MOSFET, N-Channel, POWERTRENCH®

Q1: 30 V, 66 A, 4 mΩ
Q2: 30 V, 42 A, 5.5 mΩ

FDMD8900

ON Semiconductor®

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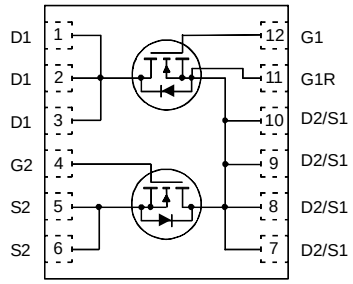
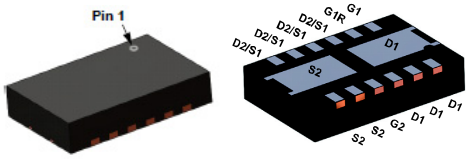




Power 3.3 x 5

PQFN12 3.3X5, 0.65P
CASE 483BN

General Description

This devices utilizes two optimized N−ch FETs in a dual 3.3 x 5 mm thermally enhanced power package. The HS Source and LS drain are internally connected providing a low source inductance package, helping to provide the best FOM.

Features

Q1: N−Channel

- Max $r_{DS(on)}$ = 4 mΩ at V_{GS} = 10 V, I_D = 19 A
- Max $r_{DS(on)}$ = 5 mΩ at V_{GS} = 4.5 V, I_D = 17 A
- Max $r_{DS(on)}$ = 6.5 mΩ at V_{GS} = 3.8 V, I_D = 15 A
- Max $r_{DS(on)}$ = 8.3 mΩ at V_{GS} = 3.5 V, I_D = 14 A

Q2: N−Channel

- Max $r_{DS(on)}$ = 5.5 mΩ at V_{GS} = 10 V, I_D = 17 A
- Max $r_{DS(on)}$ = 6.5 mΩ at V_{GS} = 4.5 V, I_D = 15 A
- Max $r_{DS(on)}$ = 9 mΩ at V_{GS} = 3.8 V, I_D = 13 A
- Max $r_{DS(on)}$ = 12 mΩ at V_{GS} = 3.5 V, I_D = 12 A
- Ideal for Flexible Layout in Primary Side of Bridge Topology
- 100% UIL Tested
- Kelvin High Side MOSFET Drive Pin−out Capability
- This Device is Pb−Free and is RoHS Compliant

Applications

- Computing
- Buck, Boost and Buck/Boost Applications
- General Purpose POL

MARKING DIAGRAM

$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
8900	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

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

Symbol	Parameter				Q1	Q2	Units
V_{DS}	Drain to Source Voltage				30	30	V
V_{GS}	Gate to Source Voltage				±12	±12	V
I_D	Drain Current	−Continuous	T_C = 25°C	(Note 5)	66	42	A
		−Continuous	T_C = 100°C	(Note 5)	42	26	
		−Continuous	T_A = 25°C	(Note 1a)	19	17	
		−Pulsed		(Note 4)	280	210	
E_{AS}	Single Pulse Avalanche Energy			(Note 3)	73	54	mJ
P_D	Power Dissipation		T_C = 25°C		27	15	W
	Power Dissipation		T_A = 25°C	(Note 1a)	2.1		
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	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case		4.7	8.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	60		

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Shipping†
8900	FDMD8900	PQFN12 3.3x5, 0.65P (Pb−Free)	3000 units / 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

