COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
Q1	20V	0.99Ω @ V_{GS} = 4.5V	0.5A
		1.2Ω @ V_{GS} = 2.5V	0.45A
		1.8Ω @ V_{GS} = 1.8V	0.37A
		2.4Ω @ V_{GS} = 1.5V	0.32A
Q2	-20V	1.9Ω @ V_{GS} = -4.5V	-0.36A
		2.4Ω @ V_{GS} = -2.5V	-0.32A
		3.4Ω @ V_{GS} = -1.8V	-0.27A
		5.0Ω @ V_{GS} = -1.5V	-0.22A

Features

- Low On-Resistance
- Very Low Gate Threshold Voltage
  - N-Channel: 1.0V Maximum
  - P-Channel: -1.0V Maximum
- Low Input/Output Leakage
- Fast Switching Speed
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Description and Applications

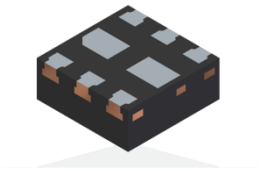
This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Power-management functions
- Backlighting
- Load switches

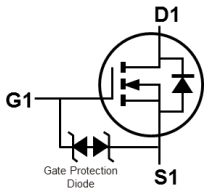
Mechanical Data

- Package: X2-DFN1010-6
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.0015 grams (Approximate)

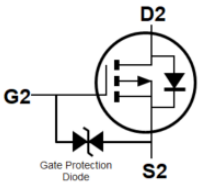
X2-DFN1010-6 (Type UXC)



Bottom View

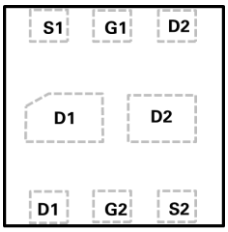


N-Channel



P-Channel

Equivalent Circuit



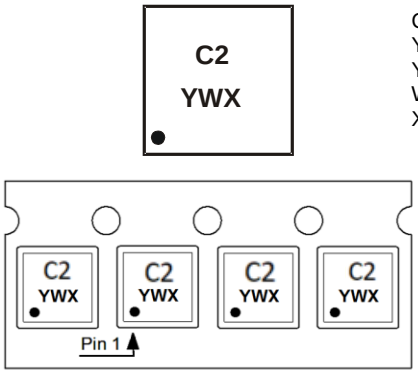
Pinout Top View

Ordering Information (Note 4)

Orderable Part Number	Package	Tape Width (mm)	Tape Pitch (mm)	Packing	
				Qty.	Carrier
DMC2991UDR4-7	X2-DFN1010-6 (Type UXC)	8	4	5000	Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

DMC2991UDR4-7	

C2 = Product Type Marking Code
YWX = Date Code Marking
Y = Year (ex: 4 = 2024)
W = Week (ex: a = Week 27; z Represents Week 52 and 53)
X = Internal Code (ex: U = Monday)

Date Code Key

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	2	3	4	5	6	7	8	9	0	1	2	3

Week	1-26	27-52	53
Code	A-Z	a-z	z

Internal Code	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Code	T	U	V	W	X	Y	Z

Maximum Ratings Q1 N-CHANNEL (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	0.5 0.4	A
Maximum Continuous Body Diode Forward Current (Note 5)			I_S	0.3	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	1.4	A

Maximum Ratings Q2 P-CHANNEL (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 5) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-0.36 -0.3	A
Maximum Continuous Body Diode Forward Current (Note 5)			I_S	-0.3	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-0.8	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P_D	0.37	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	337	°C/W
Total Power Dissipation (Note 6)		P_D	0.7	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	178	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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.

Electrical Characteristics Q1 N-CHANNEL (@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}	20	—	—	V	V_{GS} = 0V, I_D = 10μA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	—	—	1	μA	V_{DS} = 16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	μA	V_{GS} = ±5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	—	1.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.5	0.99	Ω	V_{GS} = 4.5V, I_D = 100mA
		—	0.6	1.2		V_{GS} = 2.5V, I_D = 50mA
		—	0.7	1.8		V_{GS} = 1.8V, I_D = 20mA
		—	0.9	2.4		V_{GS} = 1.5V, I_D = 10mA
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	V_{GS} = 0V, I_S = 150mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	14.6	—	pF	V_{DS} = 16V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	4.7	—		
Reverse Transfer Capacitance	C_{rss}	—	3.2	—		
Total Gate Charge	Q_g	—	0.28	—	nC	V_{GS} = 4.5V, V_{DS} = 10V I_D = 250mA
Gate-Source Charge	Q_{gs}	—	0.04	—		
Gate-Drain Charge	Q_{gd}	—	0.1	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.1	—	ns	V_{DD} = 10V, V_{GS} = 4.5V R_L = 47Ω, R_G = 10Ω I_D = 200mA
Turn-On Rise Time	t_R	—	18	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	125	—		
Turn-Off Fall Time	t_F	—	56.9	—		

