE DIODE CHARACTERISTICS

$V_{SD}$	Source-to-Drain Diode Voltage	$V_{GS} = 0 \text{ V}$ , $I_{SD} = 80 \text{ A}$ $V_{GS} = 0 \text{ V}$ , $I_{SD} = 40 \text{ A}$			1.25 1.2	V
$t_{rr}$	Reverse-Recovery Time	$I_F = 80 \text{ A}$ , $\Delta I_{SD}/\Delta t = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 64 \text{ V}$		58	75	$\text{ns}$
$Q_{rr}$	Reverse-Recovery Charge			49	67	$\text{nC}$

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  $T_J = 175^\circ\text{C}$ . Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

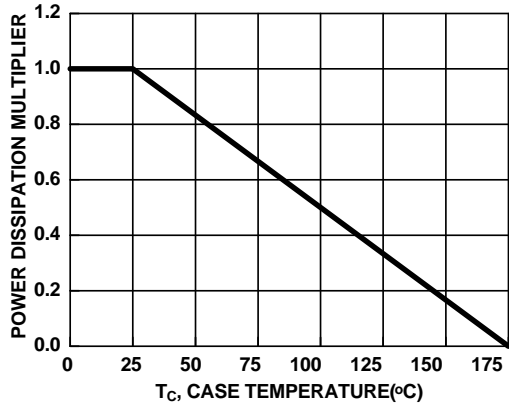


Figure 1. Normalized Power Dissipation vs. Case Temperature

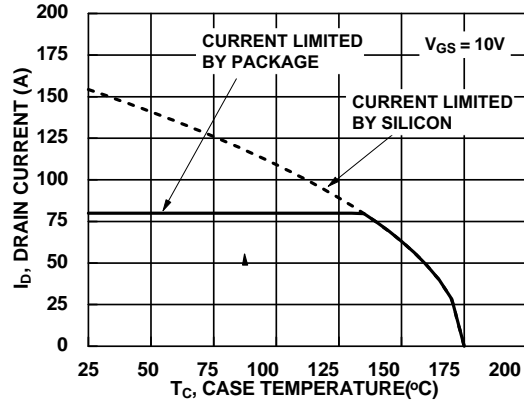


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

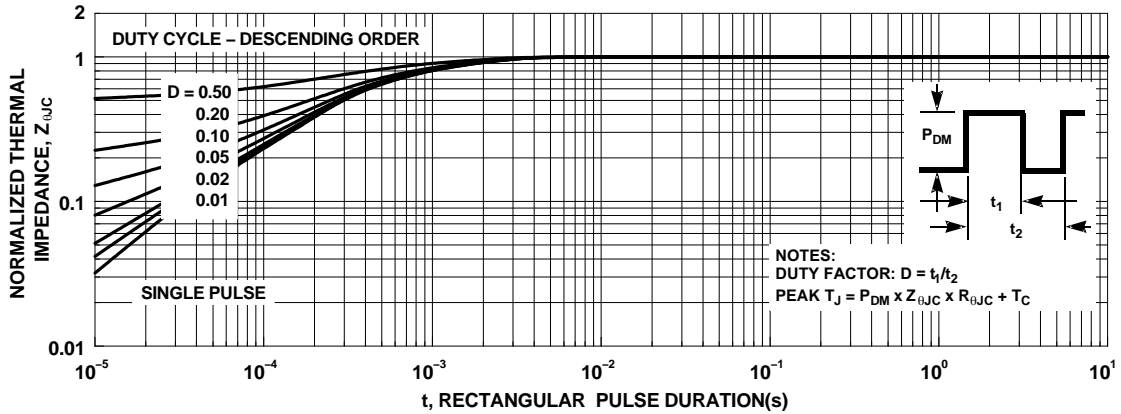


Figure 3. Normalized Maximum Transient Thermal Impedance

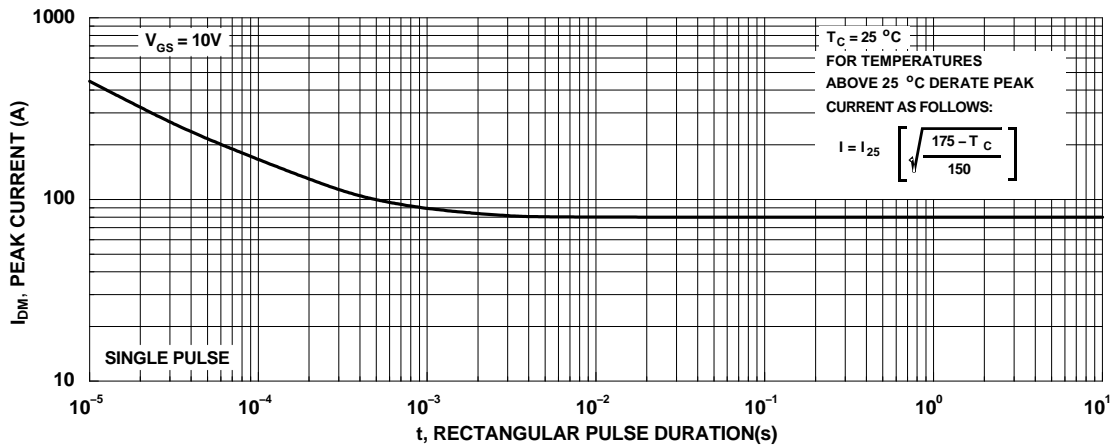


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

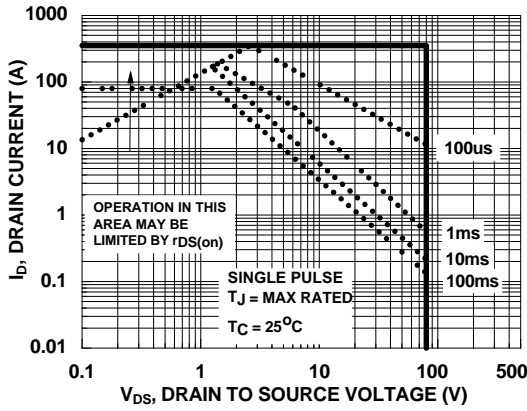
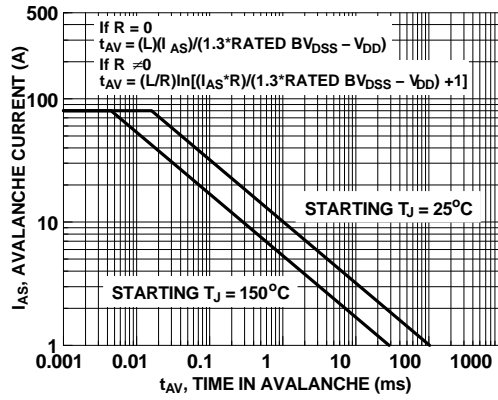