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

Symbol	Parameter	Test Conditions	Type	Min.	Typ.	Max.	Units
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	30 30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = 250 μA, referenced to 25°C	Q1 Q2	14 13			mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V V_{DS} = 24 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 V_{GS} = ±12 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	0.8 1	1.3 1.4	2.5 2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 mA, referenced to 25°C I_D = 250 mA, referenced to 25°C	Q1 Q2		−4 −4		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10 V, I_D = 19 A V_{GS} = 4.5 V, I_D = 17 A V_{GS} = 3.8 V, I_D = 15 A V_{GS} = 3.5 V, I_D = 14 A V_{GS} = 10 V, I_D = 19 A, T_J = 125°C	Q1		3.4 4 4.3 4.6 4.6	4 5 6.5 8.3 6	mΩ
		V_{GS} = 10 V, I_D = 17 A V_{GS} = 4.5 V, I_D = 15 A V_{GS} = 3.8 V, I_D = 13 A V_{GS} = 3.5 V, I_D = 12 A V_{GS} = 10 V, I_D = 17 A , T_J = 125°C	Q2		4.5 5.4 6 6.6 5.8	5.5 6.5 9 12 6.9	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 19 A V_{DS} = 5 V, I_D = 17 A	Q1 Q2		86 80		S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	Q1: V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Q1 Q2		1735 1210	2605 1815	pF
C_{oss}	Output Capacitance	Q2: V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Q1 Q2		462 356	695 535	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2		47 52	75 80	pF
R_g	Gate Resistance		Q1 Q2		0.8 1.9		W
SWITCHING CHARACTERISTICS							
$t_{d(on)}$	Turn−On Delay Time	Q1: V_{DD} = 15 V, I_D = 19 A, R_{GEN} = 6 Ω	Q1 Q2		8.7 7.1	17 14	ns
t_r	Rise Time	Q2: V_{DD} = 15 V, I_D = 17 A, R_{GEN} = 6 Ω	Q1 Q2		2.3 2	10 10	ns
$t_{d(off)}$	Turn−Off Delay Time		Q1 Q2		25 22	40 35	ns
t_f	Fall Time		Q1 Q2		2.4 2.3	10 10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; Q1: V_{DD} = 15 V, I_D = 19 A	Q1 Q2		25 19	35 27	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; Q2: V_{DD} = 15 V, I_D = 17 A	Q1 Q2		12 8.8	17 12	nC
Q_{gs}	Gate to Source Gate Charge		Q1 Q2		3.6 2.7		nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1 Q2		2.7 2.6		nC

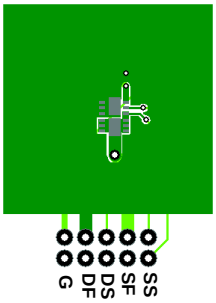
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Type	Min.	Typ.	Max.	Units
DRAIN−SOURCE DIODE CHARACTERISTICS T_J = 25°C unless otherwise noted.							
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 19 A (Note 2) V_{GS} = 0 V, I_S = 17 A (Note 2)	Q1 Q2		0.8 0.8	1.2 1.2	V
t_{rr}	Reverse Recovery Time	Q1: I_F = 19 A, Δi/Δt = 100 A/ms	Q1 Q2		26 22	42 35	ns
Q_{rr}	Reverse Recovery Charge	Q2: I_F = 17 A, Δi/Δt = 100 A/ms	Q1 Q2		10 7.8	20 16	nC

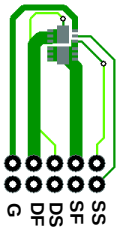
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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. 60 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 130 °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 73 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = 7 A, V_{DD} = 30 V, V_{GS} = 10 V. 100% tested at L = 0.1 mH, I_{AS} = 25 A.
   Q2: E_{AS} of 54 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = 6 A, V_{DD} = 30 V, V_{GS} = 10 V. 100% tested at L = 0.1 mH, I_{AS} = 20 A.
4. Pulse Id refers to Figure "Forward Bias Safe Operation Area".
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.

