

## Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ\text{C}$
Q1	40V	15m $\Omega$ @ $V_{GS} = 10\text{V}$	12.2A
		20m $\Omega$ @ $V_{GS} = 4.5\text{V}$	10.6A
Q2	-40V	29m $\Omega$ @ $V_{GS} = -10\text{V}$	-8.8A
		45m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-7.1A

## Description

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

## Applications

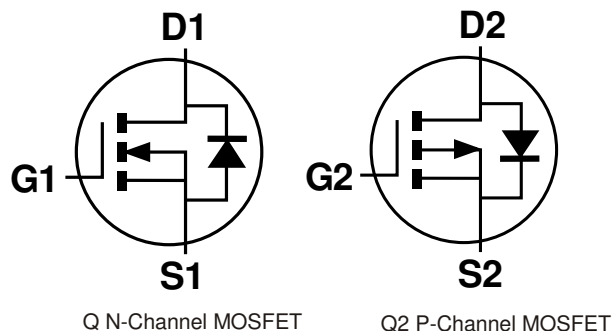
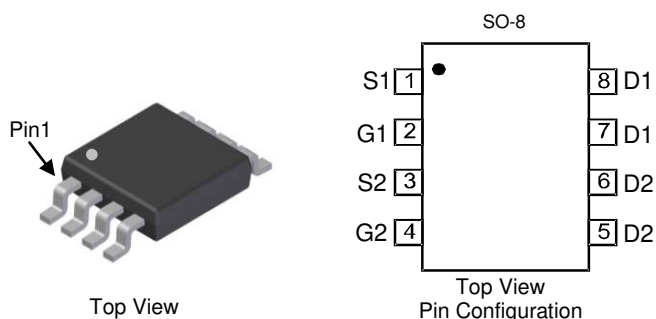
- DC-DC Converters
- Power Management Functions
- Backlighting

## 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)**

## 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—Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208
- Weight: 0.074 grams (Approximate)

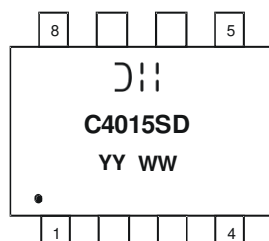


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC4015SSD-13	SO-8	2500/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, see <http://www.diodes.com/products/packages.html>.

## Marking Information



DII = Manufacturer's Marking  
 C4015SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YY = Year (ex: 18 = 2018)  
 WW = Week (01 - 53)

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

Characteristic		Symbol	Value_Q1	Value_Q2	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 6) V <sub>GS</sub> = 10V	Steady State	I <sub>D</sub>	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	-6.2 -4.9	A
	t < 10s		T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	12.2 9.8	-8.8 -7.1
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I <sub>DM</sub>	80	-50	A
Maximum Body Diode Forward Current (Note 6)		I <sub>S</sub>	2.5	-2.2	A
Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)		I <sub>SM</sub>	80	-50	A
Avalanche Current (Note 7) L = 0.1mH		I <sub>AS</sub>	27	-25	A
Avalanche Energy (Note 7) L = 0.1mH		E <sub>AS</sub>	37	32	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.2	W
	T <sub>A</sub> = +70°C		0.9	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	106	°C/W
	t < 10s		45	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.7	W
	T <sub>A</sub> = +70°C		1.1	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	76	°C/W
	t < 10s		37	
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	12	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
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 (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1	—	3	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	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3A
		—	—	20		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>ISS</sub>	—	1810	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	135	—		
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	112	—		
Gate Resistance	R <sub>G</sub>	—	1.7	—	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>	—	19	—	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 3A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	40	—		
Gate-Source Charge	Q <sub>gs</sub>	—	5.5	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	6.3	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.1	—	nS	V <sub>DD</sub> = 20V, I <sub>D</sub> = 3A V <sub>GS</sub> = 10V, R <sub>G</sub> = 3Ω,
Turn-On Rise Time	t <sub>r</sub>	—	5.7	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	23	—		
Turn-Off Fall Time	t <sub>f</sub>	—	6.3	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	12.2	—	nS	I <sub>S</sub> = 3A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	5.4	—	nC	I <sub>S</sub> = 3A, dI/dt = 100A/µs

