

## Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(on) max}$	$I_D$ $T_A = +25^\circ C$
Q2	40V	24m $\Omega$ @ $V_{GS} = 10V$	9.0A
		32m $\Omega$ @ $V_{GS} = 4.5V$	7.8A
Q1	-40V	45m $\Omega$ @ $V_{GS} = -10V$	-6.5A
		55m $\Omega$ @ $V_{GS} = -4.5V$	-5.9A

## Description

This new generation 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

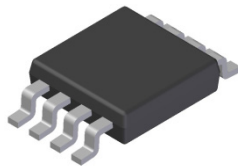
- DC-DC Converters
- Power Management Functions
- Backlighting

## Features and Benefits

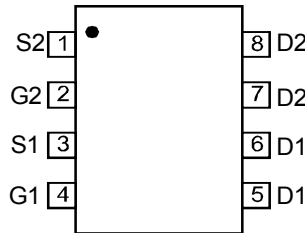
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

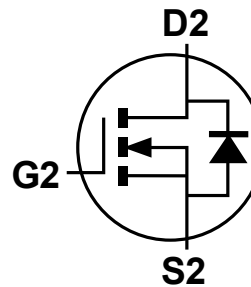
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.074 grams (approximate)



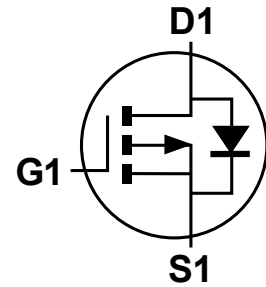
Top View



TOP VIEW  
Internal Schematic



N-Channel MOSFET



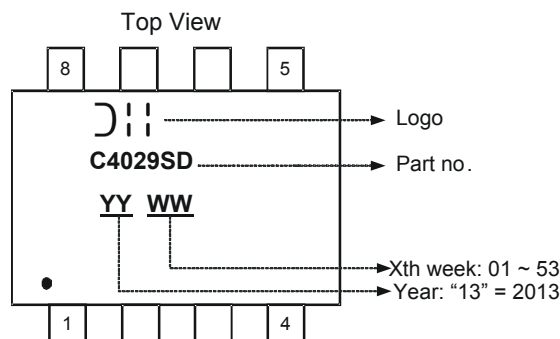
P-Channel MOSFET

## Ordering Information (Note 4 & 5)

Part Number	Compliance	Case	Packaging
DMC4029SSD-13	Standard	SO-8	2,500/Tape & Reel
DMC4029SSDQ-13	Automotive	SO-8	2,500/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](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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_grade\\_definitions/](http://www.diodes.com/quality/product_grade_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



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

Characteristic			Symbol	Value_Q2	Value_Q1	Units
Drain-Source Voltage			V <sub>DSS</sub>	40	-40	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	±20	V
Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	7.0 5.6	-5.1 -4.1	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	9.0 7.2	-6.5 -5.2	A
Maximum Body Diode Forward Current (Note 7)			I <sub>S</sub>	2.5	-2.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I <sub>DM</sub>	70	-40	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.3	W
	T <sub>A</sub> = +70°C		0.8	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	98	°C/W
	t < 10s		59	
Total Power Dissipation (Note 7)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.8	W
	T <sub>A</sub> = +70°C		1.1	
Thermal Resistance, Junction to Ambient (Note 7)	Steady state	R <sub>θJA</sub>	71	°C/W
	t < 10s		43	
Thermal Resistance, Junction to Case (Note 7)		R <sub>θJC</sub>	11.8	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