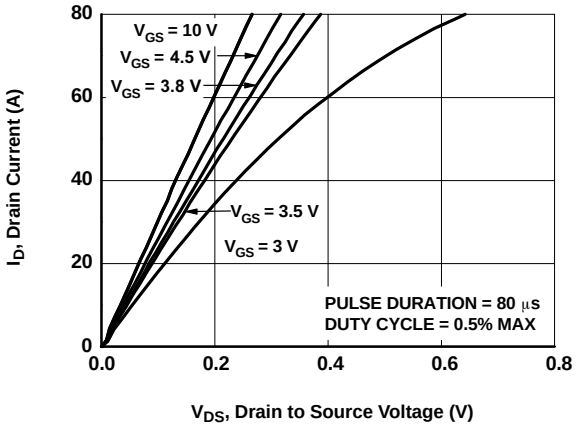


Figure 1. On-Region Characteristics

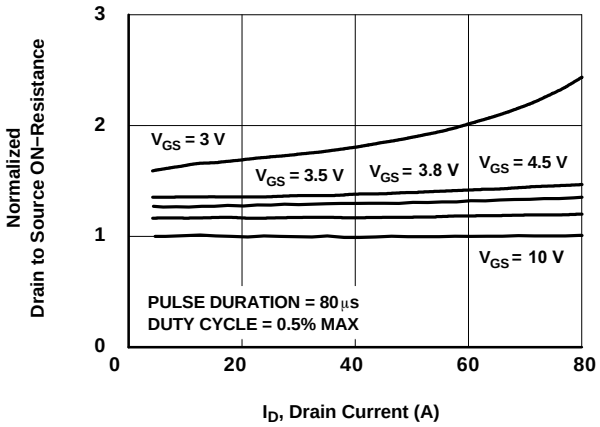


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

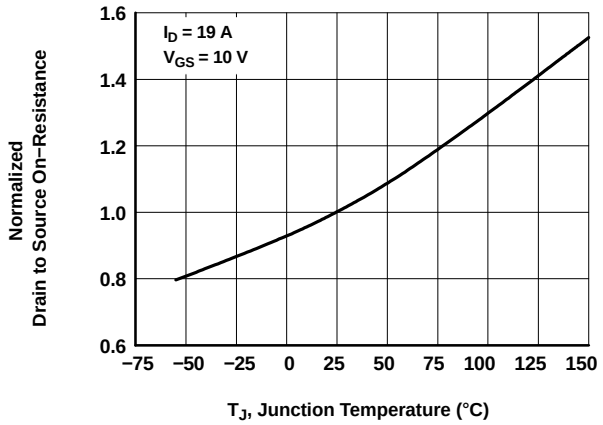


Figure 3. Normalized On Resistance vs. Junction Temperature

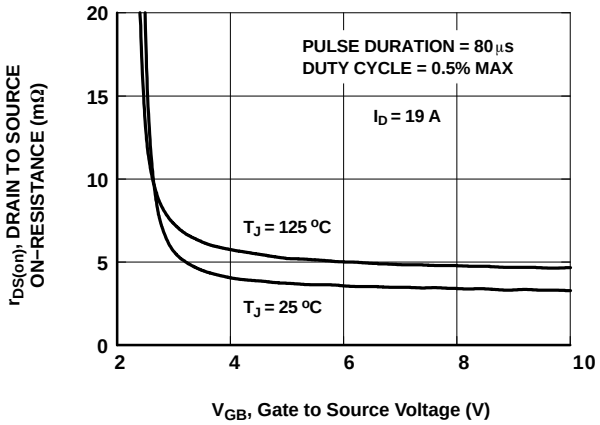


Figure 4. On Resistance vs. Gate to Source Voltage

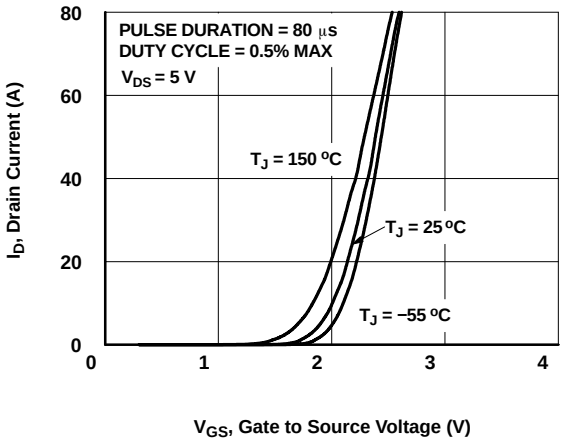


Figure 5. Transfer Characteristics

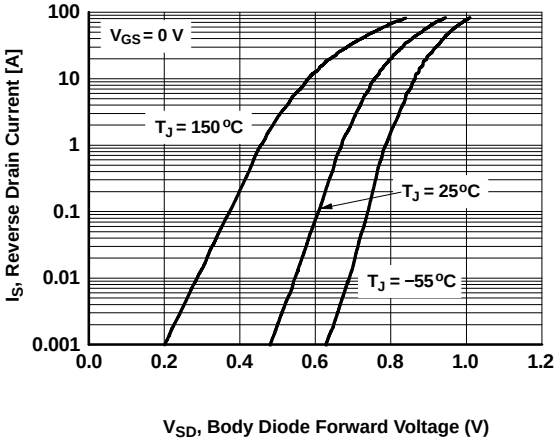


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

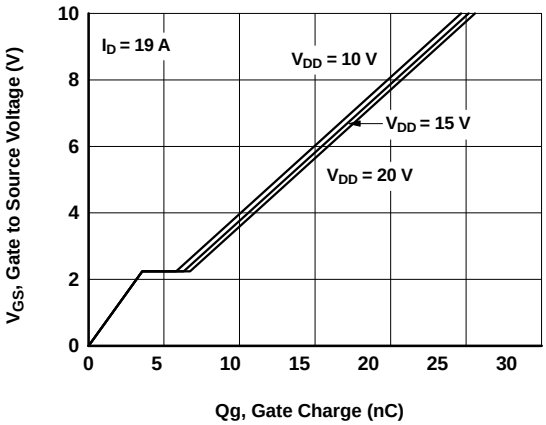


