COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

NEW PRODUCT

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = +25°C
Q1	30V	1.5Ω @ V_{GS} = 4.5V	0.22A
		2.0Ω @ V_{GS} = 2.5V	
		3.0Ω @ V_{GS} = 1.8V	
		4.5Ω @ V_{GS} = 1.5V	
Q2	-30V	5Ω @ V_{GS} = -4.5V	-0.2A
		6Ω @ V_{GS} = -2.5V	
		7Ω @ V_{GS} = -1.8V	
		10Ω @ V_{GS} = -1.5V	

Description

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) 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

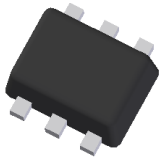
Features and Benefits

- 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**

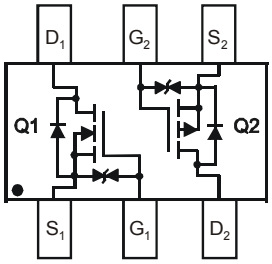
Mechanical Data

- 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 e3
- Weight: 0.027 grams (approximate)

SOT963



Top View



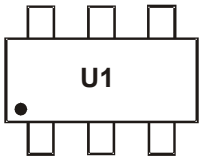
Top View
Schematic and
Transistor Diagram

Ordering Information (Note 4)

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

Notes:
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. The options -7 and -7B stand for different taping orientations.

Marking Information



U1 = Product Type Marking Code

NEW PRODUCT

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	30	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	220 160	mA
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	200	mA
Pulsed Drain Current (Note 6)			I_{DM}	600	mA

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-30	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 5) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-200 -140	mA
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	-200	mA
Pulsed Drain Current (Note 6)			I_{DM}	-600	mA

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	350	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	361	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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}	30	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	—	—	100	nA	V_{DS} = 24V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	μA	V_{GS} = ±10V, 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	$R_{DS(ON)}$	—	0.9	1.5	Ω	V_{GS} = 4.5V, I_D = 100mA
		—	1.0	2.0		V_{GS} = 2.5V, I_D = 50mA
		—	1.2	3.0		V_{GS} = 1.8V, I_D = 20mA
		—	1.4	4.5		V_{GS} = 1.5V, I_D = 10mA
		—	2.3	—		V_{GS} = 1.2V, I_D = 1mA
Diode Forward Voltage	V_{SD}	—	0.6	1.0	V	V_{GS} = 0V, I_S = 10mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	22.6	—	pF	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	2.68	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	1.8	—	pF	
Total Gate Charge	Q_g	—	0.38	—	nC	V_{GS} = 4.5V, V_{DS} = 15V, I_D = 200mA
Gate-Source Charge	Q_{gs}	—	0.05	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.07	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	3.2	—	ns	V_{DD} = 15V, V_{GS} = 4.5V, R_G = 2Ω, I_D = 200mA
Turn-On Rise Time	t_r	—	2.2	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	21	—	ns	
Turn-Off Fall Time	t_f	—	7.5	—	ns	

NEW PRODUCT

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}	-30	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	—	—	100	nA	V_{DS} = -24V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±10V, 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	$R_{DS(ON)}$	—	2.0	5	Ω	V_{GS} = -4.5V, I_D = -100mA
		—	2.5	6		V_{GS} = -2.5V, I_D = -50mA
		—	3.0	7		V_{GS} = -1.8V, I_D = -20mA
		—	3.4	10		V_{GS} = -1.5V, I_D = -10mA
		—	5.1	—		V_{GS} = -1.2V, I_D = -1mA
Diode Forward Voltage	V_{SD}	—	-0.6	-1.0	V	V_{GS} = 0V, I_S = -10mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	21.8	—	pF	V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	2.82	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	1.66	—	pF	
Total Gate Charge	Q_g	—	0.35	—	nC	V_{GS} = -4.5V, V_{DS} =- 15V, I_D = -200mA
Gate-Source Charge	Q_{gs}	—	0.05	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.10	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	3.5	—	ns	V_{DD} = -15V, V_{GS} = -4.5V, R_G = 2Ω, I_D = -200mA
Turn-On Rise Time	t_r	—	5.2	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	18.8	—	ns	
Turn-Off Fall Time	t_f	—	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

