MOSFET – Dual, N & P-Channel, POWERTRENCH®

N-Channel: 150 V, 2.4 A, 155 mΩ
P-Channel: -150 V, -0.9 A, 1200 mΩ

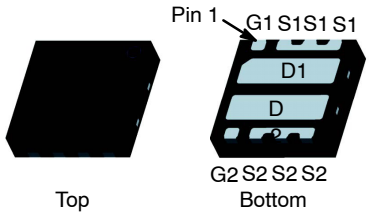
FDMC8097AC

N−Channel

V_{DS} MAX	$R_{DS(on)}$	I_D MAX
150 V	155 mΩ @ 10 V	2.4 A
	212 mΩ @ 6 V	

P−Channel

V_{DS} MAX	$R_{DS(on)}$	I_D MAX
−150 V	1200 mΩ @ −10 V	−0.9 A
	1400 mΩ @ −6 V	



WDFN8 3.3 × 3.3, 0.65P
(Power 33)
CASE 511DG

General Description

These dual N and P−Channel enhancement mode Power MOSFETs are produced using **onsemi**'s advanced POWERTRENCH process that has been especially tailored to minimize on−state resistance and yet maintain superior switching performance. Shrinking the area needed for implementation of active clamp topology; enabling best in class power density.

Features

Q1: N−Channel

- Max $R_{DS(on)}$ = 155 mΩ at V_{GS} = 10 V, I_D = 2.4 A
- Max $R_{DS(on)}$ = 212 mΩ at V_{GS} = 6 V, I_D = 2 A

Q2: P−Channel

- Max $R_{DS(on)}$ = 1200 mΩ at V_{GS} = −10 V, I_D = −0.9 A
- Max $R_{DS(on)}$ = 1400 mΩ at V_{GS} = −6 V, I_D = −0.8 A
- Optimised for Active Clamp Forward Converters
- Pb−Free, Halide Free and RoHS Compliant

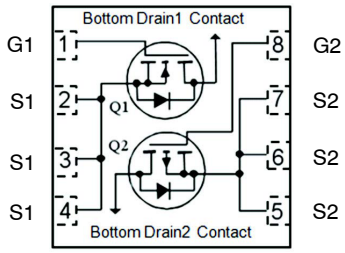
Applications

- DC−DC Converter
- Active Clamp

MARKING DIAGRAM

Z = Assembly Plant Code
XYY = 3−Digit Date Code Format
KK = 2−Alphanumeric Lot Run Traceability Code
FDMC8097AC = Specific Device Code

PIN ASSIGNMENT



ORDERING INFORMATION

Device	Package	Shipping†
FDMC8097AC	WDFN8 (Pb−Free, Halide Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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

Symbol	Parameter			Q1	Q2	Unit
V_{DS}	Drain to Source Voltage			150	−150	V
V_{GS}	Gate to Source Voltage			±20	±25	V
I_D	Drain Current	Continuous (Note 5)	T_C = 25°C	6.3	−2.0	A
		Continuous (Note 5)	T_C = 100°C	3.9	−1.2	
		Continuous	T_A = 25°C	2.4 (Note 1a)	−0.9 (Note 1b)	
		Pulsed (Note 4)		33	−8.8	
E_{AS}	Single Pulse Avalanche Energy (Note 3)			24	6	mJ
P_D	Power Dissipation for Single Operation		T_A = 25°C	1.9 (Note 1a)	1.9 (Note 1b)	W
			T_A = 25°C	0.8 (Note 1c)	0.8 (Note 1d)	
			T_C = 25°C	14	10	
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.

THERMAL CHARACTERISTICS

Symbol	Characteristic	Q1	Q2	Unit
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	65 (Note 1a)	65 (Note 1b)	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	155 (Note 1c)	155 (Note 1d)	
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case	8.9	12.5	

