

# FDB1D7N10CL7

## N-Channel Shielded Gate POWERTRENCH<sup>®</sup> MOSFET

100 V, 268 A, 1.7 mΩ

### Description

This N-Channel MOSFET is produced using ON Semiconductor's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

### Features

- Max  $R_{DS(on)}$  = 1.75 mΩ at  $V_{GS} = 10$  V,  $I_D = 100$  A
- Max  $R_{DS(on)}$  = 1.7 mΩ at  $V_{GS} = 12$  V,  $I_D = 100$  A
- Max  $R_{DS(on)}$  = 1.65 mΩ at  $V_{GS} = 15$  V,  $I_D = 100$  A
- Max  $R_{DS(on)}$  = 4.4 mΩ at  $V_{GS} = 6$  V,  $I_D = 63$  A
- 50% Lower  $Q_{rr}$  than Other MOSFET Suppliers
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested

### Applications

- Industrial Motor Drive
- Industrial Power Supply
- Industrial Automation
- Battery Operated Tools
- Battery Protection
- Solar Inverters
- UPS and Energy Inverters
- Energy Storage
- Load Switch

### MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , Unless otherwise specified)

Symbol	Parameter	Ratings	Unit
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current Continuous ( $T_C = 25^\circ\text{C}$ ) (Note 5) Continuous ( $T_C = 100^\circ\text{C}$ ) (Note 5) Pulsed (Note 4)	268	A
		190	
		1390	
$E_{AS}$	Single Pulsed Avalanche Energy (Note 3)	595	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$ $T_A = 25^\circ\text{C}$ (Note 1a)	250	W
		3.8	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	°C

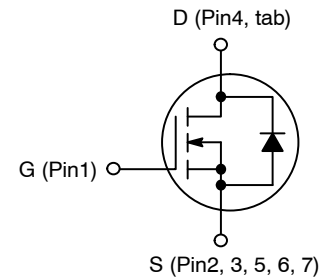
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



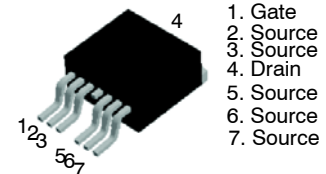
ON Semiconductor<sup>®</sup>

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$V_{DS}$	$I_D$ MAX	$r_{DS(on)}$ MAX
100 V	268 A	1.7 mΩ

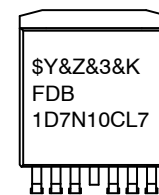


N-Channel MOSFET



D2PAK7 (TO-263 7 LD)  
CASE 418AY

### MARKING DIAGRAM



\$Y = ON Semiconductor Logo  
 &Z = Assembly Plant Code  
 &3 = Numeric Date Code  
 &K = Lot Code  
 FDB1D7N10CL7 = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

# FDB1D7N10CL7

## THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0 \text{ V}$	100	–	–	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	57	–	mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current Zero Gate Voltage Drain Current	$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0 \text{ V}$	–	–	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$	–	–	$\pm 100$	nA

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 700 \mu\text{A}$	2.0	3.1	4.0	V
$V_{GS(th)}/\Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 700 \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	–9	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 100 \text{ A}$	–	1.5	1.75	m $\Omega$
		$V_{GS} = 12 \text{ V}$ , $I_D = 100 \text{ A}$	–	1.4	1.7	
		$V_{GS} = 15 \text{ V}$ , $I_D = 100 \text{ A}$	–	1.33	1.65	
		$V_{GS} = 6 \text{ V}$ , $I_D = 63 \text{ A}$	–	2.2	4.4	
		$V_{GS} = 10 \text{ V}$ , $I_D = 100 \text{ A}$ , $T_J = 150^\circ\text{C}$	–	2.65	3.1	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5 \text{ V}$ , $I_D = 100 \text{ A}$	–	237	–	S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 50 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	–	8285	11600	pF
$C_{oss}$	Output Capacitance		–	5025	7035	pF
$C_{rss}$	Reverse Transfer Capacitance		–	50	80	pF
$R_g$	Gate Resistance		0.1	0.8	1.6	$\Omega$