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

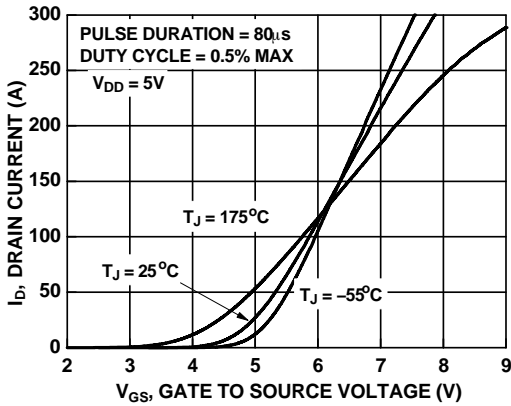


Figure 7. Transfer Characteristics

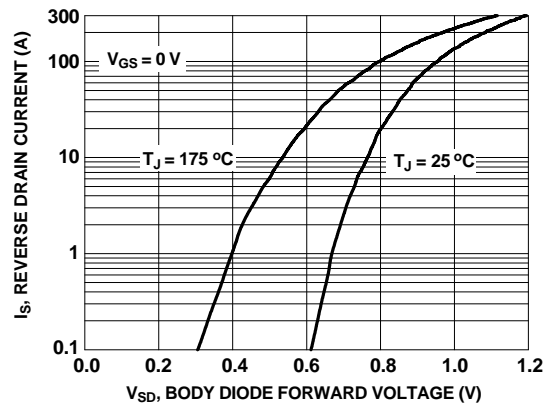


Figure 8. Forward Diode Characteristics

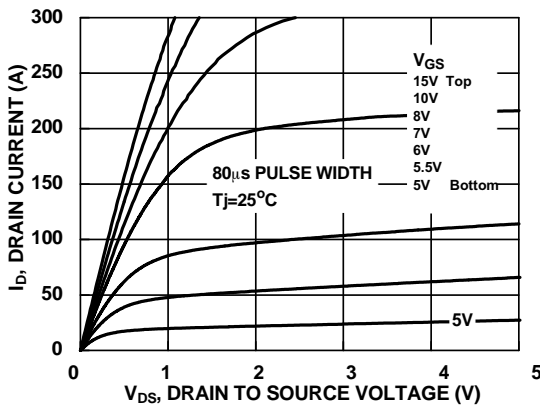


Figure 9. Saturation Characteristics

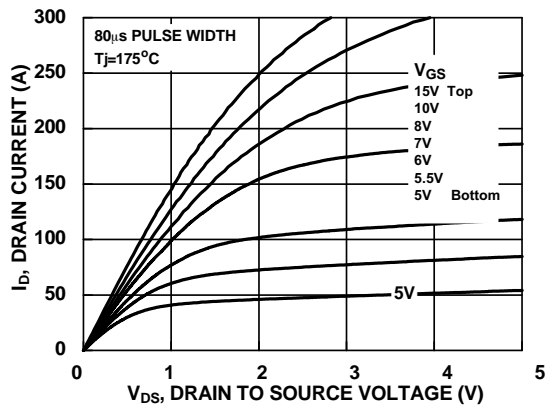


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

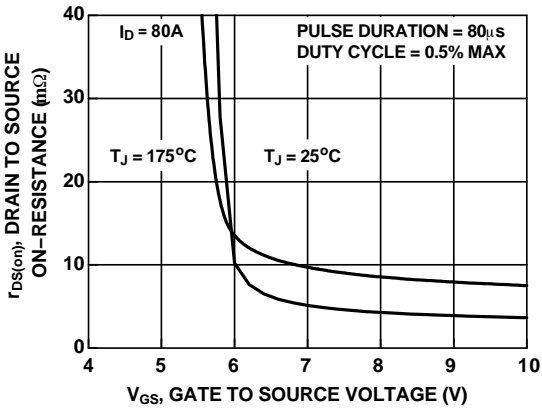


Figure 11.  $R_{DS(on)}$  vs. Gate Voltage

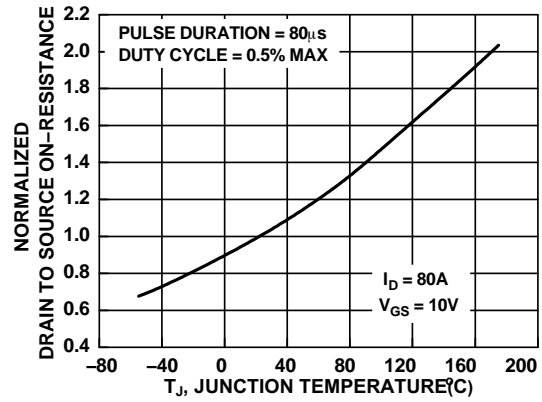


Figure 12. Normalized  $R_{DS(on)}$  vs. Junction Temperature

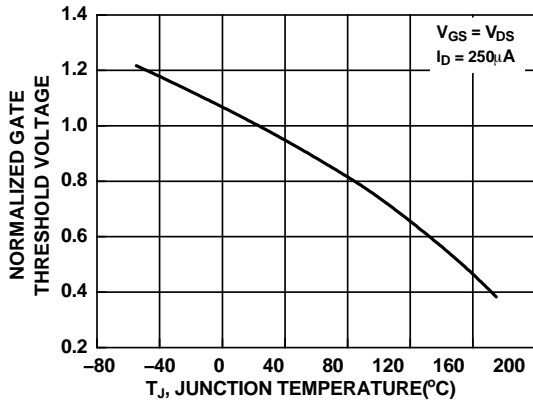


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

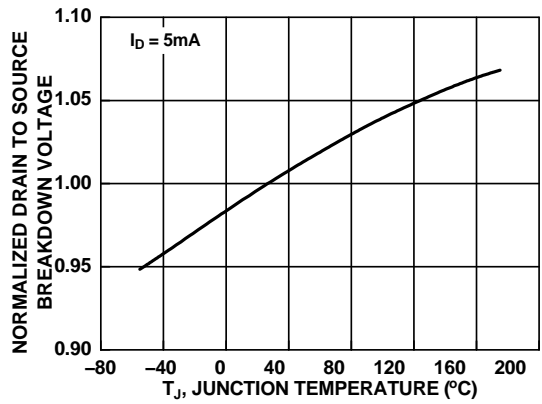


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

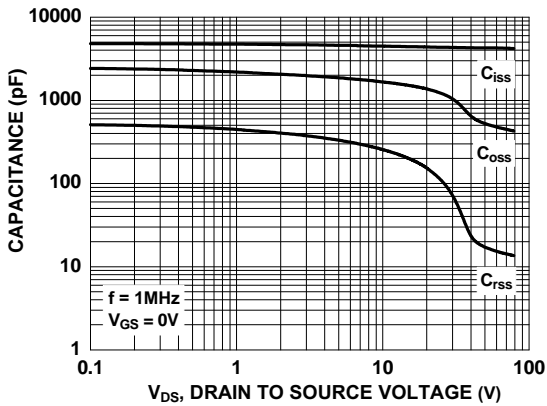


Figure 15. Capacitance vs. Drain to Source Voltage

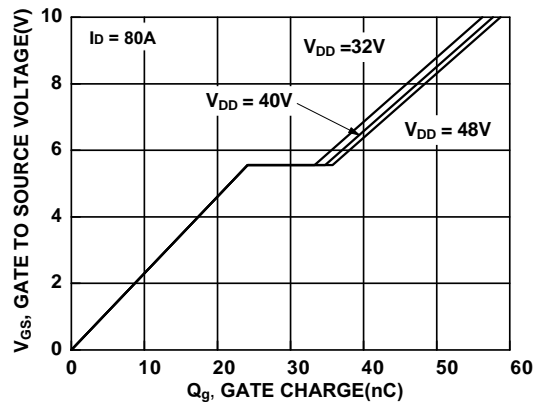
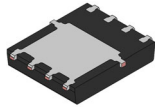


Figure 16. Single Pulse Maximum Power Dissipation

