

Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

FAIRCHILD SEMICONDUCTOR®

October 2006

FDMC6890NZ
Dual N-Channel PowerTrench® MOSFET
20V, 4A, Q1:68mΩ, Q2:100mΩ

Features

Q1: N-Channel

- Max $r_{DS(on)}$ = 68mΩ at V_{GS} = 4.5V, I_D = 4A
- Max $r_{DS(on)}$ = 100mΩ at V_{GS} = 2.5V, I_D = 3A

Q2: N-Channel

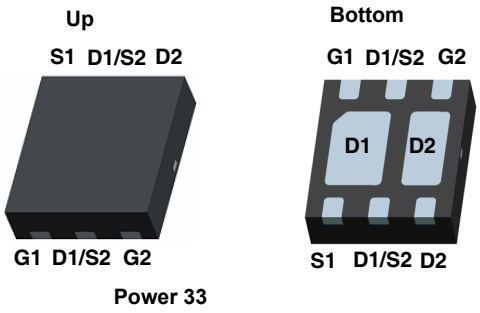
- Max $r_{DS(on)}$ = 100mΩ at V_{GS} = 4.5V, I_D = 4A
- Max $r_{DS(on)}$ = 150mΩ at V_{GS} = 2.5V, I_D = 2A
- Low gate Charge
- RoHS Compliant

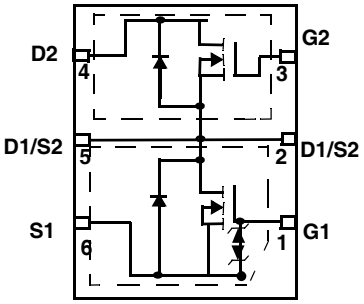
General Description

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.

Application

- DC - DC Conversion





MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Q1	Q2	Units
V_{DS}	Drain to Source Voltage	20	20	V
V_{GS}	Gate to Source Voltage	±12	±12	V
I_D	-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

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Q1 (Note 1a)	65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Q2	70	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
6890N	FDMC6890NZ	Power 33	7inch	8mm	3000 units

©2006 Fairchild Semiconductor Corporation

Electrical Characteristics T_J = 25°C unless otherwise noted

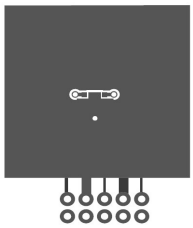
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	Q1 Q2	20 20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C	Q1 Q2		13 12		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16V, V_{GS} = 0V	Q1 Q2			1 1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12V, V_{DS}= 0V	Q1 Q2			±10 ±100	μA nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	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 = 250μA, referenced to 25°C	Q1 Q2		-3 -3		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 4.5V, I_D = 4A V_{GS} = 2.5V, I_D = 3A	Q1		58 77	68 100	mΩ
		V_{GS} = 4.5V, I_D = 4A V_{GS} = 2.5V, I_D = 2A	Q2		67 102	100 150	
g_{FS}	Forward Transconductance	V_{DS} = V, I_D =4A	Q1 Q2		10 7		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 10V, V_{GS} = 0V, f= 1MHZ	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 = 1MHz	Q1 Q2		3.3 2.8		Ω
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10V, I_D = 4A, R_{GEN} = 6Ω	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 4.5V	V_{GS} = 0V to 4.5V	Q1 Q2		2.4 1.8	3.4 2.6	nC
$Q_{g(2)}$	Total Gate Charge at 2V	V_{DD} = 10 V I_D = 4A	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

Electrical Characteristics T_J = 25°C unless otherwise noted

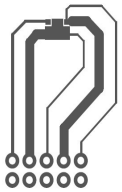
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 4A	Q1 Q2		0.94 0.92	1.25 1.25	V
t_{rr}	Reverse Recovery Time	I_F = 4A, di/dt = 100A/s	Q1 Q2		18 17	27 26	ns
Q_{rr}	Reverse Recovery Charge		Q1 Q2		9 10	14 15	nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1in^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 < 300μs, Duty cycle < 2.0%.