Electrical Characteristics Q2 P-CHANNEL (@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}	-20	—	—	V	V_{GS} = 0V, I_D = -250μA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	—	—	-1	μA	V_{DS} = -16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	μA	V_{GS} = ±5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.4	—	-1.0	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.7	1.9	Ω	V_{GS} = -4.5V, I_D = -100mA
		—	2.2	2.4		V_{GS} = -2.5V, I_D = -50mA
		—	2.9	3.4		V_{GS} = -1.8V, I_D = -20mA
		—	3.7	5.0		V_{GS} = -1.5V, I_D = -10mA
Diode Forward Voltage	V_{SD}	—	-0.7	-1.1	V	V_{GS} = 0V, I_S = -10mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	17	—	pF	V_{DS} = -16V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	4.1	—		
Reverse Transfer Capacitance	C_{rss}	—	2.7	—		
Total Gate Charge	Q_g	—	0.3	—	nC	V_{GS} = -4.5V, V_{DS} = -10V I_D = -250mA
Gate-Source Charge	Q_{gs}	—	0.04	—		
Gate-Drain Charge	Q_{gd}	—	0.1	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.3	—	ns	V_{DD} = -15V, V_{GS} = -4.5V R_G = 2Ω, I_D = -200mA
Turn-On Rise Time	t_R	—	20.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	185	—		
Turn-Off Fall Time	t_F	—	97	—		

