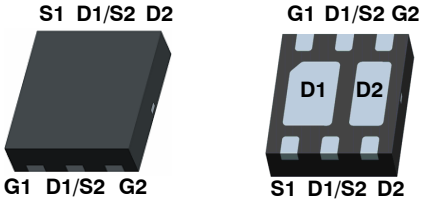
MOSFET – Dual N-Channel, POWERTRENCH®

20 V, 4 A, Q1: 68 mΩ, Q2: 100 mΩ

FDMC6890NZ



WDFN6 3x3, 0.95P
(Power 33)
CASE 511DT

General Description

FDMC6890NZ is a compact single package solution for DC to DC converters with excellent thermal and switching characteristics. Inside the Power 33 package features two N−channel MOSFETs with low on−state resistance and low gate charge to maximize the power conversion and switching efficiency. The Q1 switch also integrates gate protection from unclamped voltage input.

Features

- Q1: N−Channel
  - Max $R_{DS(on)}$ = 68 mΩ at V_{GS} = 4.5 V, I_D = 4 A
  - Max $R_{DS(on)}$ = 100 mΩ at V_{GS} = 2.5 V, I_D = 3 A
- Q2: N−Channel
  - Max $R_{DS(on)}$ = 100 mΩ at V_{GS} = 4.5 V, I_D = 4 A
  - Max $R_{DS(on)}$ = 150 mΩ at V_{GS} = 2.5 V, I_D = 2 A
  - Low Gate Charge
- These Device is Pb−Free, Halide Free and is RoHS Compliant

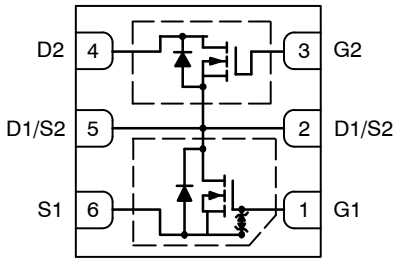
Applications

- DC−DC Conversion

MARKING DIAGRAM

6890N	= Specific Device Code
A	= Assembly Location
XY	= 2−Digit Date Code
KK	= 2−Digit Lot Run Traceability Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

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

Symbol	Parameter		Q1	Q2	Unit
V_{DS}	Drain to Source Voltage		20	20	V
V_{GS}	Gate to Source Voltage		±12	±12	V
I_D	Drain Current	– Continuous	4		A
		– Pulsed	10		
P_D	Power Dissipation (Steady State) Q1 (Note 1a)		1.92		W
	Power Dissipation (Steady State) Q2		1.78		
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	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Q1 (Note 1a)	65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Q2	70	

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	Q1 Q2	20 20	– –	– –	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	Q1 Q2	– –	13 12	– –	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V	Q1 Q2	– –	– –	1 1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12 V, V_{DS} = 0 V	Q1 Q2	– –	– –	±10 ±100	μA nA
ON CHARACTERISTICS							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	Q1 Q2	0.6 0.6	0.9 1.0	2 2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	Q1 Q2	– –	–3 –3	– –	mV/°C
$R_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 4.5 V, I_D = 4 A V_{GS} = 2.5 V, I_D = 3 A	Q1	– –	58 77	68 100	mΩ
		V_{GS} = 4.5 V, I_D = 4 A V_{GS} = 2.5 V, I_D = 2 A	Q2	– –	67 102	100 150	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 4 A	Q1 Q2	– –	10 7	– –	S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	Q1 Q2	– –	205 190	270 250	pF
C_{oss}	Output Capacitance		Q1 Q2	– –	60 60	80 80	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2	– –	40 35	60 55	pF
R_g	Gate Resistance	f = 1 MHz	Q1 Q2	– –	3.3 2.8	– –	Ω

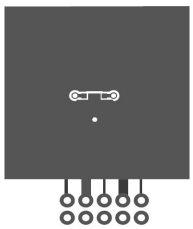
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS							
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 10 V, I_D = 4 A, R_{GEN} = 6 Ω	Q1 Q2	– –	4 4	10 10	ns
t_r	Rise Time		Q1 Q2	– –	13 12	22 21	ns
$t_{d(off)}$	Turn–Off Delay Time		Q1 Q2	– –	10 7	19 14	ns
t_f	Fall Time		Q1 Q2	– –	6 6	12 12	ns
$Q_{g(TOT)}$	Total Gate Charge at 4.5 V	V_{GS} = 0 V to 4.5 V, V_{DD} = 10 V, I_D = 4 A	Q1 Q2	– –	2.4 1.8	3.4 2.6	nC
$Q_{g(2)}$	Total Gate Charge at 2 V	V_{DD} = 10 V, I_D = 4 A	Q1 Q2	– –	1.4 0.6	1.9 0.8	nC
Q_{gs}	Gate to Source Gate Charge		Q1 Q2	– –	0.4 0.5	– –	nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1 Q2	– –	0.9 0.8	– –	nC
DRAIN–SOURCE DIODE CHARACTERISTICS							
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 4 A	Q1 Q2	– –	0.94 0.92	1.25 1.25	V
t_{rr}	Reverse Recovery Time	I_F = 4 A, di/dt = 100 A/μs	Q1 Q2	– –	18 17	27 26	ns
Q_{rr}	Reverse Recovery Charge		Q1 Q2	– –	9 10	14 15	nC