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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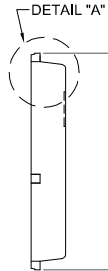
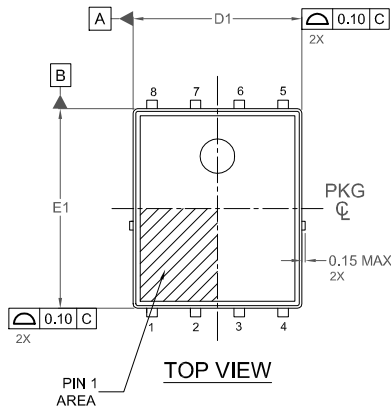


### DFN8 5.1x6.3, 1.27P CASE 506DW ISSUE A

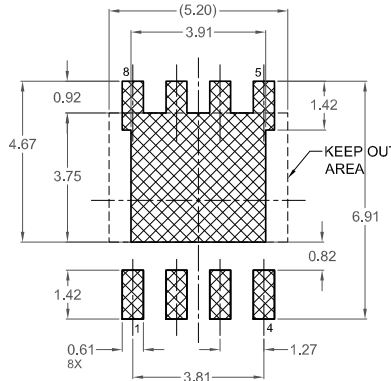
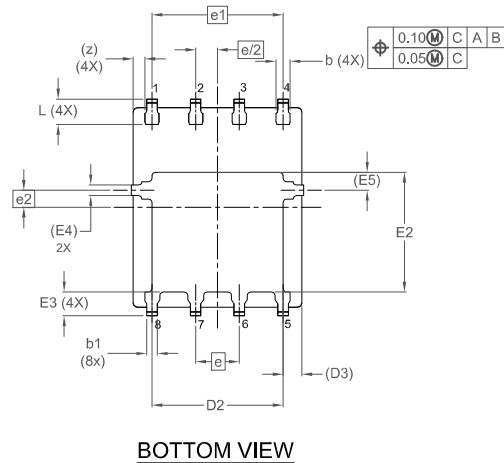
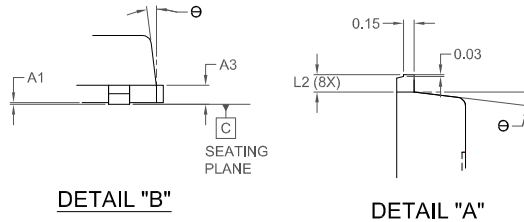
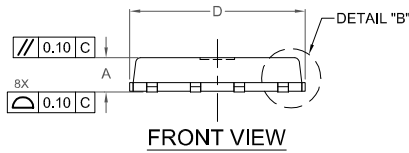
DATE 02 JUL 2021

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.



**SIDE VIEW**



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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
A3	0.20	0.25	0.30
b	0.36	0.41	0.46
b1	0.26	0.31	0.36
D	4.90	5.00	5.20
D1	4.80	4.90	5.00
D2	3.72	3.82	3.92
D3	0.54 REF		
E	6.20	6.30	6.40
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	0.59	0.69	0.79
E4	0.30 REF		
E5	0.52 REF		
e	1.27 BSC		
e/2	0.635 BSC		
e1	3.81 BSC		
e2	0.50 BSC		
L	0.64	0.74	0.84
L2	0.15	0.25	0.35
z	0.34 REF		
Θ	0°	-	7°

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