DATA SHEET
www.onsemi.com

MOSFET – N-Channel, POWERTRENCH®, DUAL COOL® 88

150 V, 72 A, 9.0 mΩ

FDMT800152DC

General Description

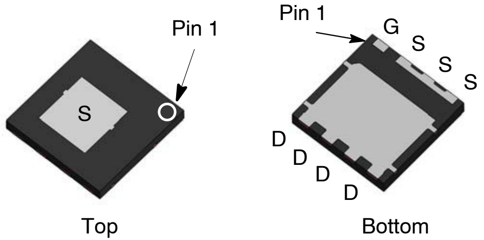
This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH process. Advancements in both silicon and DUAL COOL package technologies have been combined to offer the lowest $R_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction−to−Ambient thermal resistance.

Features

- Max $R_{DS(on)}$ = 9.0 mΩ at V_{GS} = 10 V, I_D = 13 A
- Max $R_{DS(on)}$ = 11.5 mΩ at V_{GS} = 6 V, I_D = 11 A
- Advanced Package and Silicon Combination for Low $R_{DS(on)}$ and High Efficiency
- Next Generation Enhanced Body Diode Technology, Engineered for Soft Recovery
- Low Profile 8x8 mm MLP Package
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

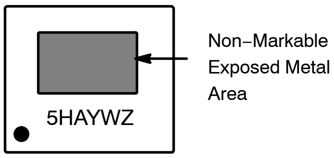
Applications

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

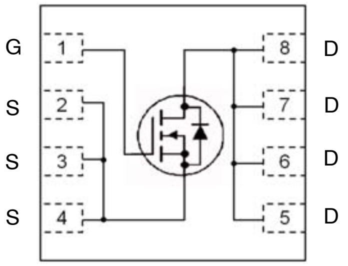


PQFN8 8X8, 2P
(DUAL COOL 88)
CASE 483AQ

MARKING DIAGRAM



5H	= Specific Device Code
A	= Assembly Plant Code
YW	= Date Code (Year & Week)
Z	= Lot Code



ORDERING INFORMATION

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

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter				Rating	Unit
V_{DS}	Drain to Source Voltage				150	V
V_{GS}	Gate to Source Voltage				±20	V
I_D	Drain Current	− Continuous	T_C = 25°C	(Note 5)	72	A
		− Continuous	T_C = 100°C	(Note 5)	45	
		− Continuous	T_A = 25°C	(Note 1a)	13	
		− Pulsed		(Note 4)	413	
E_{AS}	Single Pulse Avalanche Energy			(Note 3)	726	mJ
P_D	Power Dissipation		T_C = 25°C		113	W
	Power Dissipation		T_A = 25°C	(Note 1a)	3.2	
T_J, T_{STG}	Operating and Storage Junction Temperature Range				−55 to +150	°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.

October, 2023 − Rev. 2

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	114	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	2.9	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	−11	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 13 A	–	6.9	9.0	mΩ
		V_{GS} = 6 V, I_D = 11 A	–	8.6	11.5	
		V_{GS} = 10 V, I_D = 13 A, T_J = 125°C	–	14.6	19	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 13 A	–	41	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz	–	4196	5875	pF
C_{oss}	Output Capacitance		–	379	530	pF
C_{rss}	Reverse Transfer Capacitance		–	16	30	pF
R_g	Gate Resistance		0.1	1.3	3.3	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 75 V, I_D = 13 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	24	39	ns
t_r	Rise Time		–	13	23	ns
$t_{d(off)}$	Turn−Off Delay Time		–	36	58	ns
t_f	Fall Time		–	7.9	16	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 75 V, I_D = 13 A	–	59	83	nC
		V_{GS} = 0 V to 6 V, V_{DD} = 75 V, I_D = 13 A	–	38	53	
Q_{gs}	Gate to Source Charge	V_{DD} = 75 V, I_D = 13 A	–	18	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	12	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.9 A (Note 2)	–	0.7	1.1	V
		V_{GS} = 0 V, I_S = 13 A (Note 2)	–	0.8	1.2	
t_{rr}	Reverse Recovery Time	I_F = 13 A, di/dt = 100 A/μs	–	95	152	ns
Q_{rr}	Reverse Recovery Charge		–	187	299	nC