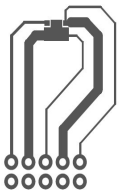
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 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. 150°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

TYPICAL CHARACTERISTICS (Q1 N−CHANNEL) (T_J = 25°C unless otherwise noted)

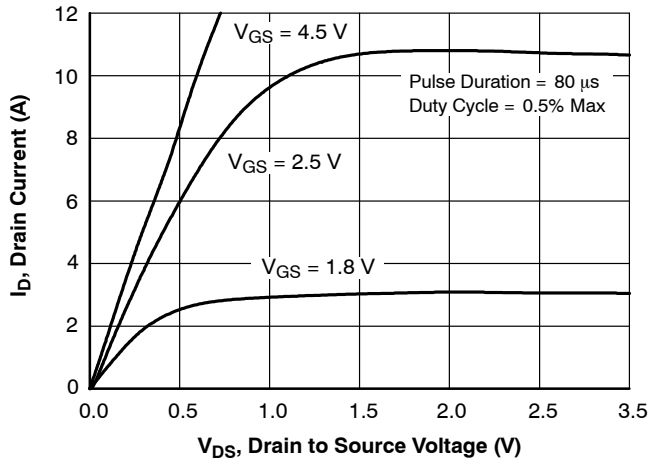


Figure 1. On Region Characteristics

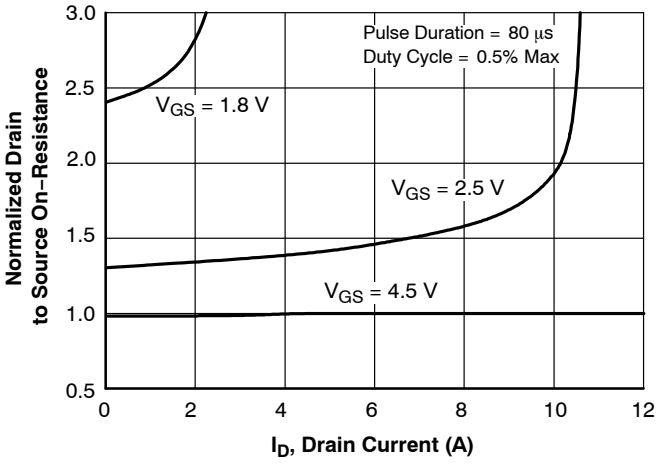


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