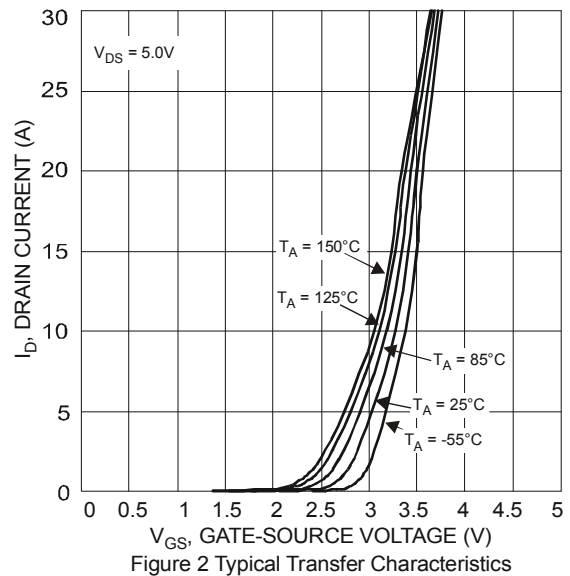
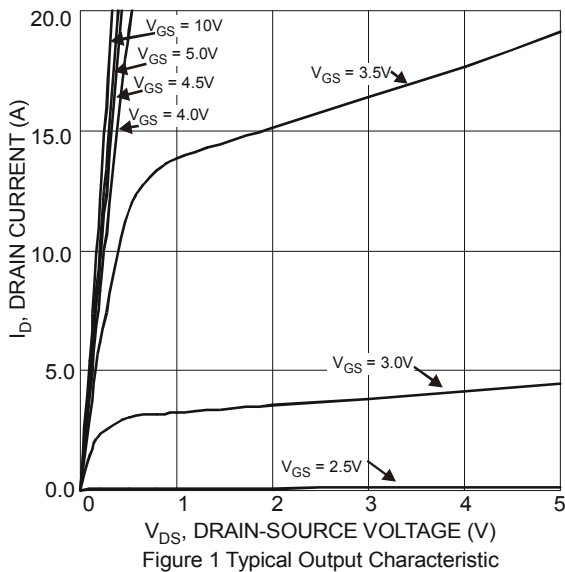
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	15	24	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 6A
		—	20	32		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.0A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>iSS</sub>	—	1060	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	84	—		
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	58	—		
Gate Resistance	R <sub>G</sub>	—	1.6	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	8.8	—	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 8A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	19.1	—		
Gate-Source Charge	Q <sub>gs</sub>	—	3.0	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	2.5	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.3	—	nS	V <sub>DD</sub> = 25V, R <sub>L</sub> = 2.5Ω V <sub>GS</sub> = 10V, R <sub>G</sub> = 3Ω
Turn-On Rise Time	t <sub>r</sub>	—	7.1	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	15.1	—		
Turn-Off Fall Time	t <sub>f</sub>	—	4.8	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	10.5	—	nS	I <sub>F</sub> = 8A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	4.15	—	nC	I <sub>F</sub> = 8A, di/dt = 100A/µs

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	μA	V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.0	—	-3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	33	45	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A
		—	40	55		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1.0A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>iss</sub>	—	1154	—	pF	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	84	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	66	—		
Gate Resistance	R <sub>G</sub>	—	12.6	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	10.6	—	nC	V <sub>DS</sub> = -20V, I <sub>D</sub> = -4.9A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	—	21.5	—		
Gate-Source Charge	Q <sub>gs</sub>	—	2.2	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.3	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	8.7	—	nS	V <sub>DS</sub> = -20V, I <sub>D</sub> = -3.9A V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 1Ω
Turn-On Rise Time	t <sub>r</sub>	—	19.6	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	34.9	—		
Turn-Off Fall Time	t <sub>f</sub>	—	25.5	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	9.61	—	nS	I <sub>S</sub> = -3.9A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	3.3	—	nC	I <sub>S</sub> = -3.9A, di/dt = 100A/μs