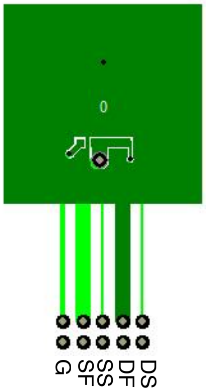
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

THERMAL CHARACTERISTICS

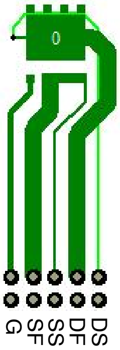
Symbol	Parameter		Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	2.0	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	1.1	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	34	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1e)	14	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1f)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1g)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1h)	60	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)	15	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)	21	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)	9	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1l)	11	

NOTES:

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



a) 38°C/W when mounted on a 1 in^2 pad of 2 oz copper.



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

c) Still air, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper
d) Still air, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
e) Still air, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper
f) Still air, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper
g) 200FPM Airflow, No Heat Sink, 1 in^2 pad of 2 oz copper
h) 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
i) 200FPM Airflow, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper
j) 200FPM Airflow, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
k) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper
l) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 726 mJ is based on starting T_J = 25°C; N−ch: L = 3 mH, I_{AS} = 22 A, V_{DD} = 150 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 69 A.
4. Pulsed Id please refer to Figure 11 SOA graph for more details.
5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro−mechanical application board design.