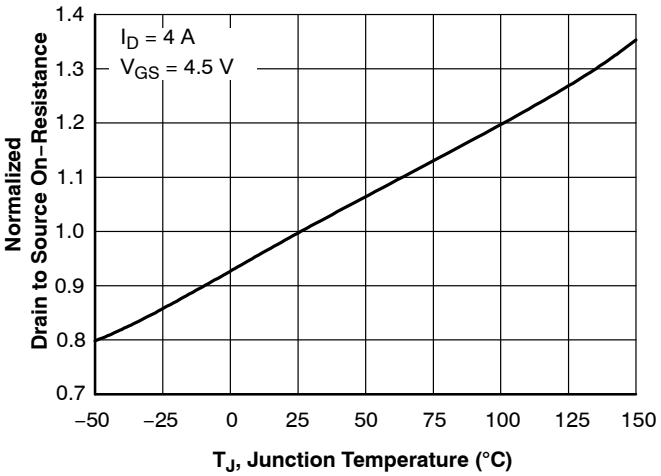


Figure 3. Normalized On−Resistance vs. Junction Temperature

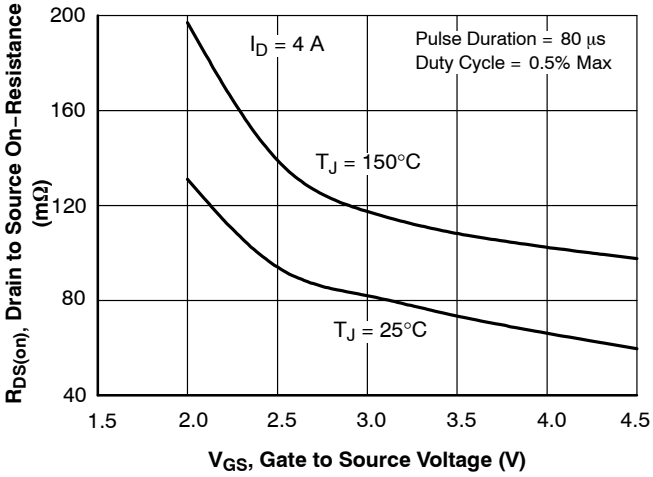


Figure 4. On−Resistance vs. Gate to Source Voltage

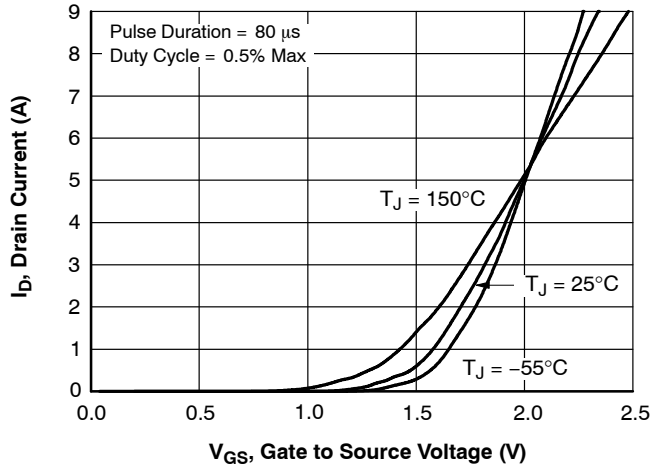


Figure 5. Transfer Characteristics

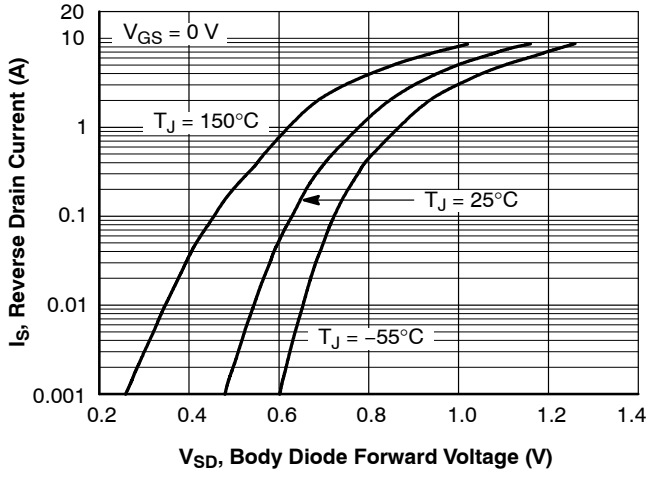


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q1 N−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