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

**N-Channel Q2**



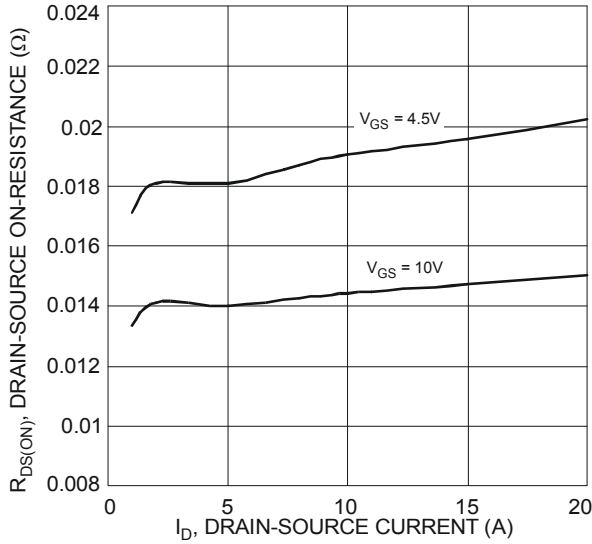


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

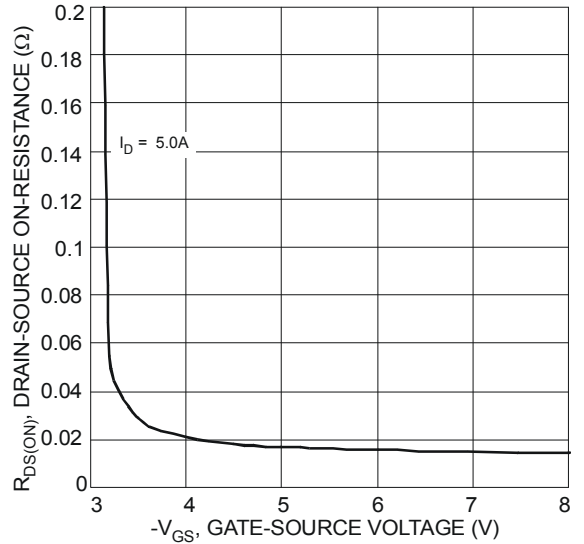


Figure 4 Typical Transfer Characteristic

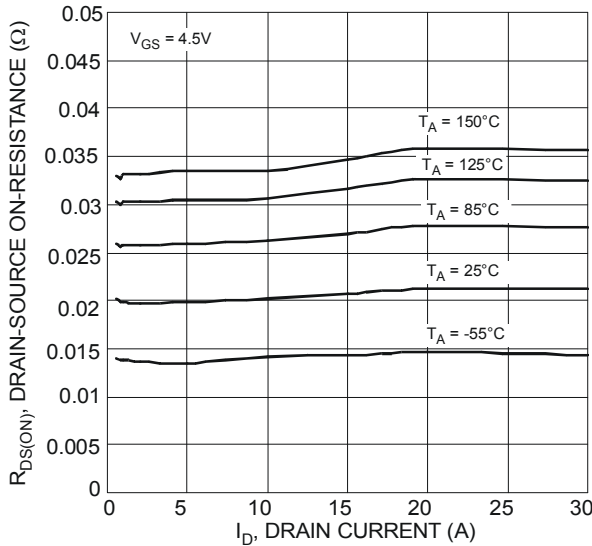


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

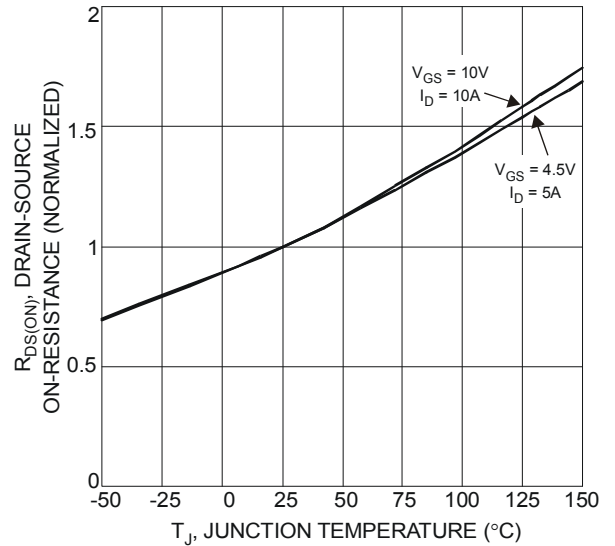