Typical Characteristics (Q1 N-Channel) T_J = 25°C unless otherwise noted

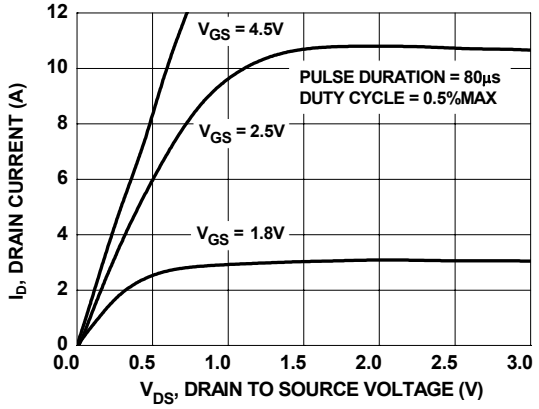


Figure 1. On-Region Characteristics

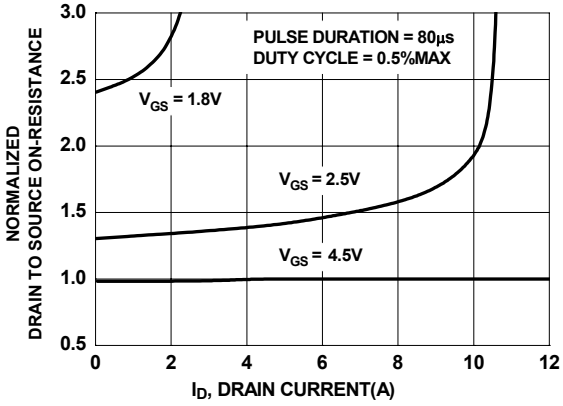


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

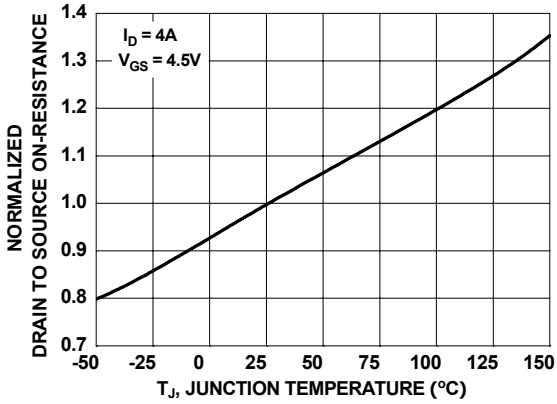


Figure 3. Normalized On-Resistance vs Junction Temperature

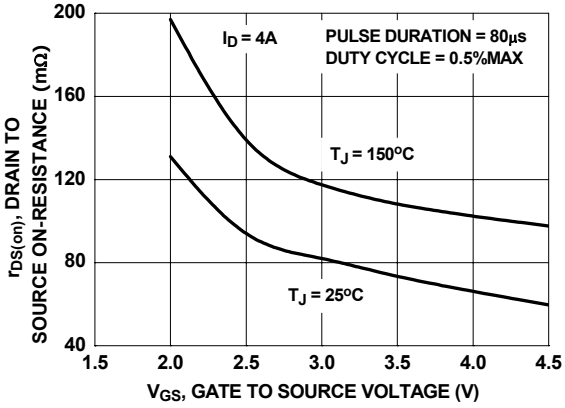


Figure 4. On-Resistance vs Gate to Source Voltage

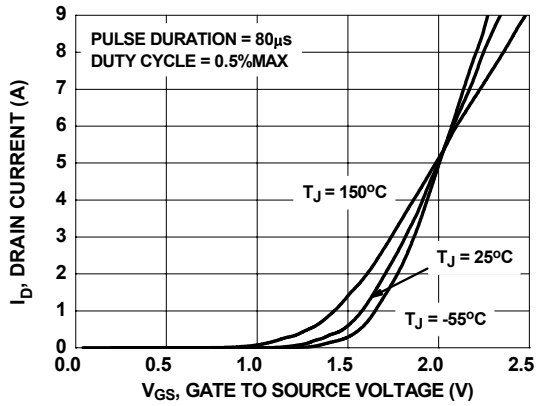


Figure 5. Transfer Characteristics

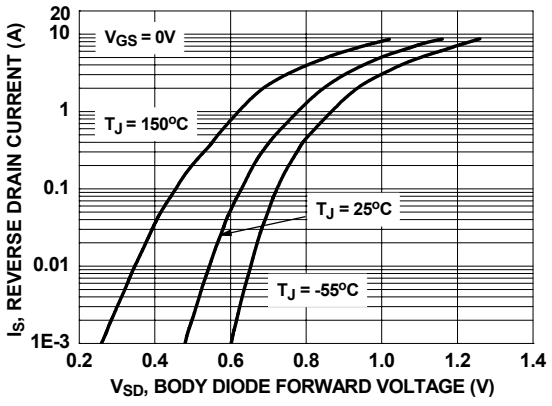


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel) T_J = 25°C unless otherwise noted