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

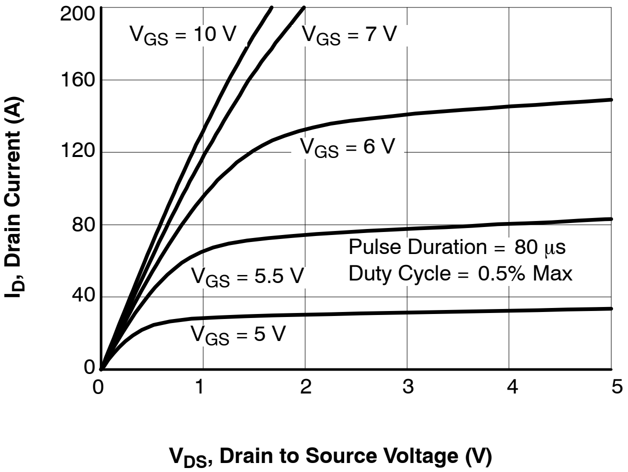


Figure 1. On−Region Characteristics

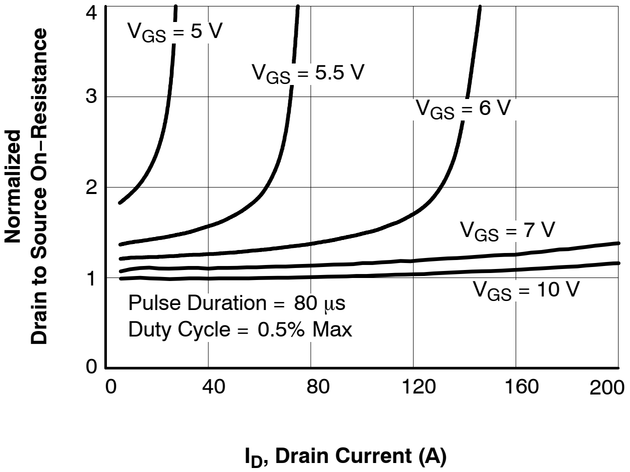


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

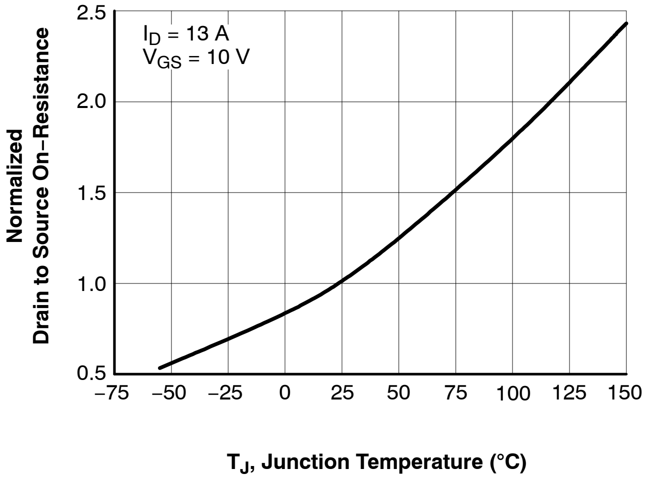


Figure 3. Normalized On−Resistance vs. Junction Temperature

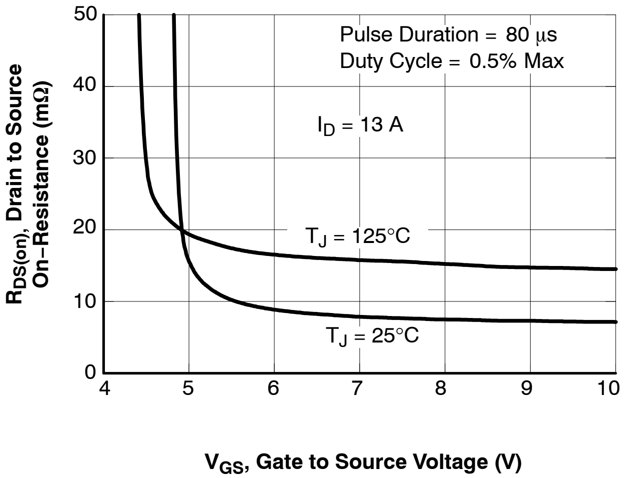


Figure 4. On−Resistance vs. Gate to Source Voltage

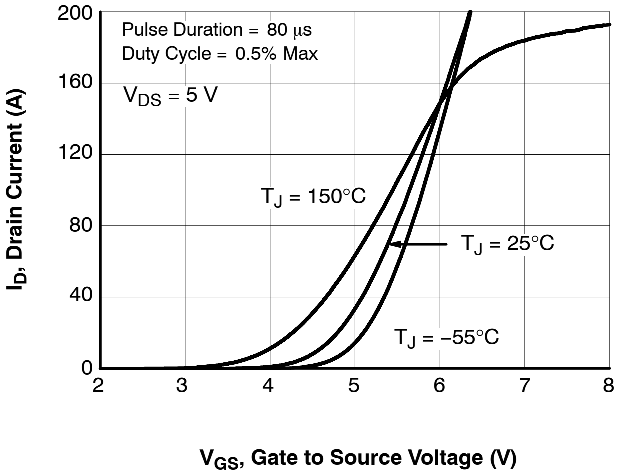


Figure 5. Transfer Characteristics

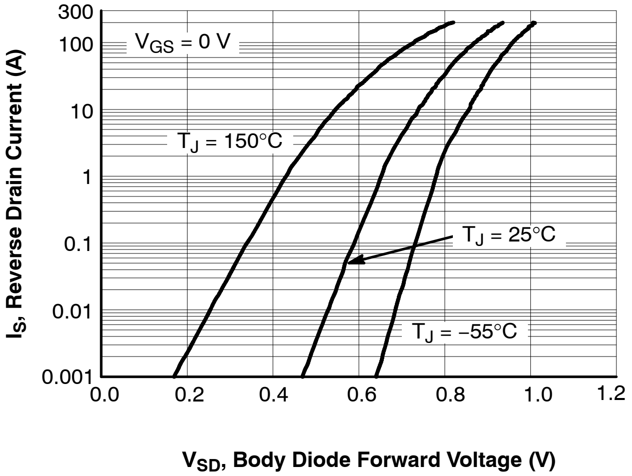


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)(continue)