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50 \text{ V}$ , $I_D = 100 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$	–	39	63	ns	
$t_r$	Rise Time		–	33	53	ns	
$t_{d(off)}$	Turn-Off Delay Time		–	85	136	ns	
$t_f$	Fall Time		–	36	58	ns	
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V to } 10 \text{ V}$	$V_{DD} = 50 \text{ V}$ , $I_D = 100 \text{ A}$	–	116	163	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V to } 6 \text{ V}$		–	74	104	nC
$Q_{gs}$	Gate to Source Gate Charge			–	37	–	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			–	24	–	nC
$Q_{oss}$	Output Charge	$V_{DD} = 50 \text{ V}$ , $V_{GS} = 0 \text{ V}$		–	333	–	nC

### SOURCE-DRAIN DIODE CHARACTERISTICS

$I_S$	Continuous Drain to Source Diode Forward Current	–	–	268	A	
$I_{SM}$	Pulsed Drain to Source Diode Forward Current	–	–	1390	A	
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$ , $I_S = 100 \text{ A}$ (Note 2)	–	0.9	1.2	V

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### SOURCE-DRAIN DIODE CHARACTERISTICS

$t_{rr}$	Reverse Recovery Time	$I_F = 50\text{ A}$ , $di/dt = 300\text{ A}/\mu\text{s}$	–	63	101	ns
$Q_{rr}$	Reverse Recovery Charge		–	186	298	nC
$t_{rr}$	Reverse Recovery Time	$I_F = 50\text{ A}$ , $di/dt = 1000\text{ A}/\mu\text{s}$	–	82	132	ns
$Q_{rr}$	Reverse Recovery Charge		–	869	1390	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.

- $R_{\theta JA}$  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  $R_{\theta CA}$  is determined by the user's board design.
  - $40^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.
  - $62.5^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.
- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.
- $E_{AS}$  of 595 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = 63\text{ A}$ ,  $V_{DD} = 90\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 91\text{ A}$ .
- Pulsed Id please refer to Figure "Forward Bias Safe Operating Area" for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

### PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB1D7N10CL7	FDB1D7N10CL7	D2-PAK-7L	330 mm	24 mm	800 Units

# FDB1D7N10CL7

## TYPICAL CHARACTERISTICS

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

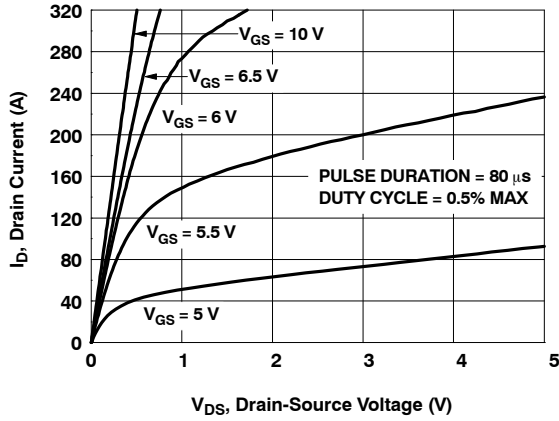


Figure 1. On-Region Characteristics

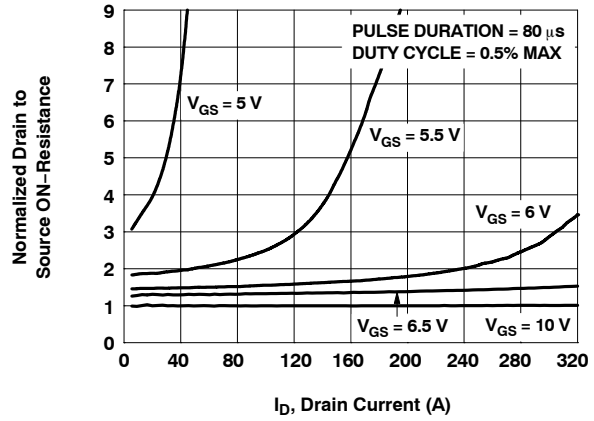


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

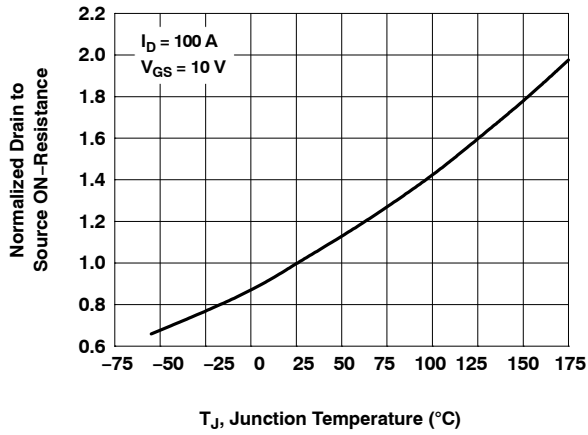


Figure 3. Normalized On-Resistance vs. Junction Temperature

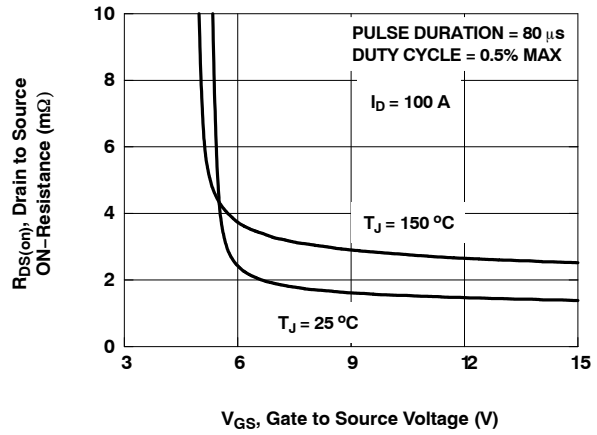


Figure 4. On-Resistance vs. Gate to Source Voltage

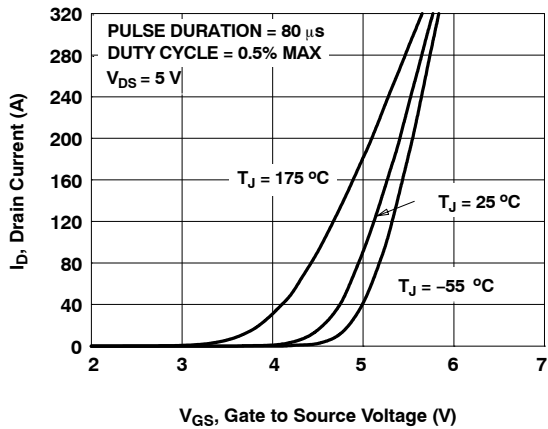


Figure 5. Transfer Characteristics

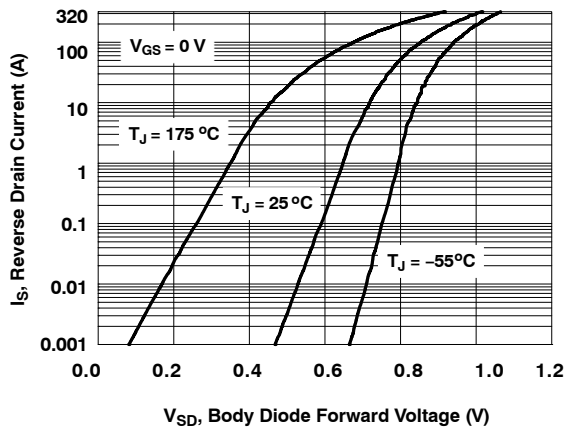


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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## TYPICAL CHARACTERISTICS (Continued)