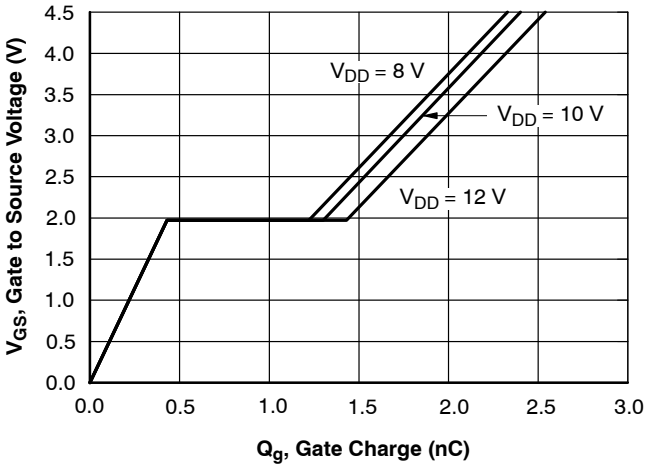


Figure 7. Gate Charge Characteristics

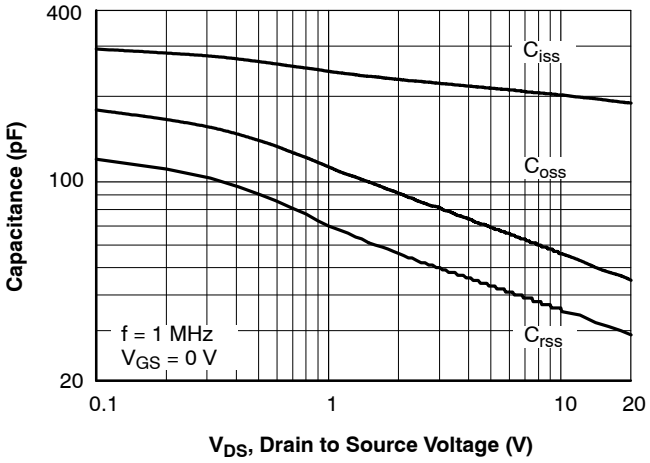


Figure 8. Capacitance vs. Drain to Source Voltage

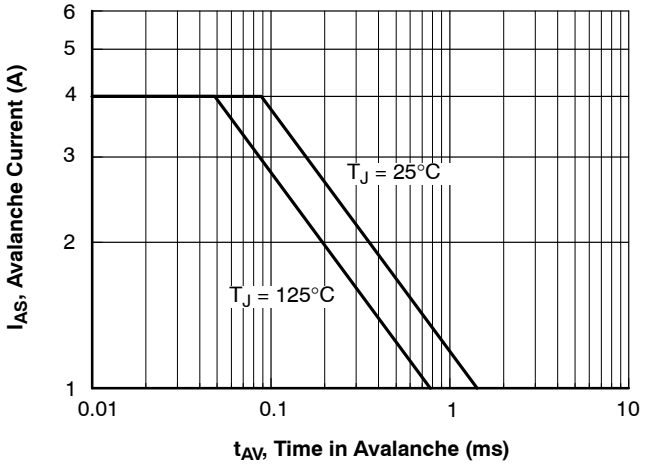


Figure 9. Unclamped Inductive Switching Capability

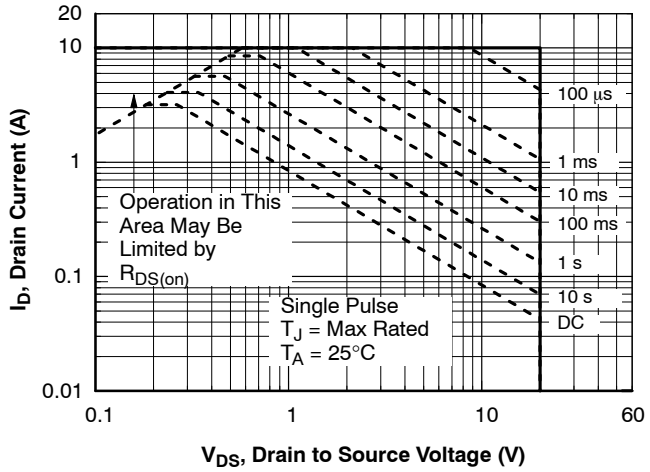


Figure 10. Forward Bias Safe Operating Area