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

Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V I_D = −250 μA, V_{GS} = 0 V	Q1 Q2	150 −150	– –	– –	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = −250 μA, referenced to 25°C	Q1 Q2	– –	98 122	– –	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V V_{DS} = −120 V, V_{GS} = 0 V	Q1 Q2	– –	– –	1 −1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V V_{GS} = ±25 V, V_{DS} = 0 V	Q1 Q2	– –	– –	±100 ±100	nA
ON CHARACTERISTICS							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA V_{GS} = V_{DS}, I_D = −250 μA	Q1 Q2	2.0 −2.0	3.1 −3.0	4.0 −4.0	V
$\Delta V_{GS(th)}$ / ΔT_J	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = −250 μA, referenced to 25°C	Q1 Q2	– –	−9 −6	– –	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.4 A V_{GS} = 6 V, I_D = 2 A V_{GS} = 10 V, I_D = 2.4 A, T_J = 125°C	Q1	– – –	124 155 245	155 212 306	mΩ
		V_{GS} = −10 V, I_D = −0.9 A V_{GS} = −6 V, I_D = −0.8 A V_{GS} = −10 V, I_D = −0.9 A, T_J = 125°C	Q2	– –	930 1030 1682	1200 1400 2171	
g_{FS}	Forward Transconductance	V_{DD} = 10 V, I_D = 2.4 A V_{DD} = −10 V, I_D = −0.9 A	Q1 Q2	– –	6.4 0.75	– –	S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	Q1 V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz Q2 V_{DS} = −75 V, V_{GS} = 0 V, f = 1 MHz	Q1 Q2	– –	279 162	395 230	pF
C_{oss}	Output Capacitance		Q1 Q2	– –	26 13	40 25	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2	– –	1.4 0.6	5 5	pF
R_g	Gate Resistance		Q1 Q2	0.1 0.1	0.6 3.3	1.5 8.3	Ω
SWITCHING CHARACTERISTICS							
$t_{d(on)}$	Turn−On Delay Time	Q1 V_{DD} = 75 V, I_D = 2.4 A, V_{GS} = 10 V, R_{GEN} = 6 Ω Q2 V_{DD} = −75 V, I_D = −0.9 A, V_{GS} = −10 V, R_{GEN} = 6 Ω	Q1 Q2	– –	5.4 5.2	11 11	ns
t_r	Rise Time		Q1 Q2	– –	1.3 1.6	10 10	ns
$t_{d(off)}$	Turn−Off Delay Time		Q1 Q2	– –	9.1 7.4	18 15	ns
t_f	Fall Time		Q1 Q2	– –	2.2 6.3	10 13	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V V_{GS} = 0 V to −10 V Q1 V_{DD} = 75 V, I_D = 2.4 A	Q1 Q2	– –	4.4 2.8	6.2 4.0	nC
		V_{GS} = 0 V to 6 V V_{GS} = 0 V to −6 V Q2 V_{DD} = −75 V I_D = −0.9 A	Q1 Q2	– –	2.9 1.8	4.1 2.6	nC
Q_{gs}	Gate to Source Charge	Q1 V_{DD} = 75 V, I_D = 2.4 A Q2 V_{DD} = −75 V I_D = −0.9 A	Q1 Q2	– –	1.3 0.8	– –	nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1 Q2	– –	1.0 0.7	– –	nC

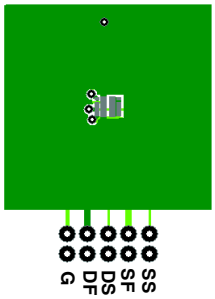
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS							
V_{SD}	Source−Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.4 A (Note 2) V_{GS} = 0 V, I_S = −0.9 A (Note 2)	Q1 Q2	− −	0.8 −0.9	1.3 −1.3	V
t_{rr}	Reverse Recovery Time	Q1 I_F = 2.4 A, di/dt = 100 A/s	Q1 Q2	− −	50 44	80 71	ns
Q_{rr}	Reverse Recovery Charge	Q2 I_F = −0.9 A, di/dt = 100 A/s	Q1 Q2	− −	43 68	69 109	nC

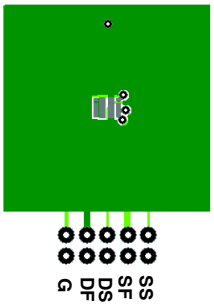
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

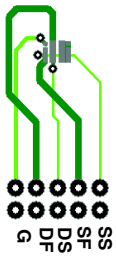
1. $R_{\theta JA}$ is determined with the device mounted on a 1in2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 65°C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 65°C/W when mounted on a 1 in^2 pad of 2 oz copper.



c) 155°C/W when mounted on a minimum pad of 2 oz copper.

d) 155°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Q1: E_{AS} of 24 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = 4 A, V_{DD} = 150 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 14 A.
   Q2: E_{AS} of 6 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = −2 A, V_{DD} = −150 V, V_{GS} = −10 V. 100% test at L = 0.1 mH, I_{AS} = −8 A.
4. Q1: Pulsed Id please refer to Fig 11 SOA graph for more details.
   Q2: Pulsed Id please refer to Fig 24 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 (Q1 N−CHANNEL)

(T_J = 25°C unless otherwise noted)