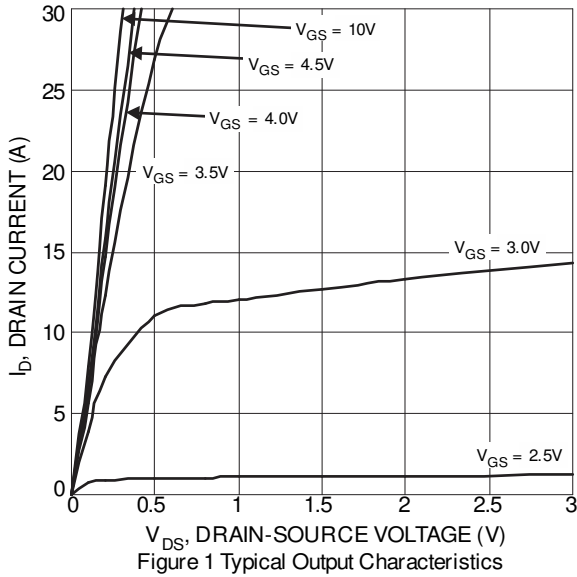


Figure 1 Typical Output Characteristics

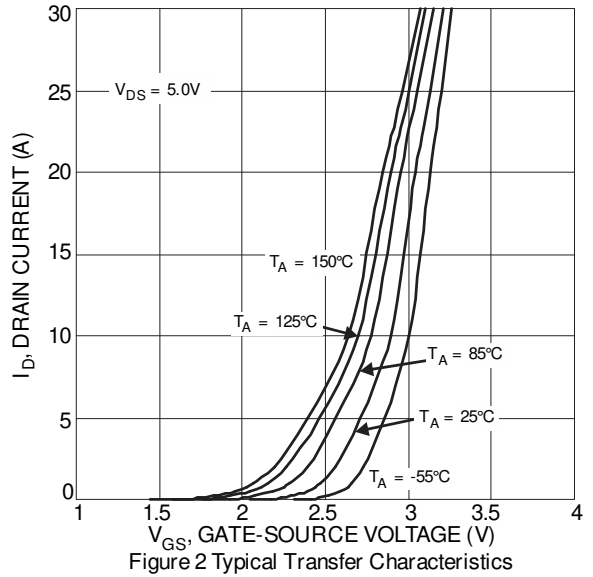


Figure 2 Typical Transfer Characteristics

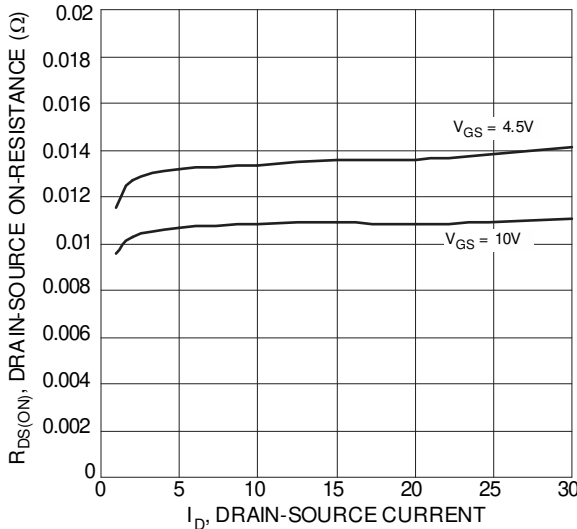


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

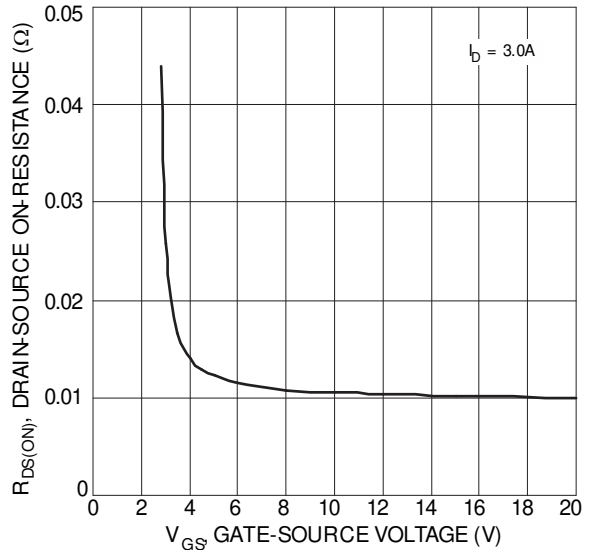


Figure 4 Typical Transfer Characteristic

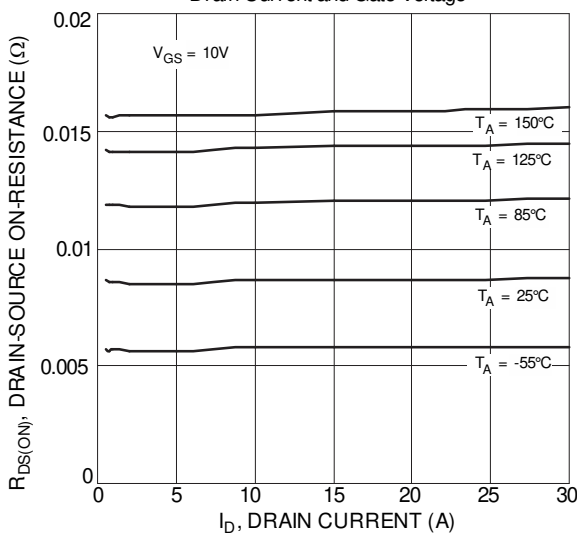


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

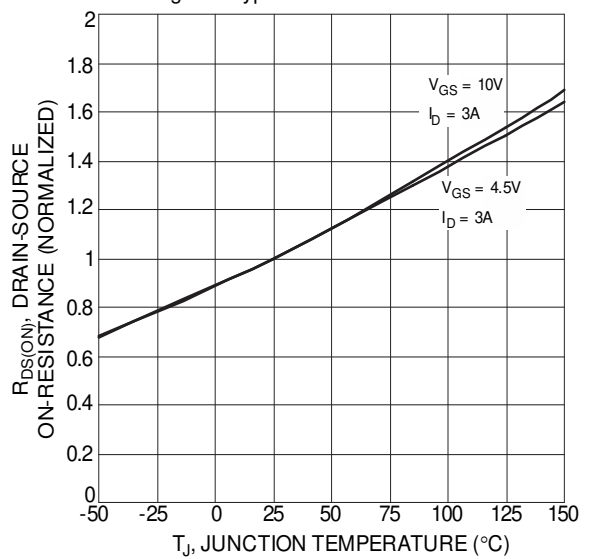


Figure 6 On-Resistance Variation with Temperature

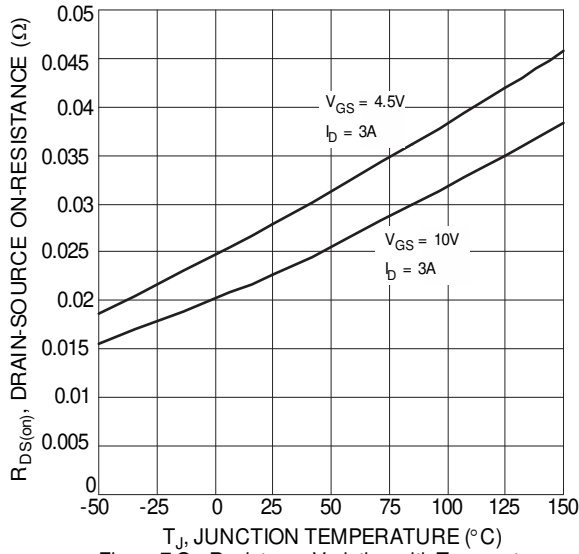


Figure 7 On-Resistance Variation with Temperature

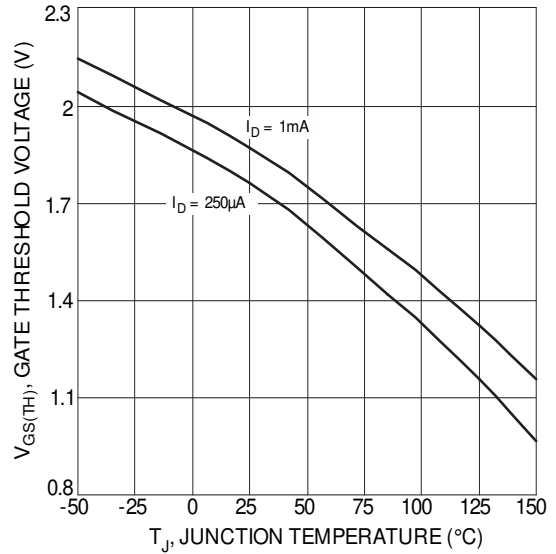


Figure 8 Gate Threshold Variation vs. Ambient Temperature

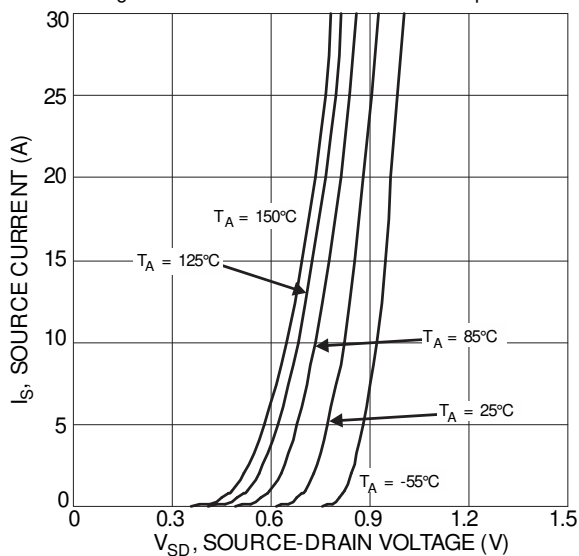


Figure 9 Diode Forward Voltage vs. Current

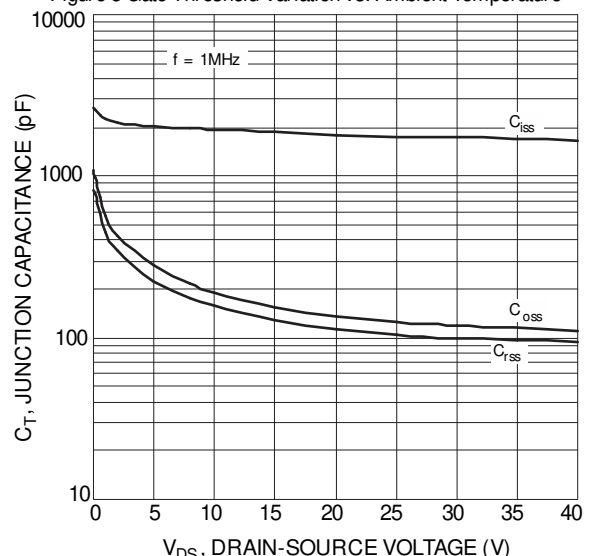