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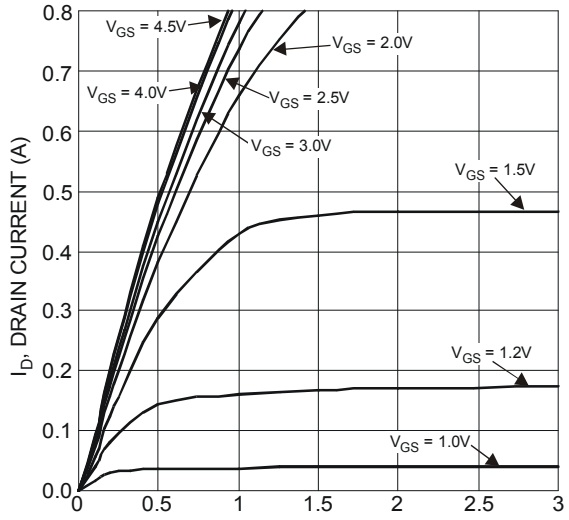

Figure 1 Typical Output Characteristics

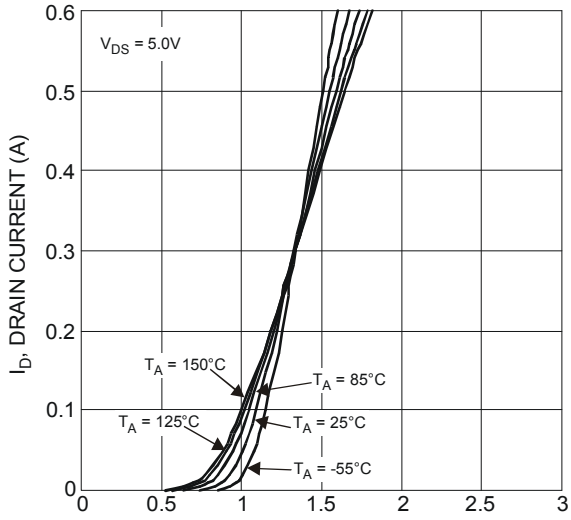

Figure 2 Typical Transfer Characteristics

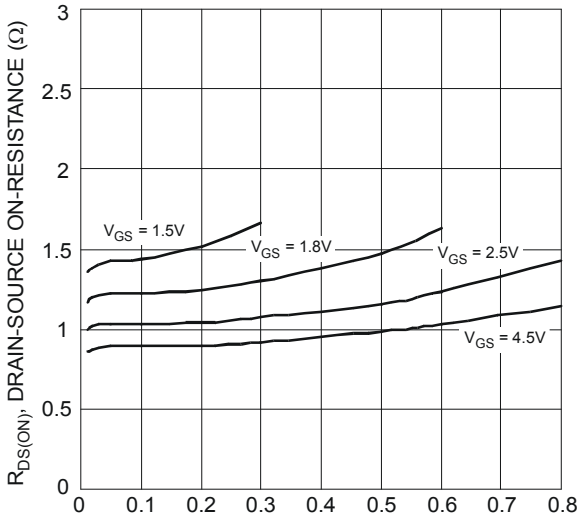

Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

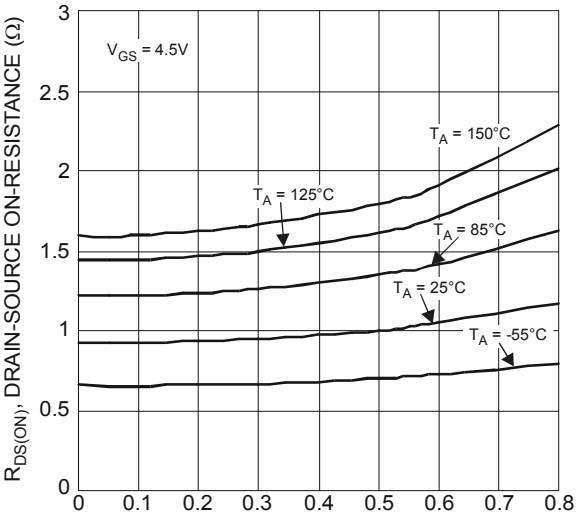