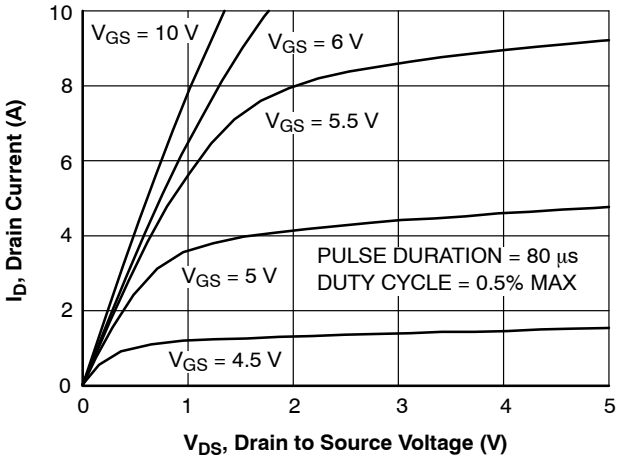


Figure 1. On−Region Characteristics

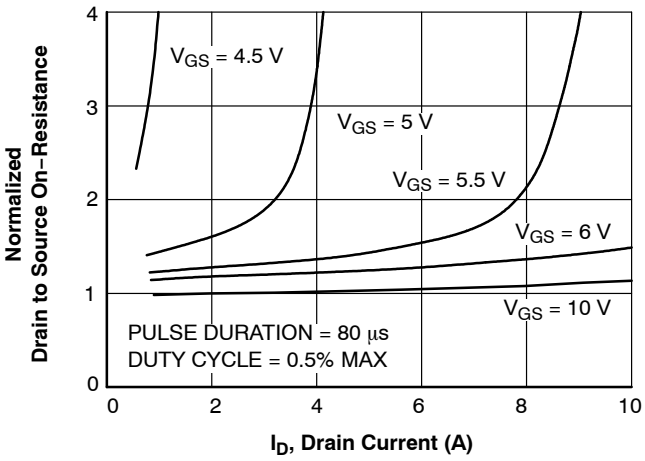


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

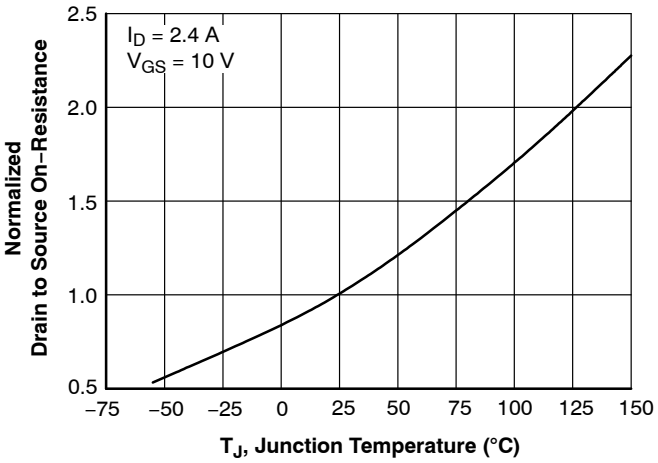


Figure 3. Normalized On−Resistance vs. Junction Temperature

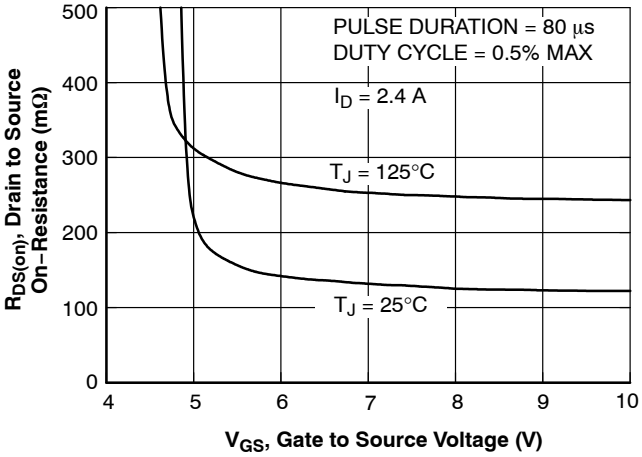


Figure 4. On−Resistance vs. Gate to Source Voltage

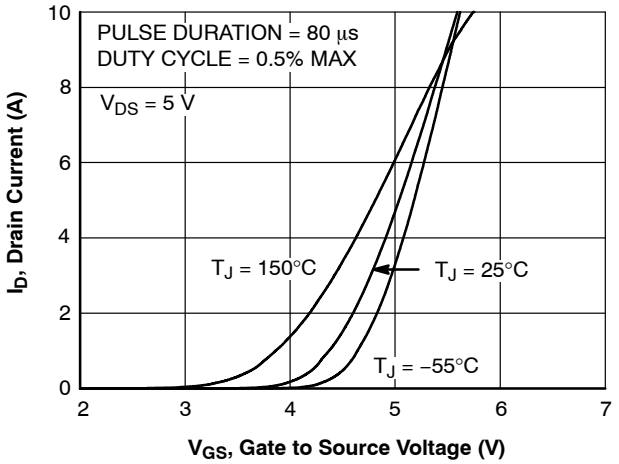


Figure 5. Transfer Characteristics

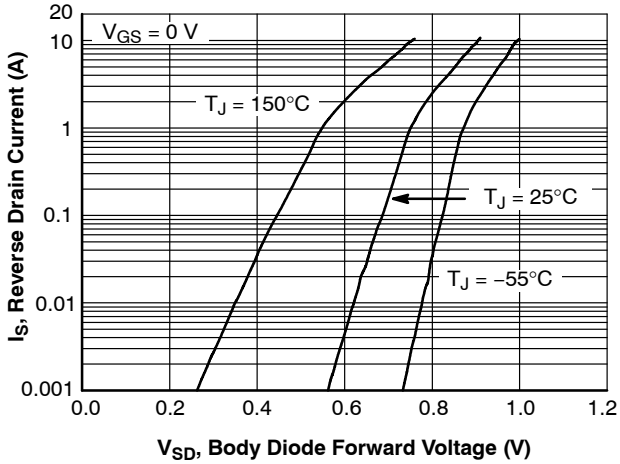


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q1 N−CHANNEL) (continued)

(T_J = 25°C unless otherwise noted)