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

Q1 N-CHANNEL

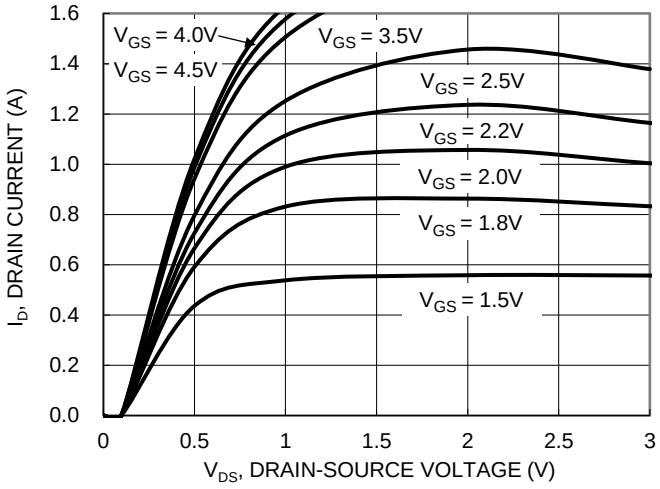


Figure 1. Typical Output Characteristic

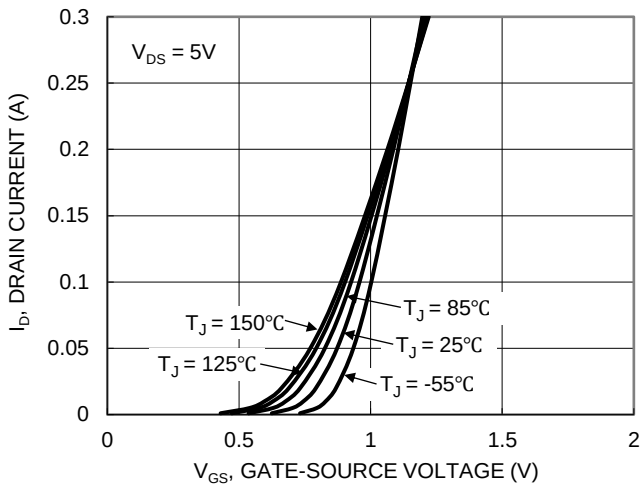


Figure 2. Typical Transfer Characteristic

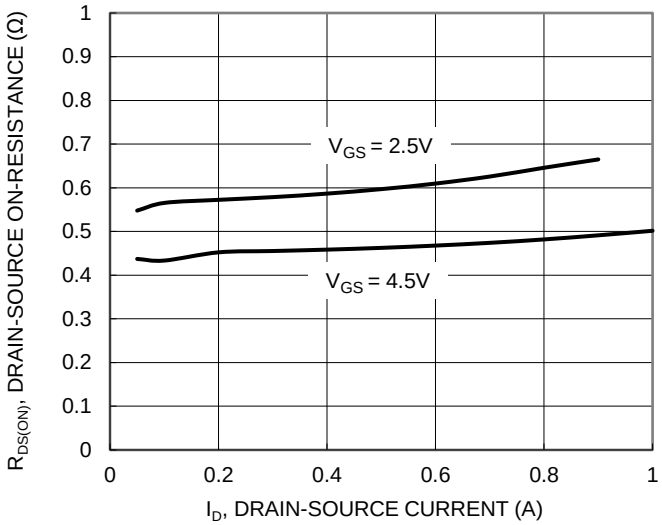


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

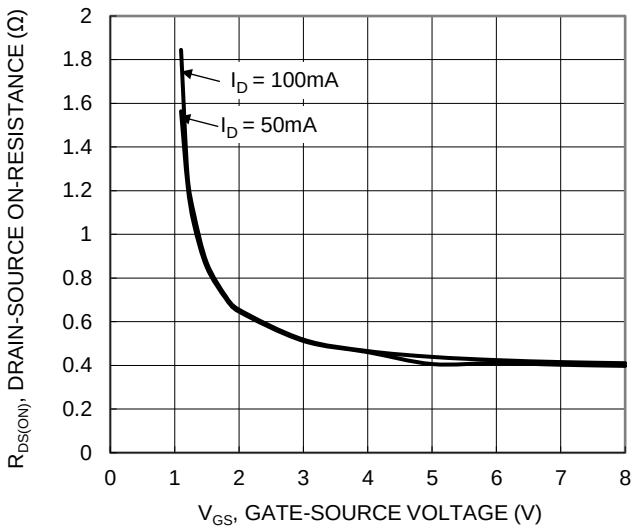


Figure 4. Typical Transfer Characteristic

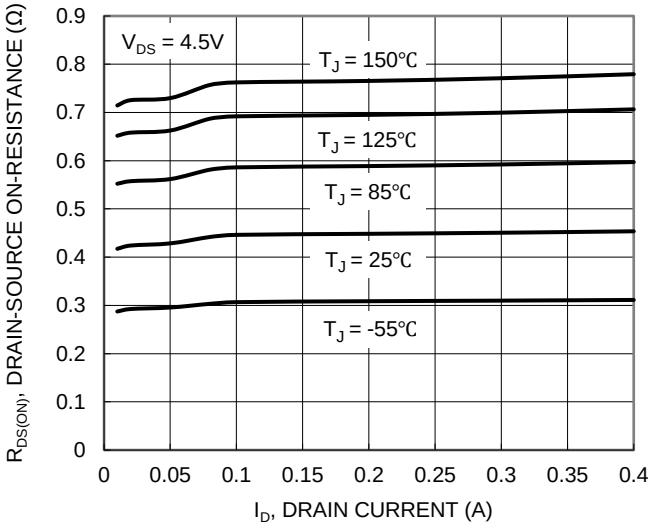


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