Figure 4 Typical On-Resistance vs. Drain Current and Temperature

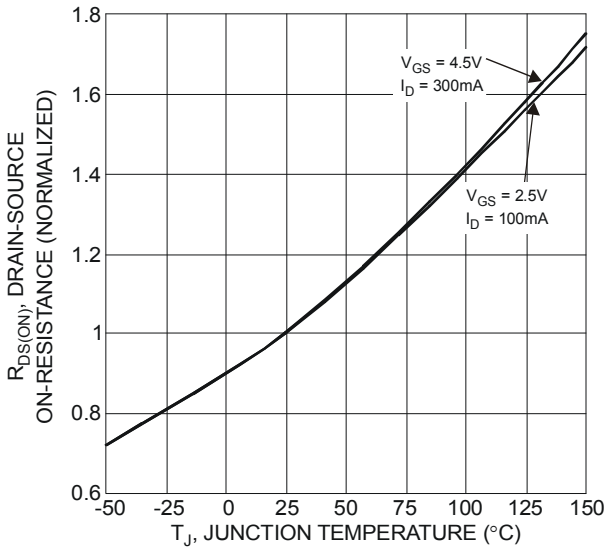

Figure 5 On-Resistance Variation with Temperature

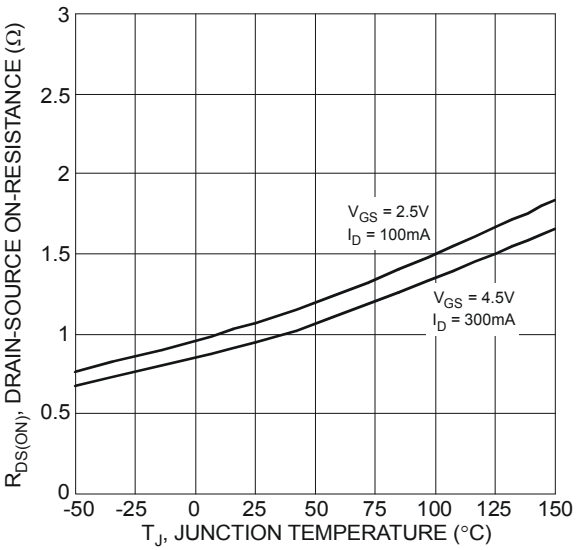

Figure 6 On-Resistance Variation with Temperature

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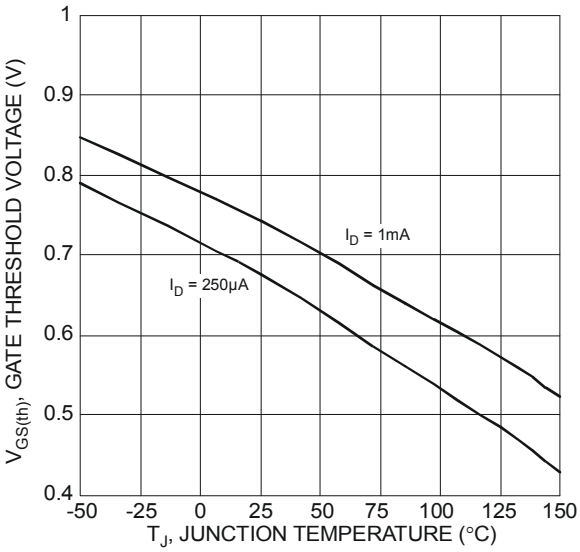