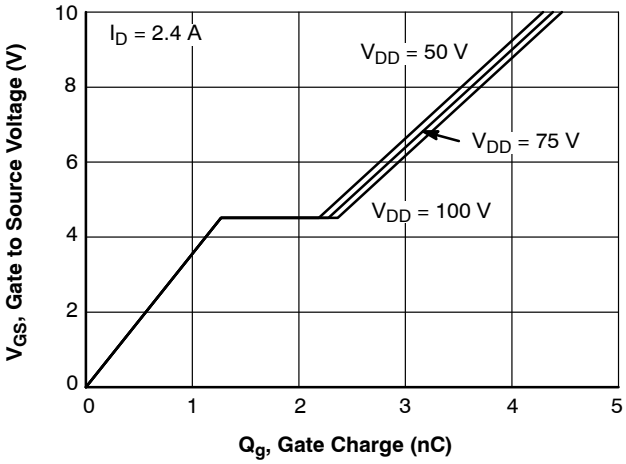


Figure 7. Gate Charge Characteristics

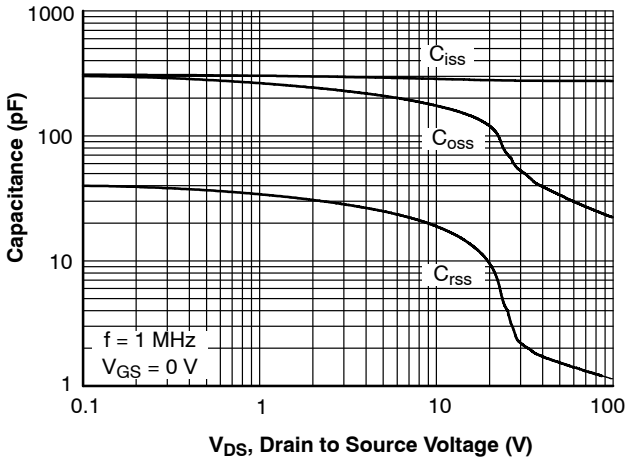


Figure 8. Capacitance vs. Drain to Source Voltage

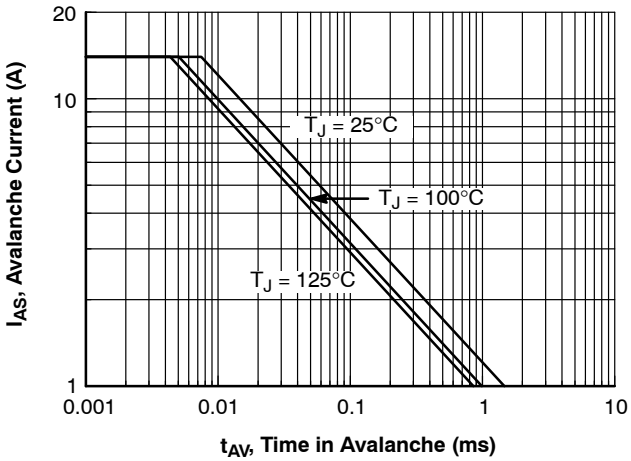


Figure 9. Unclamped Inductive Switching Capability

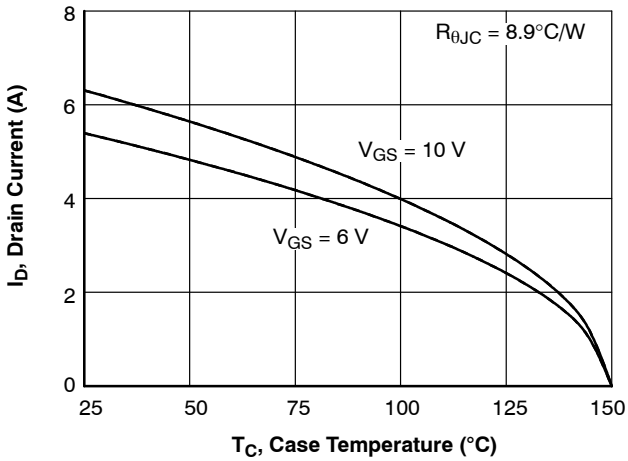


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

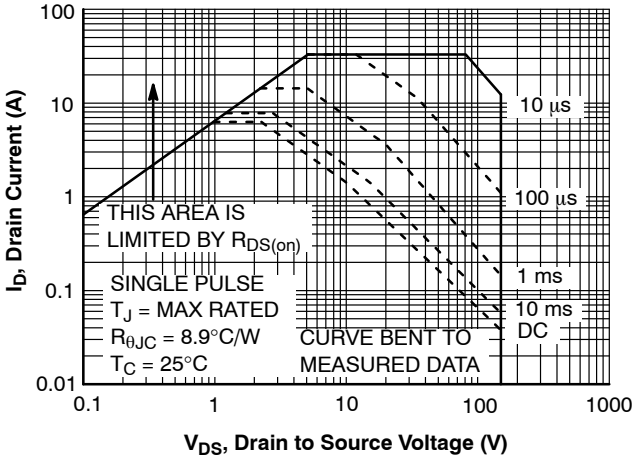


Figure 11. Forward Bias Safe Operating Area

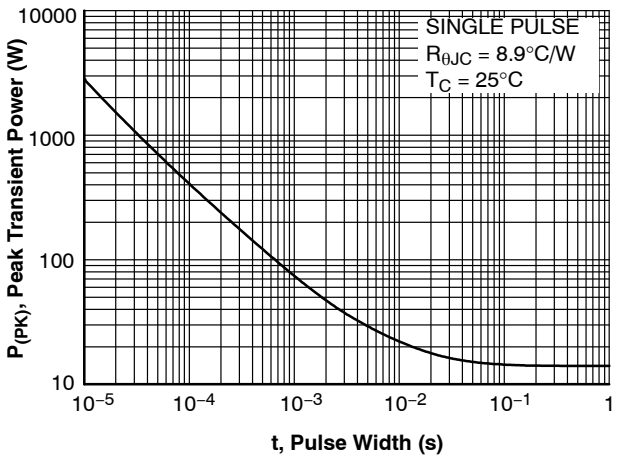


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (Q1 N−CHANNEL) (continued)