Figure 6 On-Resistance Variation with Temperature

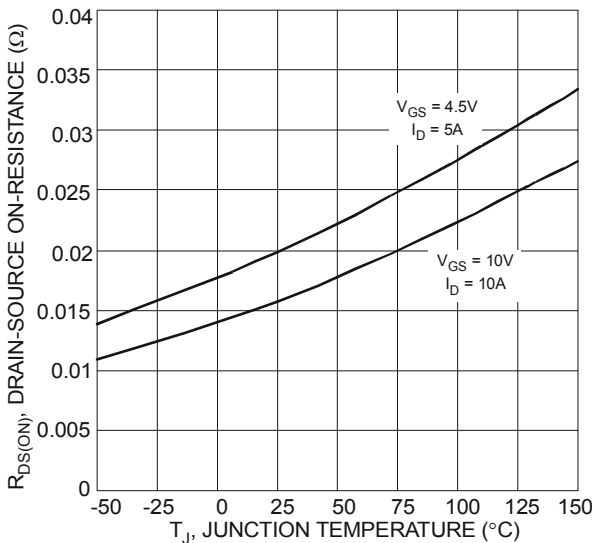


Figure 7 On-Resistance Variation with Temperature

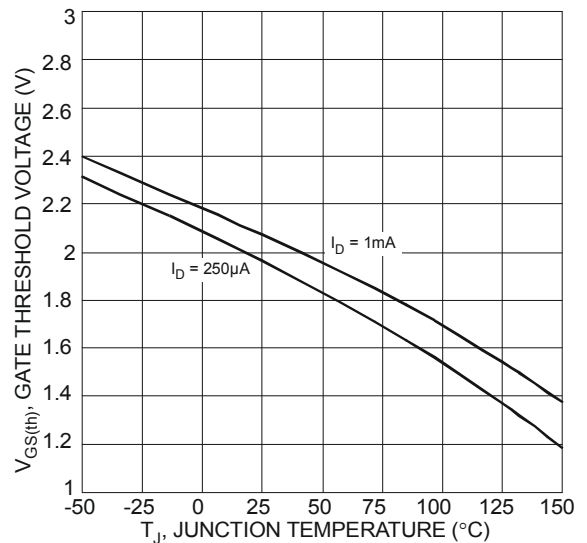


Figure 8 Gate Threshold Variation vs. Ambient Temperature

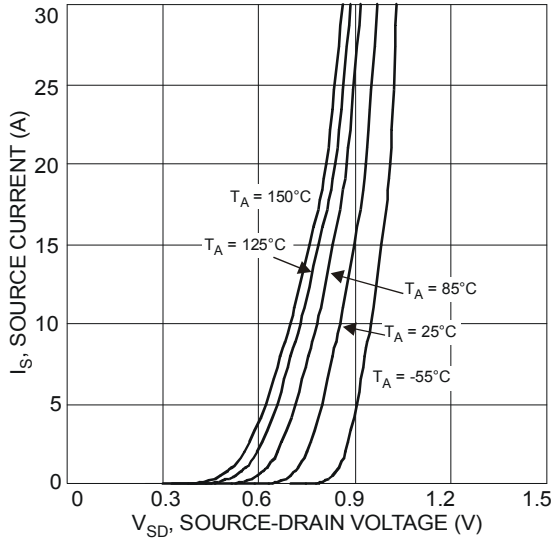


Figure 9 Diode Forward Voltage vs. Current

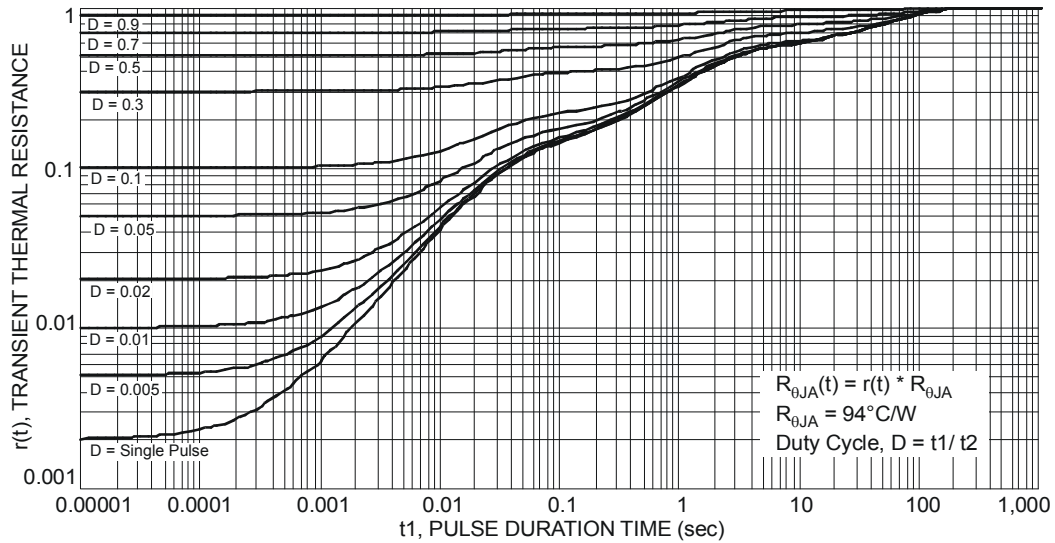