Figure 7 Gate Threshold Variation vs. Ambient Temperature

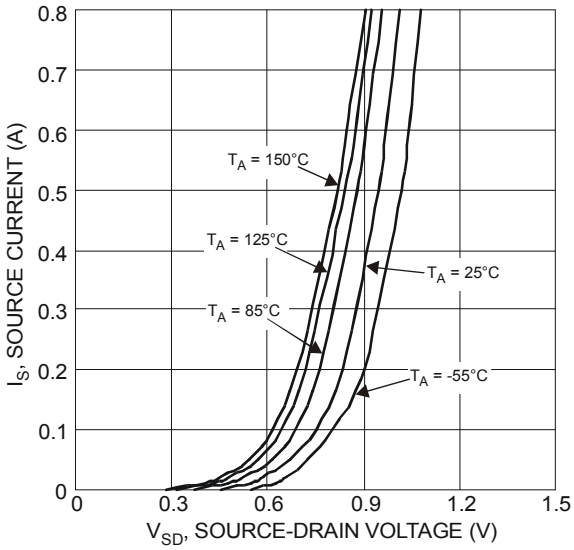

Figure 8 Diode Forward Voltage vs. Current

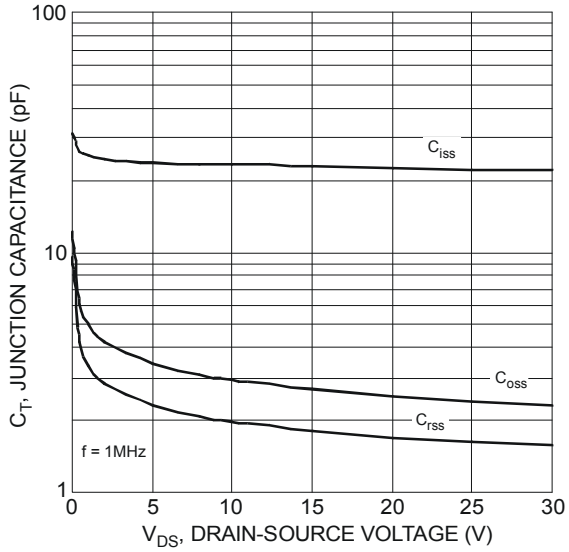

Figure 9 Typical Junction Capacitance

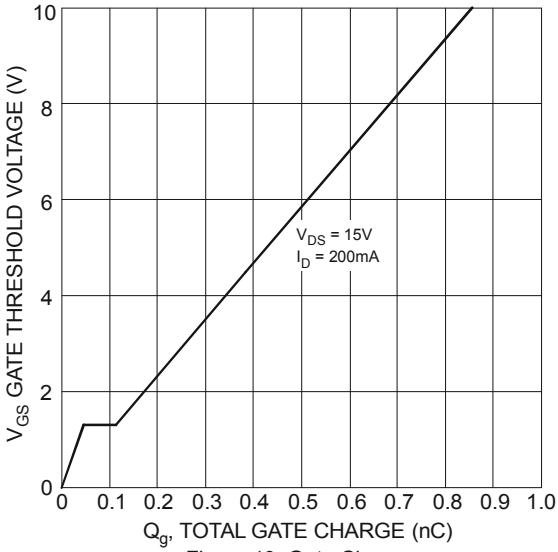

Figure 10 Gate Charge

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P-CHANNEL

