Lead-free Green

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
Q1 N-Channel	30V	460mΩ @ V_{GS} = 4.5V	1.1A
		560mΩ @ V_{GS} = 2.5V	0.9A
Q2 P-Channel	-30V	1000mΩ @ V_{GS} = -4.5V	-0.7A
		1500mΩ @ V_{GS} = -2.5V	-0.5A

Features and Benefits

- Footprint of just 1.3 mm^2
- Ultra Low Profile Package – 0.35mm Profile
- Low Gate Threshold Voltage
- Fast Switching Speed
- Ultra-Small Surface Mount Package
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

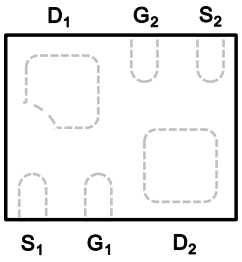
- Motor Control
- Power Management Functions
- Backlighting

Mechanical Data

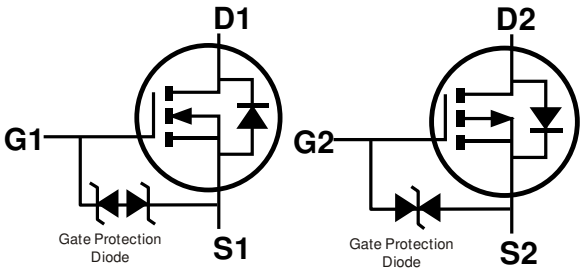
- Case: X2-DFN1310-6 (Type B)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.002 grams (Approximate)

X2-DFN1310-6 (Type B)

Bottom View



Top View
Pin-Out



Q1 N-Channel

Q2 P-Channel

Equivalent Circuit

Ordering Information (Note 4)

Part Number	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DMC3730UFL3-7	7	8	3,000

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at http"//www.diodes.com/products/packages.html.

Marking Information

730 = Product Type Marking Code

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Q1	Q2	Unit
Drain-Source Voltage			V_{DSS}	30	-30	V
Gate-Source Voltage			V_{GSS}	±8	±8	V
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	1.1 0.8	-0.7 -0.6	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.39	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	330	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	0.81	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	156	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	51	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (N-Channel Q1) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1	µA	V_{DS} = 30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.45	0.72	0.95	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	291	460	mΩ	V_{GS} = 4.5V, I_D = 200mA
			335	560		V_{GS} = 2.5V, I_D = 100mA
			398	730		V_{GS} = 1.8V, I_D = 75mA
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 300mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{ISS}	—	65.9	—	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{OSS}	—	5.8	—	pF	
Reverse Transfer Capacitance	C_{RSS}	—	4.3	—	pF	
Gate Resistance	R_G	—	64	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_G	—	0.9	—	nC	V_{DS} = 15V, V_{GS} = 4.5V, I_D = 1A
Gate-Source Charge	Q_{GS}	—	0.1	—	nC	
Gate-Drain Charge	Q_{GD}	—	0.1	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.6	—	ns	V_{GS} = 4.5V, V_{DS} = 10V, R_G = 6Ω, I_D = 1A
Turn-On Rise Time	t_R	—	6.4	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	19.4	—	ns	
Turn-Off Fall Time	t_F	—	6.9	—	ns	

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Electrical Characteristics (P-Channel Q2) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-30	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	-1	µA	V_{DS} = -30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.5	-0.78	-1.1	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	644	1,000	mΩ	V_{GS} = -4.5V, I_D = -400mA
			769	1,500		V_{GS} = -2.5V, I_D = -200mA
			949	2,000		V_{GS} = -1.8V, I_D = -100mA
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -300mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{ISS}	—	83	—	pF	V_{DS} = -30V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{OSS}	—	6.2	—	pF	
Reverse Transfer Capacitance	C_{RSS}	—	4.1	—	pF	
Gate Resistance	R_G	—	177	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_G	—	0.9	—	nC	V_{DS} = -15V, V_{GS} = -4.5V, I_D = -1A
Gate-Source Charge	Q_{GS}	—	0.1	—	nC	
Gate-Drain Charge	Q_{GD}	—	0.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	6.0	—	ns	V_{GS} = -4.5V, V_{DS} = -10V, R_G = 6Ω, I_D = -1A
Turn-On Rise Time	t_R	—	11.7	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	28.9	—	ns	
Turn-Off Fall Time	t_F	—	15.5	—	ns	

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Typical Characteristics (N-Channel)

