

# MOSFET – N-Channel, DUAL COOL<sup>®</sup> DFN8, POWERTRENCH<sup>®</sup> 40 V, 192 A, 1.1 mΩ



ON Semiconductor<sup>®</sup>

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

## FDMS8320LDC

### Features

- Max  $R_{DS(on)}$  = 1.1 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 44\text{ A}$
- Max  $R_{DS(on)}$  = 1.5 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 37\text{ A}$
- Advanced Package and Silicon Combination for Low  $R_{DS(on)}$  and High Efficiency
- Next Generation Enhanced Body Diode Technology, Engineered for Soft Recovery
- MSL1 Robust Package Design
- 100% UIL Tested
- This Device is Pb-Free, Halogen Free and RoHS Compliant

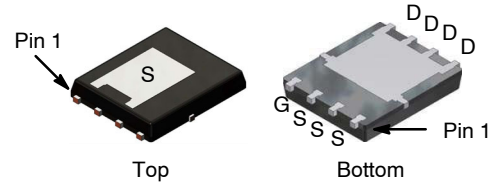
### Applications

- OringFET/Load Switching
- Synchronous Rectification
- DC-DC Conversion

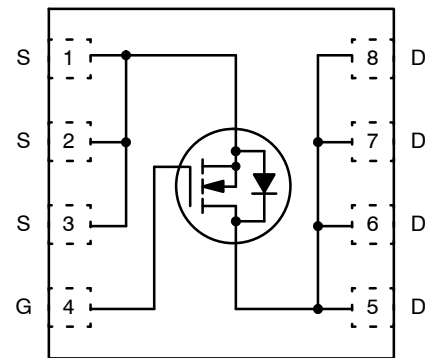
### MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Ratings	Unit
$V_{DSS}$	Drain-to-Source Voltage	40	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous $T_C = 25^\circ\text{C}$	192
		- Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	44
		- Pulsed (Note 4)	300
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	661	mJ
$P_D$	Power Dissipation, $T_C = 25^\circ\text{C}$	125	W
	Power Dissipation, $T_A = 25^\circ\text{C}$ (Note 1a)	3.2	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

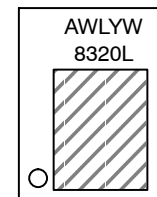
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



DFN8  
DUAL COOL  
CASE 506EG



### MARKING DIAGRAM



8320L = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
Y = Year  
W = Work Week

### ORDERING INFORMATION

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

# FDMS8320LDC

## 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	40	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C	-	22	-	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32 V, V <sub>GS</sub> = 0 V	-	-	1	μA
I <sub>GSS</sub>	Gate-to-Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 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	1.0	1.6	3.0	V
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate-to-Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C	-	-6	-	mV/°C
R <sub>DS(on)</sub>	Static Drain-to-Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 44 A	-	0.8	1.1	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 37 A	-	1.1	1.5	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 44 A, T <sub>J</sub> = 125°C	-	1.2	1.7	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 44 A	-	244	-	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	8310	11635	pF
C <sub>oss</sub>	Output Capacitance		-	2255	3160	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	132	185	pF
R <sub>g</sub>	Gate Resistance	f = 1 MHz	0.1	1.4	2.6	Ω

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 44 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω	-	19	34	ns
t <sub>r</sub>	Rise Time		-	15	27	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	69	110	ns
t <sub>f</sub>	Fall Time		-	14	25	ns
Q <sub>g(ToT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 10 V, V <sub>DD</sub> = 20 V, I <sub>D</sub> = 44 A	-	121	170	nC
Q <sub>g(ToT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 4.5 V, V <sub>DD</sub> = 20 V, I <sub>D</sub> = 44 A	-	57	80	nC
Q <sub>GS</sub>	Gate-to-Source Charge	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 44 A	-	21	-	nC
Q <sub>gd</sub>	Gate-to-Drain "Miller" Charge	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 44 A	-	16	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTIC

V <sub>SD</sub>	Source-to-Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2.6 A (Note 2)	-	0.7	1.1	V
		V <sub>GS</sub> = 0 V, I <sub>S</sub> = 44 A (Note 2)	-	0.8	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 44 A, di/dt = 100 A/μs	-	65	104	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	57	91	nC
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 44 A, di/dt = 300 A/μs	-	49	79	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	89	143	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.

