

## Product Summary

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
Q1	30V	1.5Ω @ V <sub>GS</sub> = 4.5V	0.40A
		2.0Ω @ V <sub>GS</sub> = 2.5V	0.35A
		3.0Ω @ V <sub>GS</sub> = 1.8V	0.28A
		4.5Ω @ V <sub>GS</sub> = 1.5V	0.23A
Q2	-30V	5Ω @ V <sub>GS</sub> = -4.5V	-0.22A
		6Ω @ V <sub>GS</sub> = -2.5V	-0.20A
		7Ω @ V <sub>GS</sub> = -1.8V	-0.18A
		10Ω @ V <sub>GS</sub> = -1.5V	-0.15A

## Features and Benefits

- Low On-Resistance
- Very Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surface Mount Package 0.8mm x 0.6mm
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

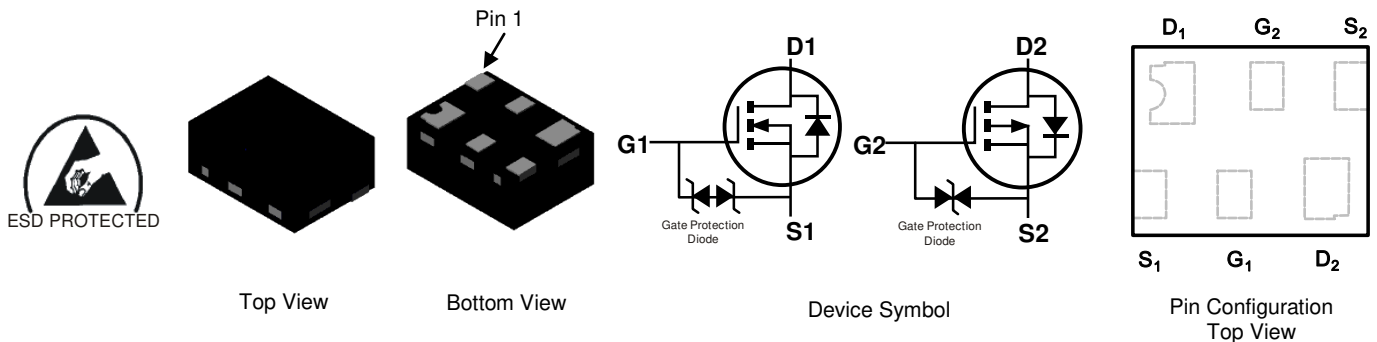
## Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

## Mechanical Data

- Case: X2-DFN0806-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.027 grams (Approximate)

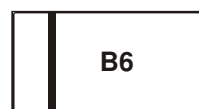


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC31D5UDA-7B	X2-DFN0806-6	10,000/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



Top View

B6 = Product Type Marking Code  
Bar denotes Pin 1

**Maximum Ratings Q1 N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit	
Drain-Source Voltage		V <sub>DSS</sub>	30	V	
Gate-Source Voltage		V <sub>GSS</sub>	±12	V	
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	I <sub>D</sub>	T <sub>A</sub> = +25°C	0.4	A
			T <sub>A</sub> = +70°C	0.32	
Maximum Continuous Body Diode Forward Current (Note 6)		I <sub>S</sub>	0.8	A	
Pulsed Drain Current (Note 6)		I <sub>DM</sub>	0.8	A	

**Maximum Ratings Q2 P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit	
Drain-Source Voltage		V <sub>DSS</sub>	-30	V	
Gate-Source Voltage		V <sub>GSS</sub>	±12	V	
Continuous Drain Current (Note 5) V <sub>GS</sub> = -4.5V	Steady State	I <sub>D</sub>	T <sub>A</sub> = +25°C	-0.22	A
			T <sub>A</sub> = +70°C	-0.17	
Maximum Continuous Body Diode Forward Current (Note 6)		I <sub>S</sub>	-0.8	A	
Pulsed Drain Current (Note 6)		I <sub>DM</sub>	-0.8	A	

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P <sub>D</sub>	0.37	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	345	°C/W
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics Q1 N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	100	nA	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.4	0.7	1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	1.2	1.5	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 100mA
		—	1.3	2.0		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 50mA
		—	1.5	3.0		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 20mA
		—	1.8	4.5		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 10mA
Diode Forward Voltage	V <sub>SD</sub>	—	0.6	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 10mA
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	22.6	—	pF	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	2.68	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	1.8	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	0.38	—	nC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 200mA
Gate-Source Charge	Q <sub>gs</sub>	—	0.05	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.07	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.2	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 4.5V, R <sub>g</sub> = 2Ω, I <sub>D</sub> = 200mA
Turn-On Rise Time	t <sub>R</sub>	—	2.2	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	21	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	7.5	—	ns	

- Notes: 5. Device mounted on FR-4 PCB, with minimum recommended pad layout.  
6. Device mounted on minimum recommended pad layout test board, 10μs pulse duty cycle = 1%.  
7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

**Electrical Characteristics Q2 P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-100	nA	V <sub>DS</sub> = -24V, V <sub>GS</sub> = 0V @T <sub>C</sub> = +25°C
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.4	-0.7	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	1.8	5	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -100mA
		—	2.3	6		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -50mA
		—	3	7		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -20mA
		—	3.4	10		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -10mA
Diode Forward Voltage	V <sub>SD</sub>	—	-0.6	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -10mA
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iSS</sub>	—	21.8	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oSS</sub>	—	2.82	—	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	1.66	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	0.35	—	nC	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -15V, I <sub>D</sub> = -200mA
Gate-Source Charge	Q <sub>gs</sub>	—	0.05	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.10	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.5	—	ns	V <sub>DD</sub> = -15V, V <sub>GS</sub> = -4.5V, R <sub>g</sub> = 2Ω, I <sub>D</sub> = -200mA
Turn-On Rise Time	t <sub>R</sub>	—	5.2	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	18.8	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	8.7	—	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**

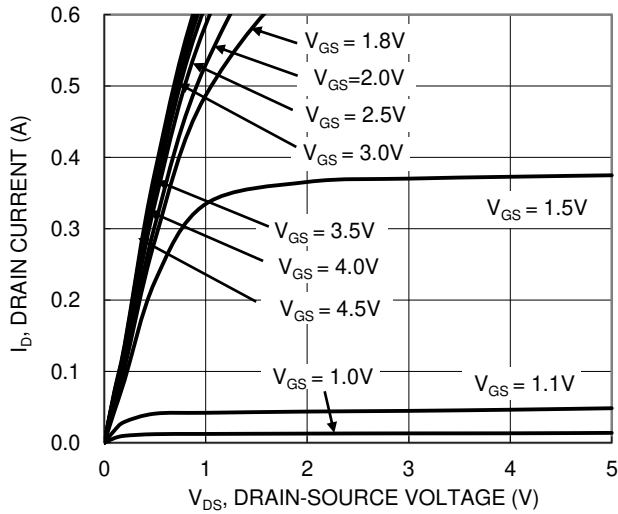


Figure 1. Typical Output Characteristic

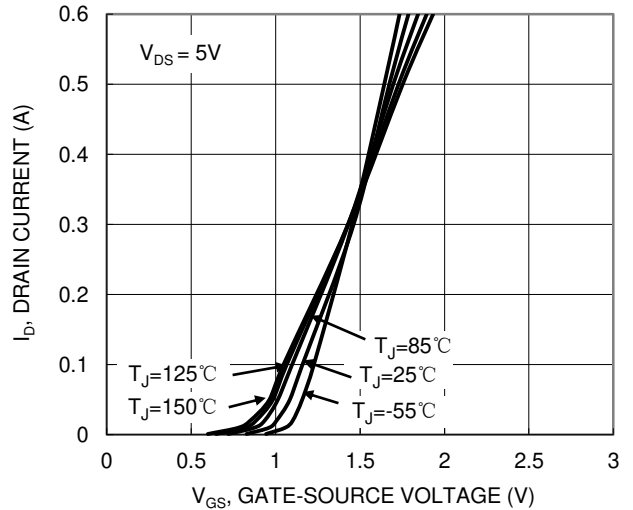


Figure 2. Typical Transfer Characteristic

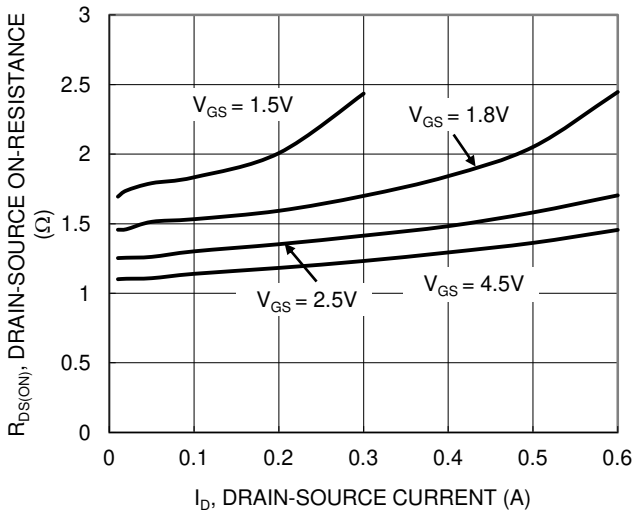


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

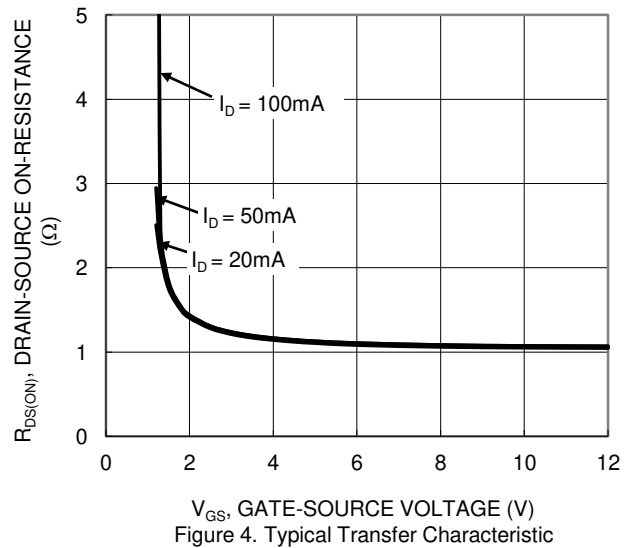


Figure 4. Typical Transfer Characteristic

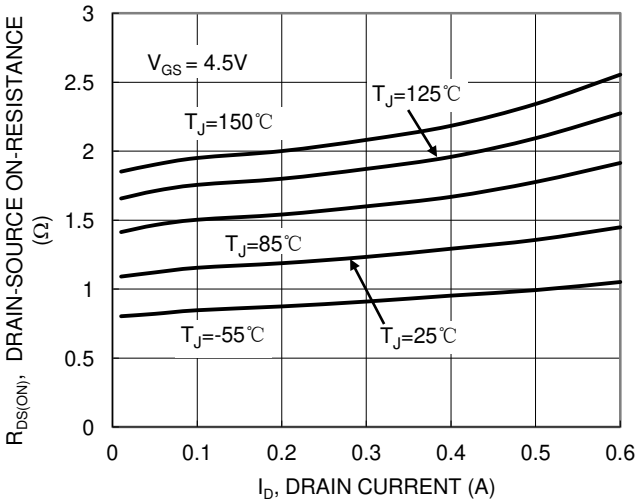


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

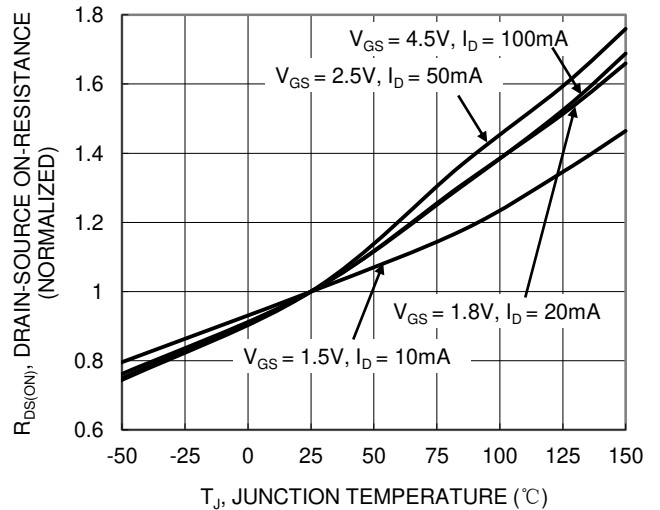


Figure 6. On-Resistance Variation with Temperature

**Typical Characteristics - N-CHANNEL** (continued)

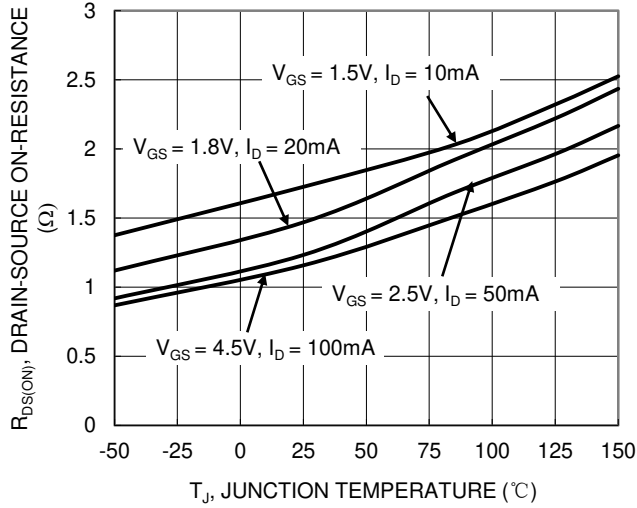


Figure 7. On-Resistance Variation with Temperature

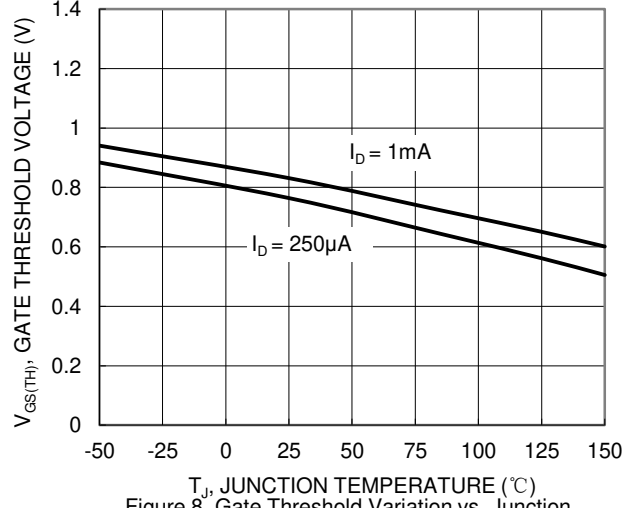


Figure 8. Gate Threshold Variation vs. Junction Temperature

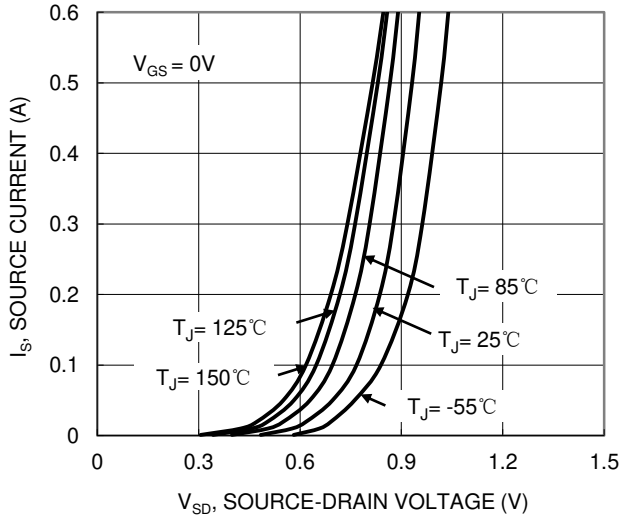


Figure 9. Diode Forward Voltage vs. Current

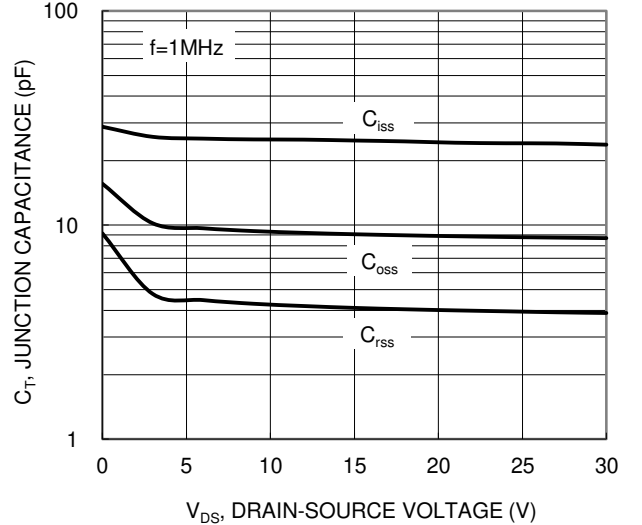


Figure 10. Typical Junction Capacitance

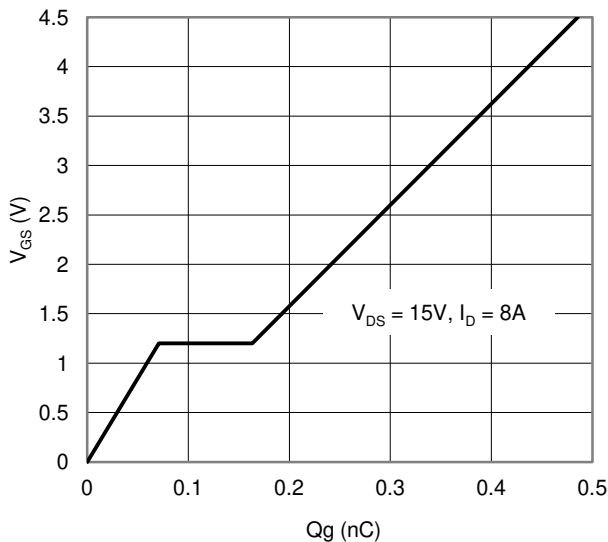


Figure 11. Gate Charge

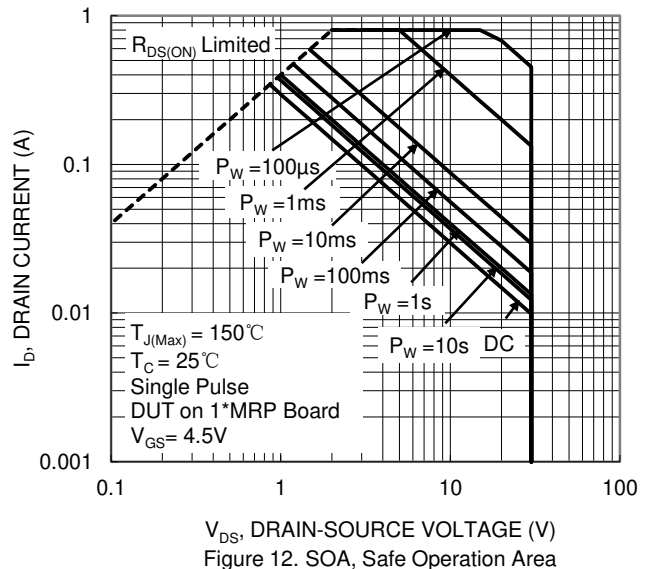


Figure 12. SOA, Safe Operation Area

**Typical Characteristics - P-CHANNEL**

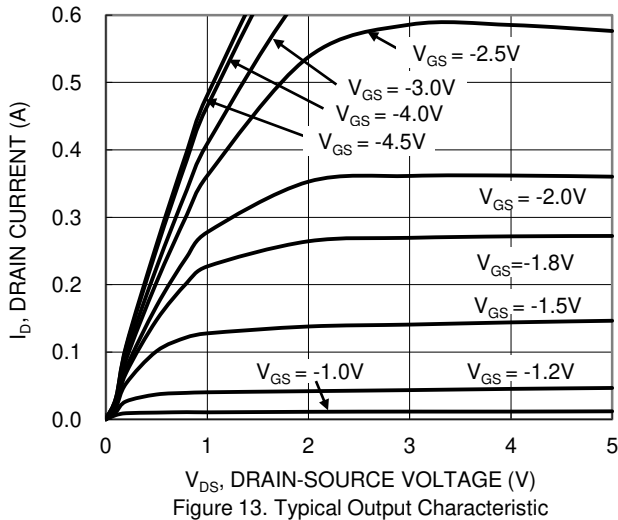


Figure 13. Typical Output Characteristic

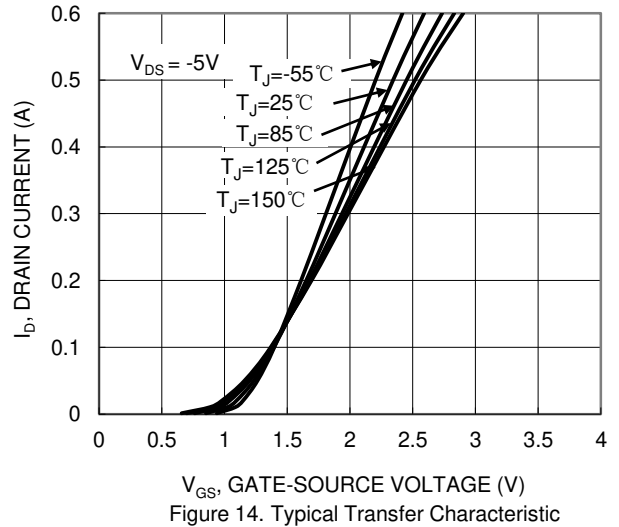


Figure 14. Typical Transfer Characteristic

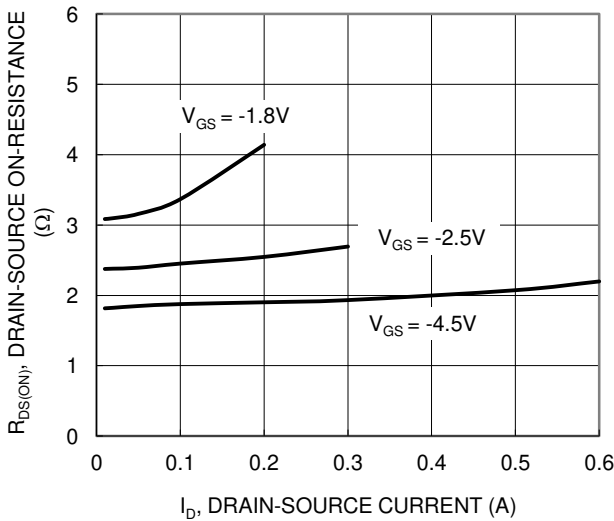


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

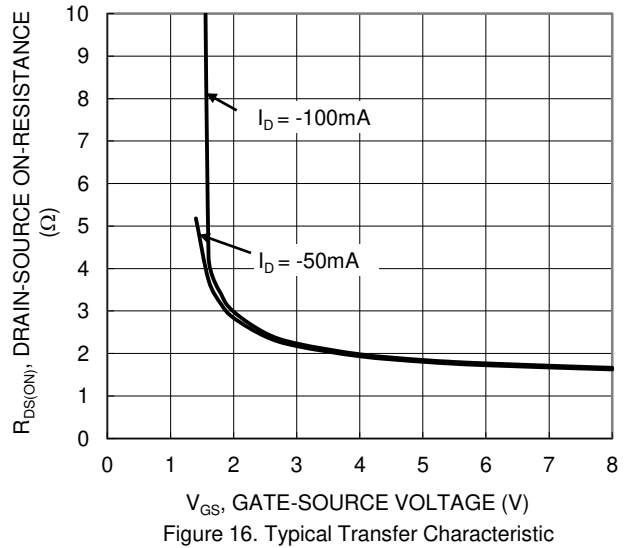


Figure 16. Typical Transfer Characteristic

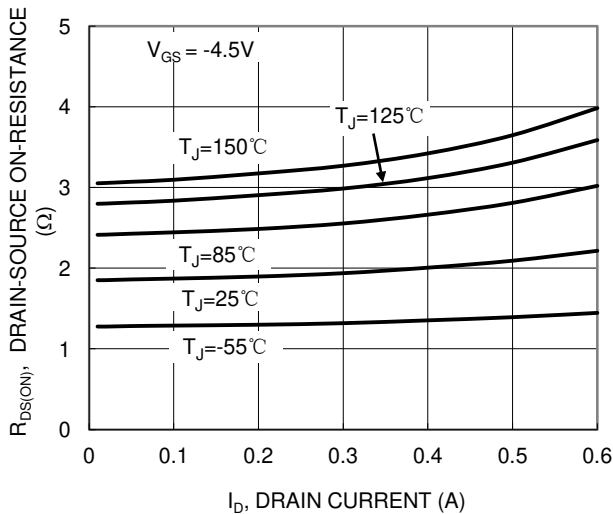


Figure 17. Typical On-Resistance vs. Drain Current and Junction Temperature

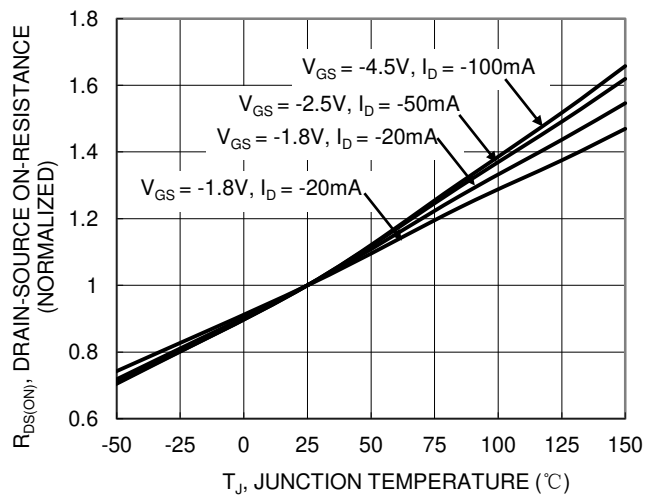


Figure 18. On-Resistance Variation with Junction Temperature

**Typical Characteristics - P-CHANNEL** (continued)

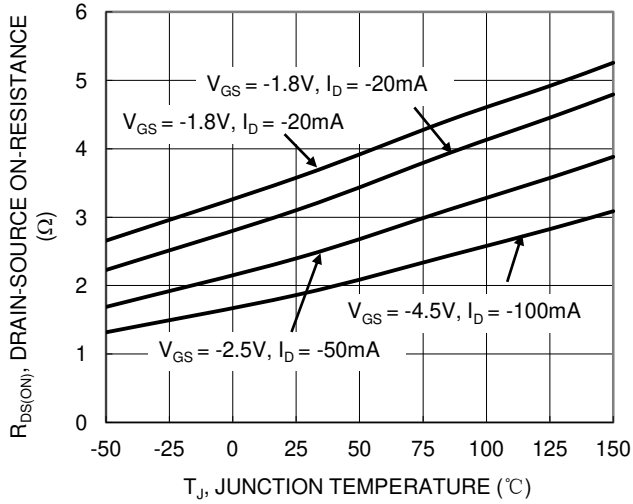


Figure 19. On-Resistance Variation with Junction Temperature

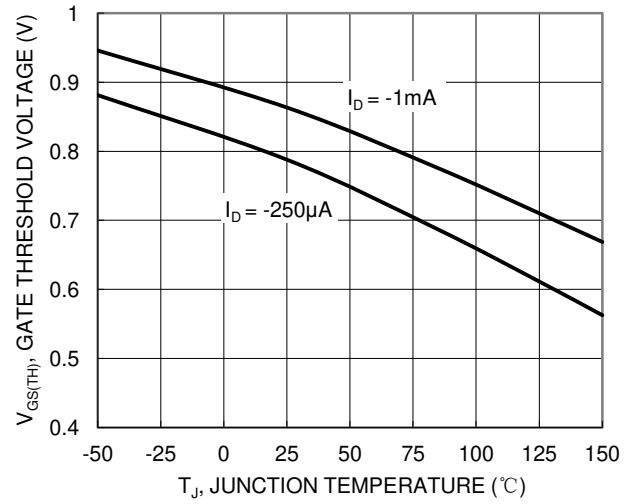


Figure 20. Gate Threshold Variation vs. Junction Temperature

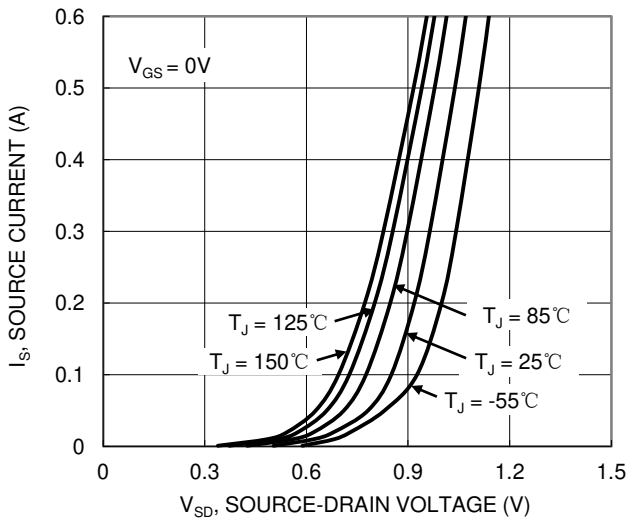


Figure 21. Diode Forward Voltage vs. Current

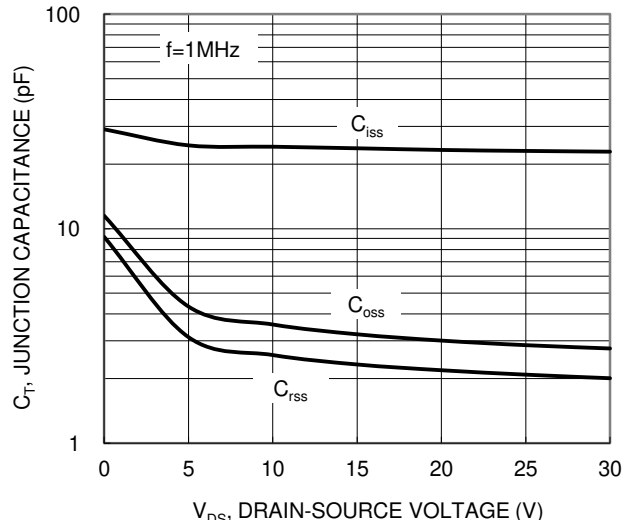


Figure 22. Typical Junction Capacitance

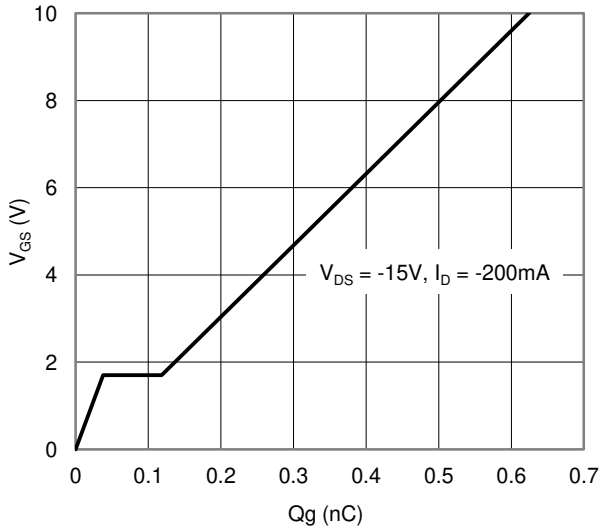


Figure 23. Gate Charge

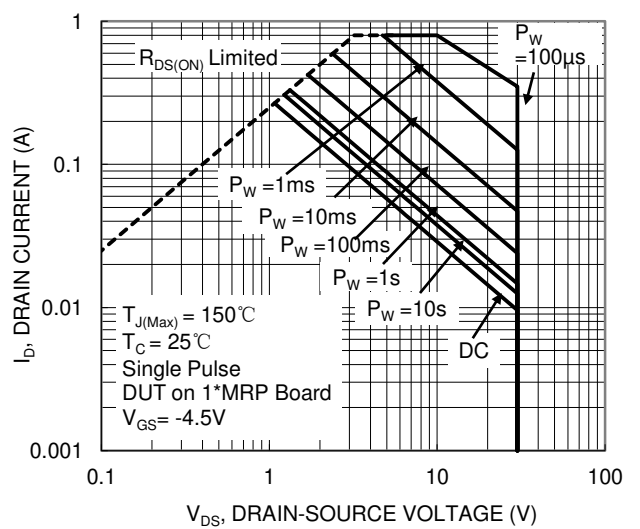


Figure 24. SOA, Safe Operation Area

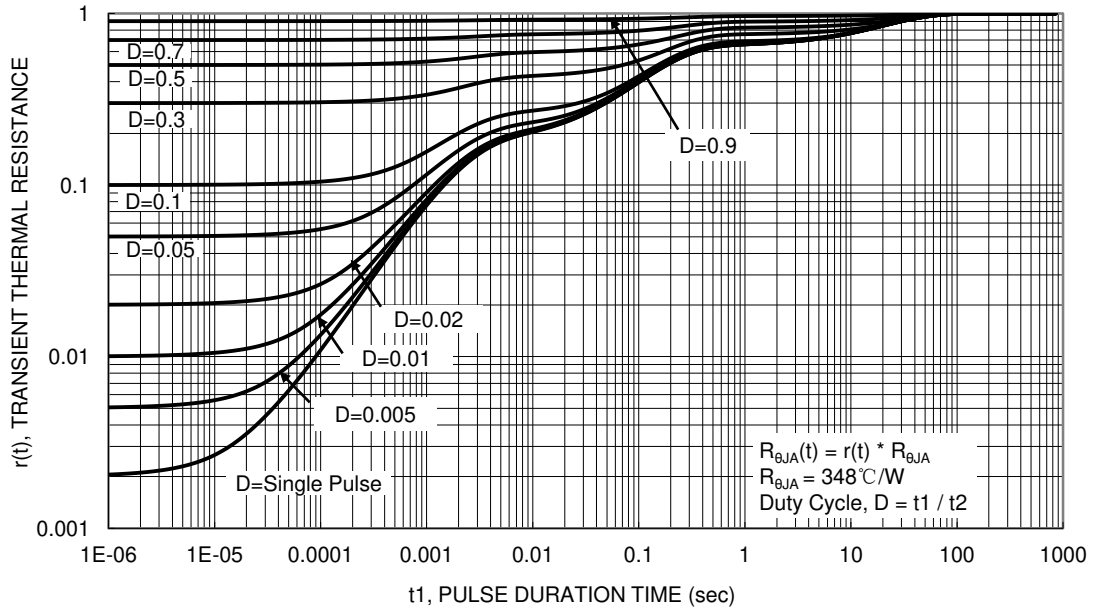


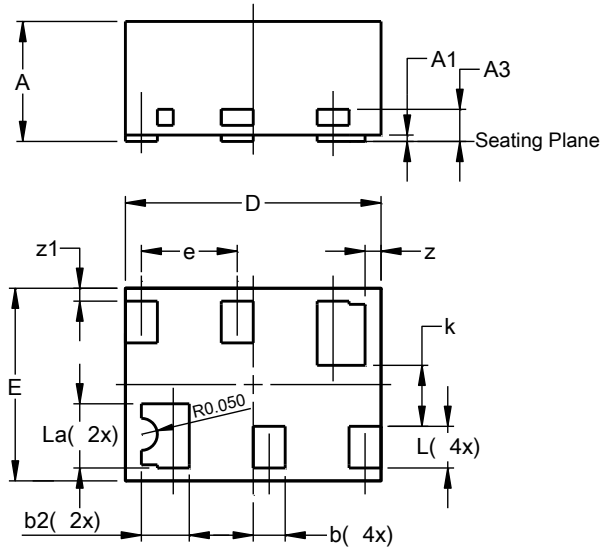
Figure 25. Transient Thermal Resistance



**Package Outline Dimensions**

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

**X2-DFN0806-6**

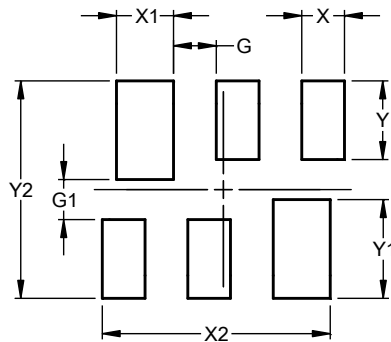


X2-DFN0806-6			
Dim	Min	Max	Typ
A	--	0.40	0.36
A1	0.00	0.03	0.02
A3	--	--	0.10
b	0.07	0.15	0.10
b2	0.10	0.20	0.15
D	0.75	0.85	0.80
E	0.55	0.65	0.60
e	--	--	0.30
k	--	--	0.19
L	0.10	0.18	0.13
La	0.17	0.25	0.20
z	--	--	0.05
z1	--	--	0.04
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**X2-DFN0806-6**



Dimensions	Value (in mm)
G	0.150
G1	0.140
X	0.150
X1	0.200
X2	0.800
Y	0.275
Y1	0.345
Y2	0.760

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