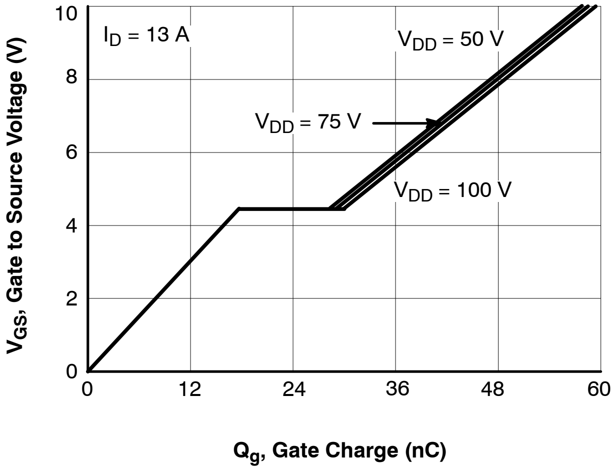


Figure 7. Gate Charge Characteristics

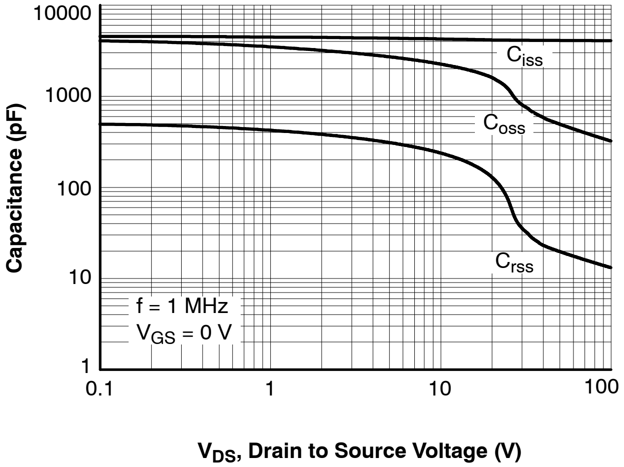


Figure 8. Capacitance vs. Drain to Source Voltage

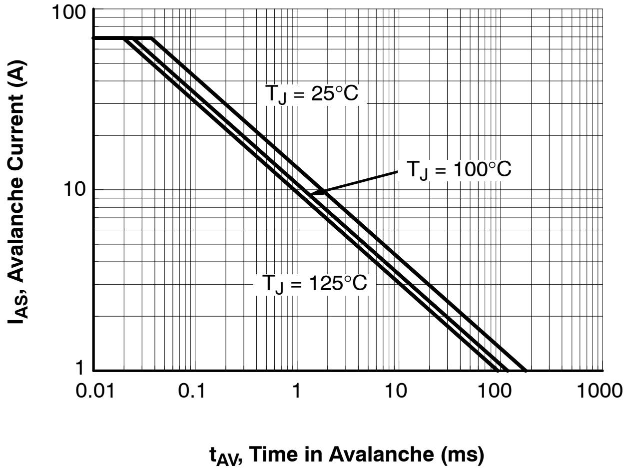


Figure 9. Unclamped Inductive Switching Capability

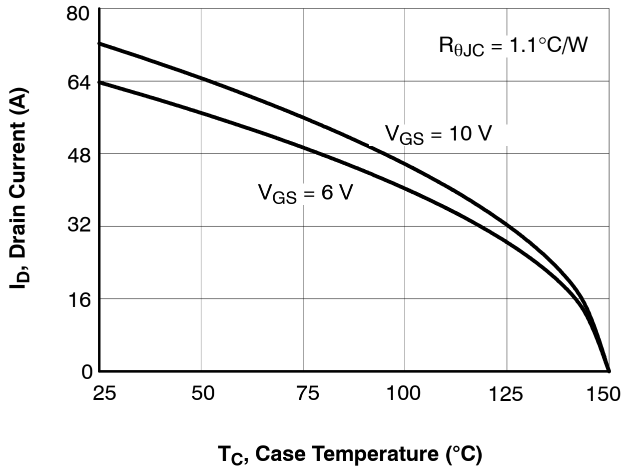