(T_J = 25°C unless otherwise noted)

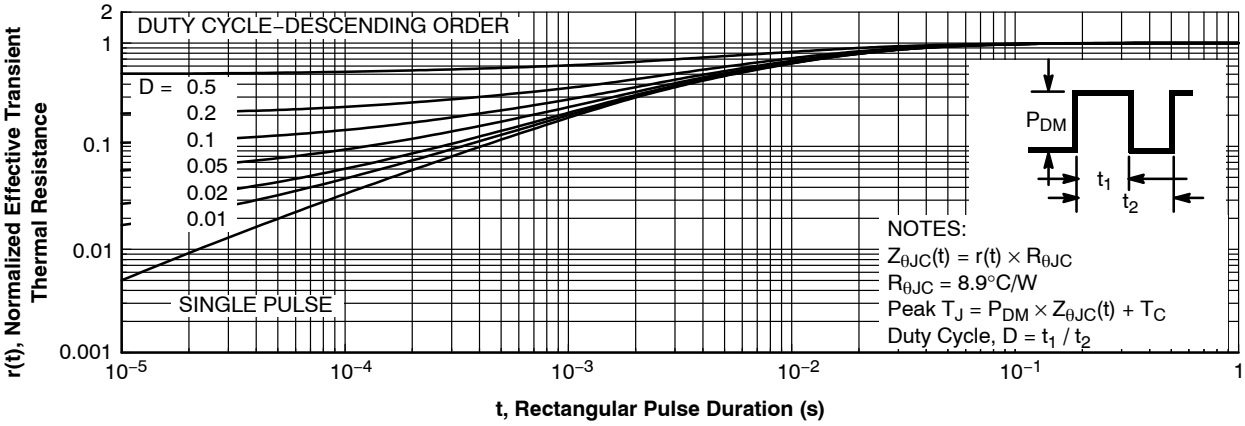


Figure 13. Junction−to−Case Transient Thermal Response Curve

TYPICAL CHARACTERISTICS (Q2 P−CHANNEL)

(T_J = 25°C unless otherwise noted)