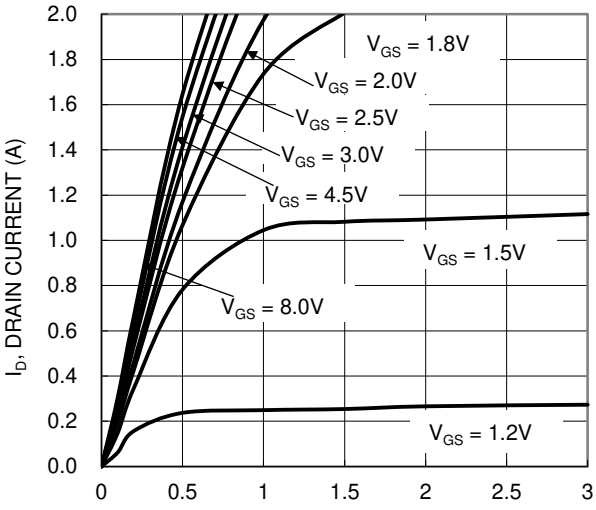


Figure 1. Typical Output Characteristic

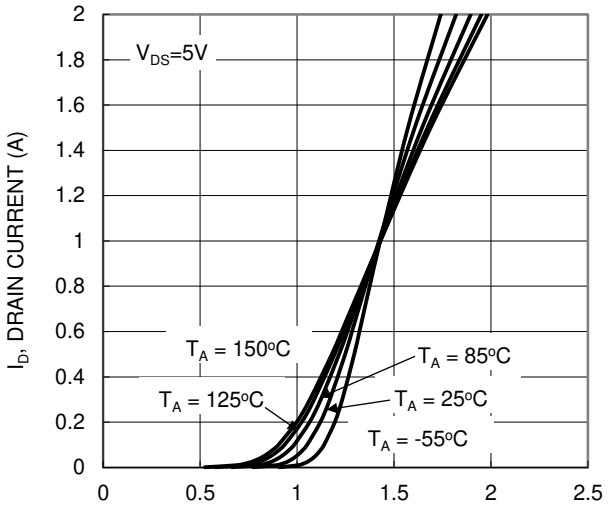


Figure 2. Typical Transfer Characteristic

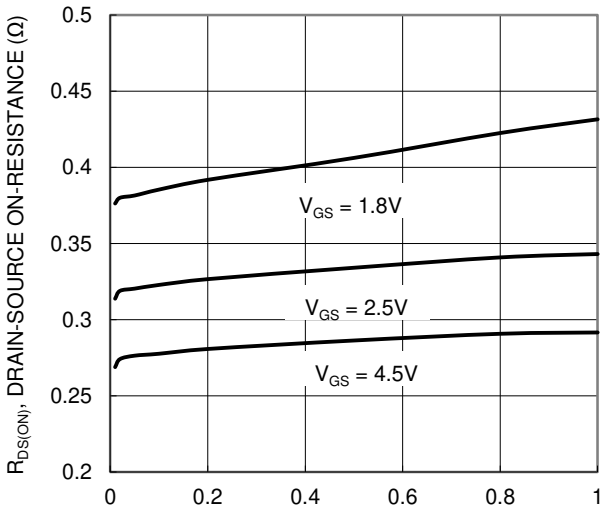


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

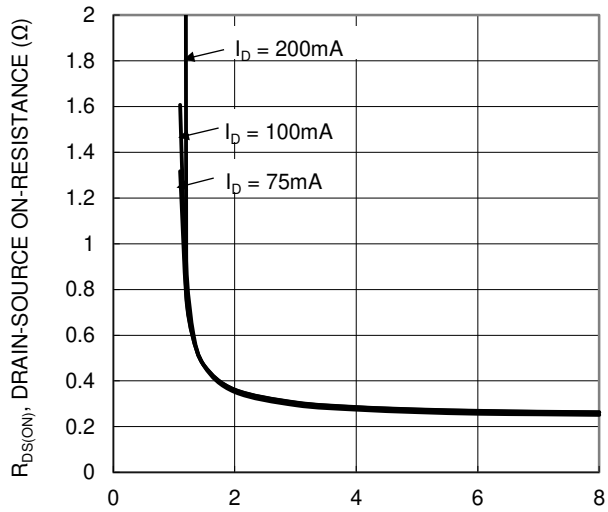


Figure 4. Typical Transfer Characteristic

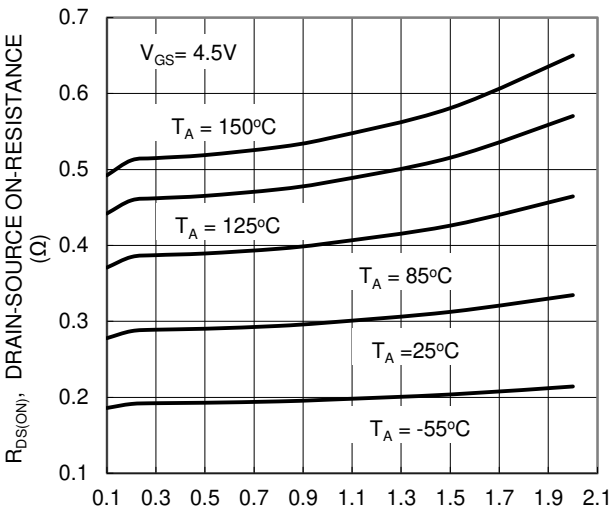


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

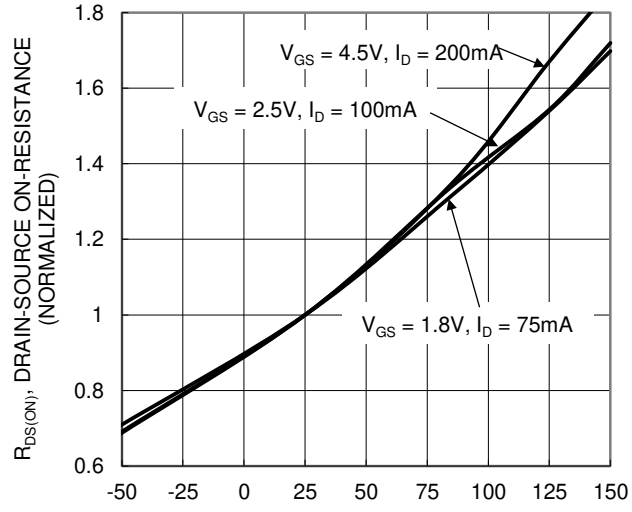


Figure 6. On-Resistance Variation with Junction Temperature

Typical Characteristics (N-Channel) (Continued)