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

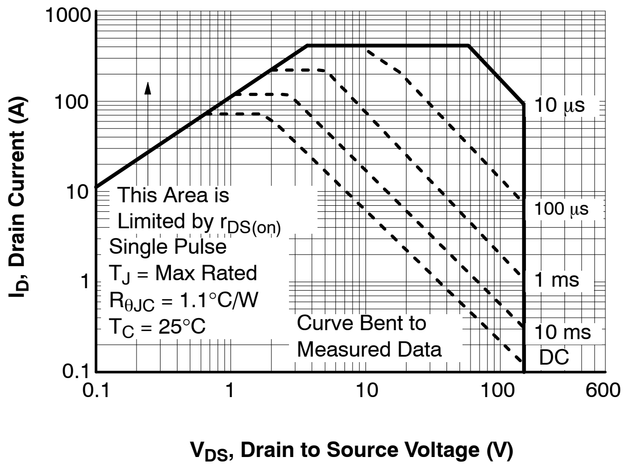


Figure 11. Forward Bias Safe Operating Area

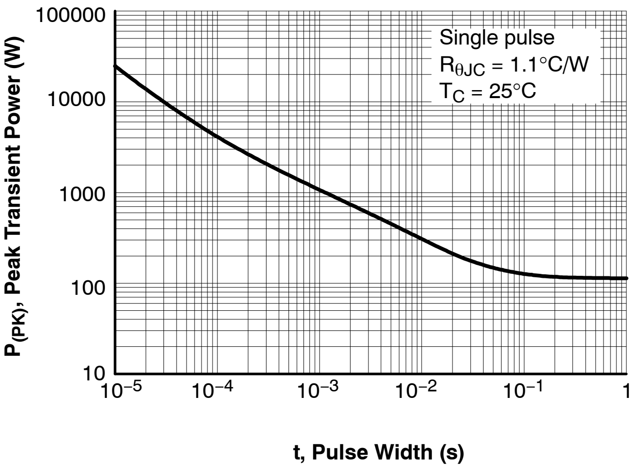


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

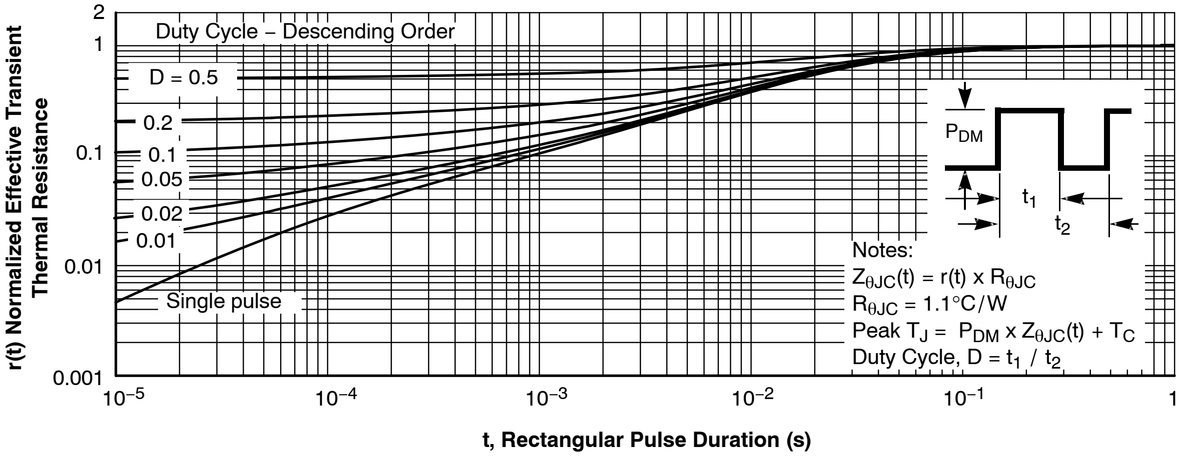
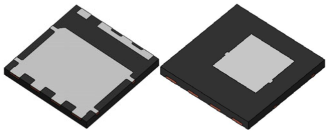