Figure 10 Transient Thermal Resistance

**P-Channel Q1**

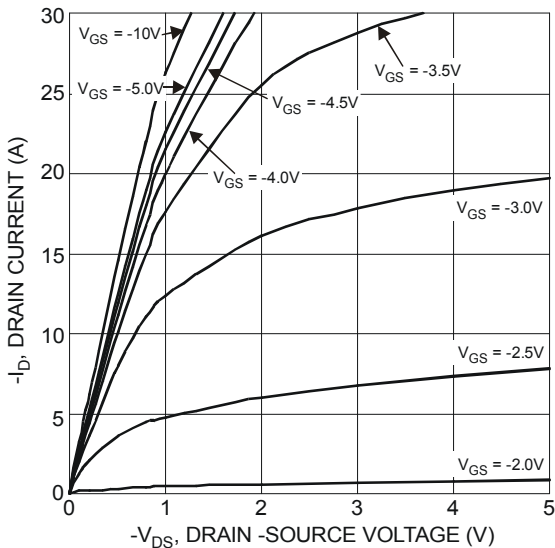


Figure 1 Typical Output Characteristics

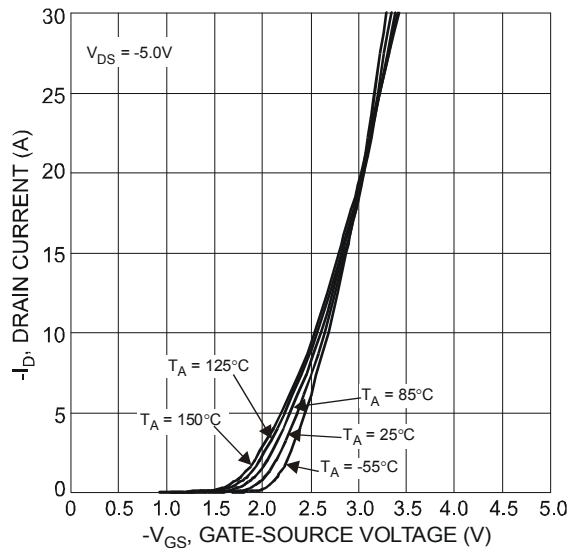


Figure 2 Typical Transfer Characteristics

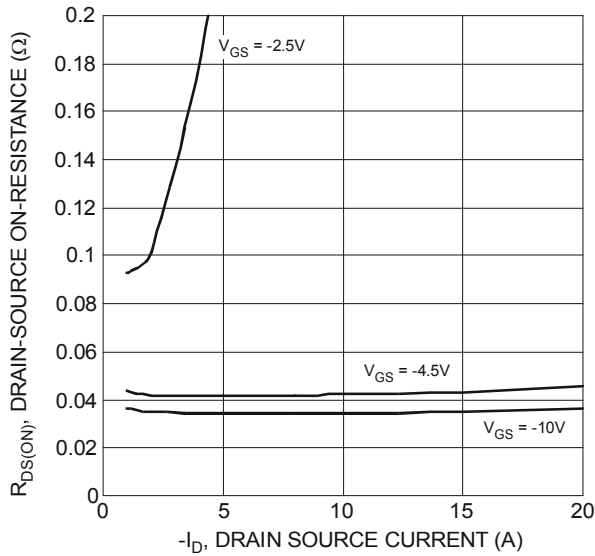


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

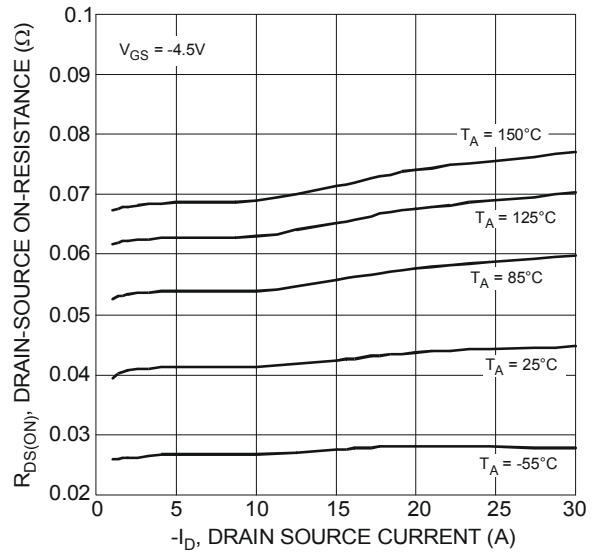


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