Figure 10 Typical Junction Capacitance

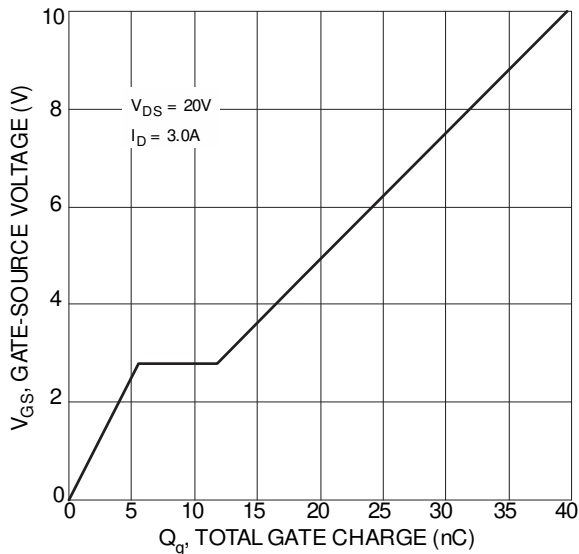


Figure 11 Gate-Charge Characteristics

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
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 (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1	—	-3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	29	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -3A
		—	—	45		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	1626	—	pF	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	135	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	107	—		
Gate Resistance	R <sub>G</sub>	—	11	—	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>	—	17	—	nC	V <sub>DS</sub> = -20V, I <sub>D</sub> = -3A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	—	34	—		
Gate-Source Charge	Q <sub>gs</sub>	—	3.7	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	6.0	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	3.9	—	nS	V <sub>DD</sub> = -20V, R <sub>L</sub> = 1.6Ω V <sub>GS</sub> = -10V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = -3A
Turn-On Rise Time	t <sub>r</sub>	—	2.8	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	83	—		
Turn-Off Fall Time	t <sub>f</sub>	—	30	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	17.3	—	nS	I <sub>S</sub> = -3A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	7.2	—	nC	I <sub>S</sub> = -3A, dI/dt = 100A/μs

- Notes:
5. Device mounted on FR-4 substrate PCB, 2oz copper, with minimum recommended pad layout.
  6. Device mounted on FR-4 substrate PCB, 2oz copper, with 1inch square copper plate.
  7. I<sub>AS</sub> and EAS rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.