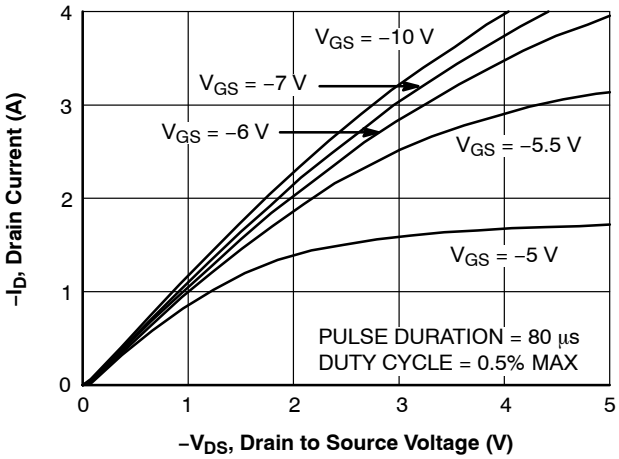


Figure 14. On−Region Characteristics

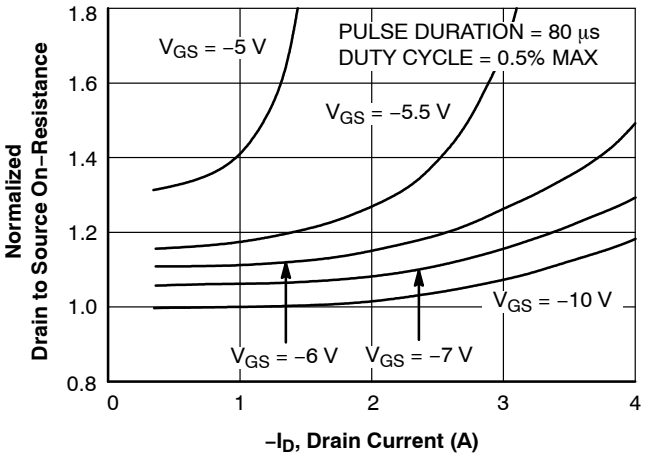


Figure 15. Normalized On−Resistance vs. Drain Current and Gate Voltage

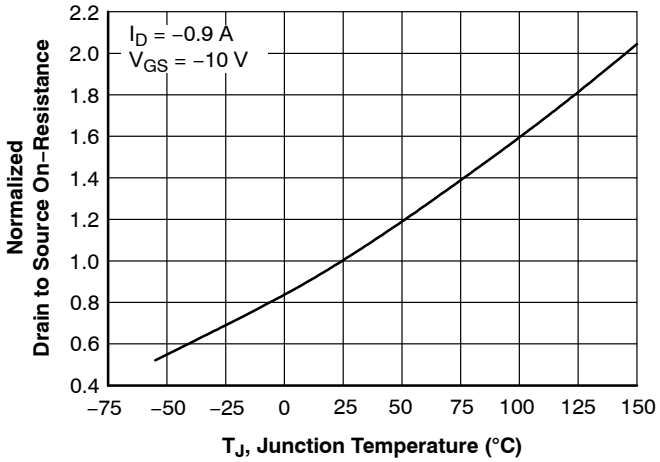


Figure 16. Normalized On−Resistance vs. Junction Temperature

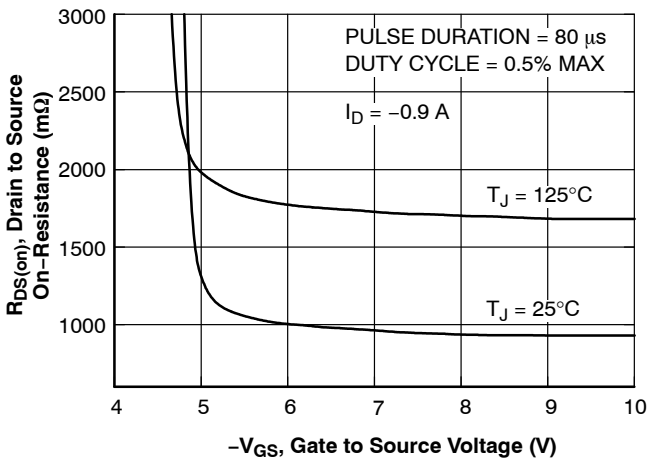


Figure 17. On−Resistance vs. Gate to Source Voltage

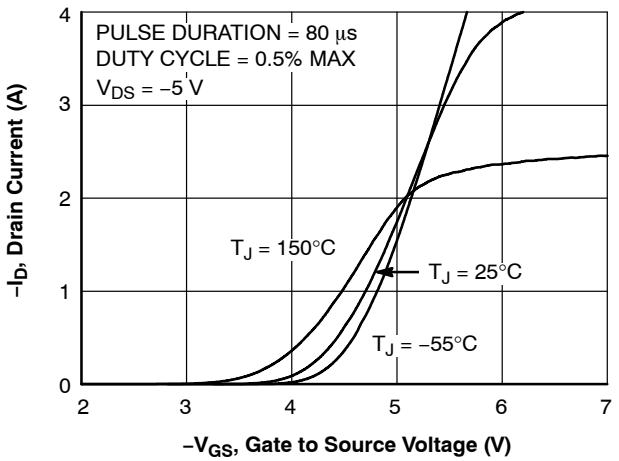


Figure 18. Transfer Characteristics

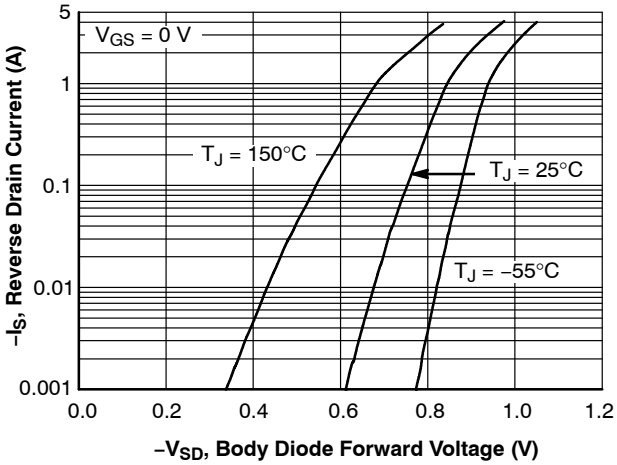


Figure 19. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q2 P−CHANNEL) (continued)

(T_J = 25°C unless otherwise noted)