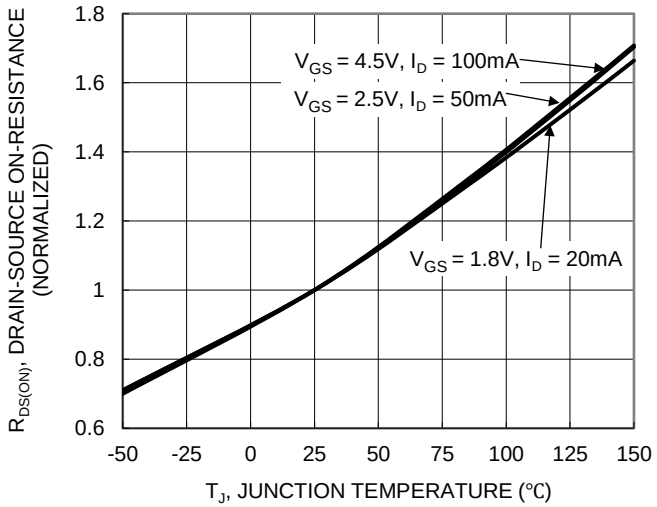


Figure 6. On-Resistance Variation with Junction Temperature

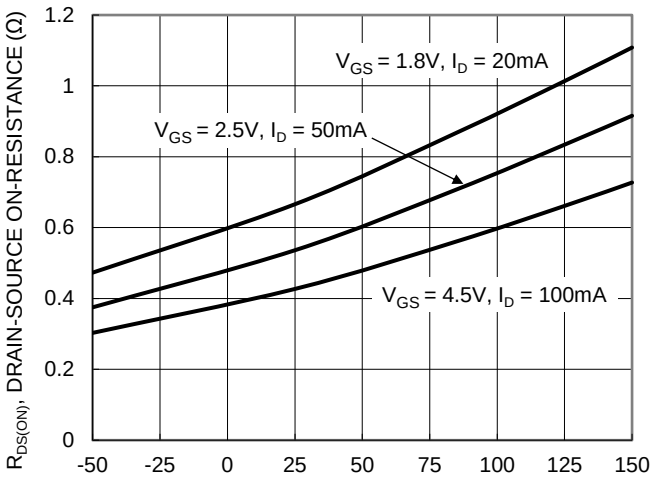


Figure 7. On-Resistance Variation with Junction Temperature

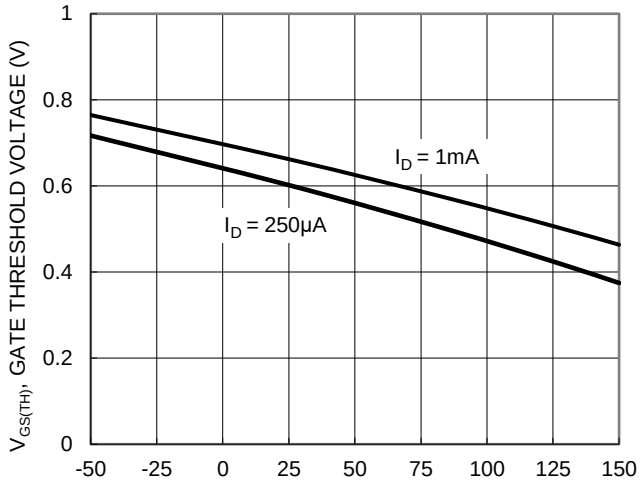


Figure 8. Gate Threshold Variation vs. Junction Temperature

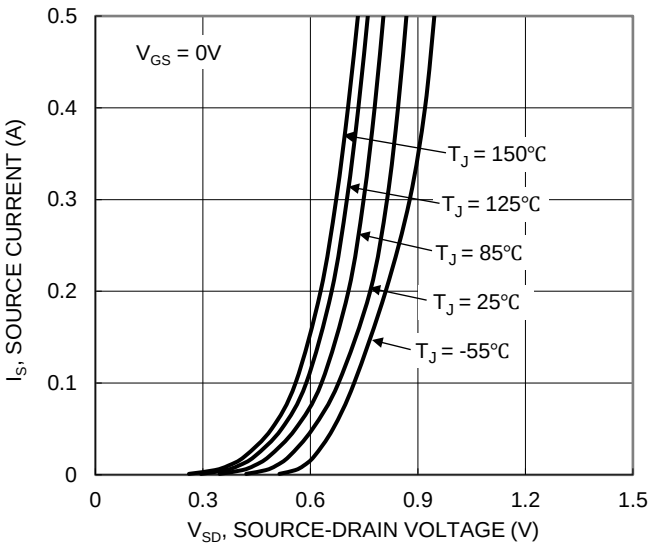


Figure 9. Diode Forward Voltage vs. Current

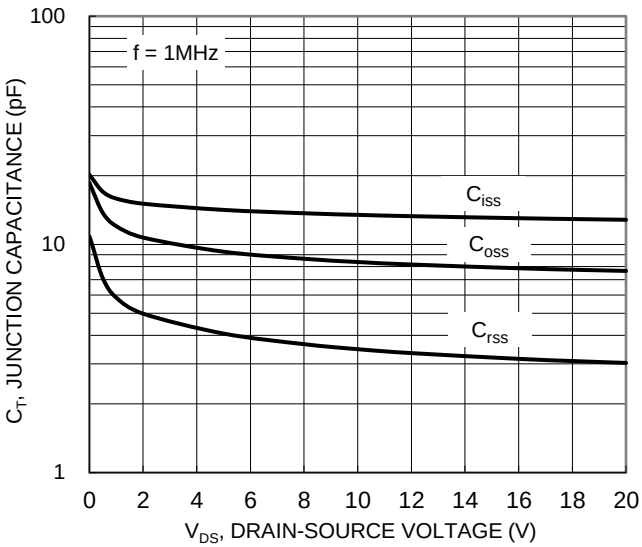


Figure 10. Typical Junction Capacitance

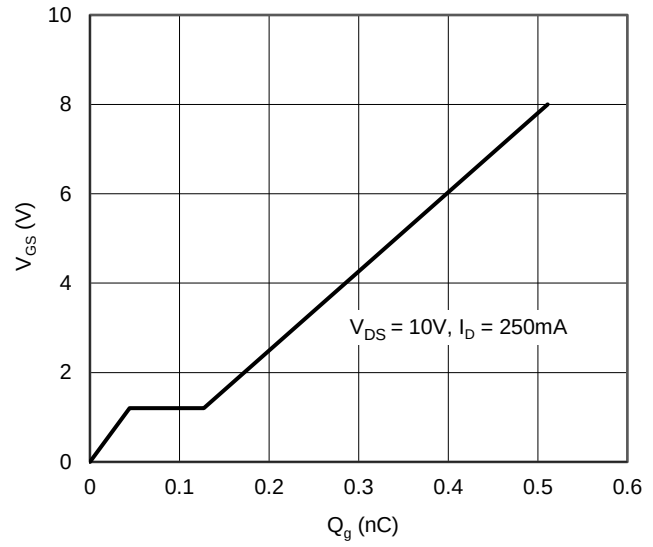


Figure 11. Gate Charge