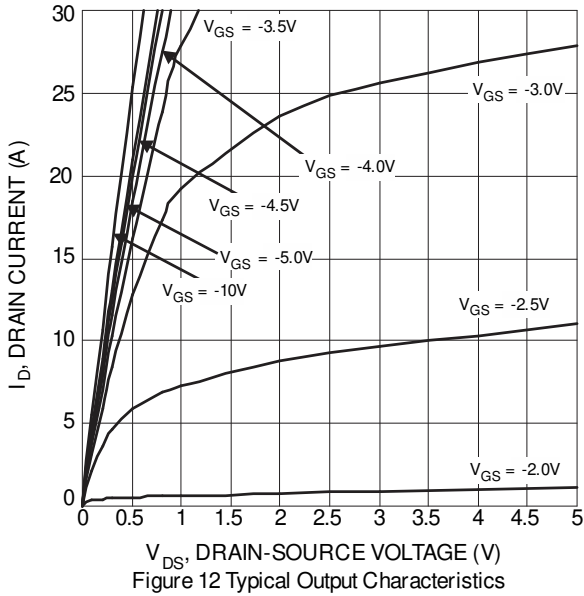


Figure 12 Typical Output Characteristics

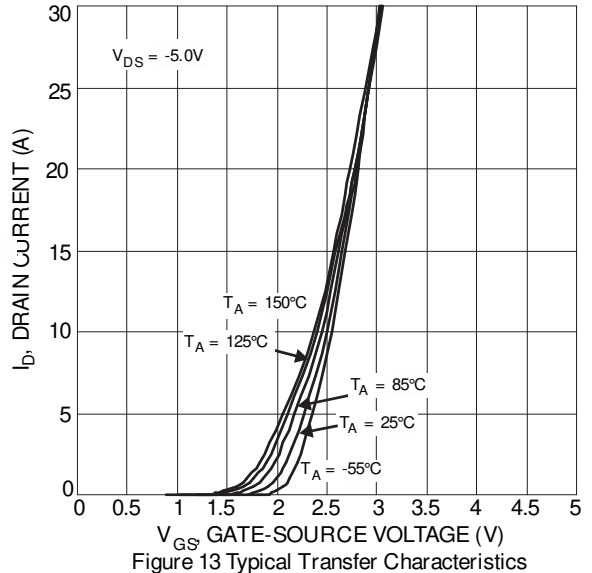


Figure 13 Typical Transfer Characteristics

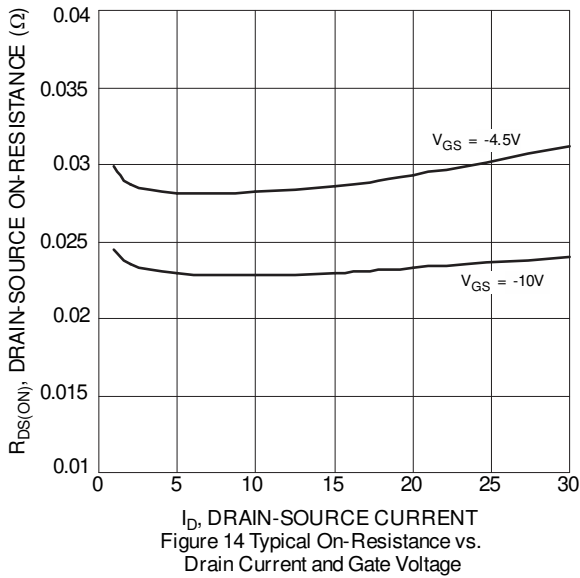


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