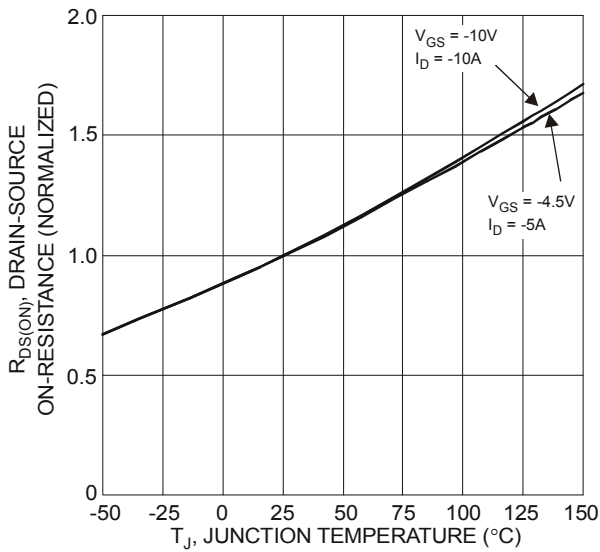


Figure 5 On-Resistance Variation with Temperature

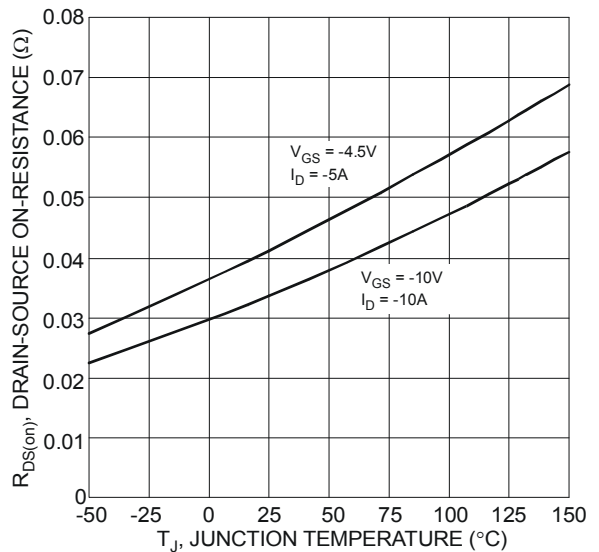


Figure 6 On-Resistance Variation with Temperature

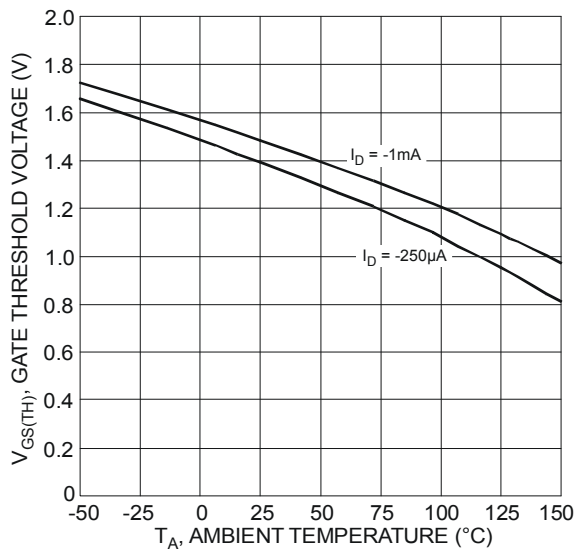


Figure 7 Gate Threshold Variation vs. Ambient Temperature

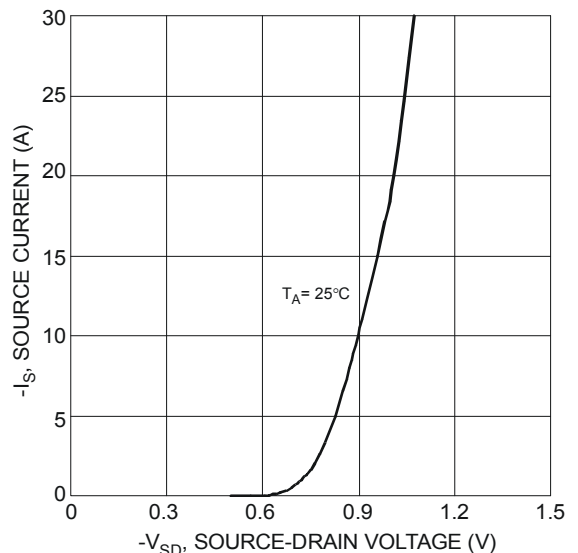
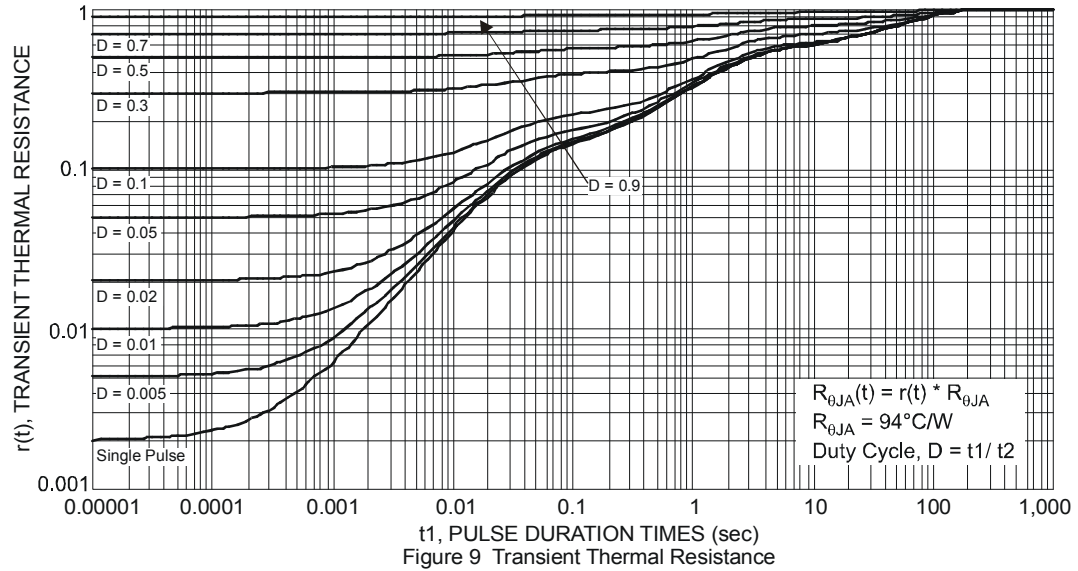