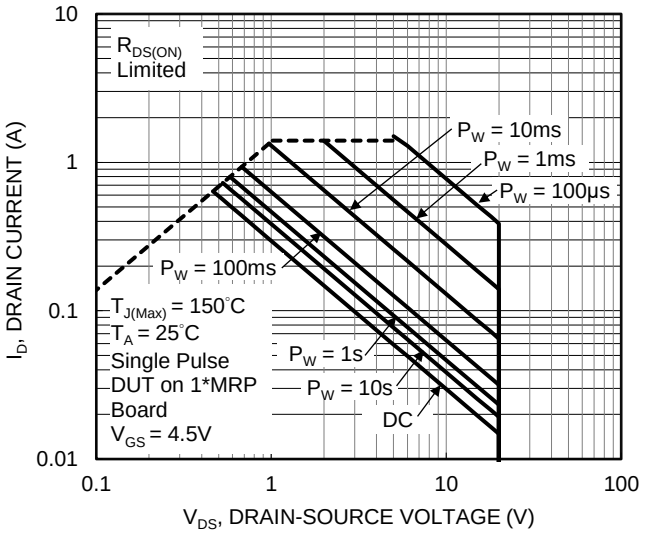


Figure 12. SOA, Safe Operation Area

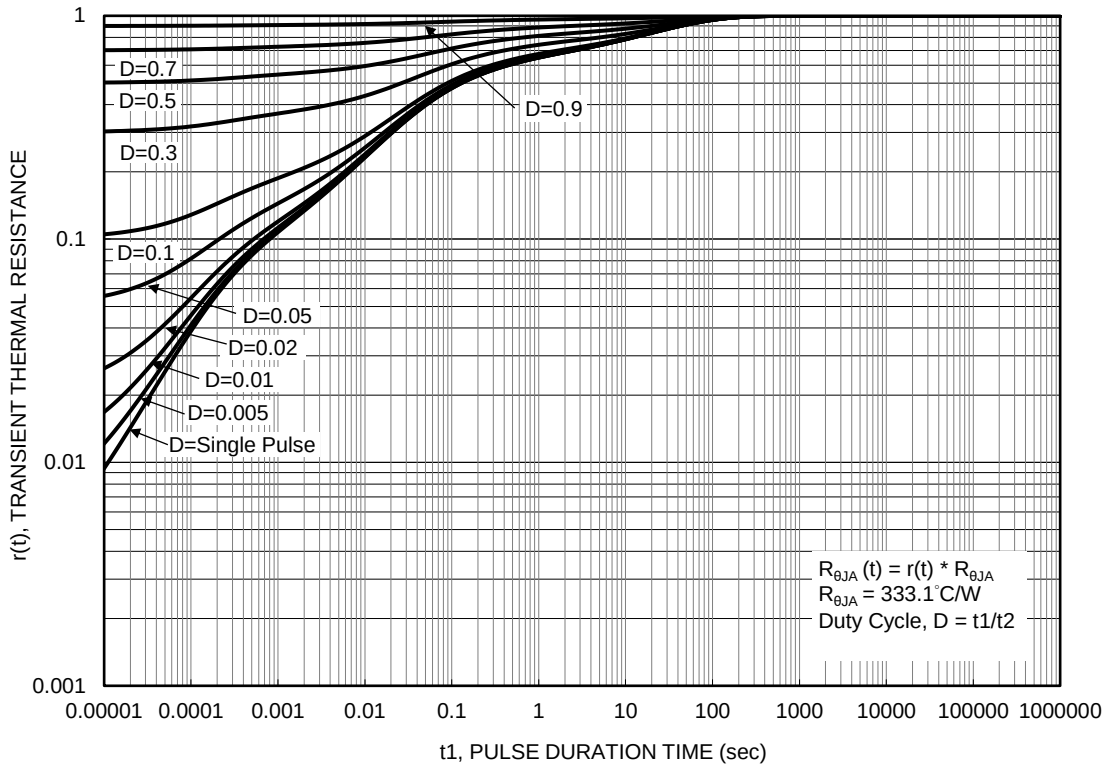


Figure 13. Transient Thermal Resistance

Q2 P-CHANNEL

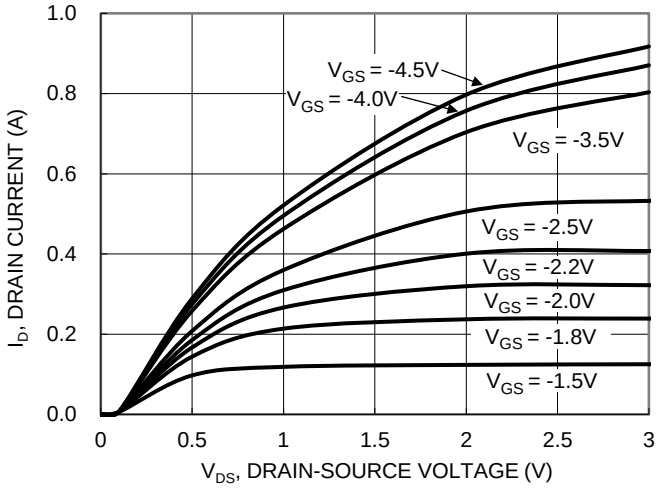


Figure 14. Typical Output Characteristic

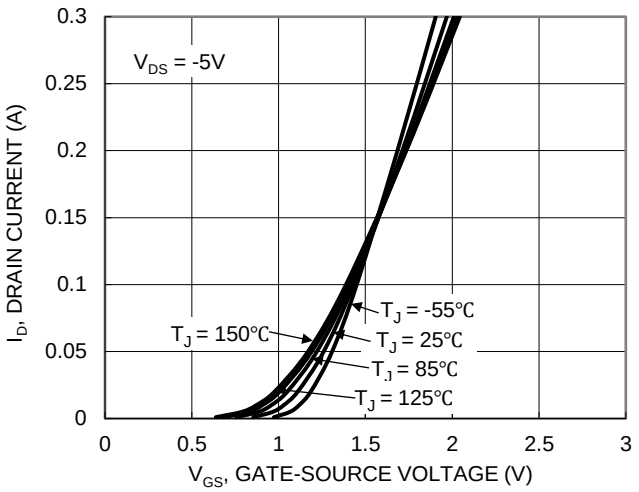


Figure 15. Typical Transfer Characteristic

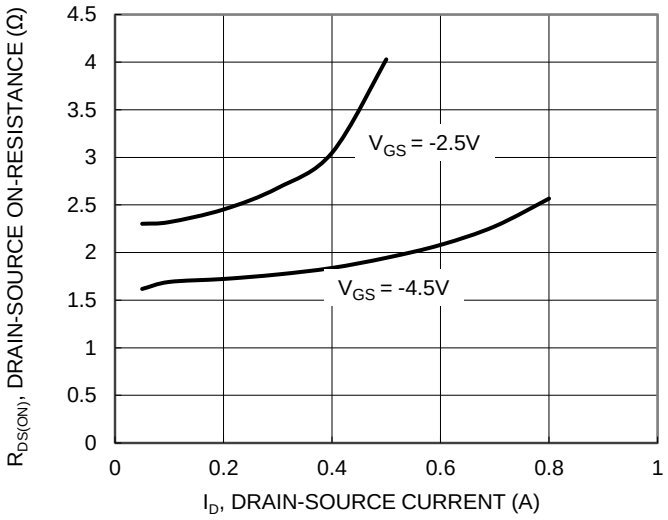


Figure 16. Typical On-Resistance vs. Drain Current and Gate Voltage

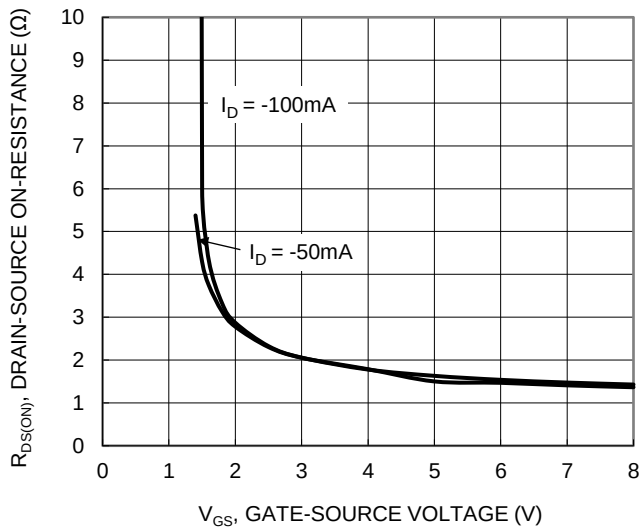


Figure 17. Typical Transfer Characteristic