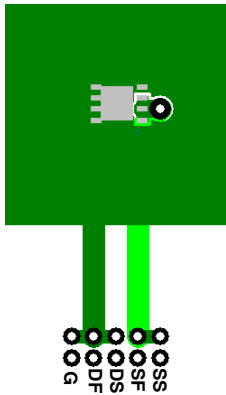
# FDMS8320LDC

## THERMAL CHARACTERISTICS

Symbol	Characteristic	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Top Source)	2.9	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	1.0	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1c)	27	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1d)	34	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1e)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1f)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1g)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1h)	61	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1i)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1j)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1k)	11	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1l)	13	

**NOTES:**

- $R_{\theta JA}$  is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a. 38°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 81°C/W when mounted on a minimum pad of 2 oz copper

- Still air, 20.9 × 10.4 × 12.7 mm Aluminum Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- Still air, 20.9 × 10.4 × 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
- Still air, 45.2 × 41.4 × 11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- Still air, 45.2 × 41.4 × 11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- 200FPM Airflow, No Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
- 200FPM Airflow, 20.9 × 10.4 × 12.7 mm Aluminum Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- 200FPM Airflow, 20.9 × 10.4 × 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
- 200FPM Airflow, 45.2 × 41.4 × 11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- 200FPM Airflow, 45.2 × 41.4 × 11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
- $E_{AS}$  of 661 mJ is based on starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 3 \text{ mH}$ ,  $I_{AS} = 21 \text{ A}$ ,  $V_{DD} = 40 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ . 100% test at  $L = 0.1 \text{ mH}$ ,  $I_{AS} = 66 \text{ A}$ .
- Pulse Id measured at 250 μs, refer to Figure 11 SOA graph for more details.