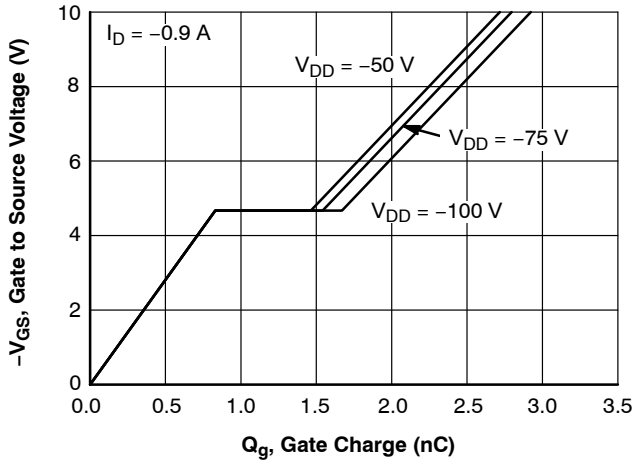


Figure 20. Gate Charge Characteristics

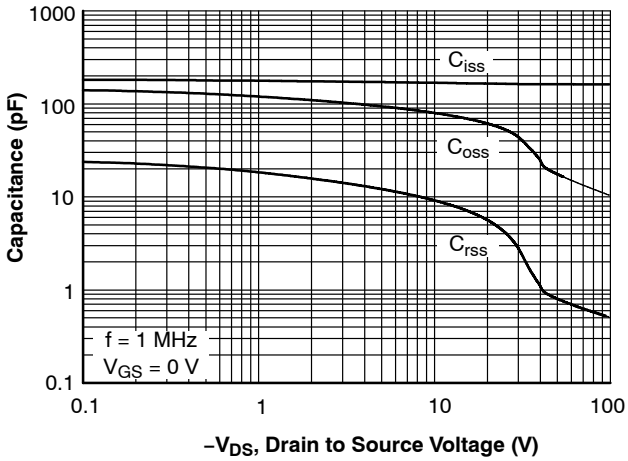


Figure 21. Capacitance vs. Drain to Source Voltage

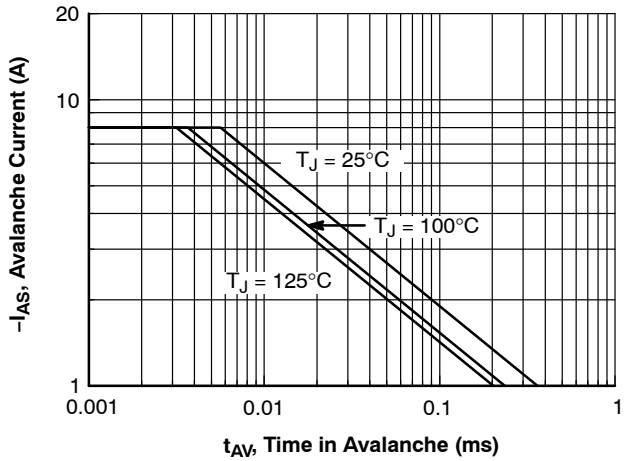


Figure 22. Unclamped Inductive Switching Capability

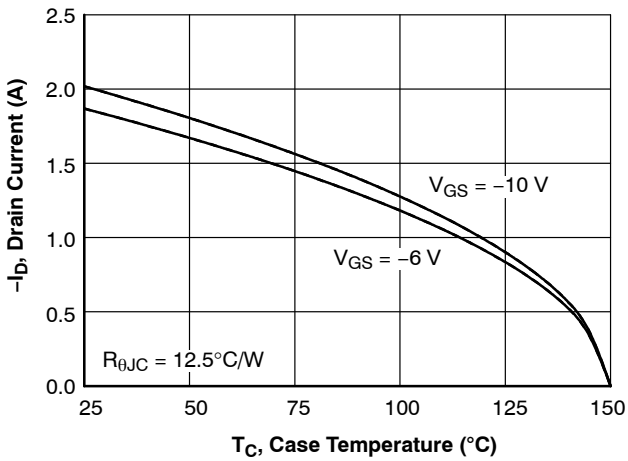


Figure 23. Maximum Continuous Drain Current vs. Case Temperature

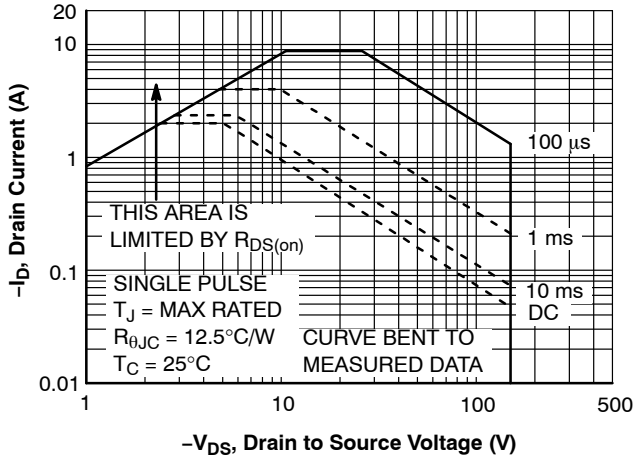


Figure 24. Forward Bias Safe Operating Area

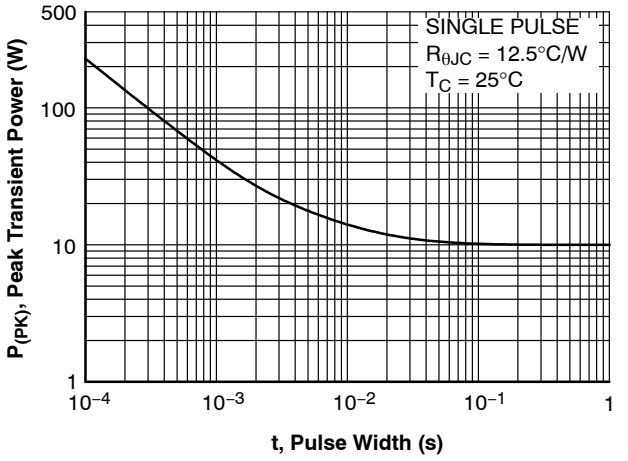


Figure 25. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (Q2 P−CHANNEL) (continued)

(T_J = 25°C unless otherwise noted)