Figure 7. Gate Charge Characteristics

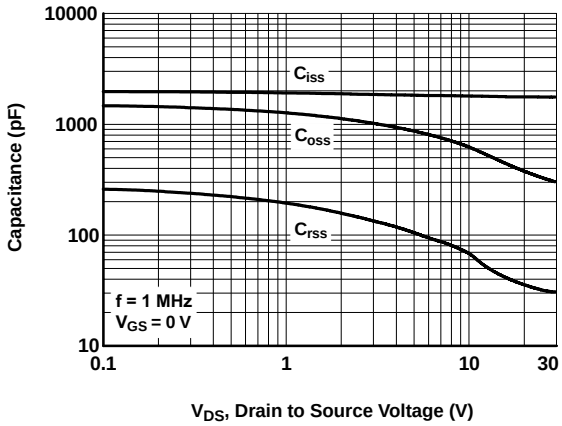


Figure 8. Capacitance vs. Drain to Source Voltage

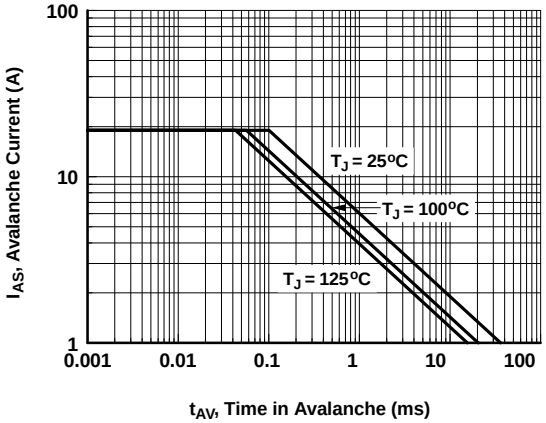


Figure 9. Unclamped Inductive Switching Capability

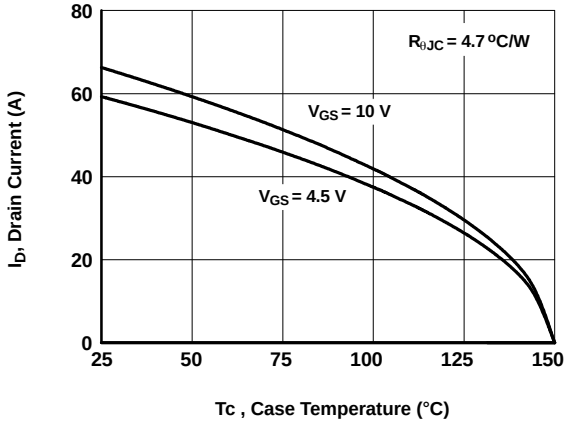


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

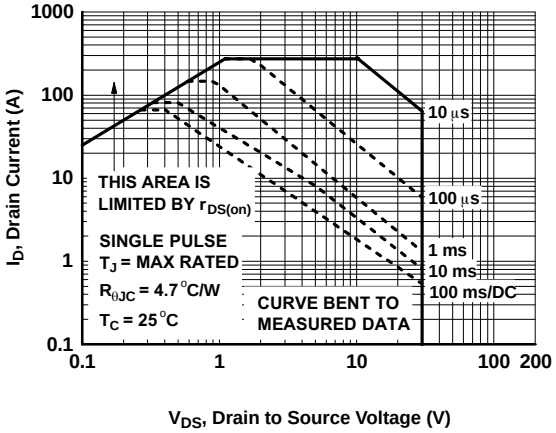


Figure 11. Forward Bias Safe Operating Area

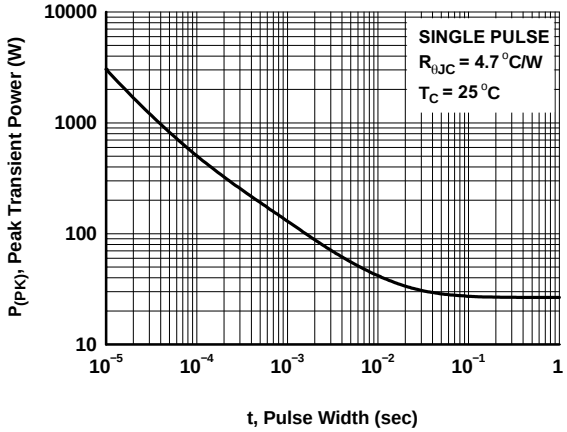


Figure 12. Single Pulse Maximum Power Dissipation

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

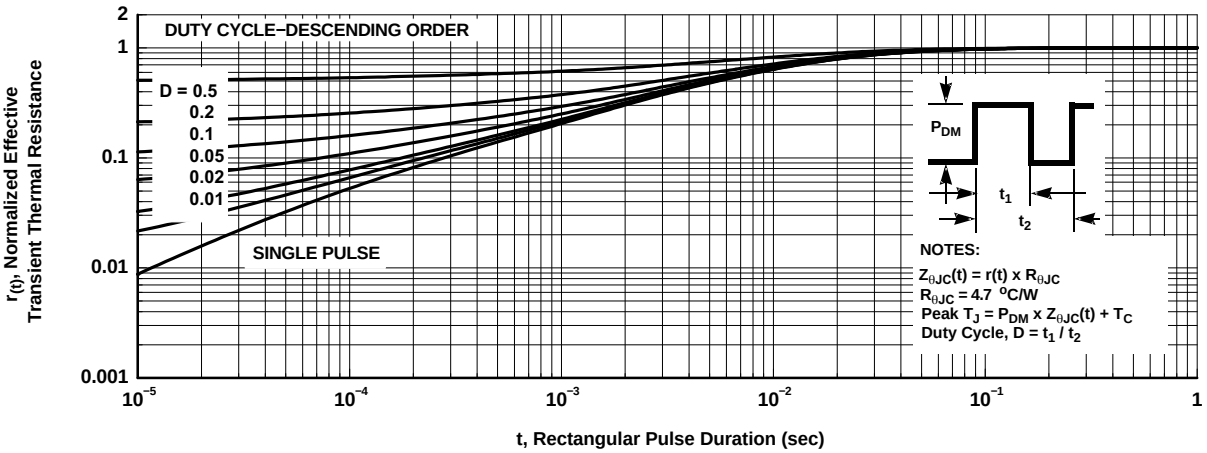