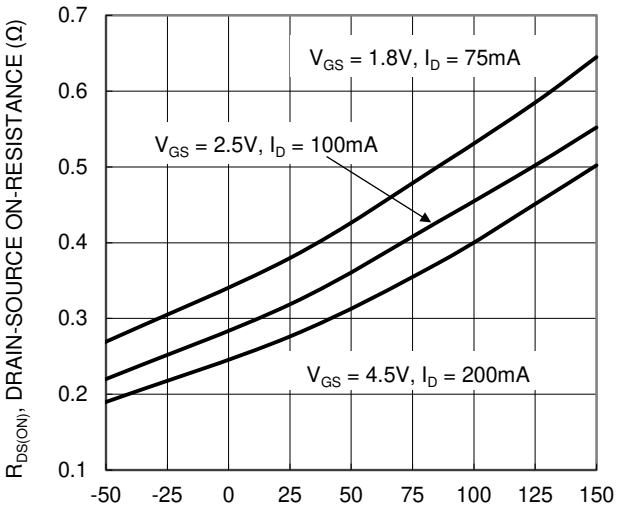


Figure 7. On-Resistance Variation with Junction Temperature

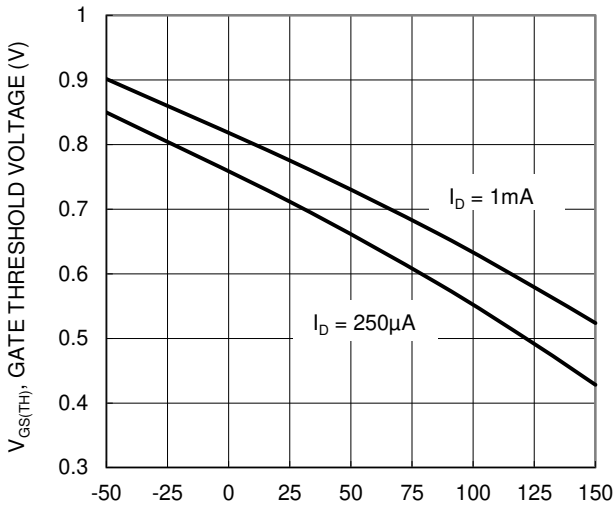


Figure 8. Gate Threshold Variation vs Junction Temperature

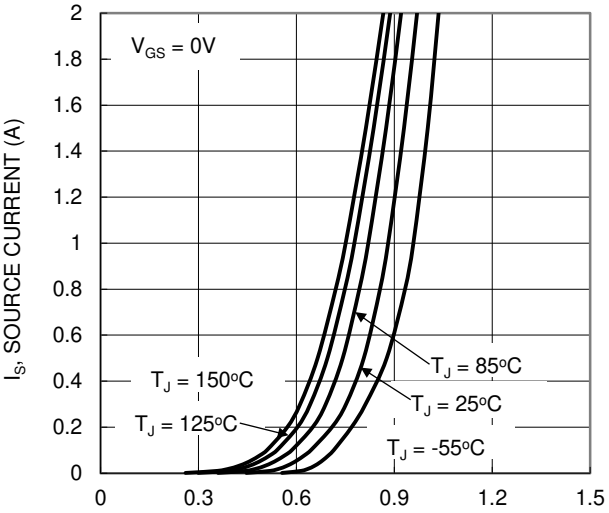


Figure 9. Diode Forward Voltage vs. Current

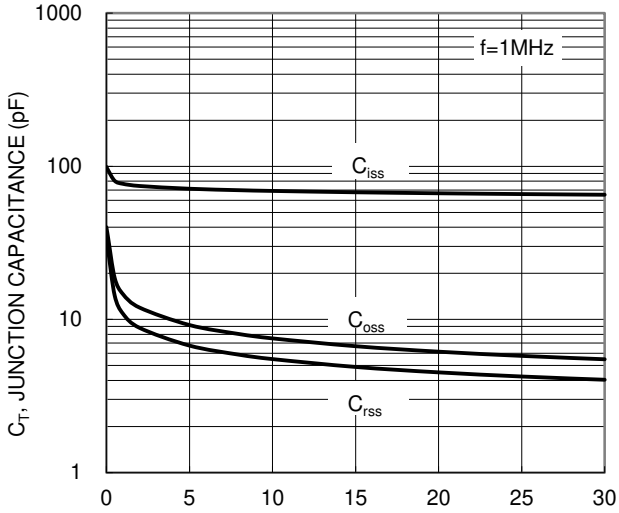


Figure 10. Typical Junction Capacitance

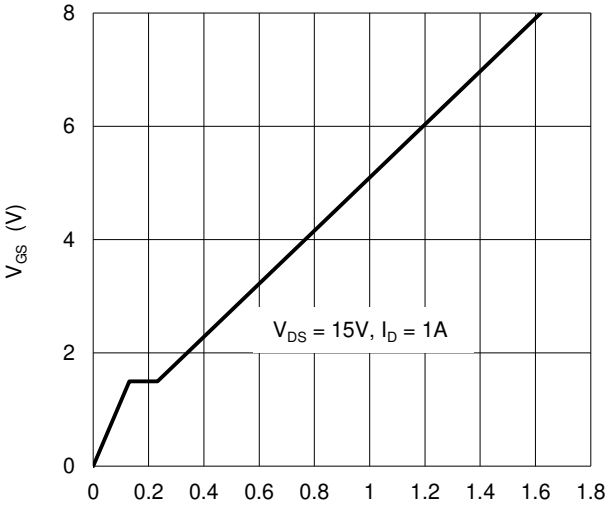


Figure 11. Gate Charge

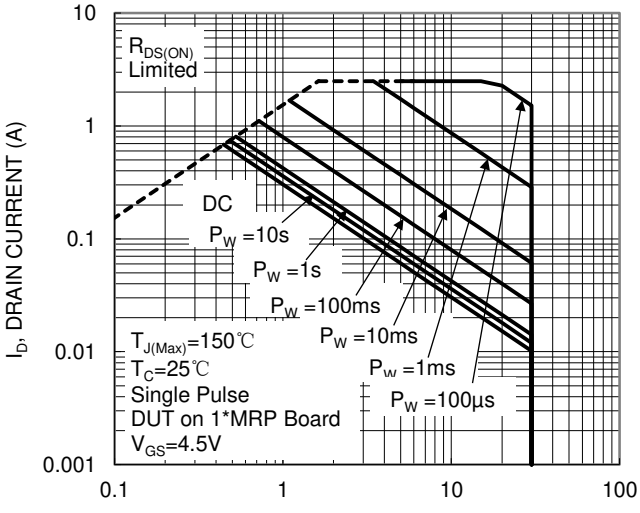


Figure 12. SOA, Safe Operation Area

Typical Characteristics (P-Channel)