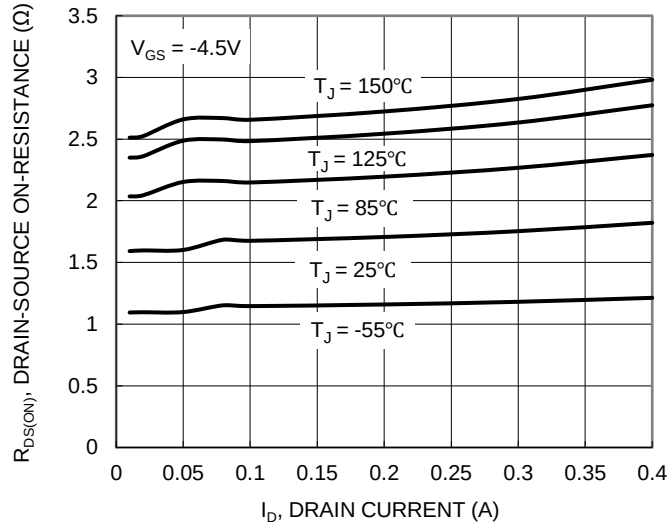


Figure 18. Typical On-Resistance vs. Drain Current and Junction Temperature

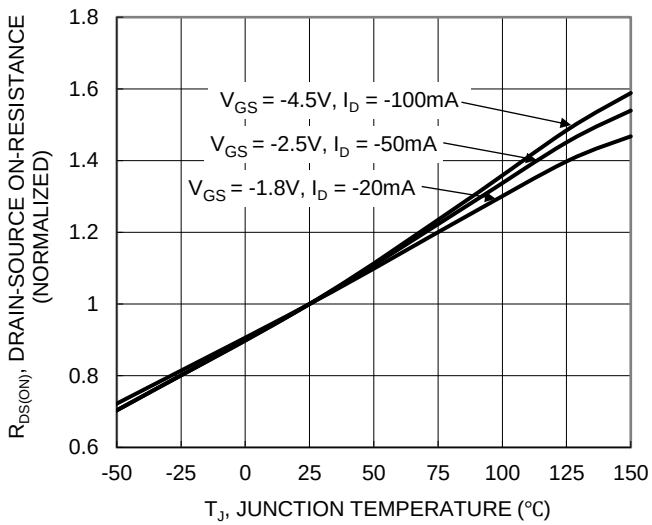


Figure 19. On-Resistance Variation with Junction Temperature

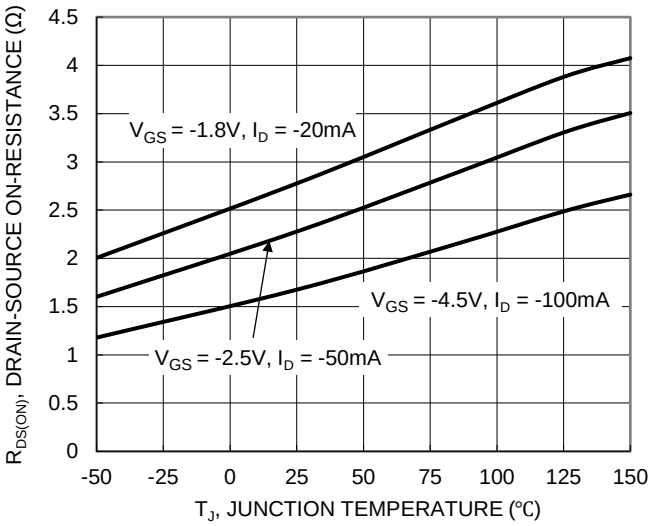


Figure 20. On-Resistance Variation with Junction Temperature

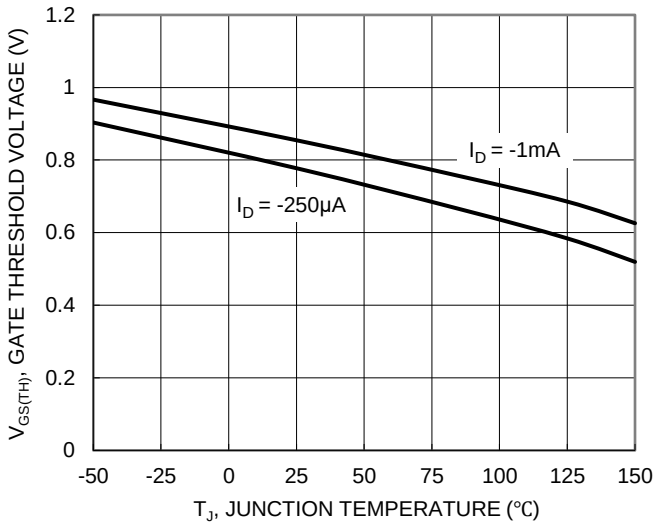


Figure 21. Gate Threshold Variation vs. Junction Temperature

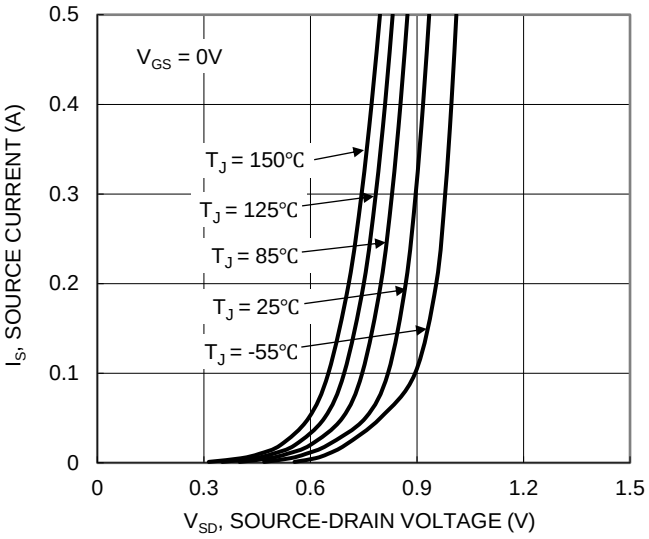


Figure 22. Diode Forward Voltage vs. Current

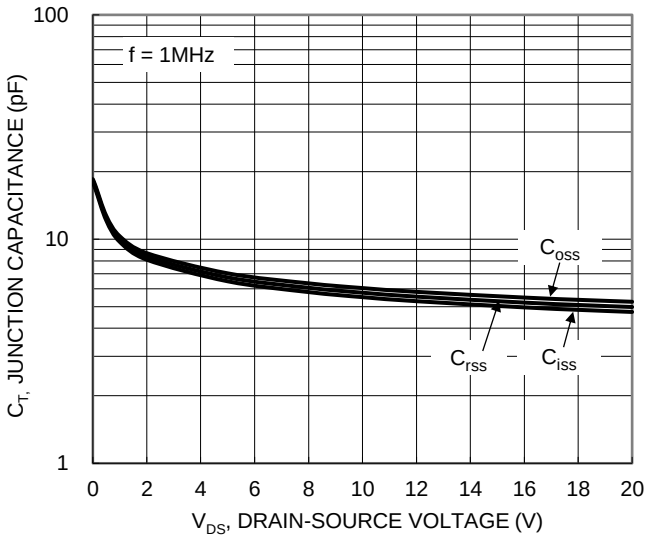


Figure 23. Typical Junction Capacitance

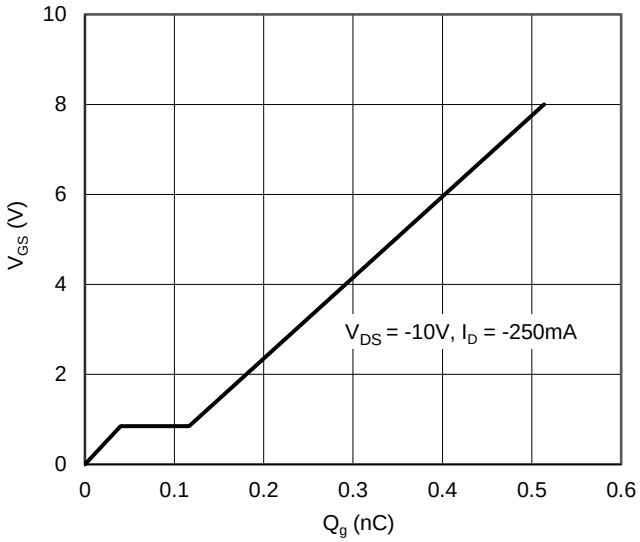


Figure 24. Gate Charge

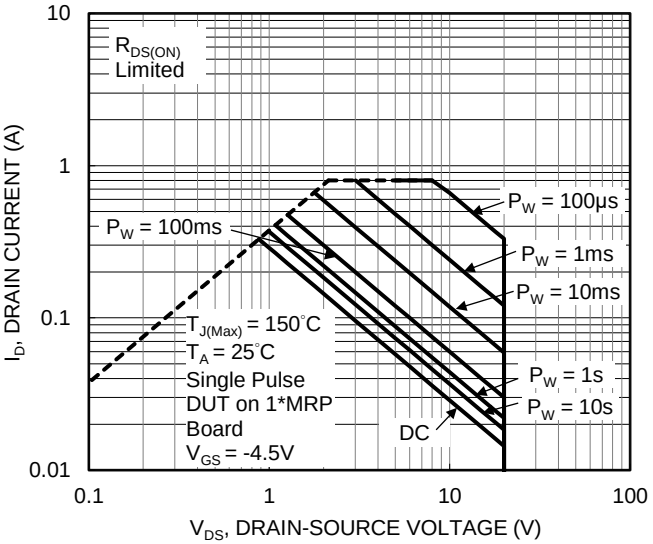


Figure 25. SOA, Safe Operation Area

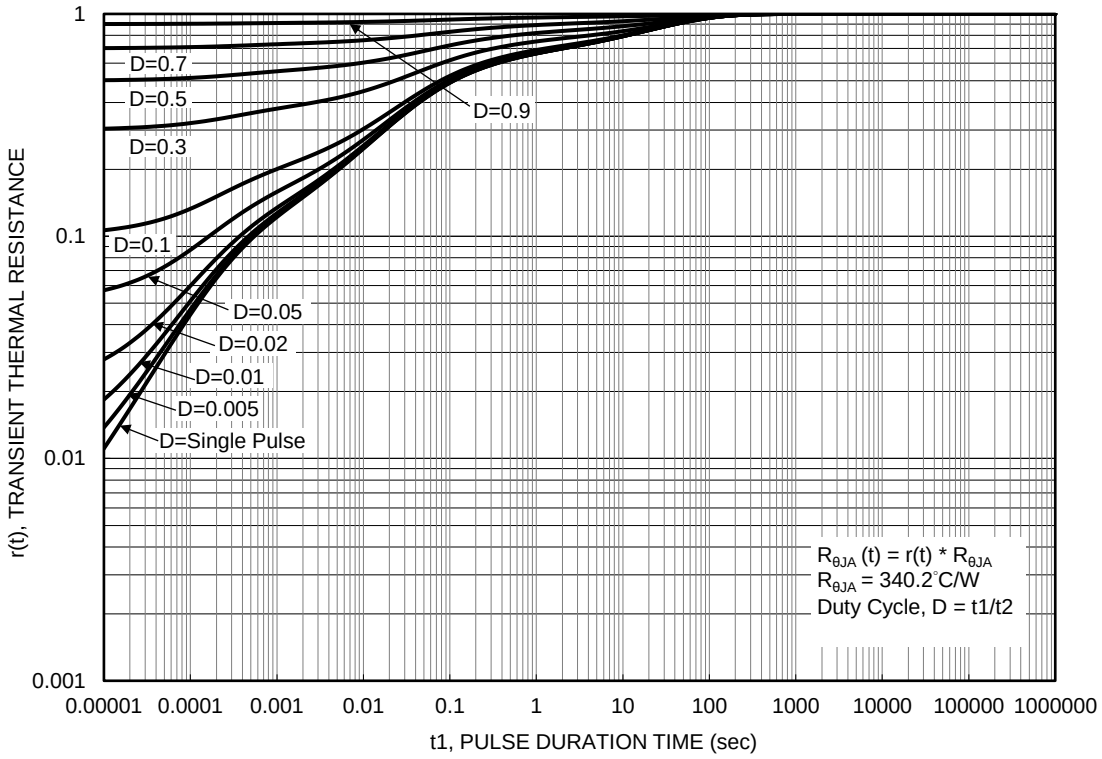
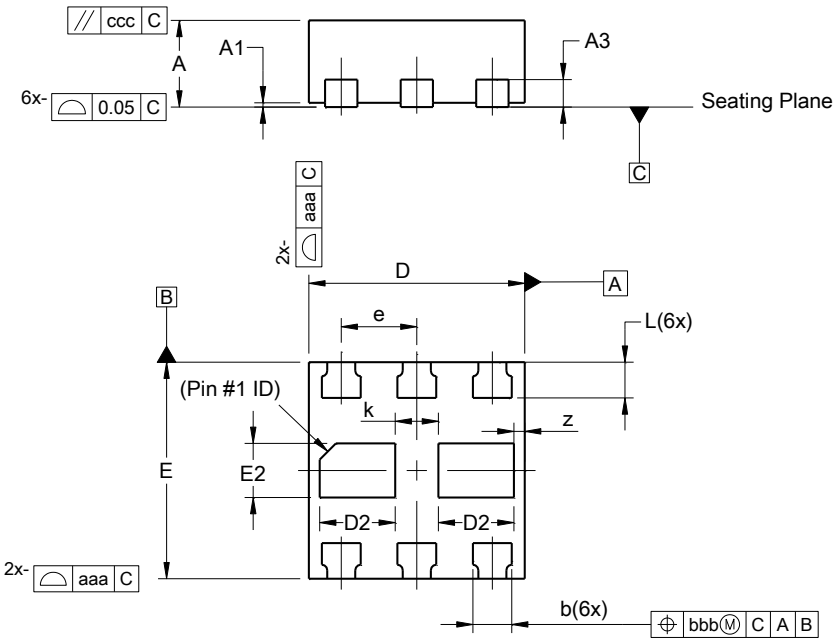


Figure 26. Transient Thermal Resistance

Package Outline Dimensions

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

X2-DFN1010-6 (Type UXC)

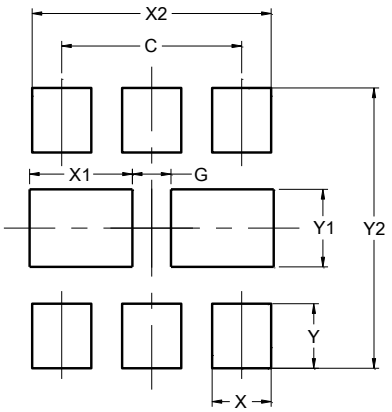


X2-DFN1010-6 (Type UXC)			
Dim	**Min**	**Max**	**Typ**
A	--	0.40	0.39
A1	--	0.05	--
A3	--	--	0.127
b	0.13	0.23	0.18
D	0.95	1.05	1.00
D2	0.30	0.40	0.35
E	0.95	1.05	1.00
E2	0.20	0.30	0.25
e	0.350 BSC		
L	0.115	0.215	0.165
k	--	--	0.20
z	0.02	0.08	0.05
aaa	0.08		
bbb	0.07		
ccc	0.05		
All Dimensions in mm			

Suggested Pad Layout

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

X2-DFN1010-6 (Type UXC)



Dimensions	Value (in mm)
C	0.700
G	0.300
X	0.230
X1	0.450
X2	0.930
Y	0.250
Y1	0.300
Y2	1.085

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