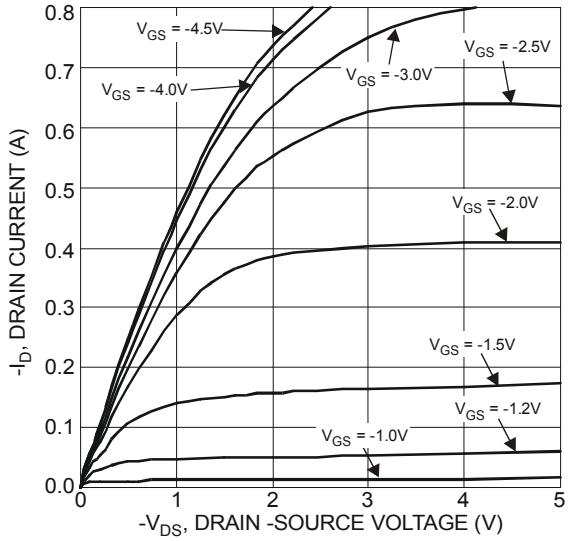

Figure 1 Typical Output Characteristics

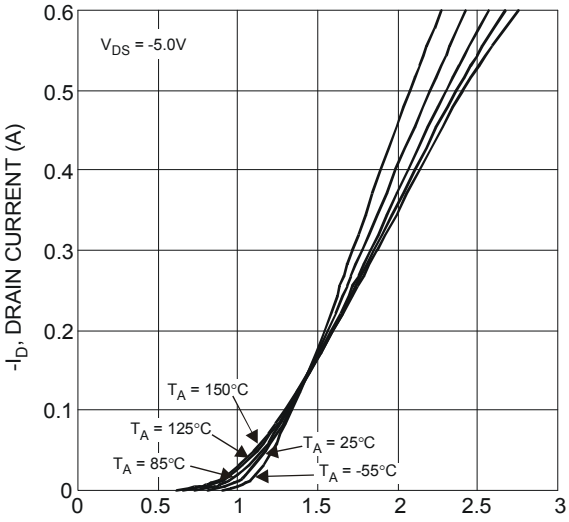

Figure 2 Typical Transfer Characteristics

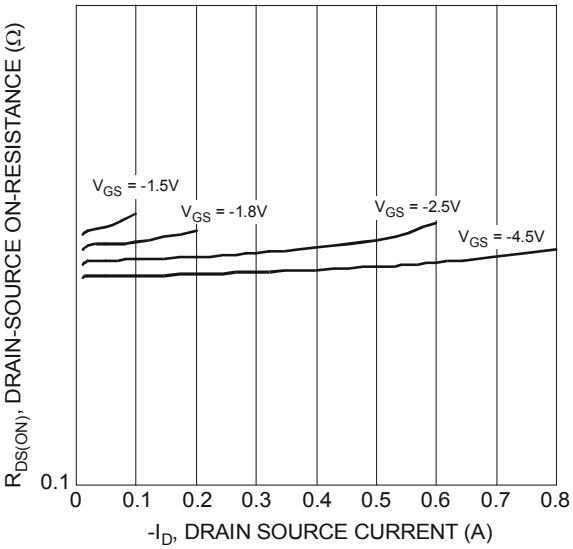

Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

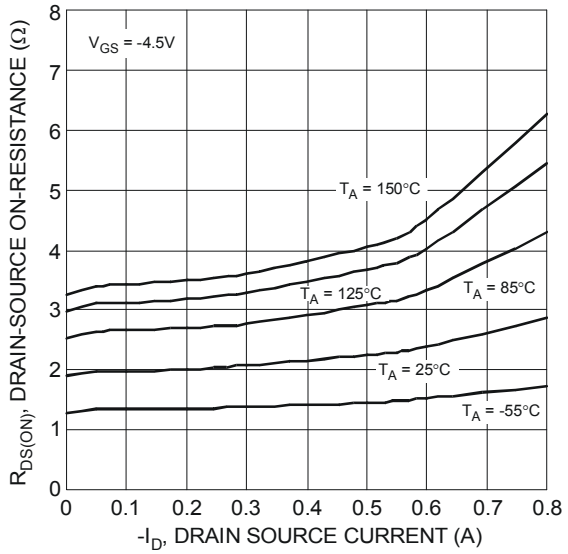