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## TYPICAL CHARACTERISTICS

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

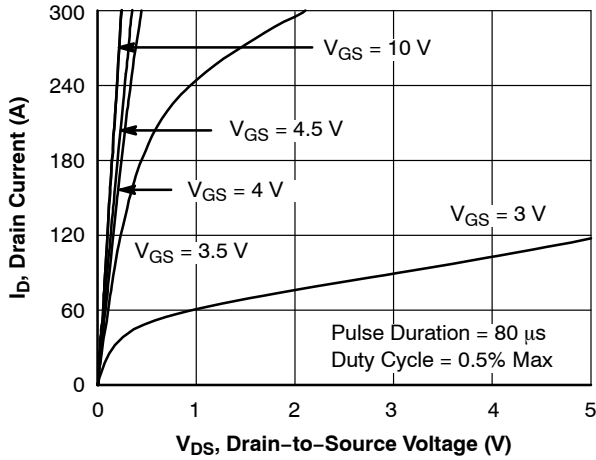


Figure 1. On-Region Characteristics

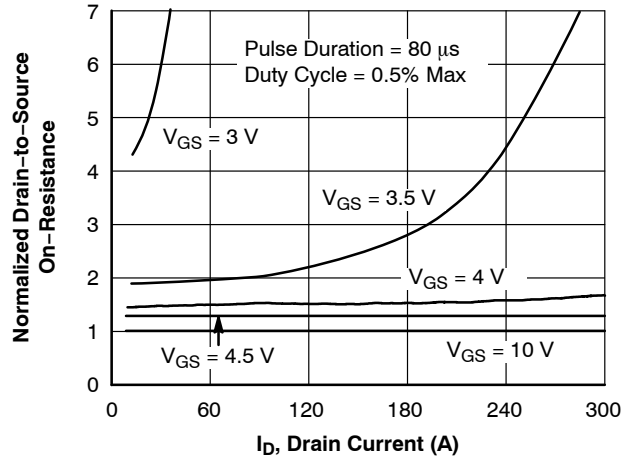


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

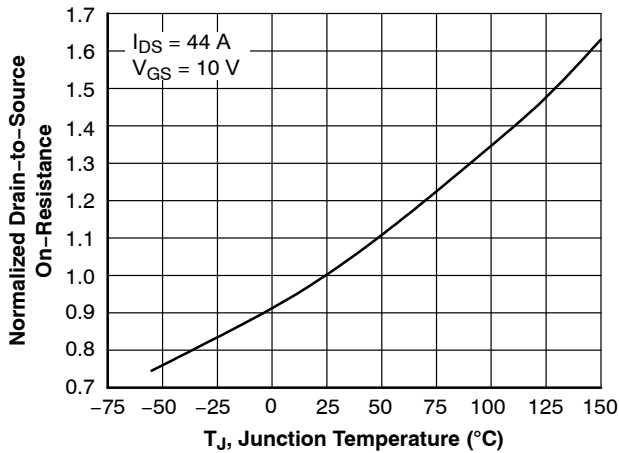


Figure 3. Normalized On-Resistance vs. Junction Temperature

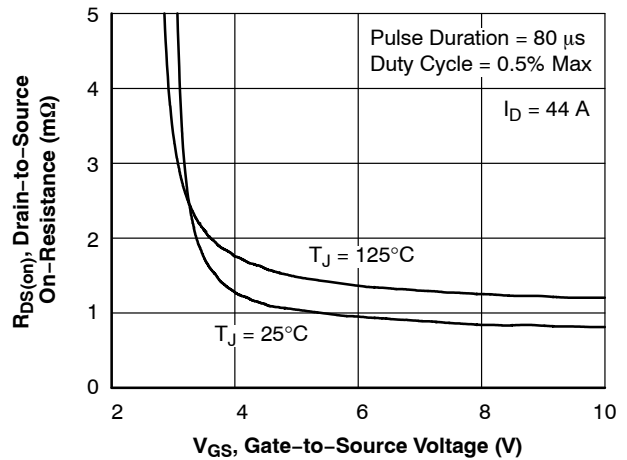


Figure 4. On-Resistance vs. Gate-to-Source Voltage

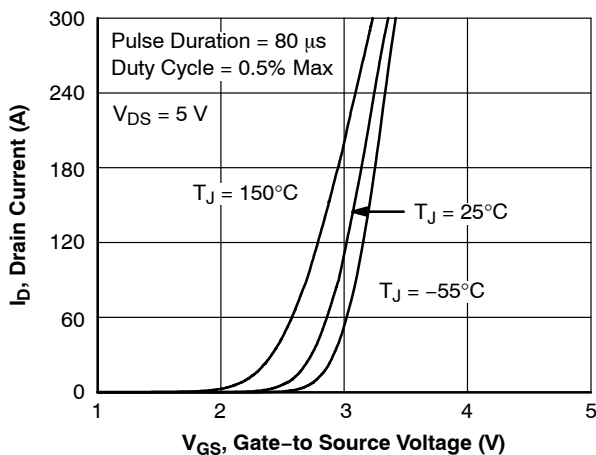


Figure 5. Transfer Characteristics

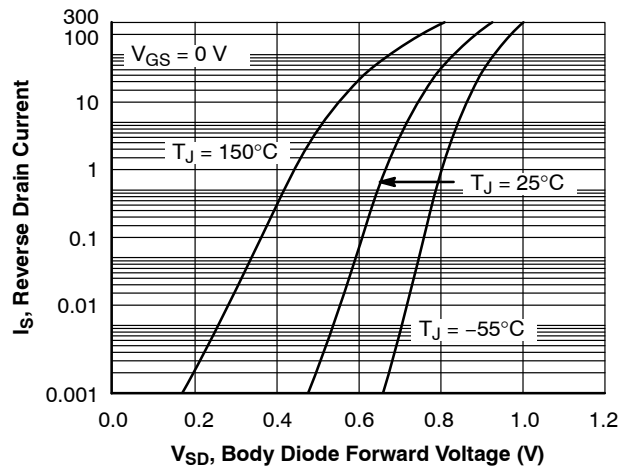


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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## TYPICAL CHARACTERISTICS (continued)