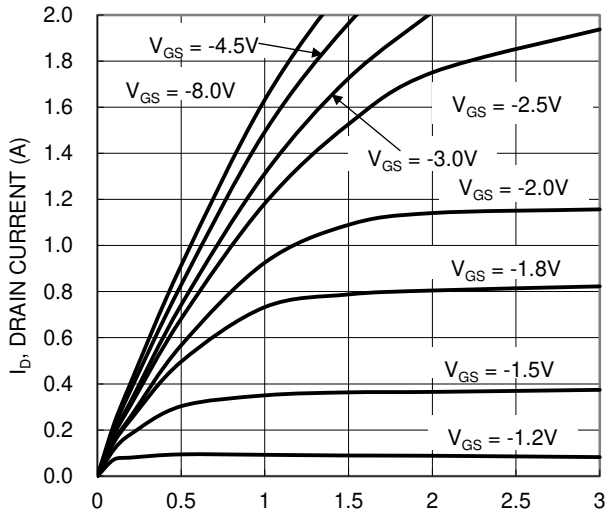


Figure 13. Typical Output Characteristic

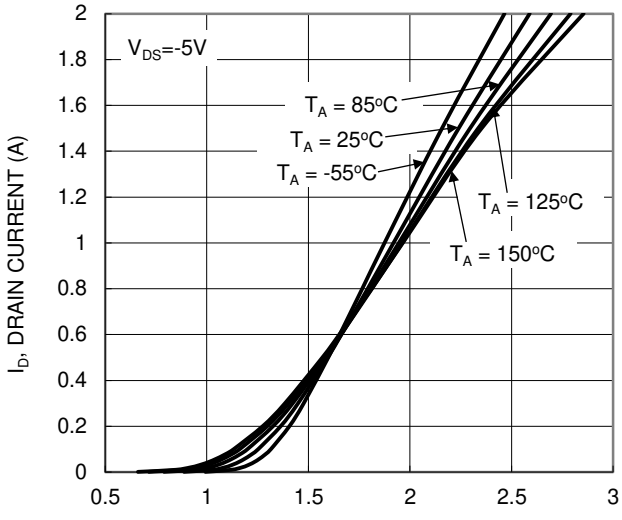


Figure 14. Typical Transfer Characteristic

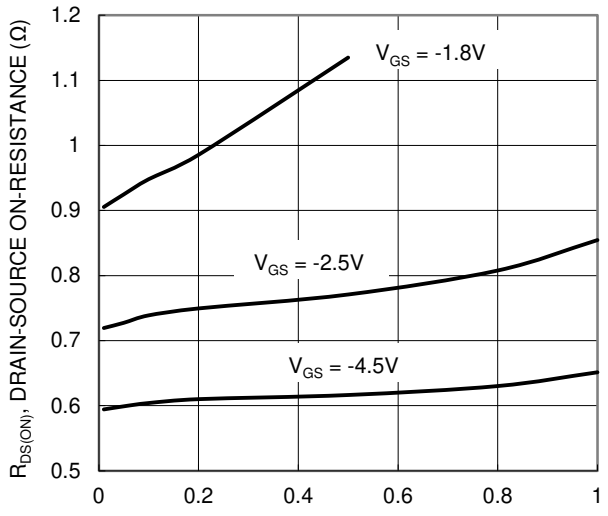


Figure 15. Typical On-Resistance vs Drain Current and Gate Voltage

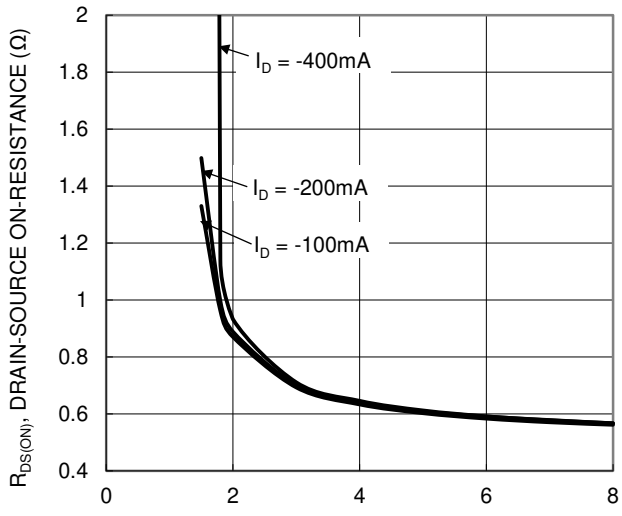