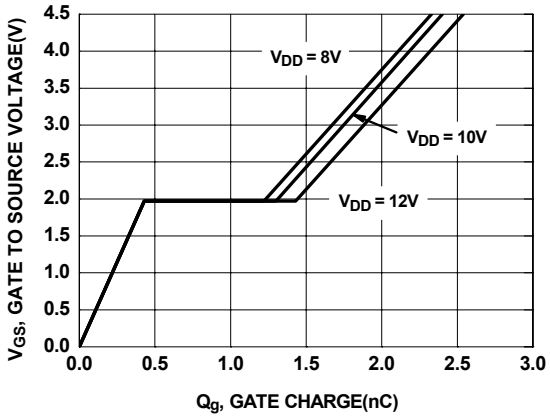


Figure 7. Gate Charge Characteristics

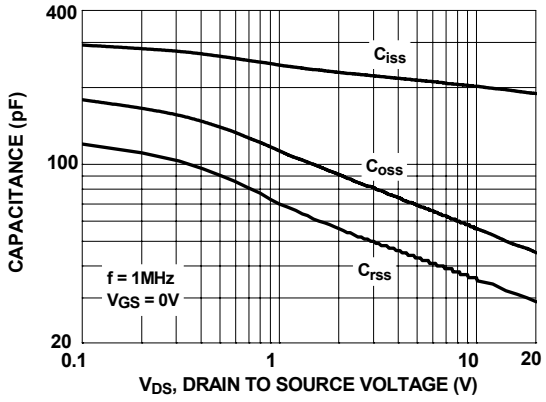


Figure 8. Capacitance vs Drain to Source Voltage

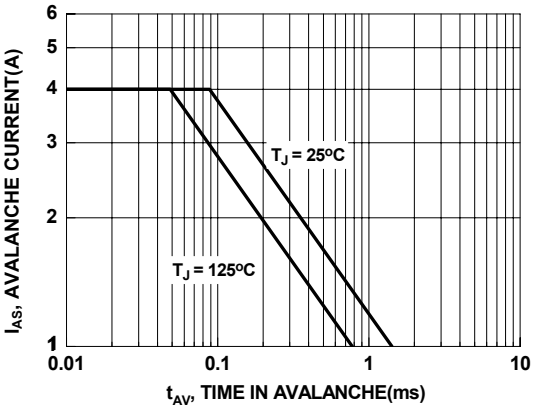


Figure 9. Unclamped Inductive Switching Capability

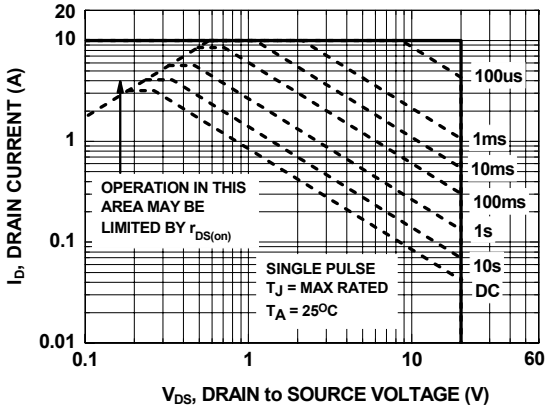