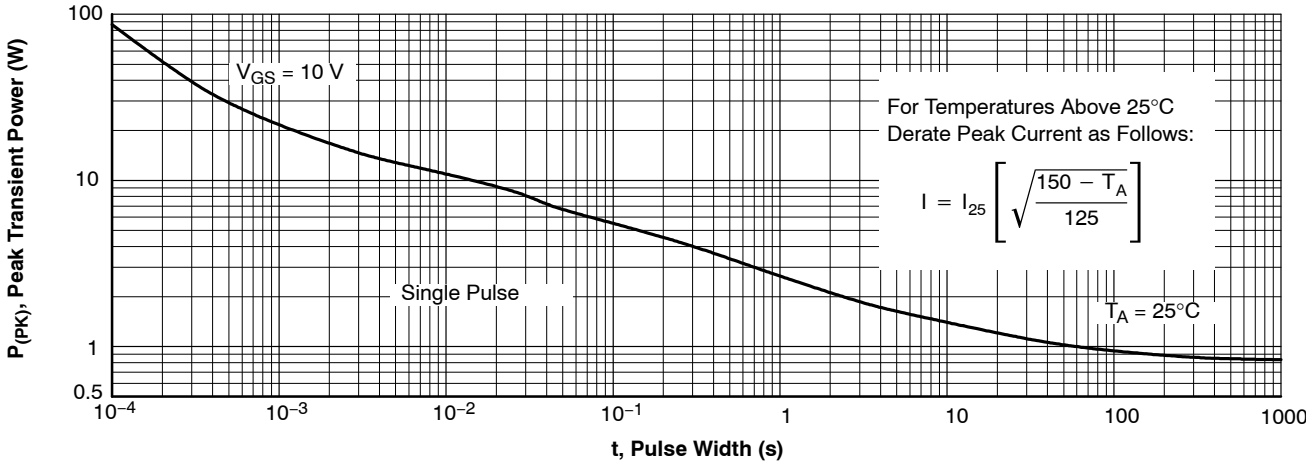


Figure 11. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (Q1 N−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

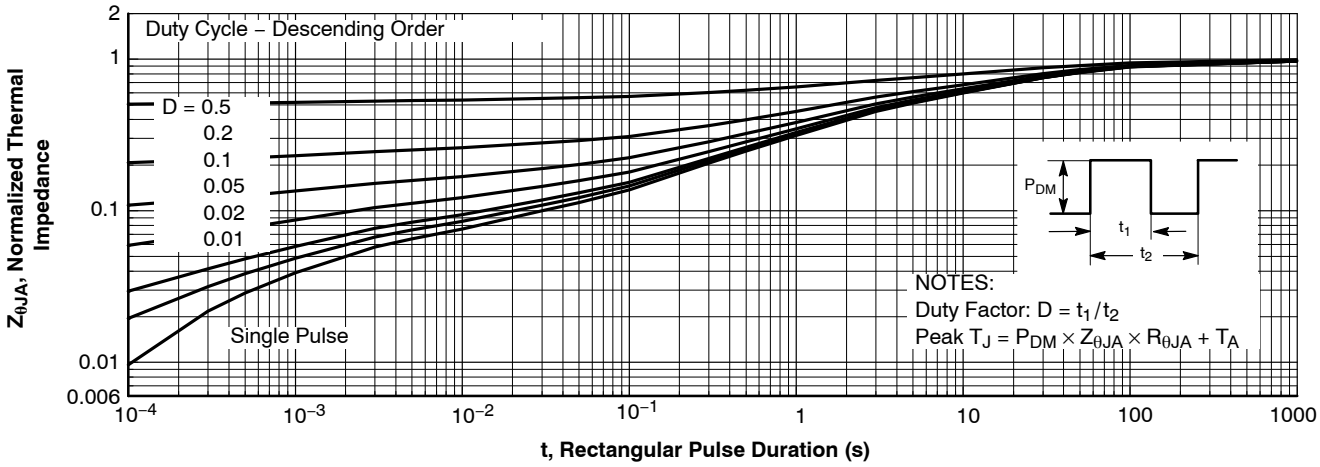


Figure 12. Transient Thermal Response Curve

TYPICAL CHARACTERISTICS (Q2 N−CHANNEL) (T_J = 25°C unless otherwise noted)