Figure 13. Junction−to−Case Transient Thermal Response Curve

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

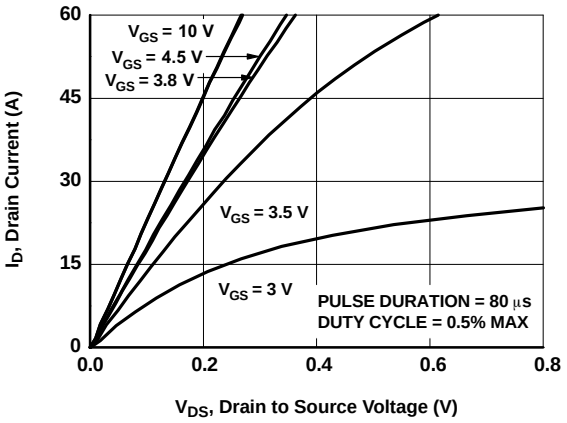


Figure 14. On-Region Characteristics

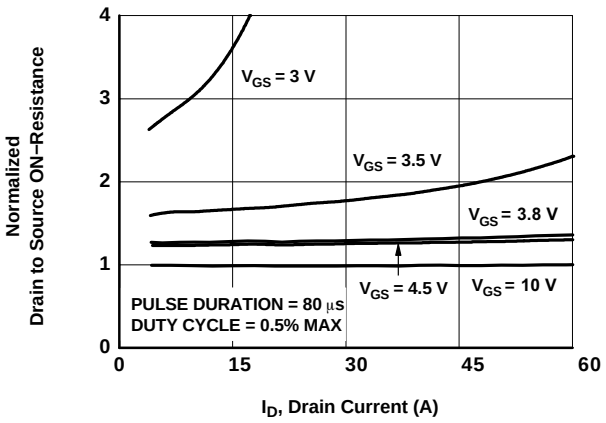


Figure 15. Normalized On−Resistance vs. Drain Current and Gate Voltage

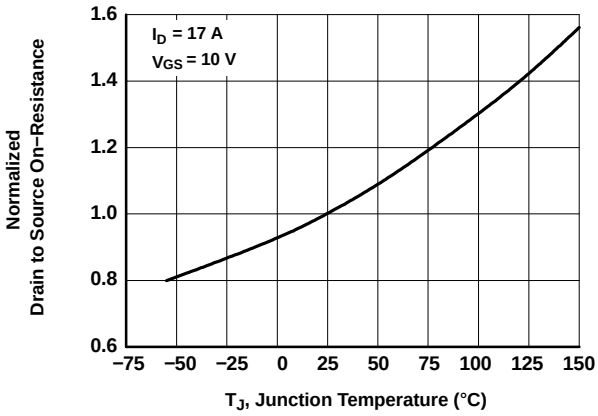


Figure 16. Normalized On−Resistance vs. Junction Temperature

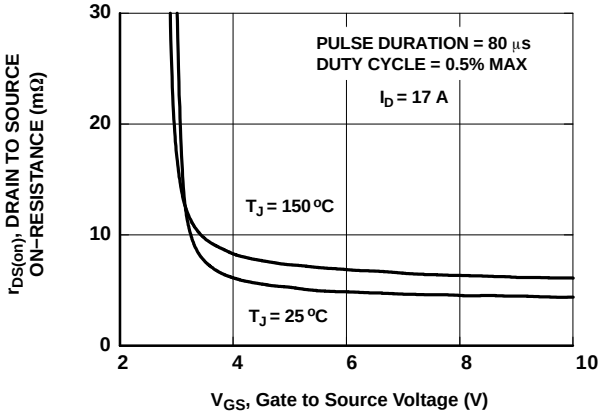


Figure 17. On Resistance vs. Gate to Source Voltage

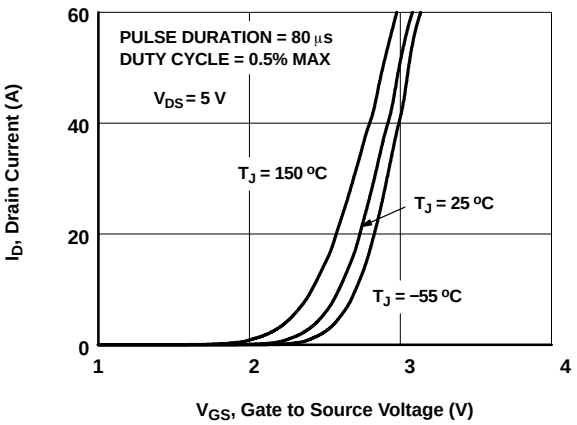


Figure 18. Transfer Characteristics

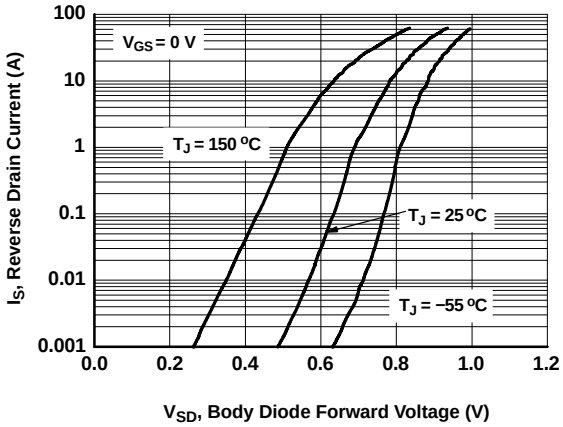