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

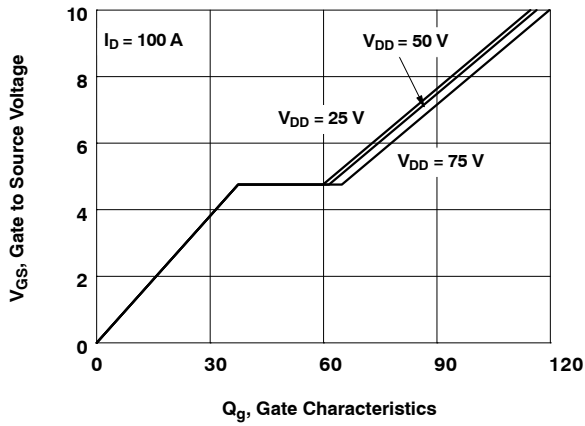


Figure 7. Gate Charge Characteristics

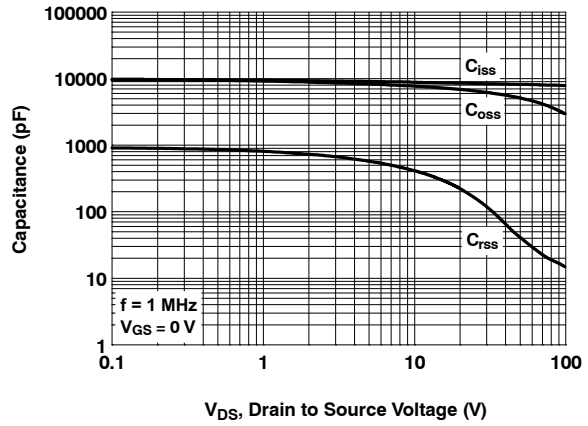


Figure 8. Capacitance vs. Drain to Source Voltage

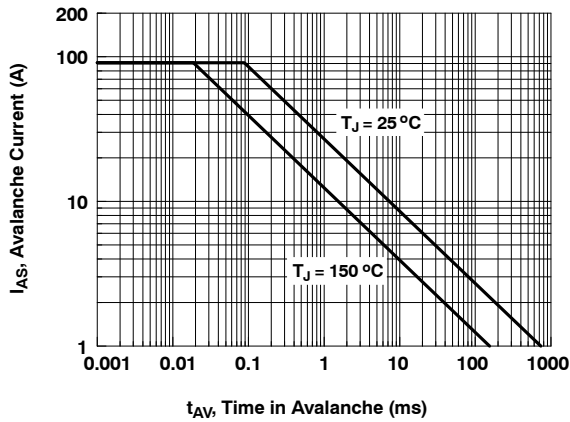


Figure 9. Unclamped Inductive Switching Capability

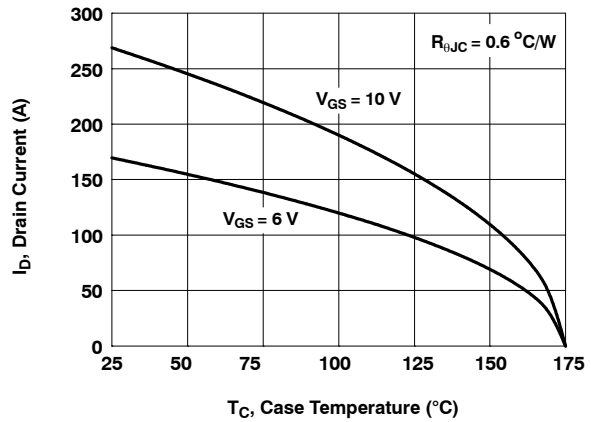


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

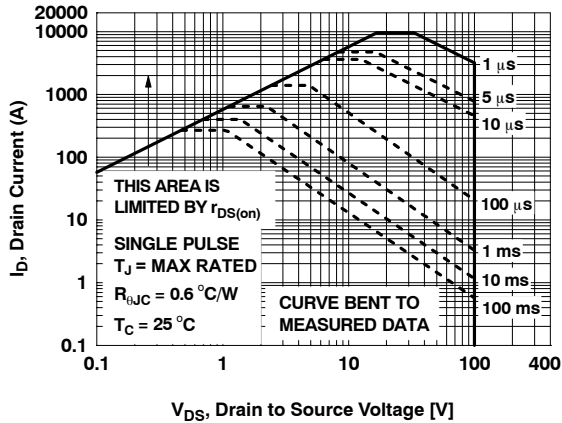


Figure 11. Forward Bias Safe Operating Area

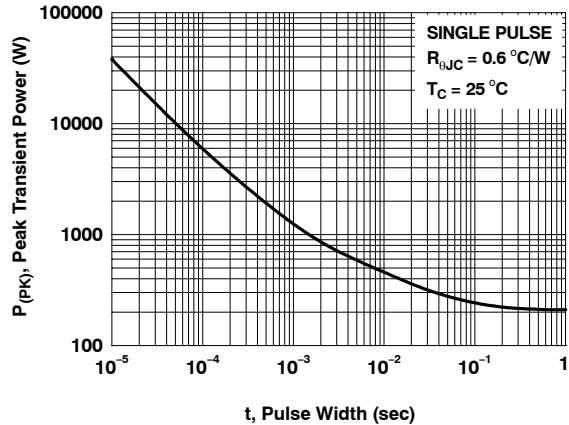


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS (Continued)