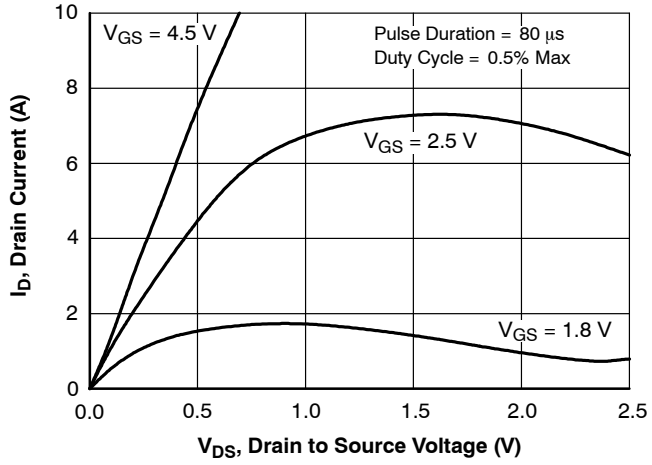


Figure 13. On Region Characteristics

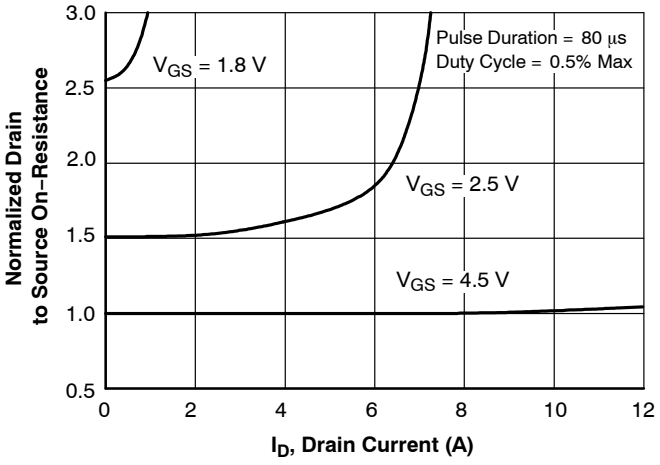


Figure 14. Normalized On−Resistance vs. Drain Current and Gate Voltage

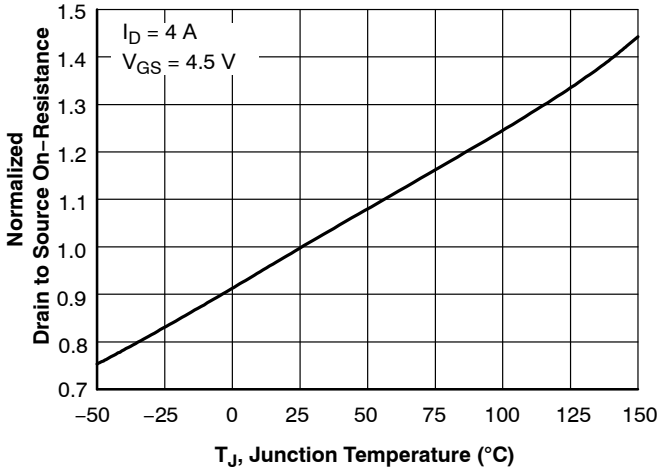


Figure 15. Normalized On Resistance vs. Junction Temperature

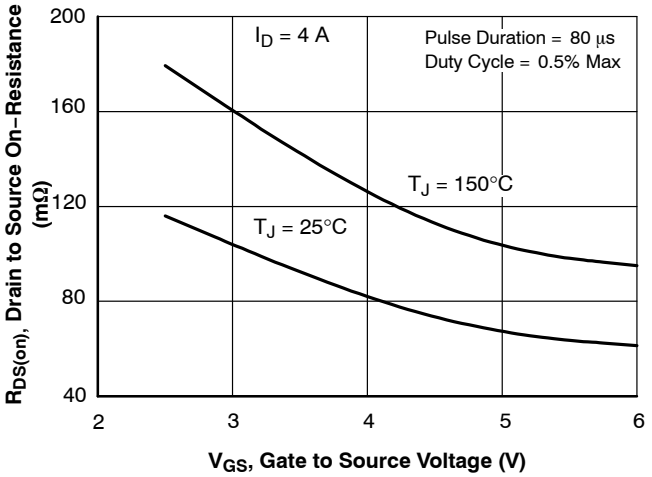


Figure 16. On−Resistance vs. Gate to Source Voltage

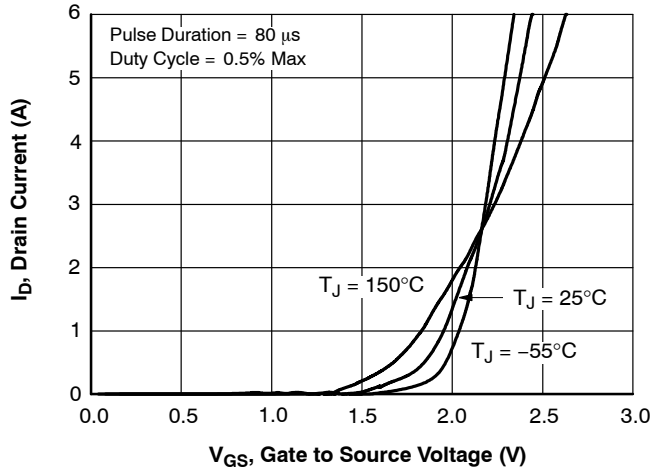


Figure 17. Transfer Characteristics

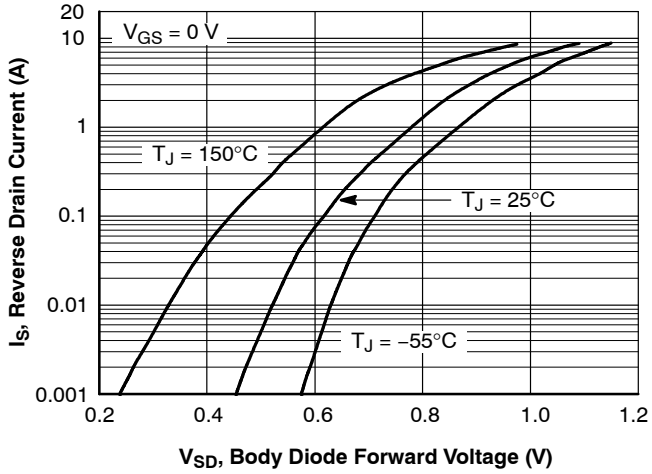


Figure 18. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q2 N−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