Figure 19. Source to Drain Diode Forward Voltage vs. Source Current

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

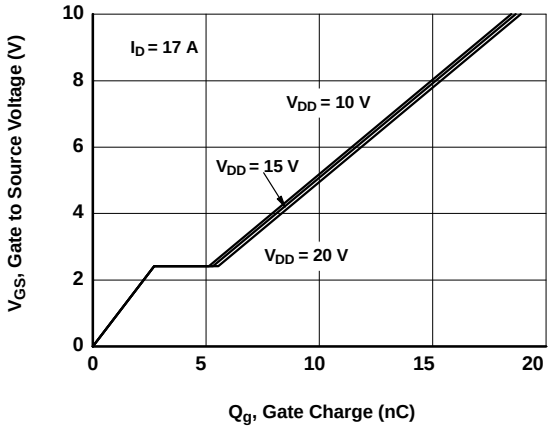


Figure 20. Gate Charge Characteristics

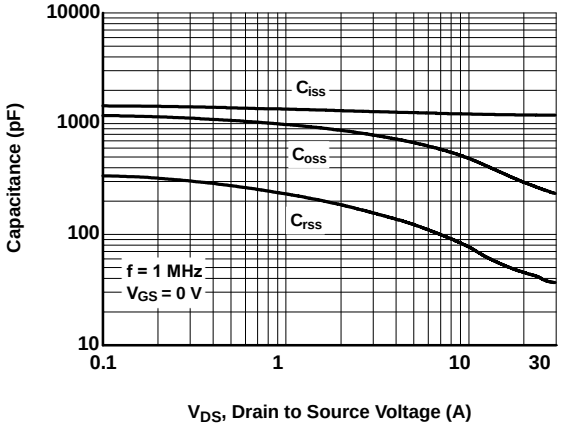


Figure 21. Capacitance vs. Drain to Source Voltage

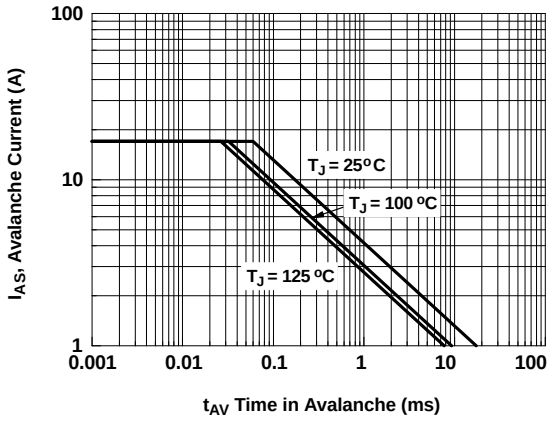


Figure 22. Unclamped Inductive Switching Capability

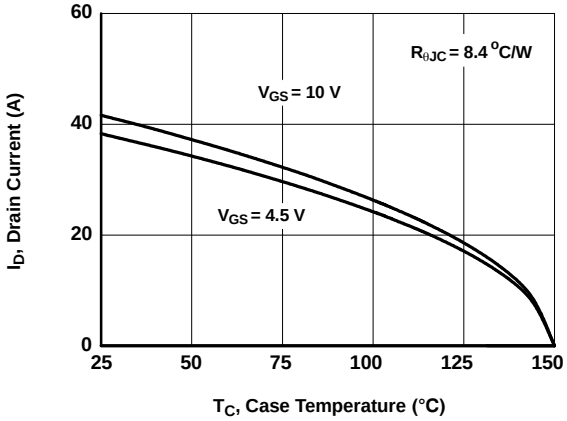


Figure 23. Maximum Continuous Drain Current vs. Case Temperature

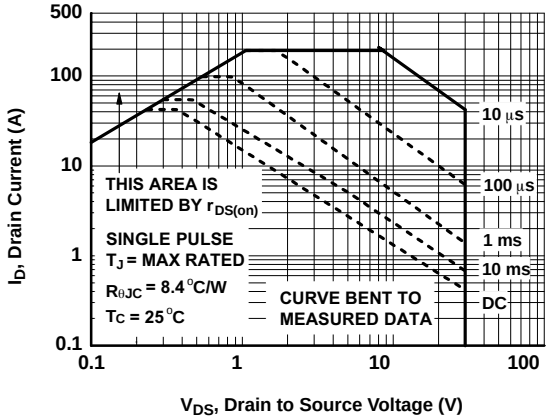


Figure 24. Forward Bias Safe Operating Area