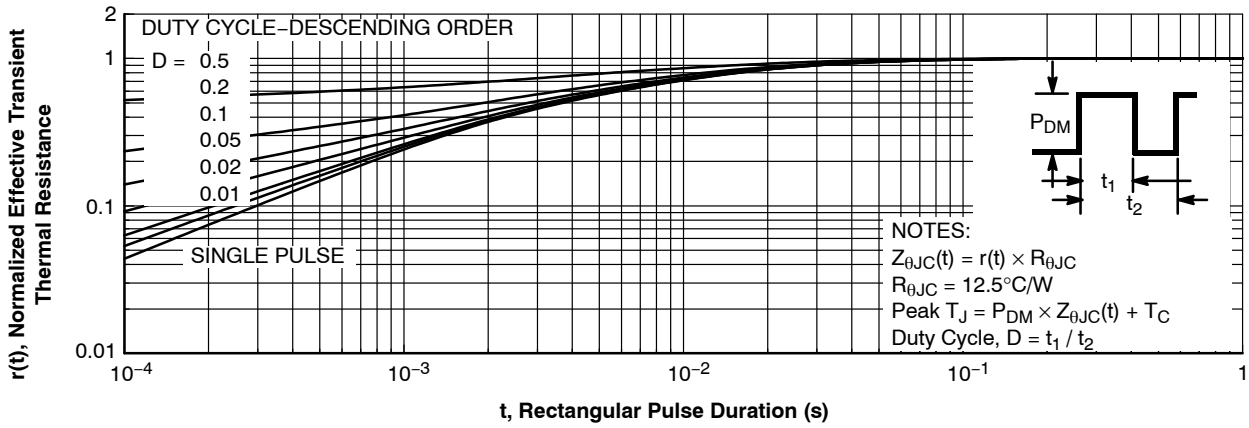
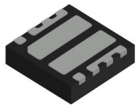
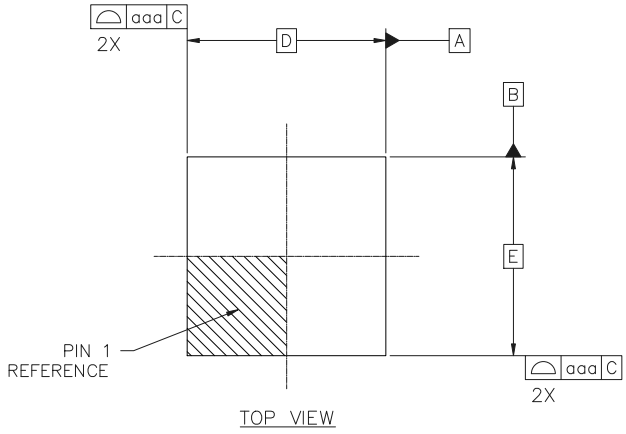


Figure 26. Junction−to−Case Transient Thermal Response Curve

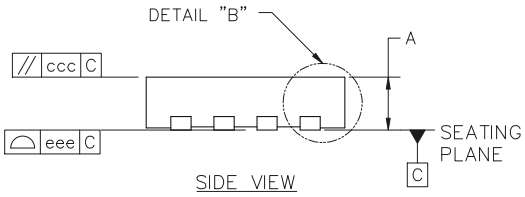


WDFN8 3.00x3.00x0.75, 0.65P
CASE 511DG
ISSUE B

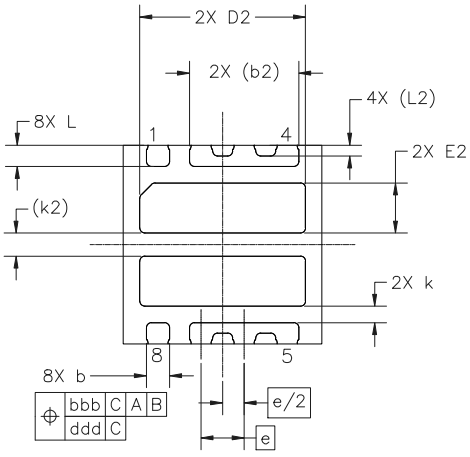
DATE 15 NOV 2024



TOP VIEW

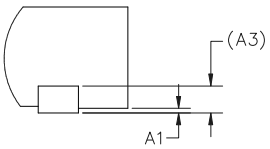


SIDE VIEW

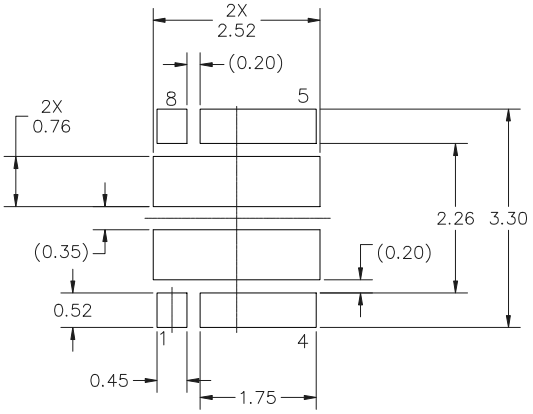


BOTTOM VIEW

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	---	0.05
A3	0.20 REF		
b	0.30	0.35	0.40
b2	1.65 REF		
D	3.00 BSC		
D2	2.45	2.50	2.55
E	3.00 BSC		
E2	0.71	0.76	0.81
e	0.65 BSC		
k	0.22	---	---
k2	0.35 REF		
L	0.27	0.32	0.37
L2	0.16 REF		
TOLERANCE FORM AND POSITION			
aaa	0.10		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.08		



DETAIL "B"
SCALE 2:1



RECOMMENDED MOUNTING FOOTPRINT

NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15 AND 0.30MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

* For additional information on our Pb−Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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