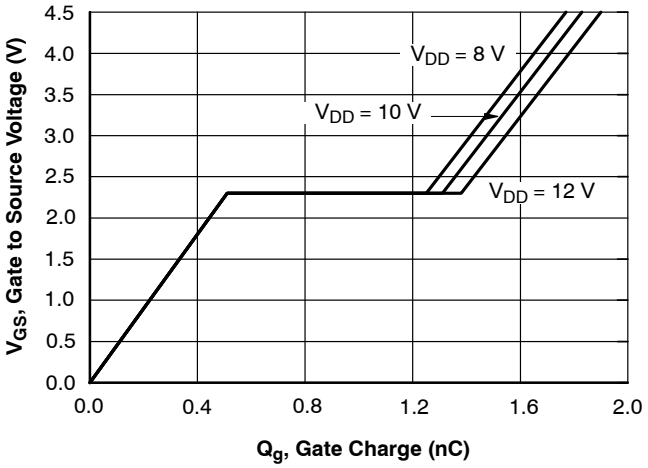


Figure 19. Gate Charge Characteristics

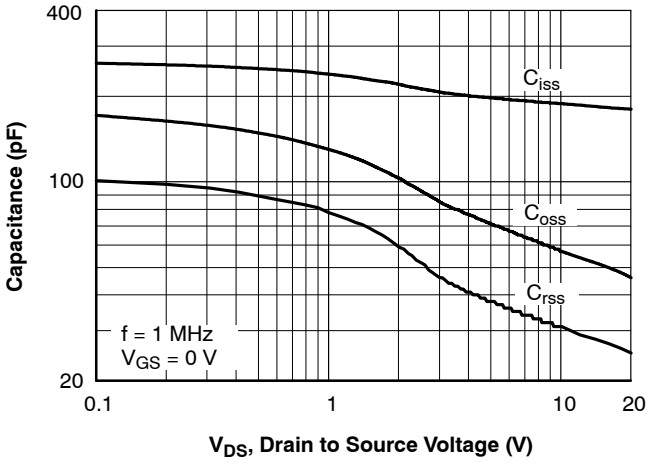


Figure 20. Capacitance vs. Drain to Source Voltage

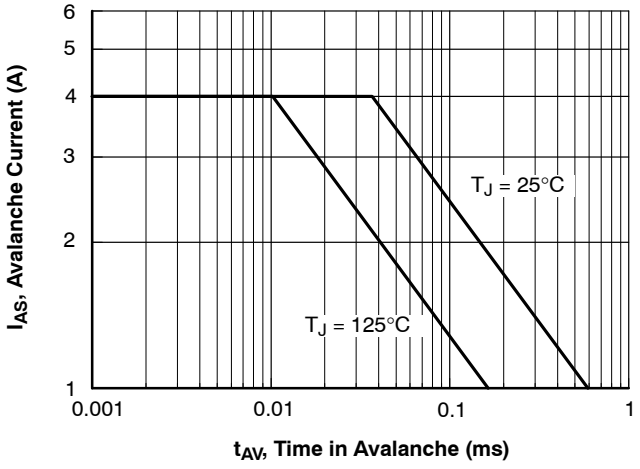


Figure 21. Unclamped Inductive Switching Capability

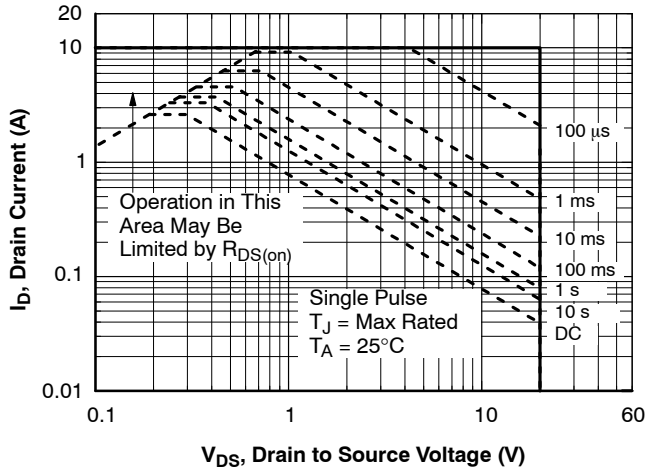


Figure 22. Forward Bias Safe Operating Area

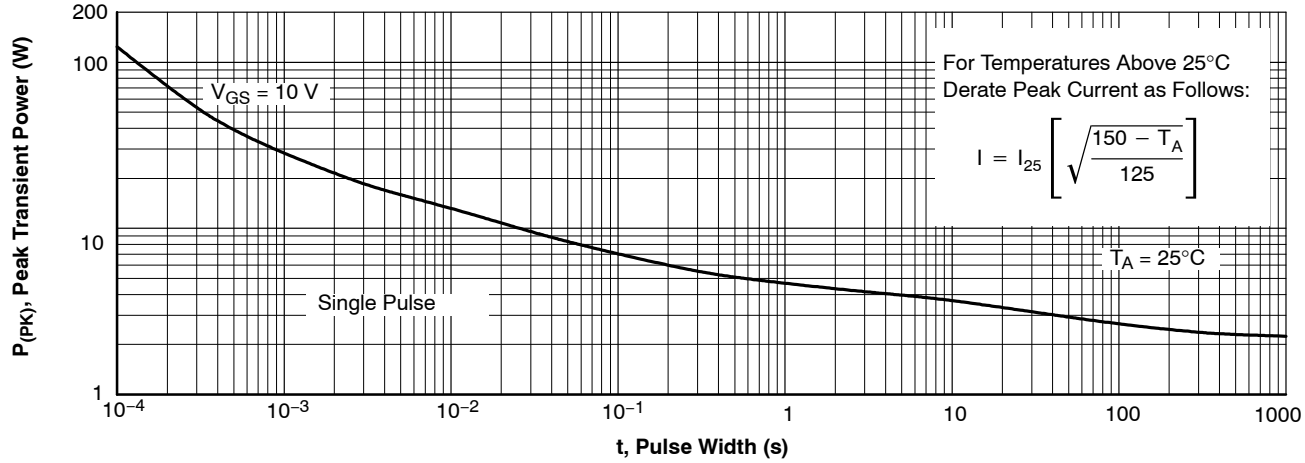


Figure 23. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (Q2 N−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