Figure 4 Typical On-Resistance vs. Drain Current and Temperature

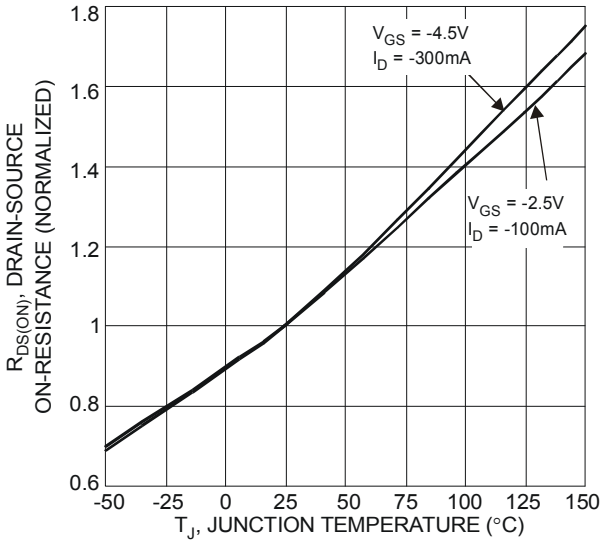

Figure 5 On-Resistance Variation with Temperature

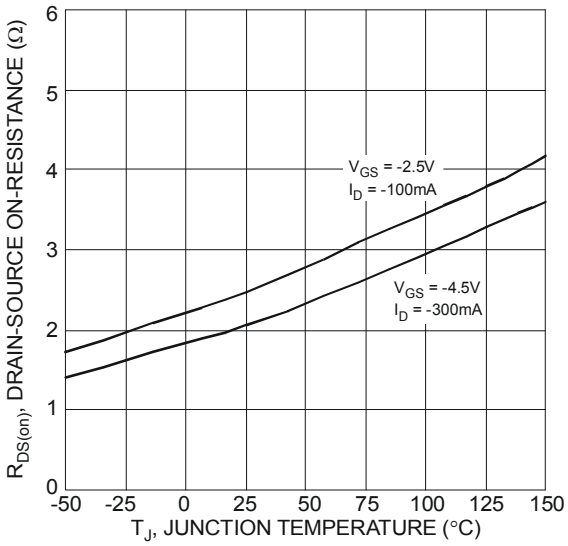

Figure 6 On-Resistance Variation with Temperature

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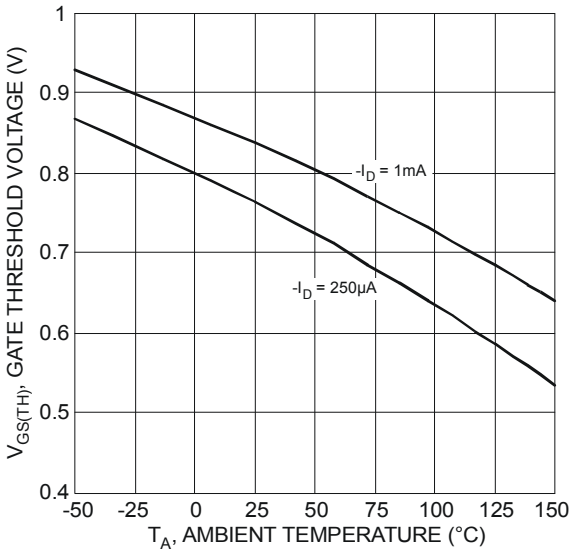