Figure 10. Forward Bias Safe Operating Area

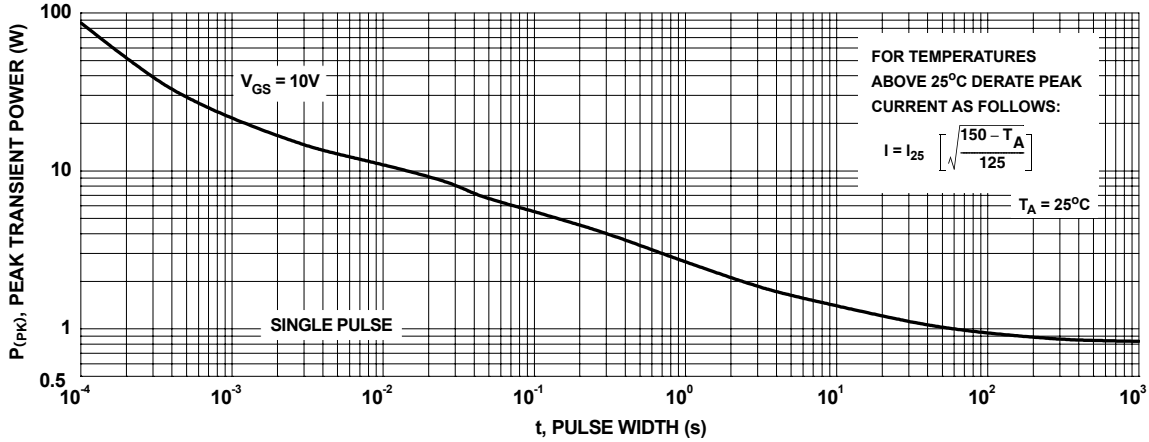


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics (Q1 N-Channel) T_J = 25°C unless otherwise noted

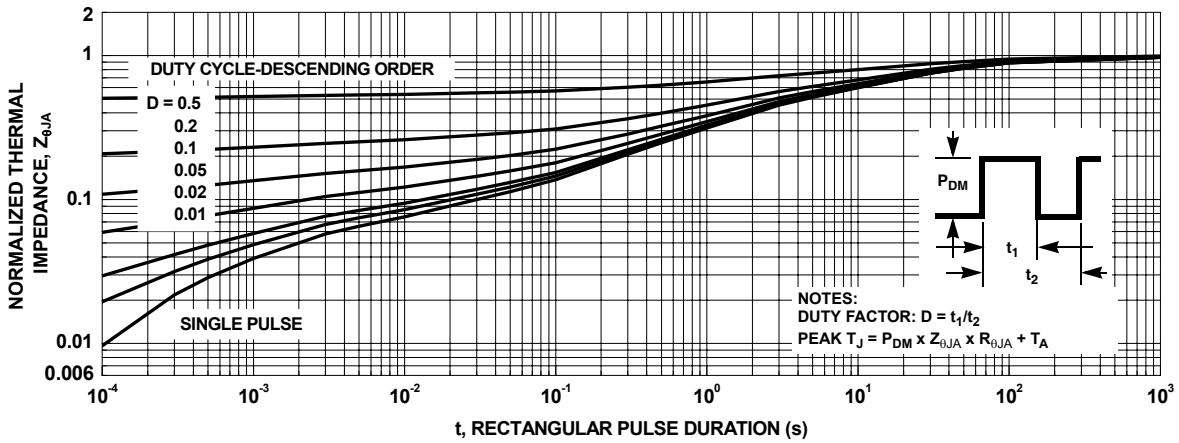


Figure 12. Transient Thermal Response Curve

Typical Characteristics (Q2 N-Channel)