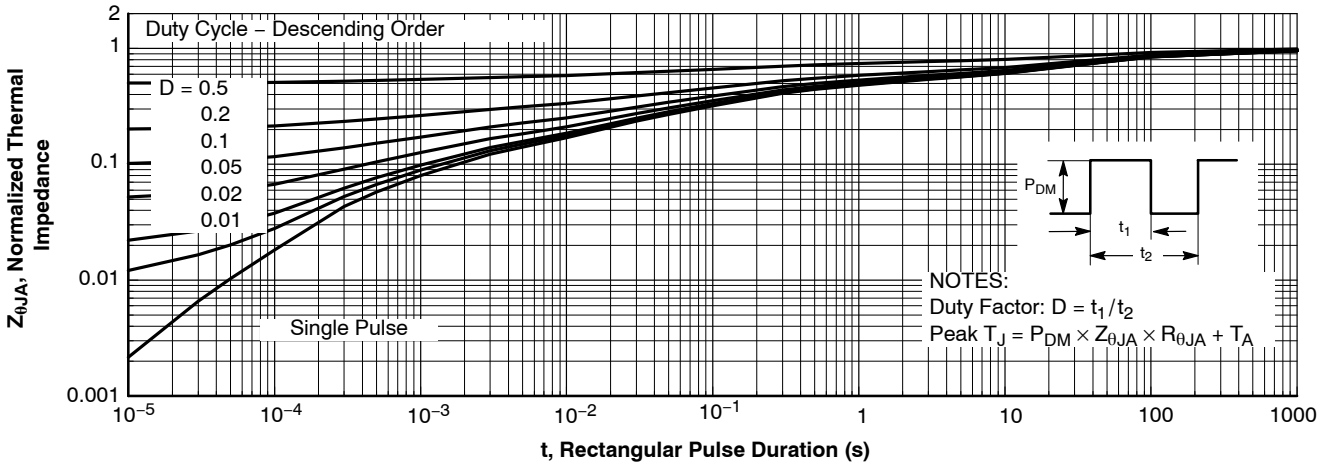


Figure 24. Transient Thermal Response Curve

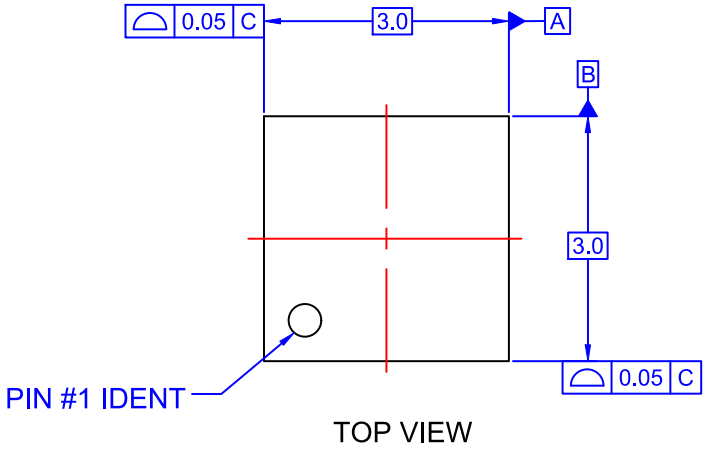
PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping†
FDMC6890NZ	6890N	WDFN6 3 x 3, 0.95P (Power 33) (Pb−Free/Halide Free)	7”	8 mm	3000 / Tape & Reel

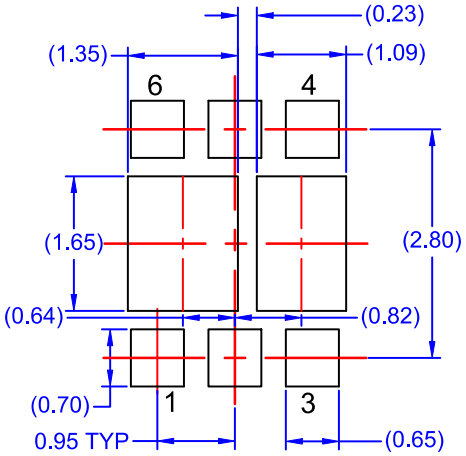
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

WDFN6 3x3, 0.95P
CASE 511DT
ISSUE O

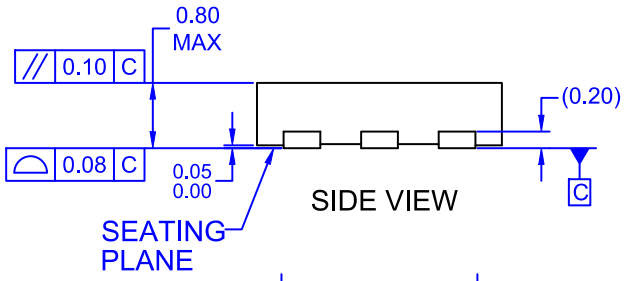
DATE 31 DEC 2016



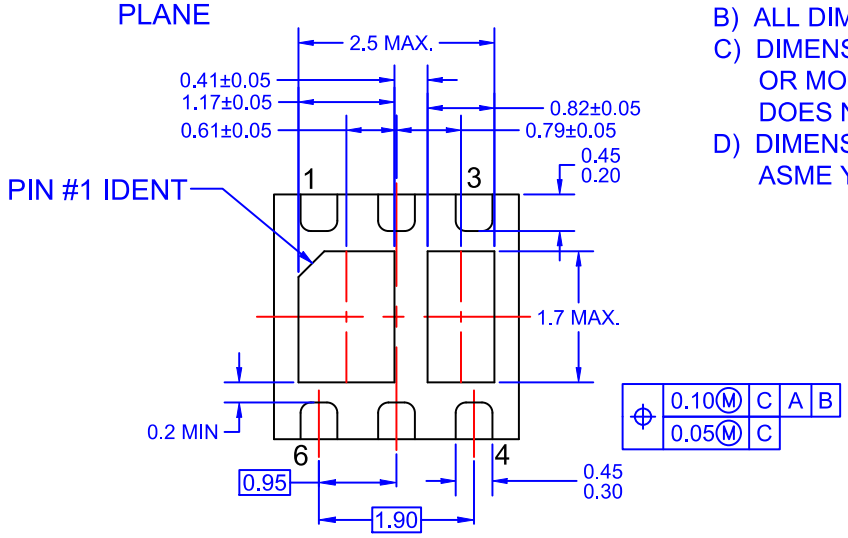
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED
A) CONFORMS TO JEDEC REGISTRATION, MO-229, VARIATION WEEA
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.

DOCUMENT NUMBER:	**98AON13605G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**WDFN6 3x3, 0.95P**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
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