Figure 13. Junction−to−Case Transient Thermal Response Curve

ORDERING INFORMATION

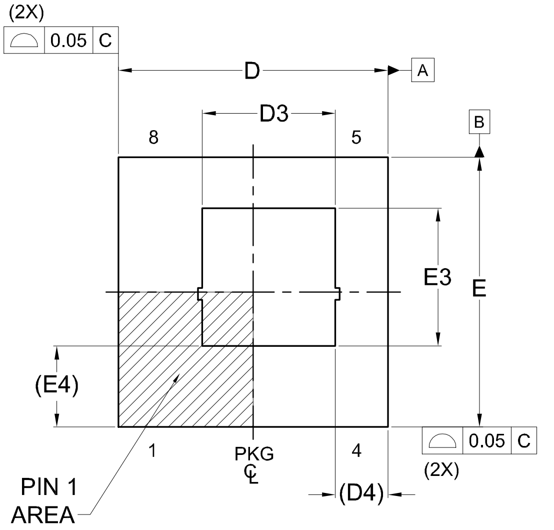
Device Marking	Device	Package	Reel Size	Tape Width	Shipping†
800152DC	FDMT800152DC	PQFN8 8X8, 2P, DUAL COOL 88	13”	13.3 mm	3000 / Tape & Reel

†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.

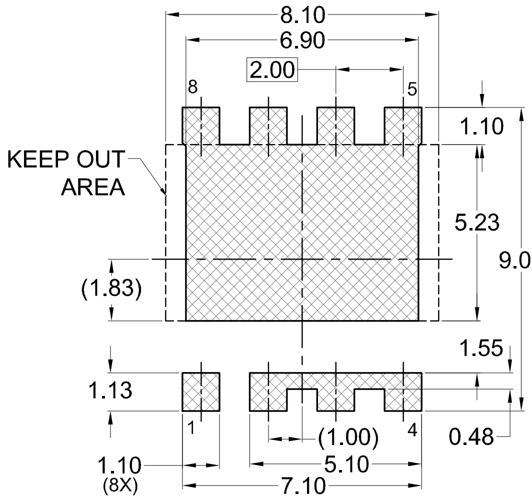


PQFN8 8X8, 2P
CASE 483AQ
ISSUE B

DATE 24 OCT 2022

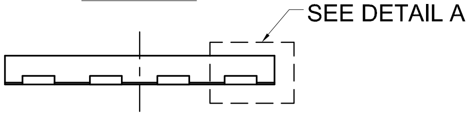


TOP VIEW

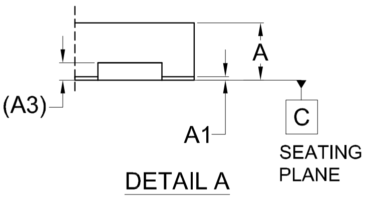


LAND PATTERN RECOMMENDATION

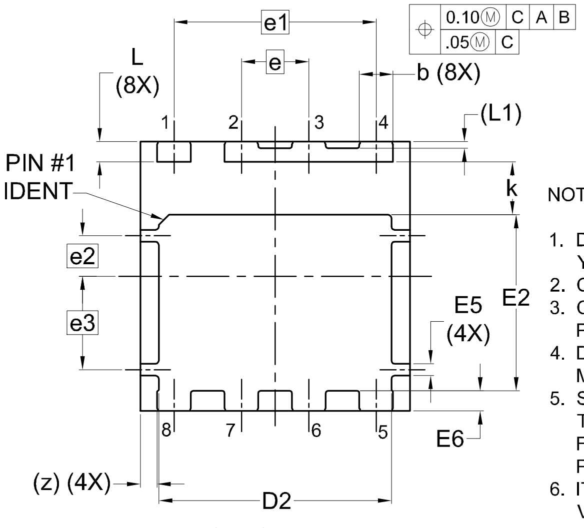
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.



FRONT VIEW



DETAIL A
SCALE: 2X



BOTTOM VIEW

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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.75	0.85	0.95
A1	0.00	-	0.05
A3	0.25 REF		
b	0.90	1.00	1.10
D	7.90	8.00	8.10
D2	6.80	6.90	7.00
D3	3.68	3.86	4.03
D4	1.56 REF		
E	7.90	8.00	8.10
E2	5.13	5.23	5.33
E3	3.99	4.09	4.19
E4	2.41 REF		
E5	0.35 REF		
E6	0.60 REF		
e	2.00 BSC		
e1	6.00 BSC		
e2	1.20 BSC		
e3	2.78 BSC		
k	1.48	1.58	1.68
L	0.50	0.60	0.70
L1	0.20 REF		
z	0.50 REF		

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