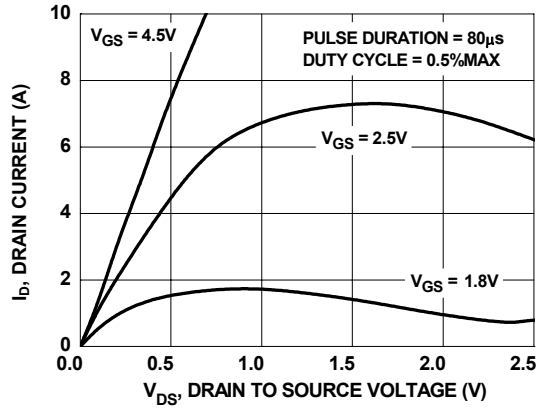


Figure 13. On Region Characteristics

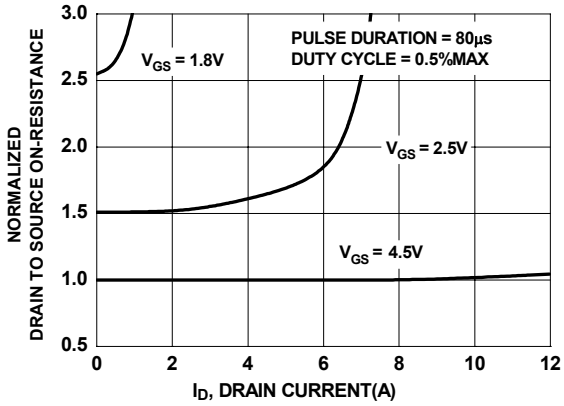


Figure 14. Normalized on-Resistance vS Drain Current and Gate Voltage

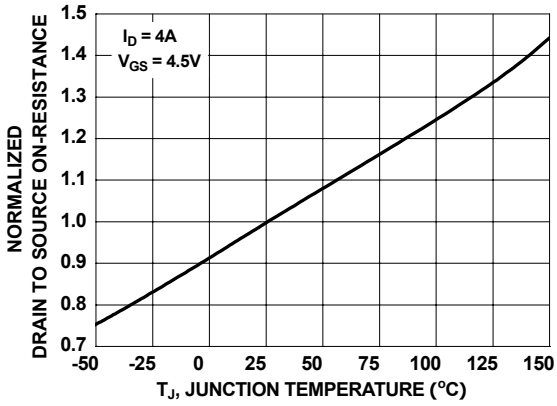


Figure 15. Normalized On Resistance vs Junction Temperature

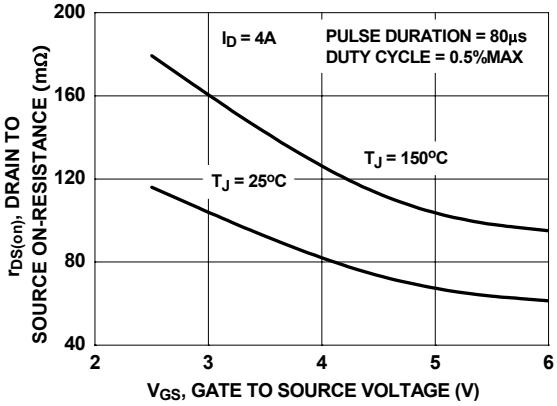


Figure 16. On-Resistance vs Gate to Source Voltage

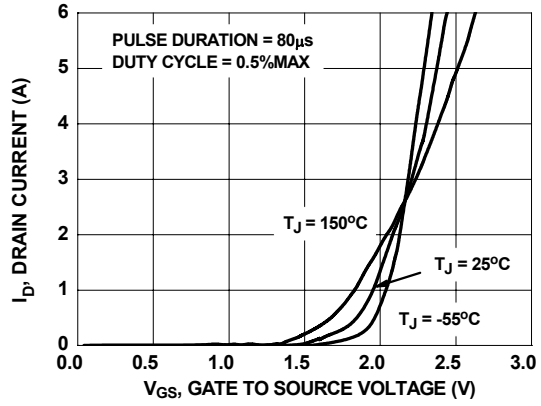


Figure 17. Transfer Characteristics

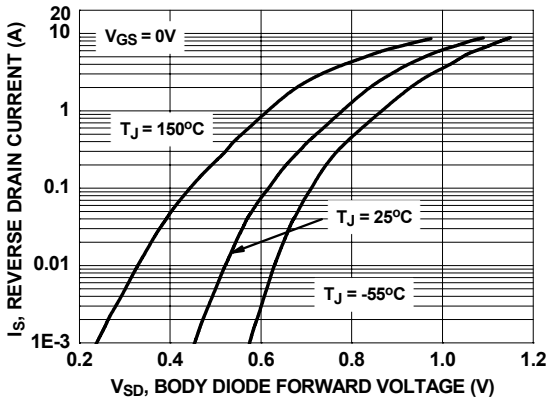