Figure 16. Typical Transfer Characteristic

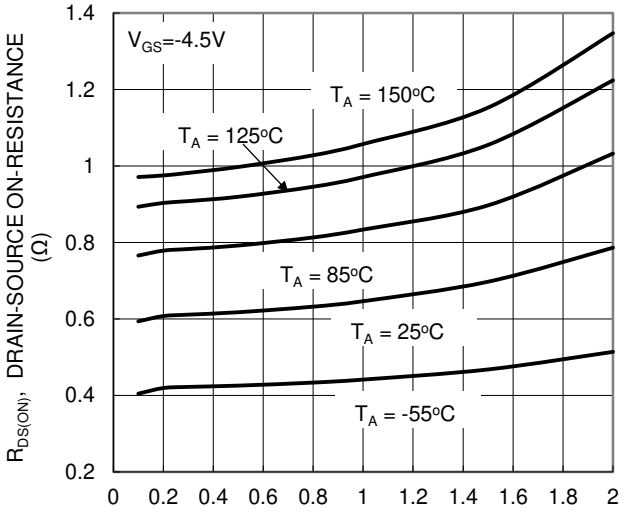


Figure 17. Typical On-Resistance vs Drain Current and Junction Temperature

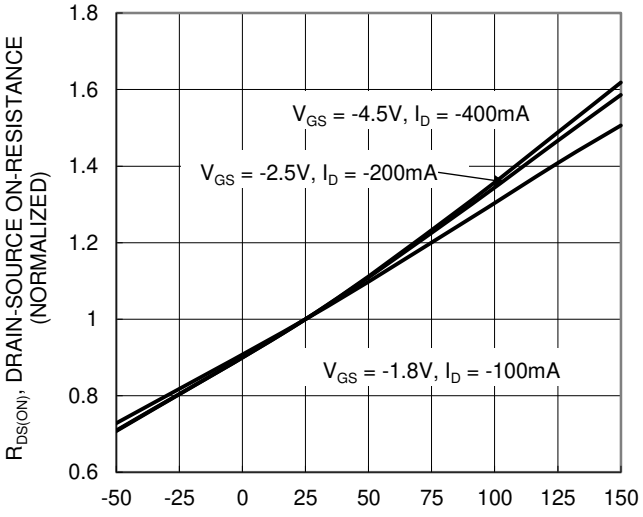


Figure 18. On-Resistance Variation with Junction Temperature

Typical Characteristics (P-Channel) (Continued)