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

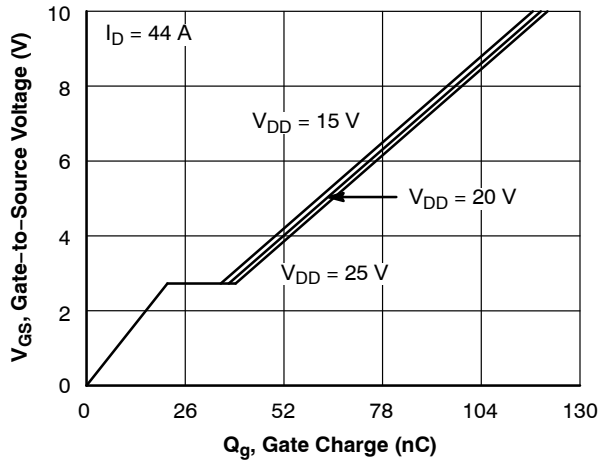


Figure 7. Gate Charge Characteristics

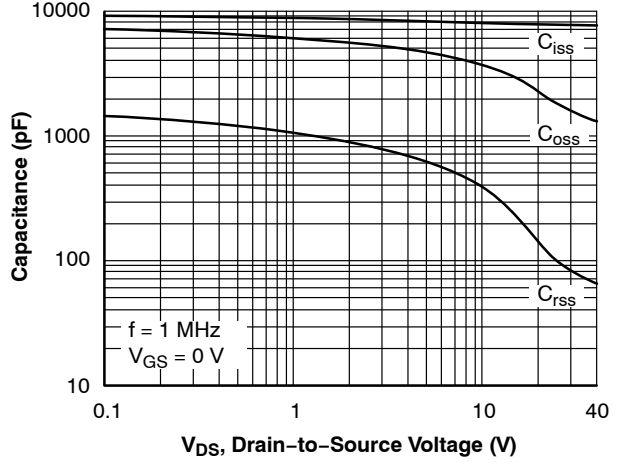


Figure 8. Capacitance vs. Drain-to-Source Voltage

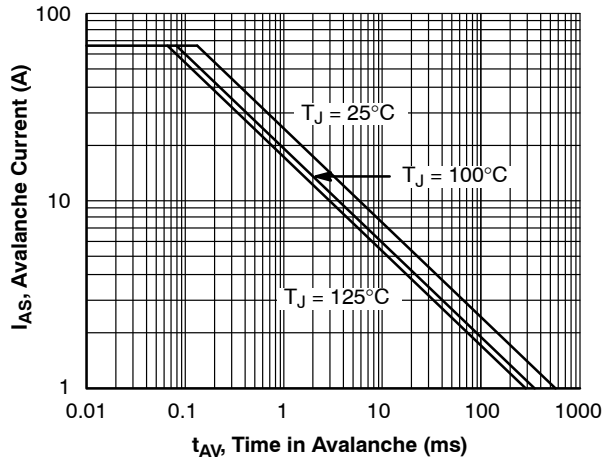


Figure 9. Unclamped Inductive Switching Capability

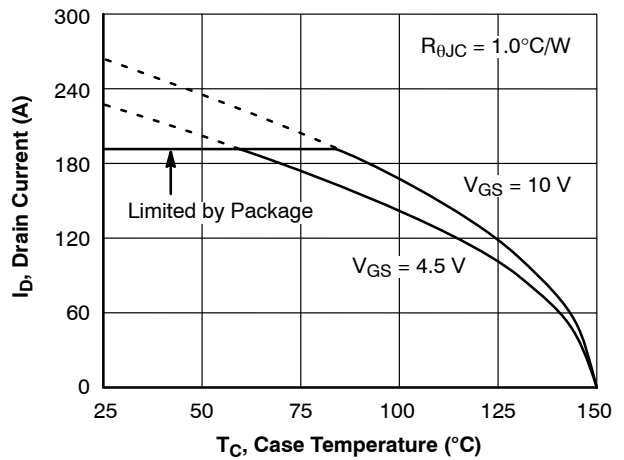


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

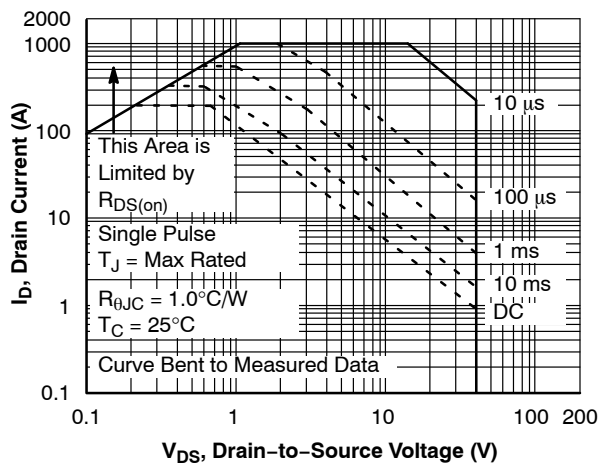


Figure 11. Forward Bias Safe Operating Area