Figure 18. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics

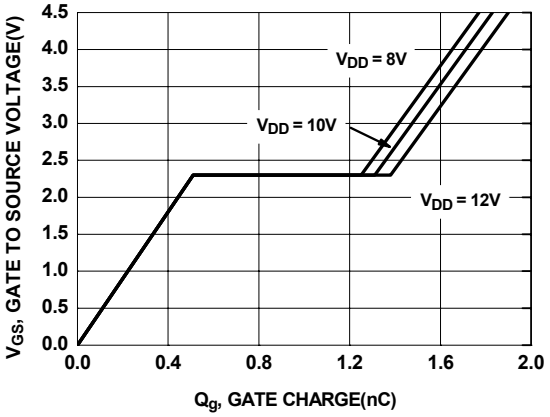


Figure 19. Gate Charge Characteristics

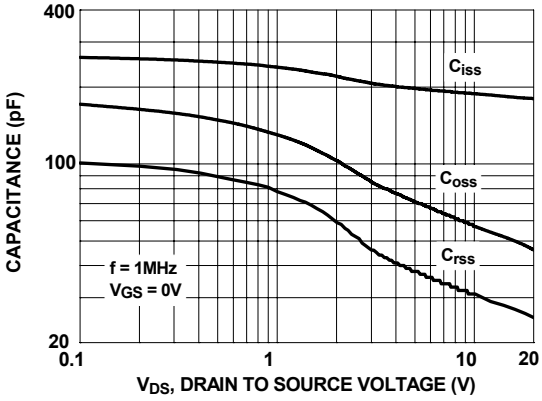


Figure 20. Capacitance vs Drain to Source Voltage

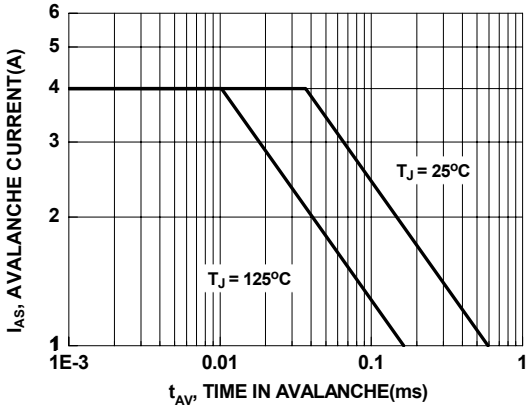


Figure 21. Unclamped Inductive Switching Capability

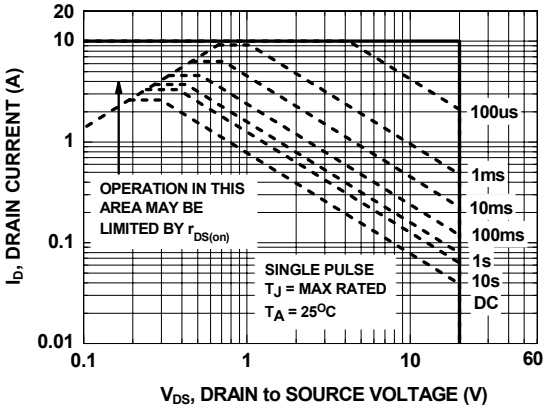


Figure 22. Forward Bias Safe Operating Area

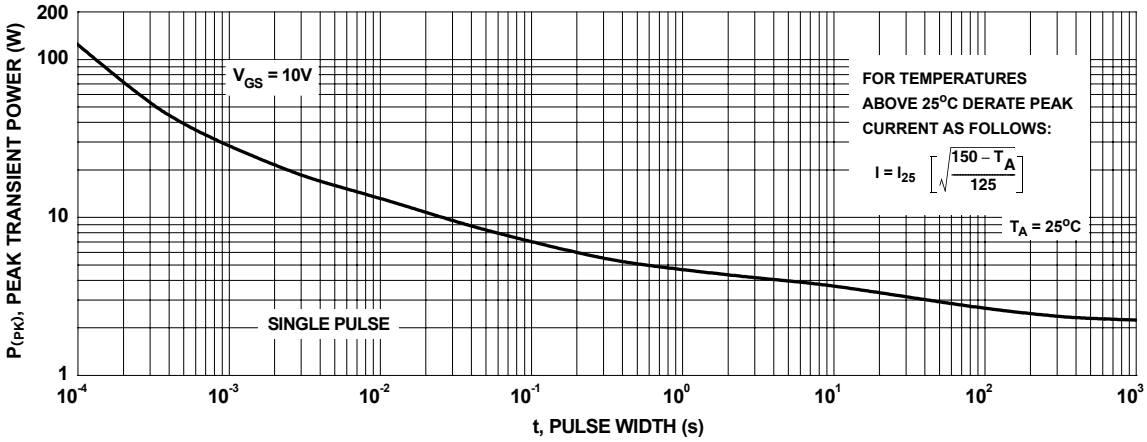


Figure 23. Single Pulse Maximum Power Dissipation