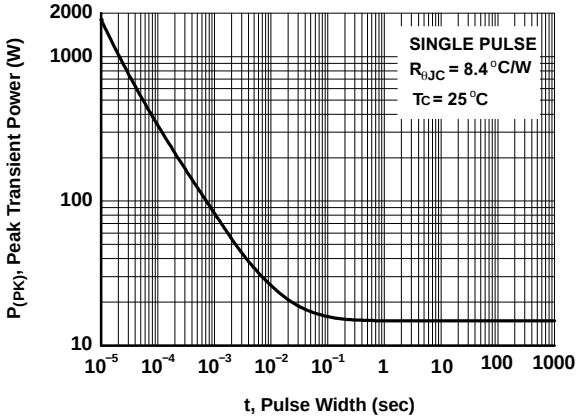


Figure 25. Single Pulse Maximum Power Dissipation

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

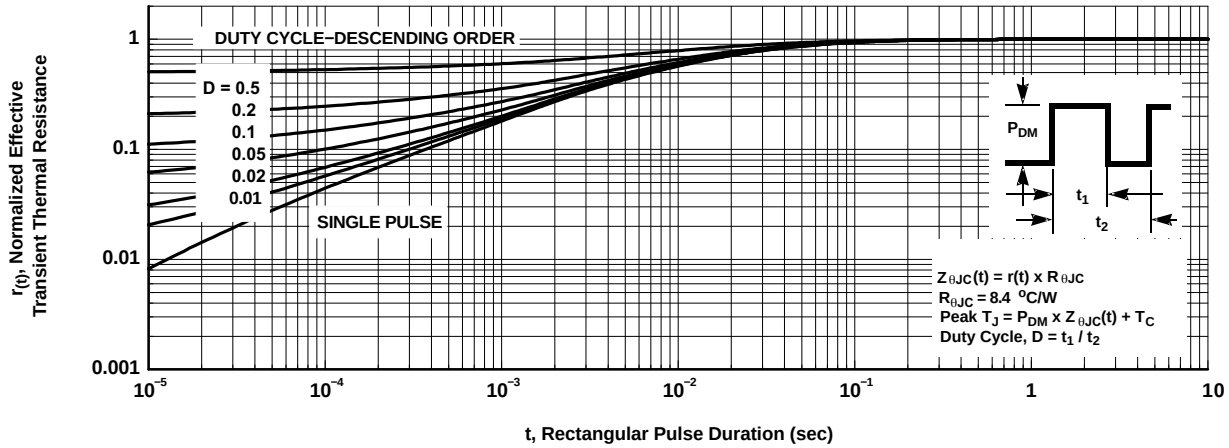
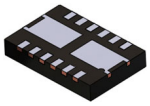
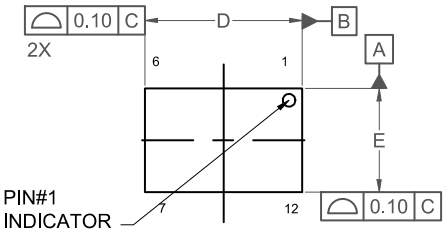


Figure 26. Junction −to−Case Transient Thermal Response Curve

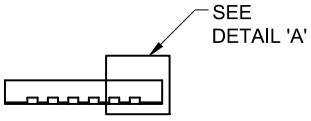


PQFN12 3.3X5, 0.65P
CASE 483BN
ISSUE A

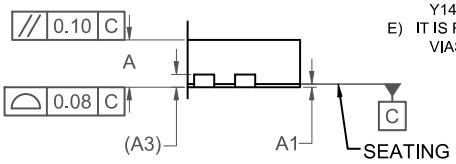
DATE 26 AUG 2021



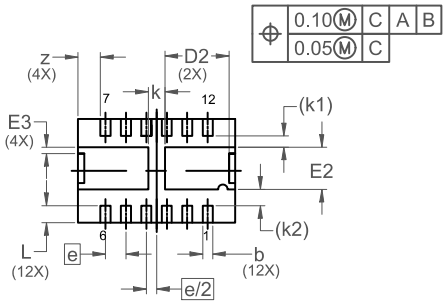
TOP VIEW



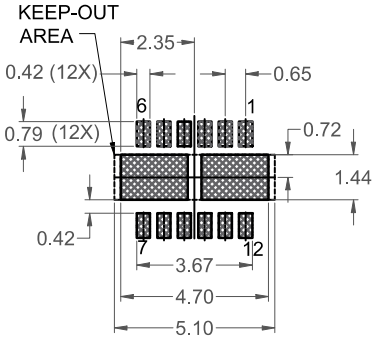
FRONT VIEW



DETAIL 'A'
SCALE: 2:1



BOTTOM 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.

NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC MO-240, VARIATION BA.
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-1994.
E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3	0.20 REF		
b	0.27	0.32	0.37
D	4.90	5.00	5.10
D2	1.92	2.04	2.14
E	3.20	3.30	3.40
E2	1.24	1.34	1.44
E3	0.10	0.20	0.30
e	0.65 BSC		
e/2	0.325 BSC		
k	0.53 REF		
k1	0.36 REF		
k2	0.52 REF		
L	0.44	0.54	0.64
z	0.72 REF		

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DESCRIPTION:	**PQFN12 3.3X5, 0.65P**		**PAGE 1 OF 1**

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