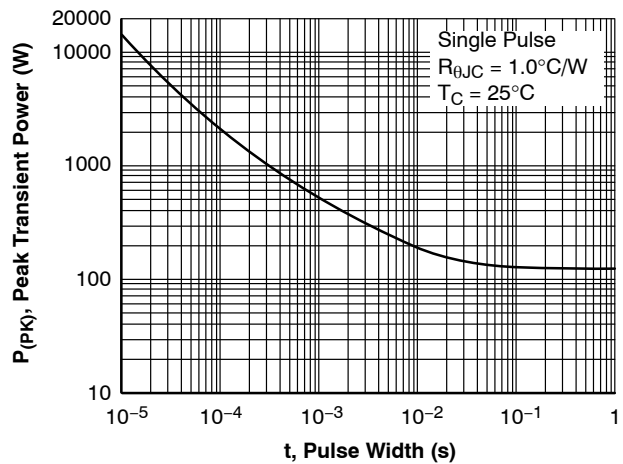


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS (continued)

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

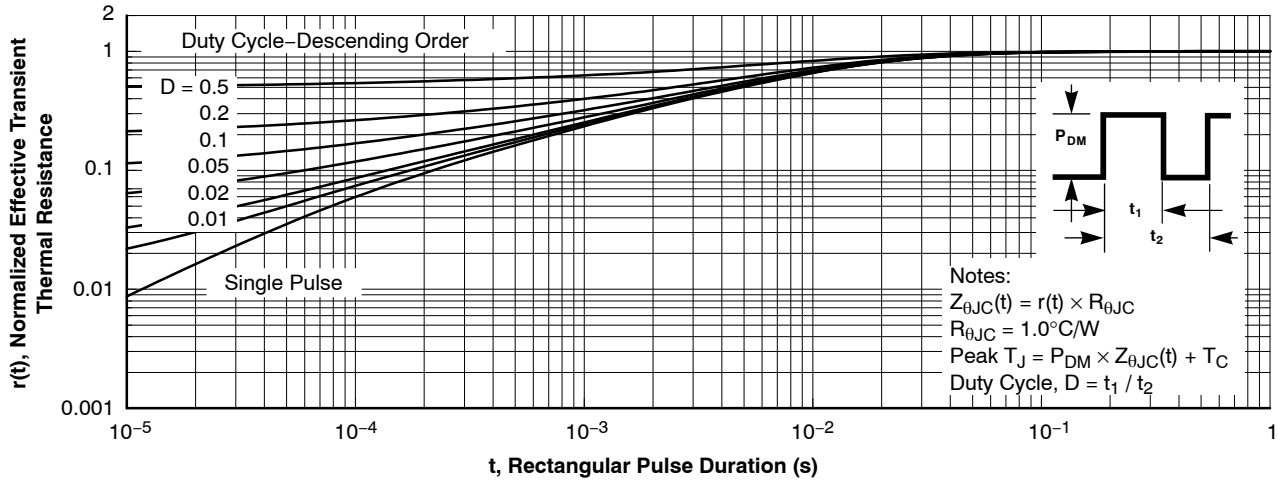


Figure 13. Junction-to-Case Transient Thermal Response Curve

## PACKAGE MARKING AND ORDERING INFORMATION

### PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size <sup>†</sup>	Tape Width	Quantity
8320L	FDMS8320LDC	DUAL COOL 56	13"	12 mm	3000 Units

<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.

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# MECHANICAL CASE OUTLINE

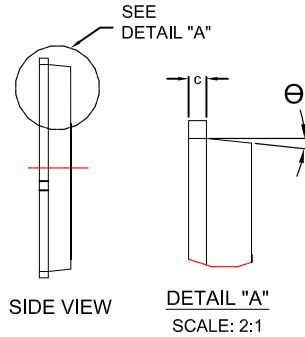
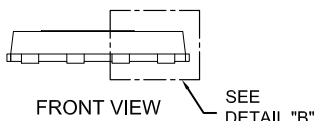
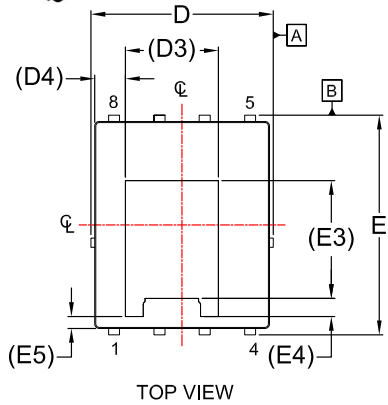
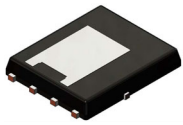
## PACKAGE DIMENSIONS

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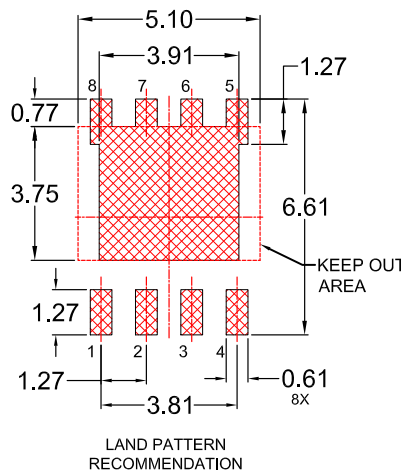
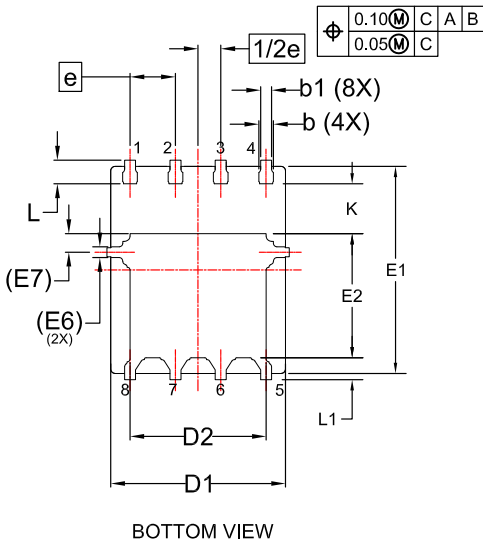
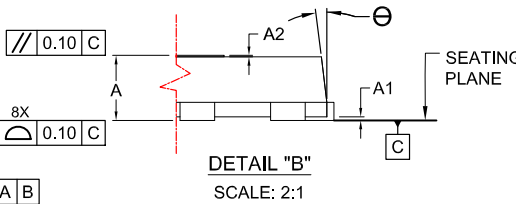
### DFN8 5x6.15, 1.27P, DUAL COOL CASE 506EG ISSUE D

DATE 25 AUG 2020



NOTES:

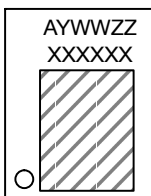
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.



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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.85	0.90	0.95
A1	-	-	0.05
A2	-	-	0.05
b	0.31	0.41	0.51
b1	0.21	0.31	0.41
c	0.20	0.25	0.30
D	4.90	5.00	5.10
D1	4.80	4.90	5.00
D2	3.67	3.82	3.97
D3	2.60 REF		
D4	0.86 REF		
E	6.05	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	3.30 REF		
E4	0.50 REF		
E5	0.34 REF		
E6	0.30 REF		
E7	0.52 REF		
e	1.27 BSC		
1/2e	0.635 BSC		
K	1.30	1.40	1.50
L	0.56	0.66	0.76
L1	0.52	0.62	0.72
θ	0°	---	12°

### GENERIC MARKING DIAGRAM\*



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

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[SSM6P69NU,LF](#) [DMP22D4UFO-7B](#)