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

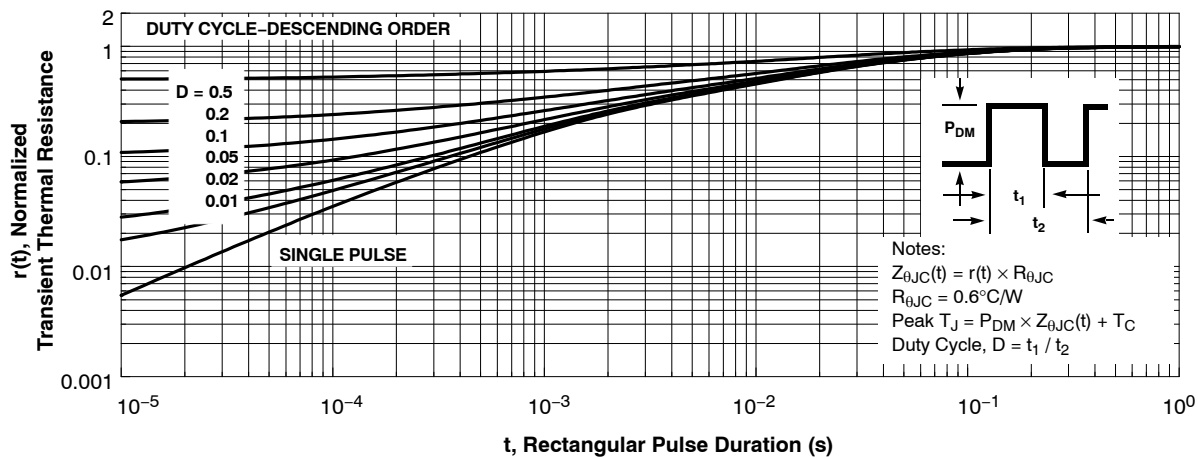


Figure 13. Normalized Max Junction to Case Transient Thermal Response Curve

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# MECHANICAL CASE OUTLINE

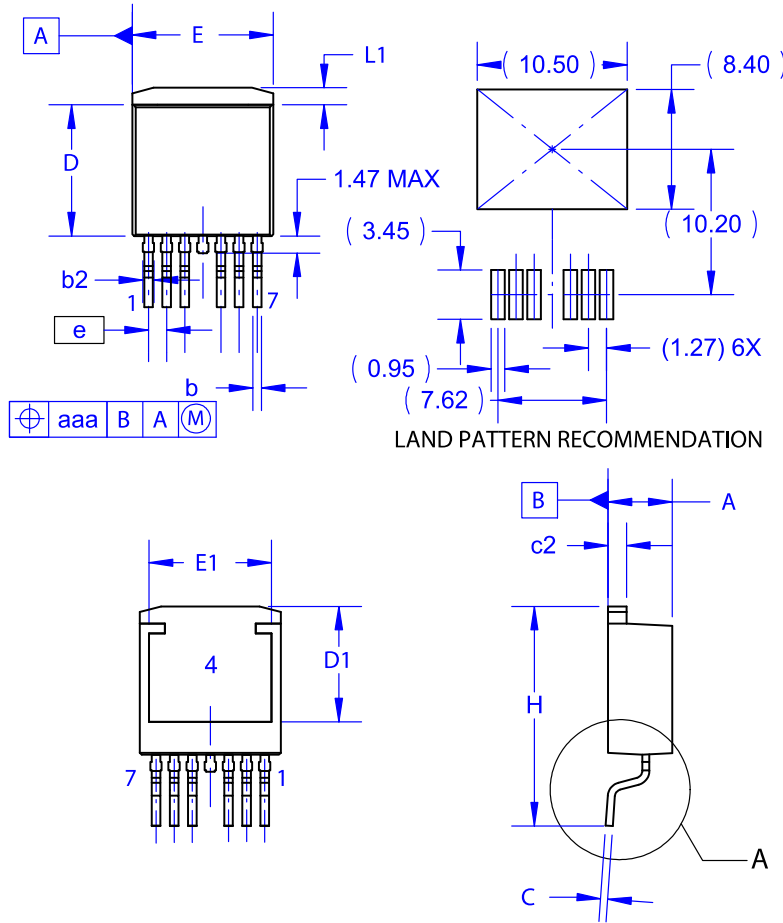
## PACKAGE DIMENSIONS

ON Semiconductor®



### D2PAK7 (TO-263 7 LD) CASE 418AY ISSUE C

DATE 15 JUL 2019

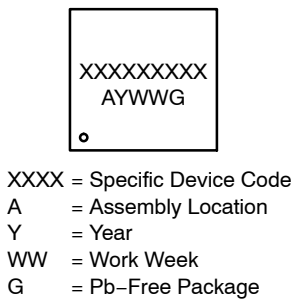


**NOTES:**

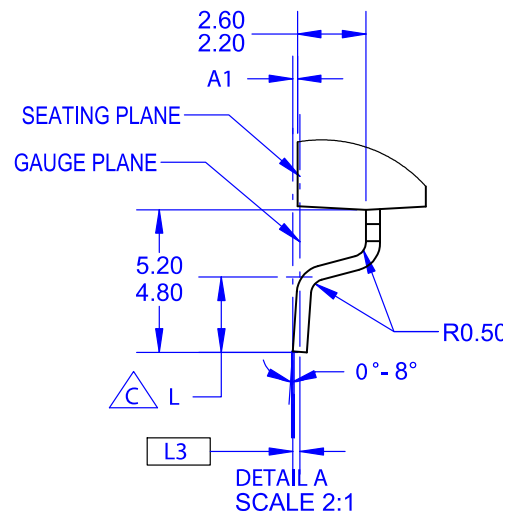
- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. OUT OF JEDEC STANDARD VALUE.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- F. LAND PATTERN RECOMMENDATION PER IPC-TO127P1524X465-8N.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.70	0.80	0.90
b	0.50	0.60	0.70
c	0.40	0.50	0.60
c2	1.20	1.30	1.40
D	9.00	9.20	9.40
D1	7.70	~	~
E	9.70	9.90	10.20
E1	8.38	8.58	8.78
e	~	1.27	~
H	15.10	15.40	15.70
L	2.44	2.64	2.84
L1	1.00	1.20	1.40
L3	~	0.25	~
aaa	~	~	0.25

**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.



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