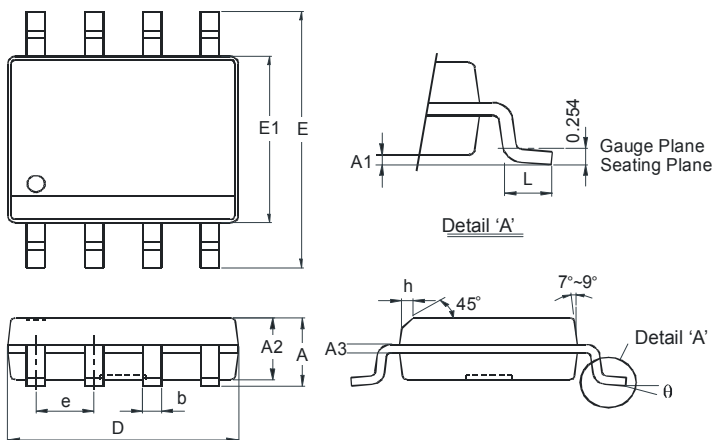


Figure 8 Diode Forward Voltage vs. Current



**Package Outline Dimensions**

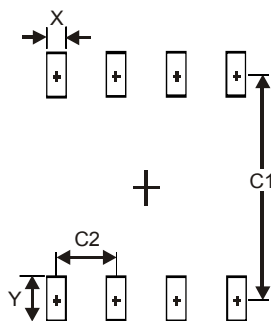
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

**Suggested Pad Layout**

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



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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