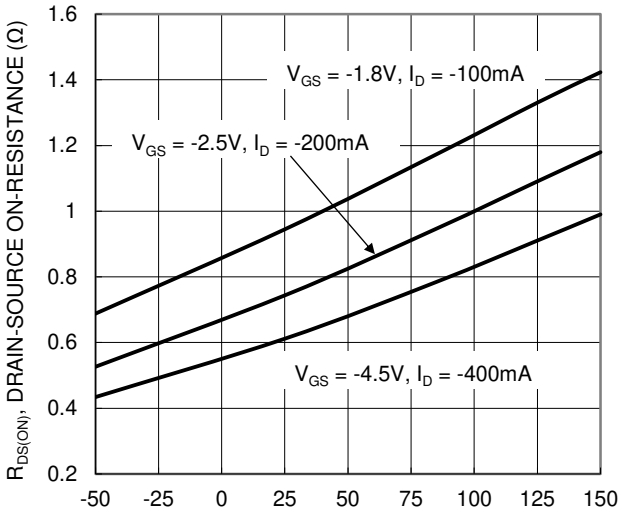


Figure 19. On-Resistance Variation with Junction Temperature

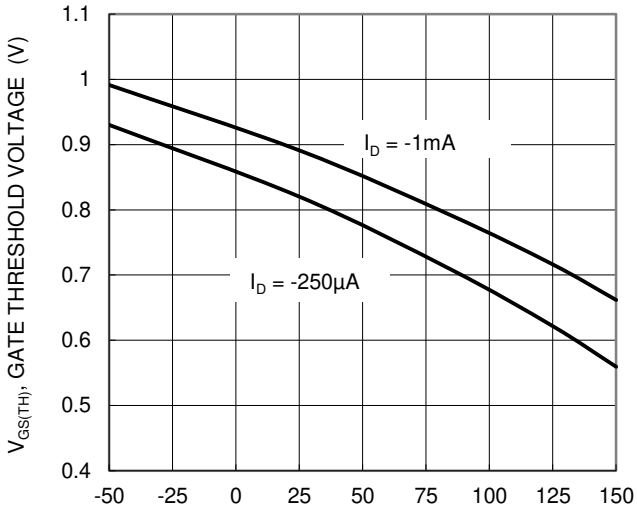


Figure 20. Gate Threshold Variation vs Junction Temperature

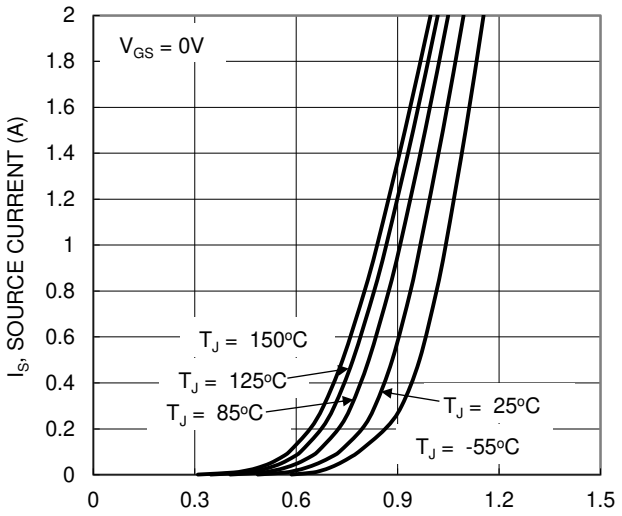


Figure 21. Diode Forward Voltage vs. Current

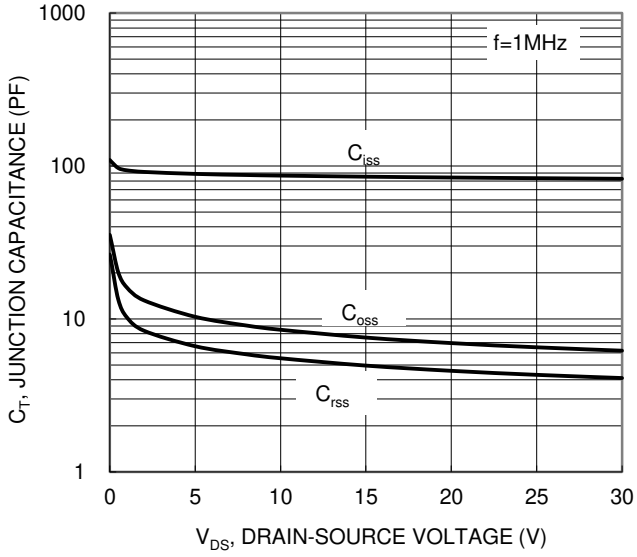


Figure 22. Typical Junction Capacitance

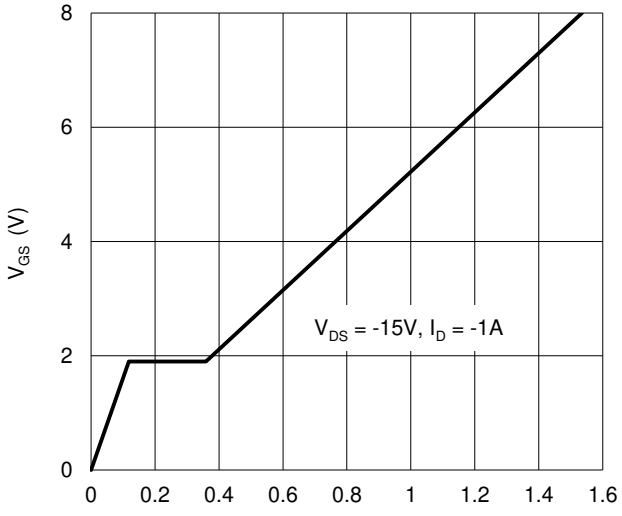


Figure 23. Gate Charge