Typical Characteristics

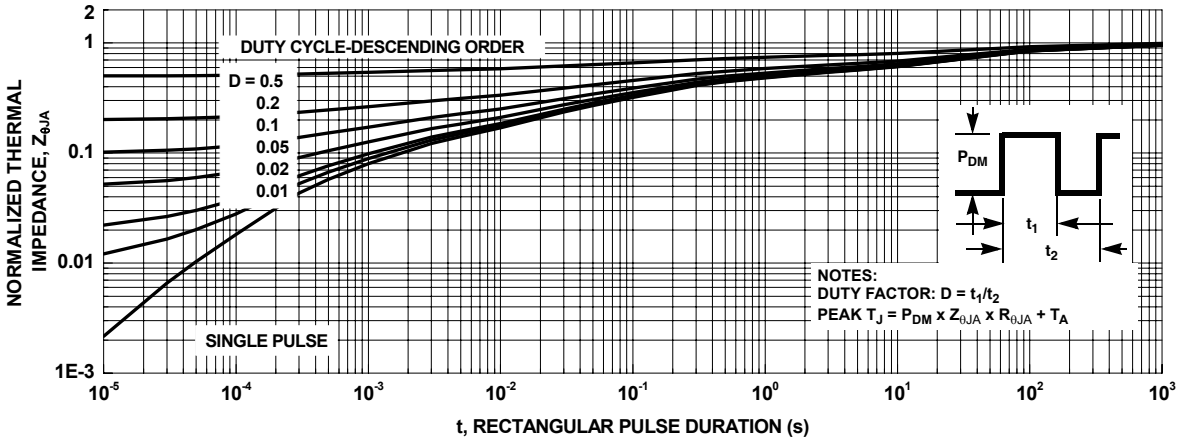
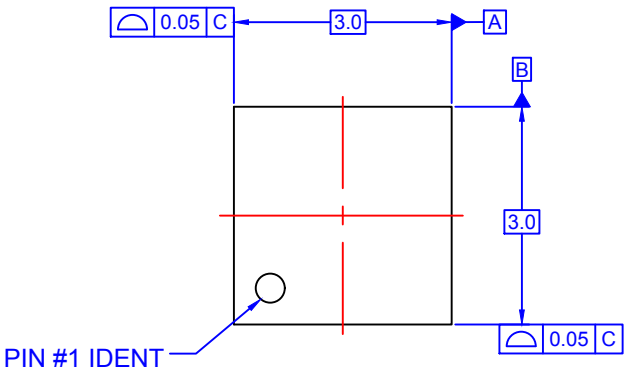
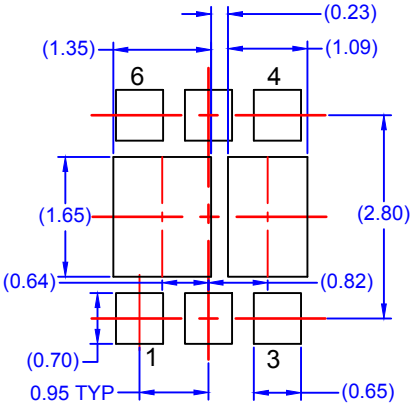


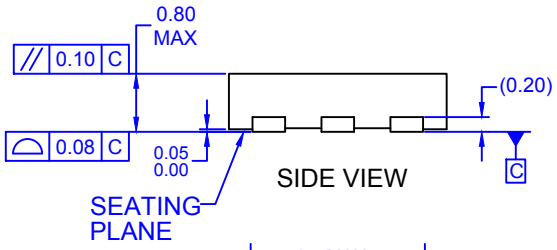
Figure 24. Transient Thermal Response Curve



TOP VIEW

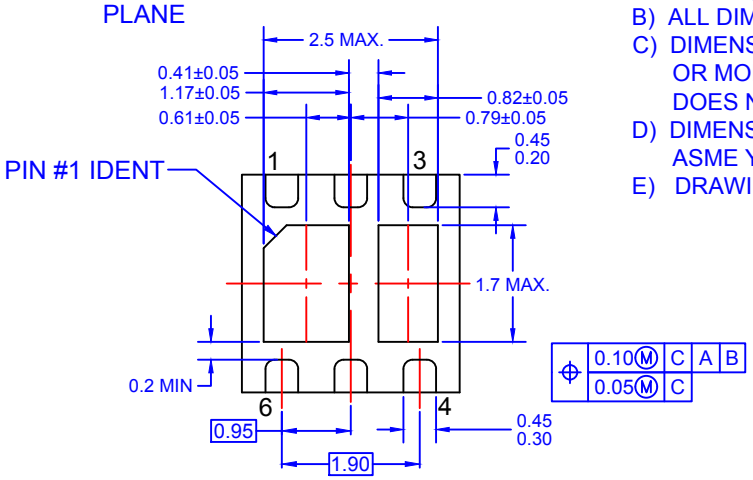


RECOMMENDED LAND PATTERN



SIDE 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.
E) DRAWING FILE NAME: MKT-MLP06HREV2



BOTTOM VIEW

FAIRCHILD

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative