

## Product Summary

Device	V <sub>(BR)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	0.22A
		2.0Ω @ V <sub>GS</sub> = 2.5V	
		3.0Ω @ V <sub>GS</sub> = 1.8V	
		4.5Ω @ V <sub>GS</sub> = 1.5V	
Q2	-30V	5Ω @ V <sub>GS</sub> = -4.5V	-0.2A
		6Ω @ V <sub>GS</sub> = -2.5V	
		7Ω @ V <sub>GS</sub> = -1.8V	
		10Ω @ V <sub>GS</sub> = -1.5V	

## Description

This MOSFET has been 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.


## Applications

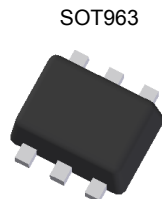
- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

## Features and Benefits

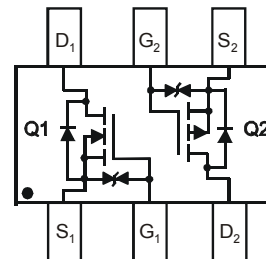
- Low On-Resistance
- Very low Gate Threshold Voltage, 1.0V max
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surface Mount Package 1mm x 1mm
- ESD Protected Gate
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

- Case: SOT963
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe  
Solderable per MIL-STD-202, Method 208 
- Weight: 0.027 grams (approximate)



Top View



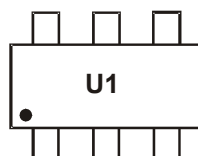
Top View  
Schematic and  
Transistor Diagram

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC31D5UDJ-7	SOT963	10K/Tape & Reel
DMC31D5UDJ-7B	SOT963	10K/Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - See [http://www.diodes.com/quality/lead\\_free.html](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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>. The options -7 and -7B stand for different taping orientations.

## Marking Information



U1 = Product Type Marking Code

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

Characteristic	Symbol	Value	Units
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	I <sub>D</sub>	220 160	mA
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	200	mA
Pulsed Drain Current (Note 6)	I <sub>DM</sub>	600	mA

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

Characteristic	Symbol	Value	Units
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	I <sub>D</sub>	-200 -140	mA
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	-200	mA
Pulsed Drain Current (Note 6)	I <sub>DM</sub>	-600	mA

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	350	mW
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	361	°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 @T <sub>C</sub> = +25°C	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	—	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>	—	0.9	1.5	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 100mA
		—	1.0	2.0		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 50mA
		—	1.2	3.0		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 20mA
		—	1.4	4.5		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 10mA
		—	2.3	—		V <sub>GS</sub> = 1.2V, I <sub>D</sub> = 1mA
		—	—	—		—
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	

**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 @T <sub>C</sub> = +25°C	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	—	-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>	—	2.0	5	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -100mA
		—	2.5	6		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -50mA
		—	3.0	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
		—	5.1	—		V <sub>GS</sub> = -1.2V, I <sub>D</sub> = -1mA
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:
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.

**N-CHANNEL**

NEW PRODUCT

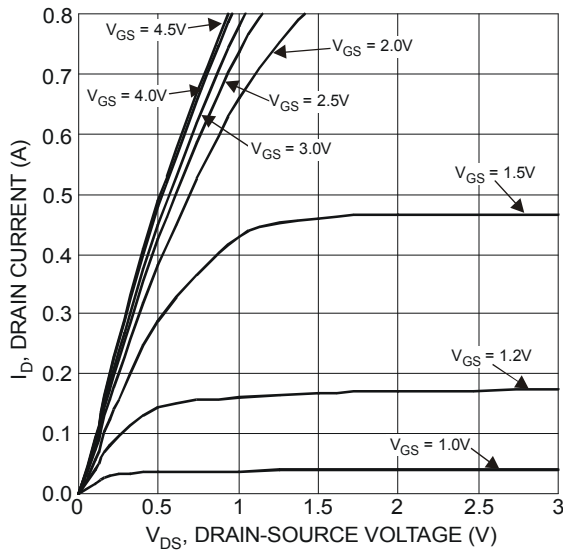


Figure 1 Typical Output Characteristics

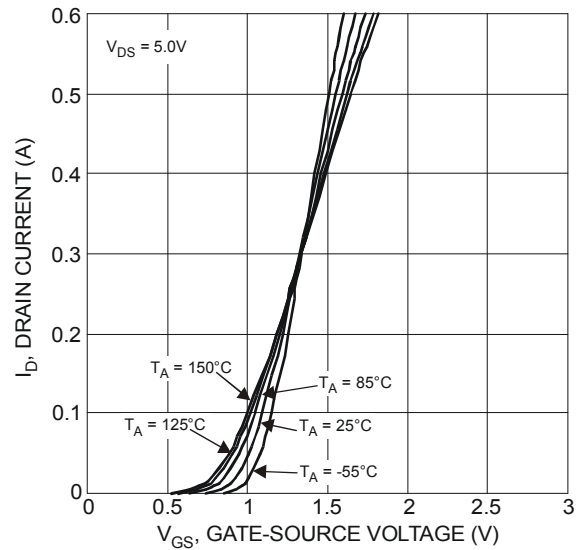


Figure 2 Typical Transfer Characteristics

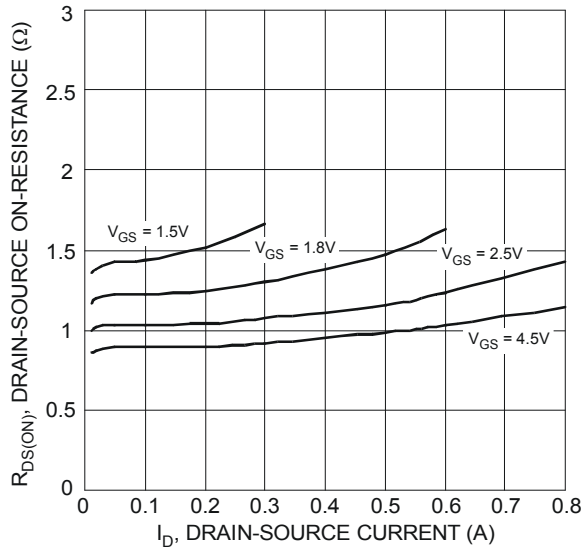


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

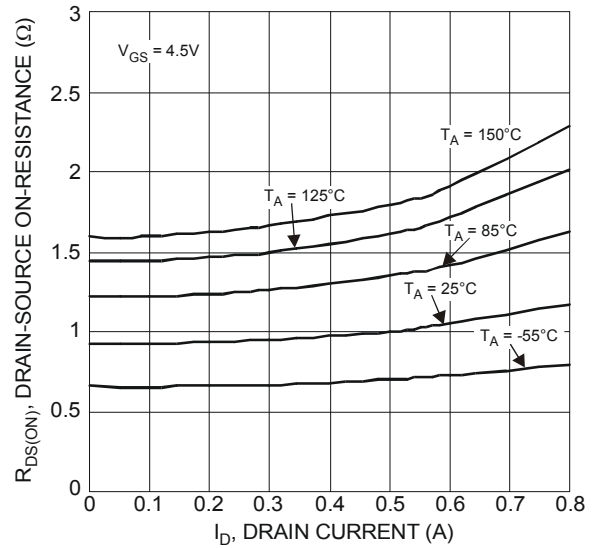


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

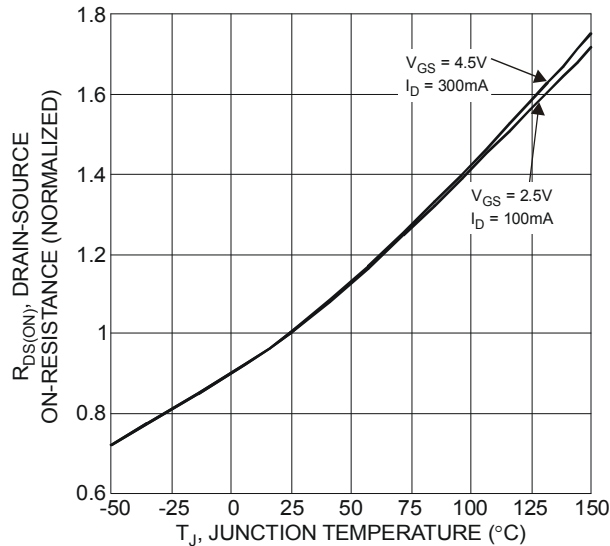


Figure 5 On-Resistance Variation with Temperature

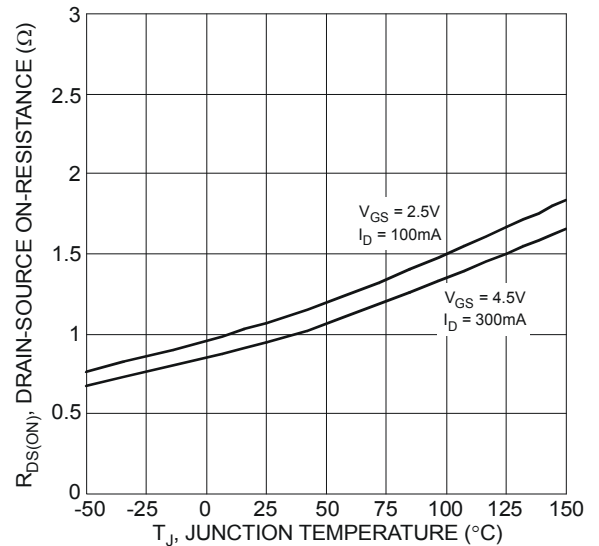


Figure 6 On-Resistance Variation with Temperature

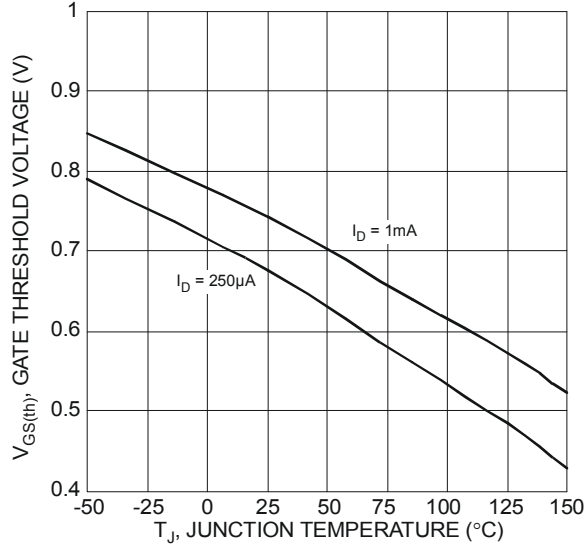


Figure 7 Gate Threshold Variation vs. Ambient Temperature

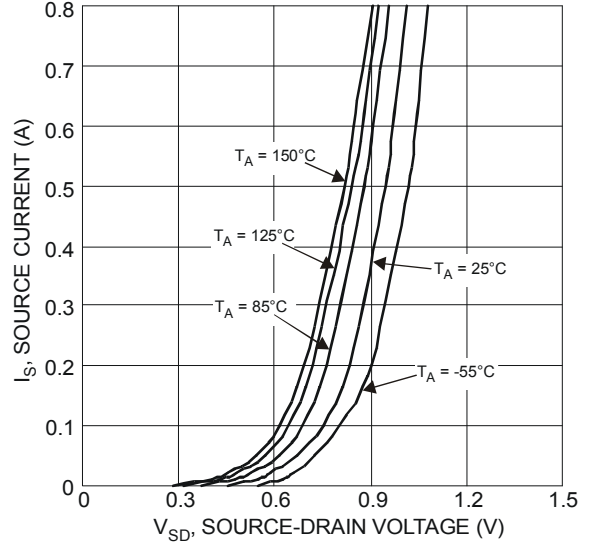


Figure 8 Diode Forward Voltage vs. Current

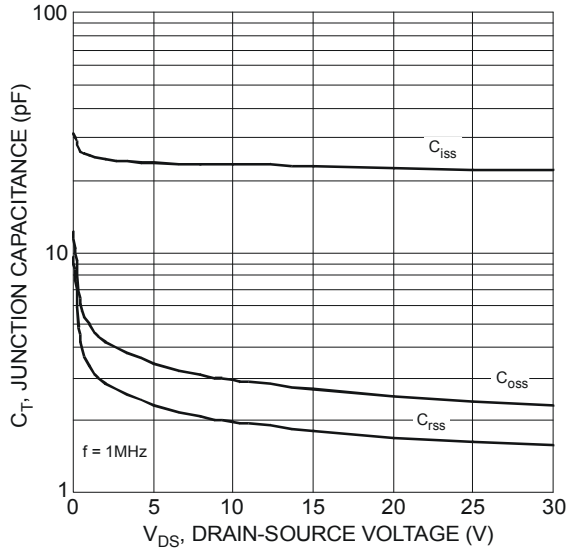


Figure 9 Typical Junction Capacitance

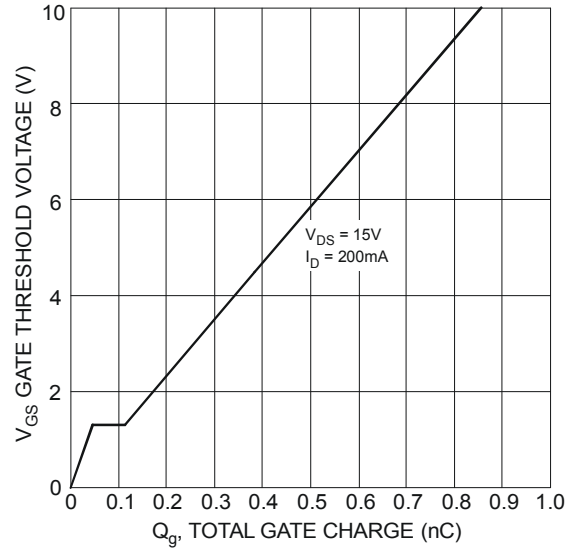


Figure 10 Gate Charge

**P-CHANNEL**

NEW PRODUCT

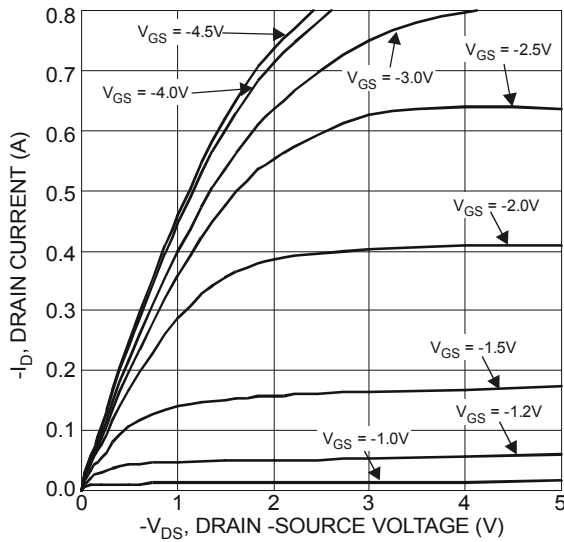


Figure 1 Typical Output Characteristics

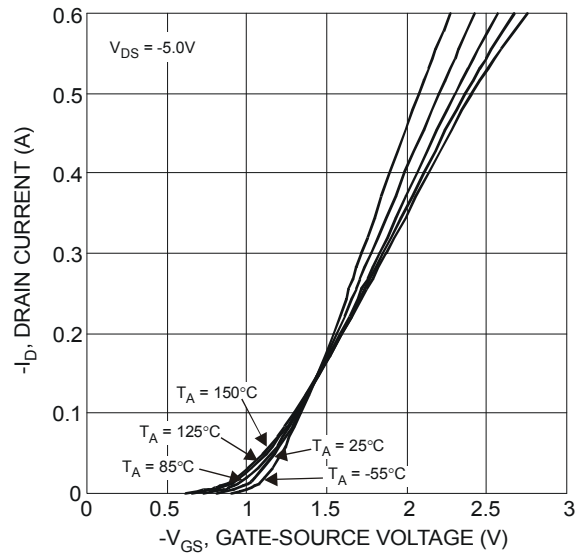


Figure 2 Typical Transfer Characteristics

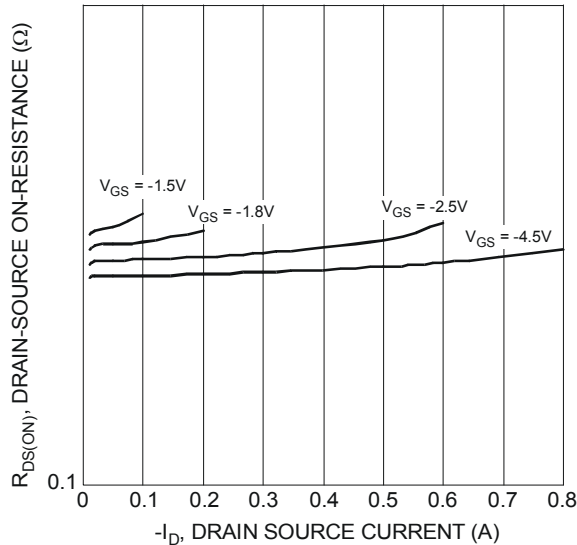


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

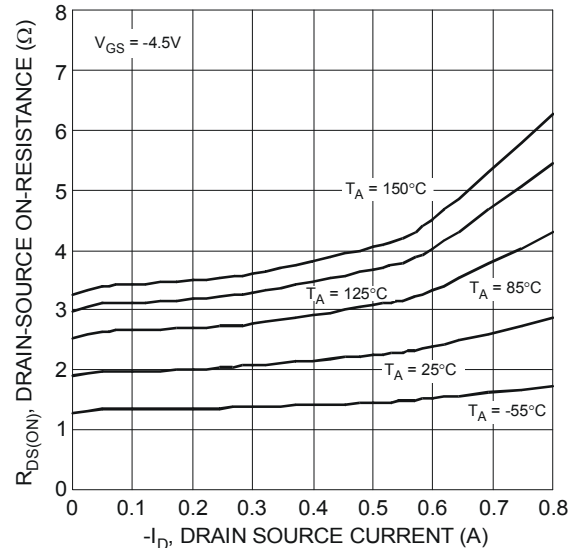


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

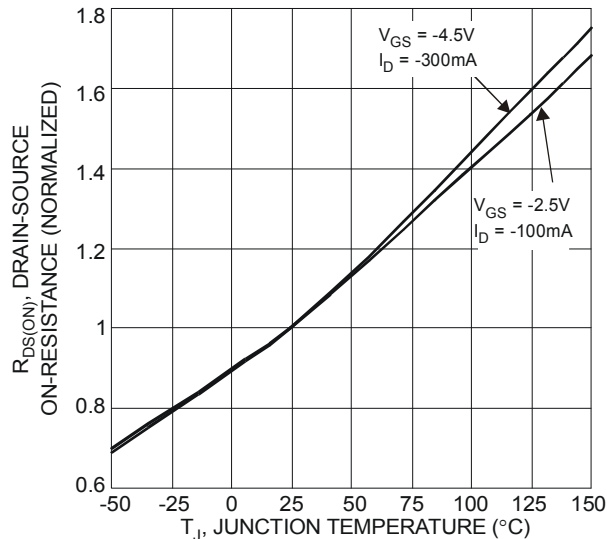


Figure 5 On-Resistance Variation with Temperature

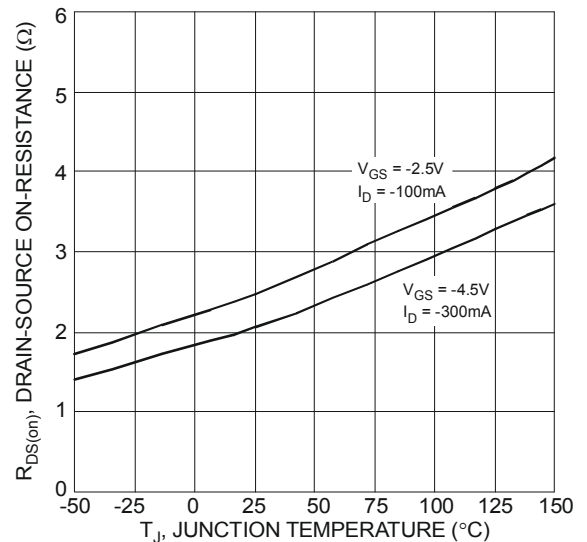


Figure 6 On-Resistance Variation with Temperature

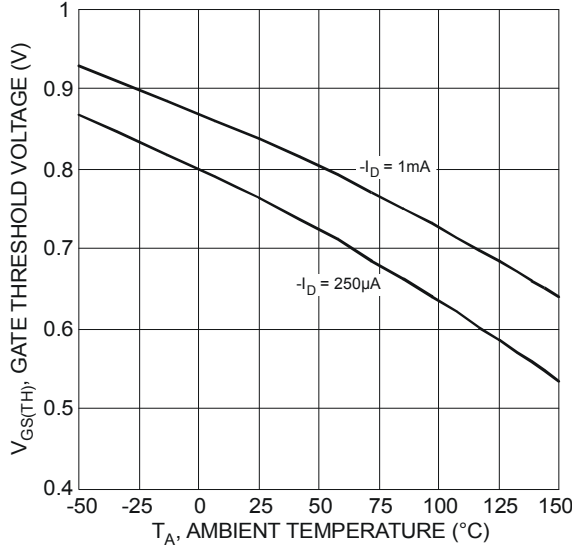


Figure 7 Gate Threshold Variation vs. Ambient Temperature

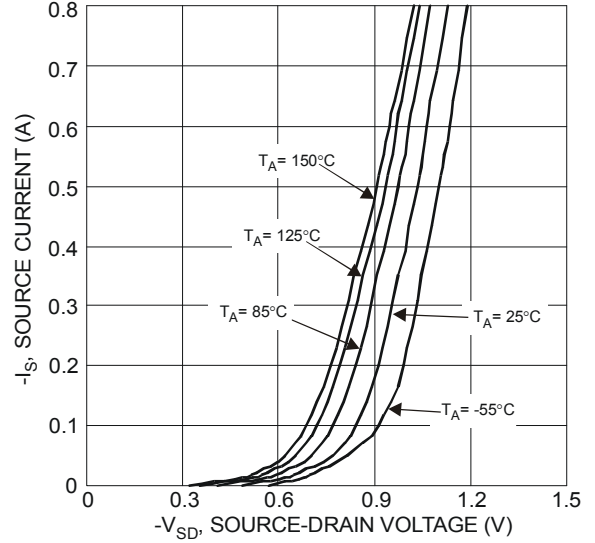


Figure 8 Diode Forward Voltage vs. Current

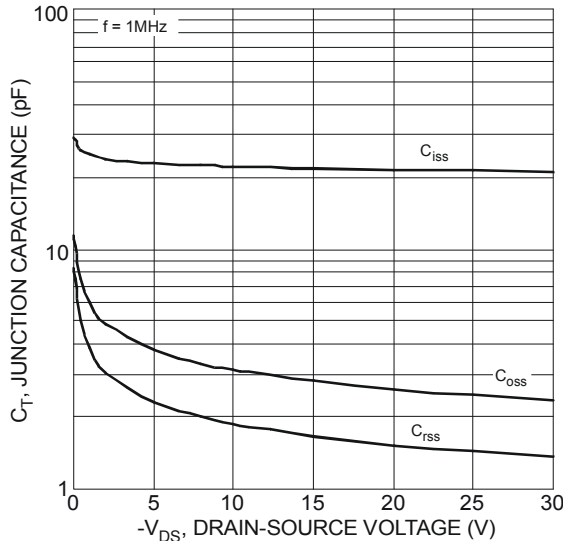


Figure 9 Typical Junction Capacitance

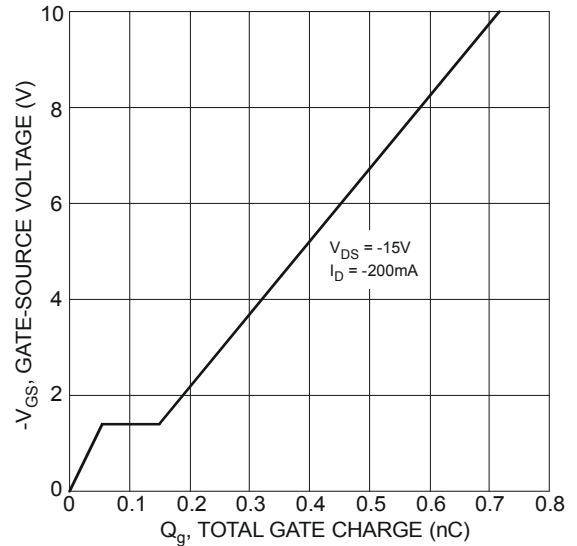


Figure 10 Gate-Charge Characteristics

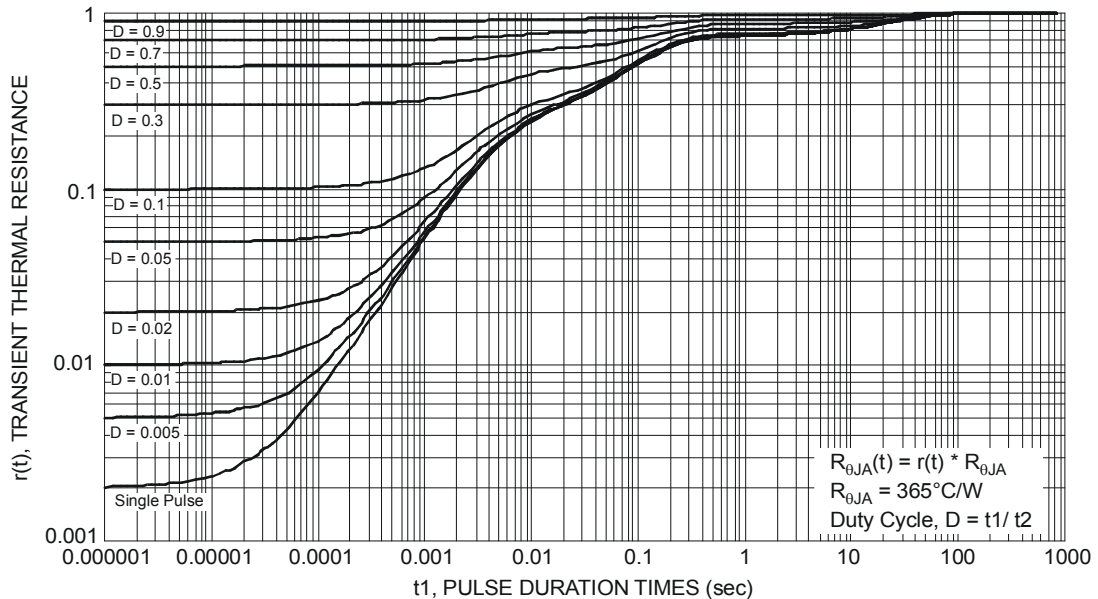
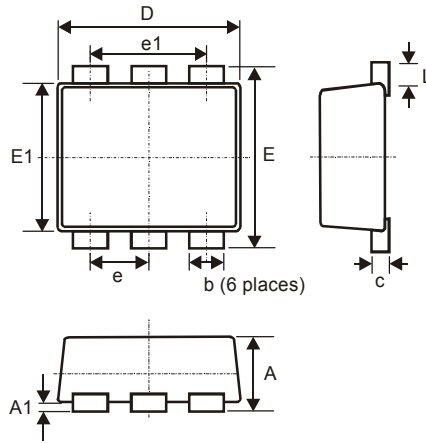


Figure 11 Transient Thermal Resistance

## Package Outline Dimensions

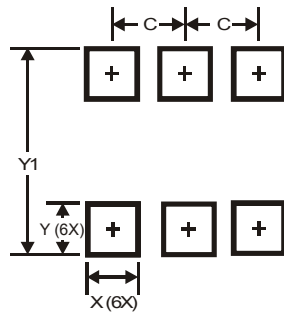
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



SOT963			
Dim	Min	Max	Typ
A	0.40	0.50	0.45
A1	0	0.05	-
c	0.120	0.180	0.150
D	0.95	1.05	1.00
E	0.95	1.05	1.00
E1	0.75	0.85	0.80
L	0.05	0.15	0.10
b	0.10	0.20	0.15
e	0.35 Typ		
e1	0.70 Typ		
All Dimensions in mm			

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
C	0.350
X	0.200
Y	0.200
Y1	1.100



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