Figure 7 Gate Threshold Variation vs. Ambient Temperature

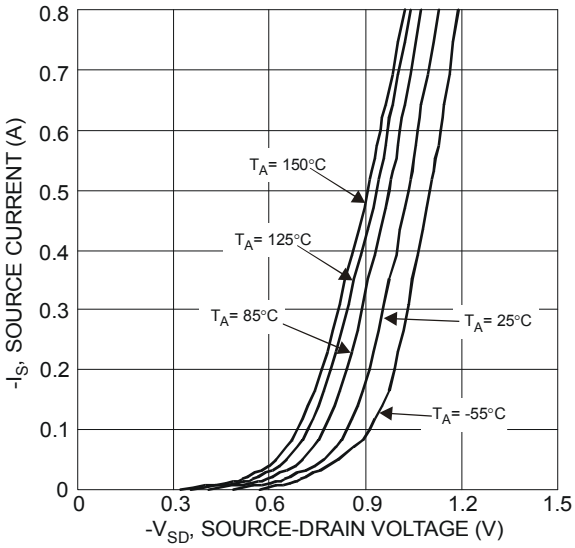

Figure 8 Diode Forward Voltage vs. Current

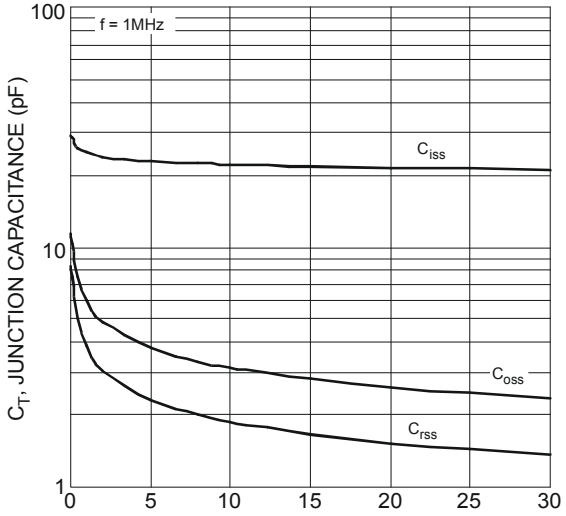

Figure 9 Typical Junction Capacitance

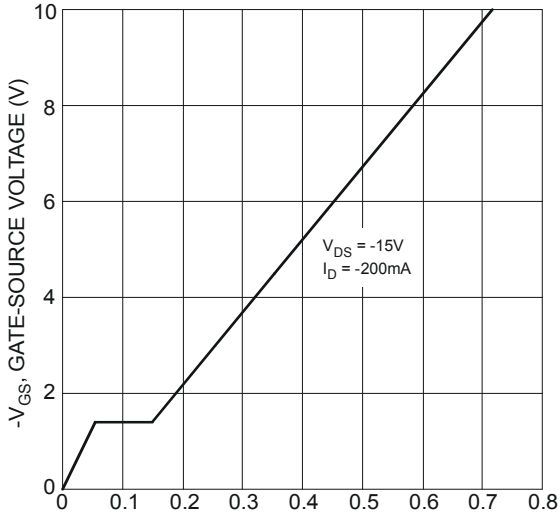

Figure 10 Gate-Charge Characteristics

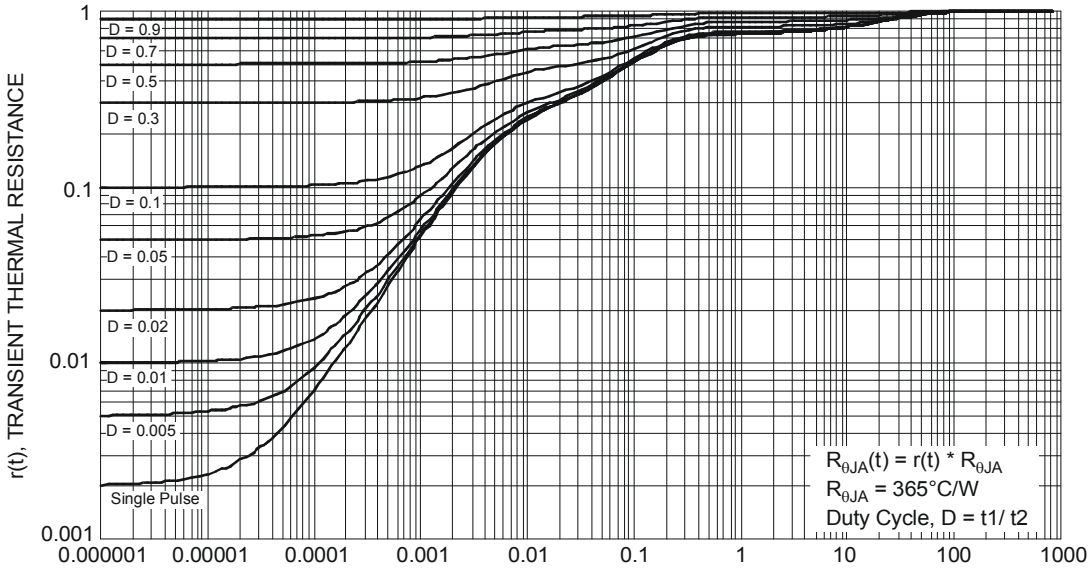

Figure 11 Transient Thermal Resistance

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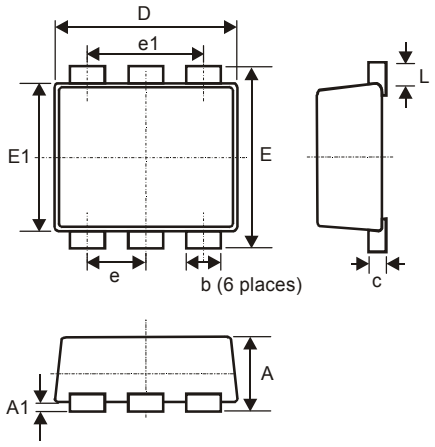
Package Outline Dimensions

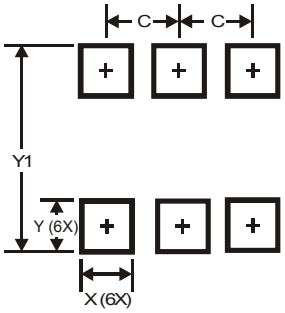
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



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

NEW PRODUCT

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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.

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