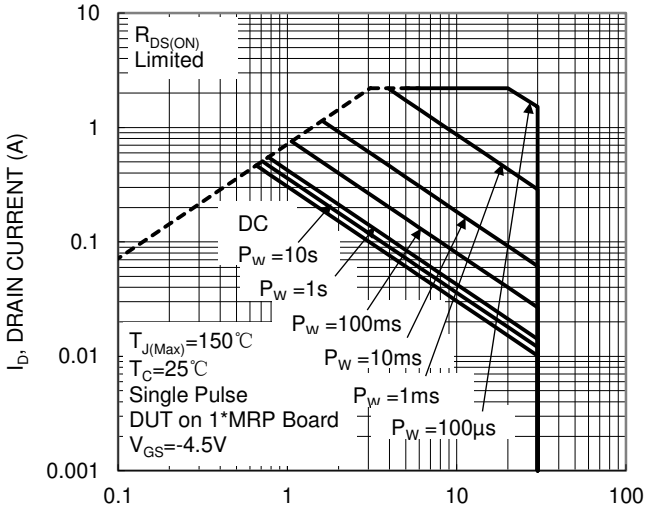


Figure 24. SOA, Safe Operation Area

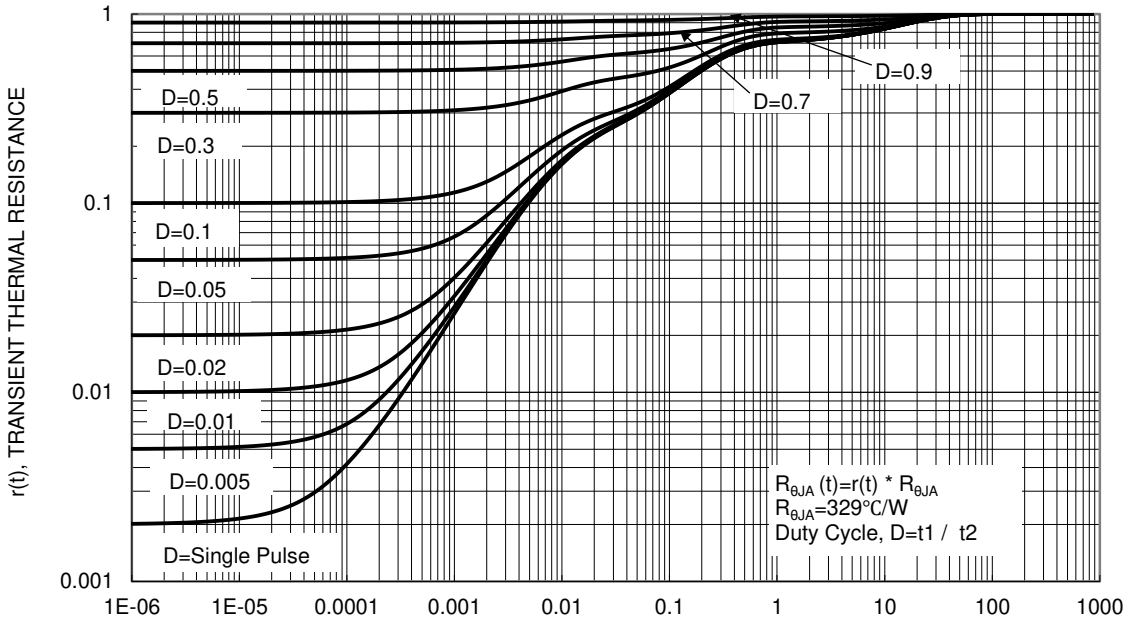
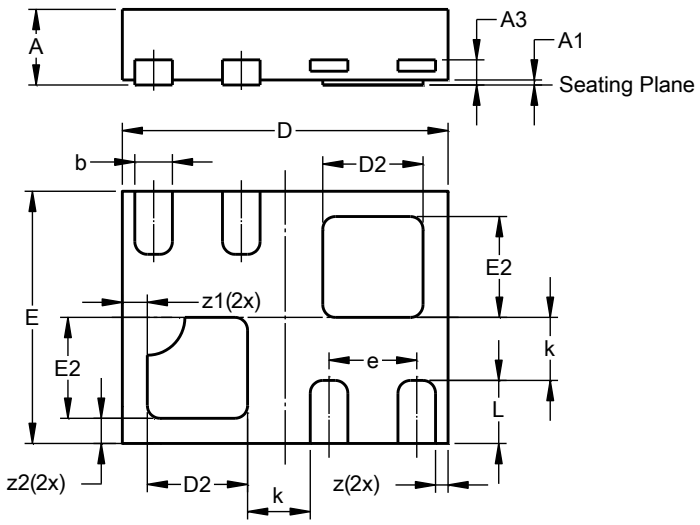


Figure 25. Transient Thermal Resistance

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

X2-DFN1310-6 (Type B)

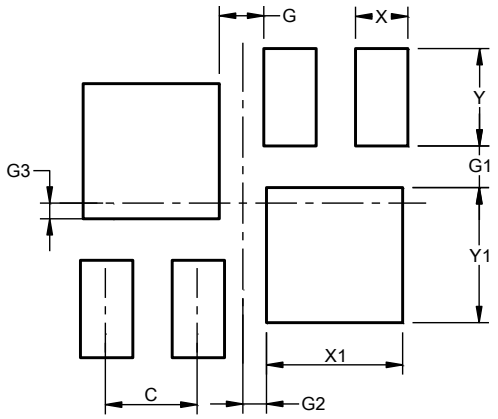


X2-DFN1310-6 (Type B)			
Dim	**Min**	**Max**	**Typ**
A	0.25	0.35	0.30
A1	0	0.05	0.02
A3	–	–	0.100
b	0.10	0.20	0.15
D	1.25	1.35	1.30
D2	0.30	0.50	0.40
E	0.95	1.05	1.00
E2	0.30	0.50	0.40
e	–	–	0.35
k	0.15	–	–
L	0.20	0.30	0.25
z	–	–	0.05
z1	–	–	0.10
z2	–	–	0.10
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

X2-DFN1310-6 (Type B)



Dimensions	Value (in mm)
C	0.350
G	0.17
G1	0.16
G2	0.09
G3	0.06
X	0.20
X1	0.52
Y	0.375
Y1	0.52

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1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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