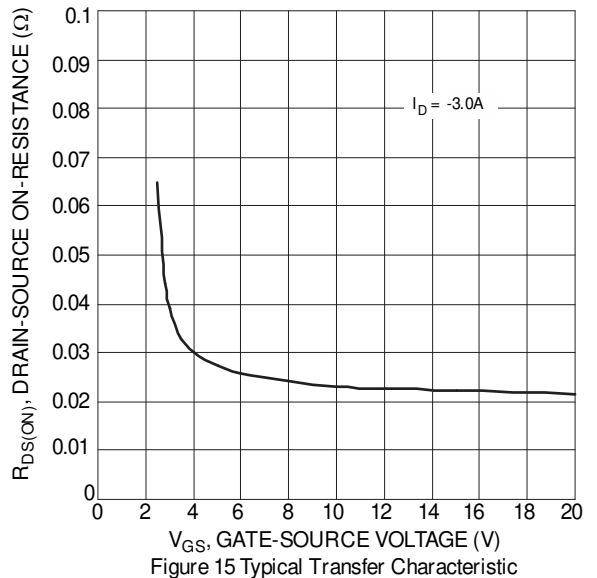


Figure 15 Typical Transfer Characteristic

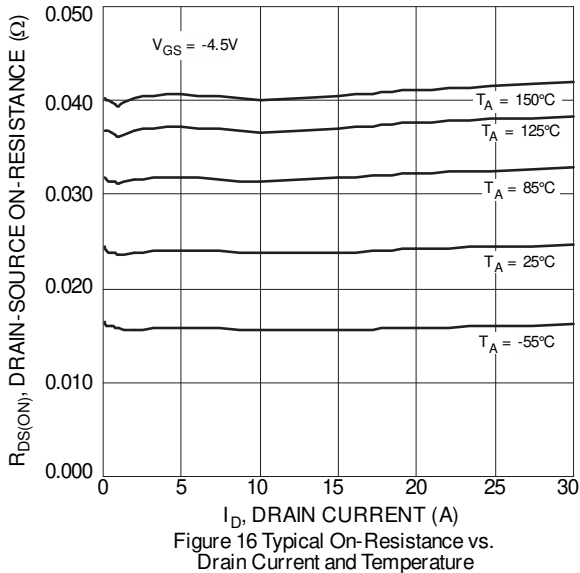


Figure 16 Typical On-Resistance vs. Drain Current and Temperature

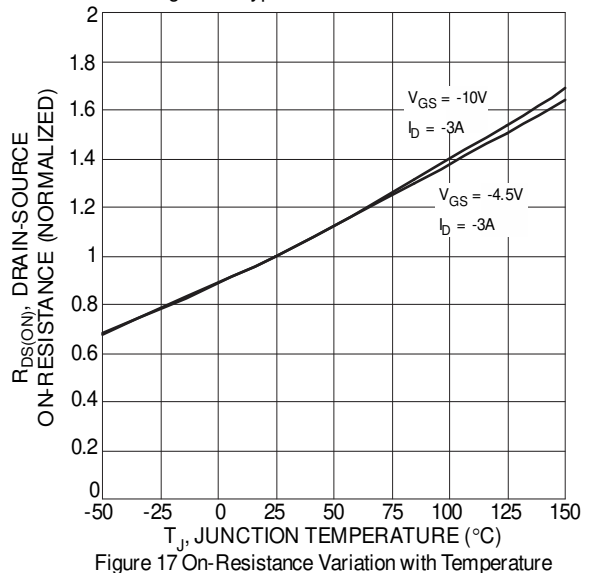
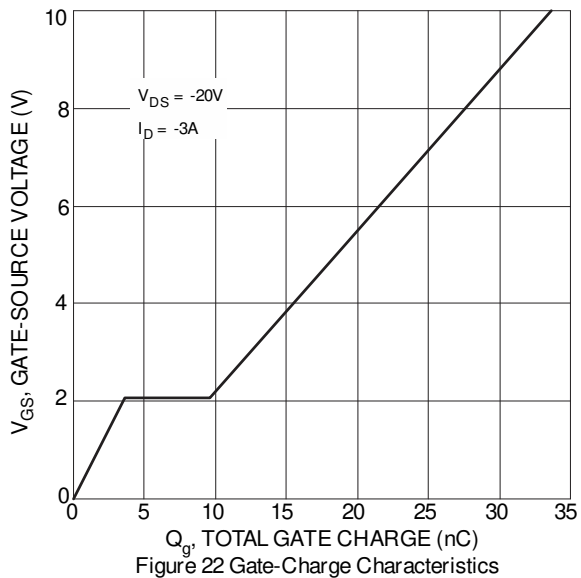
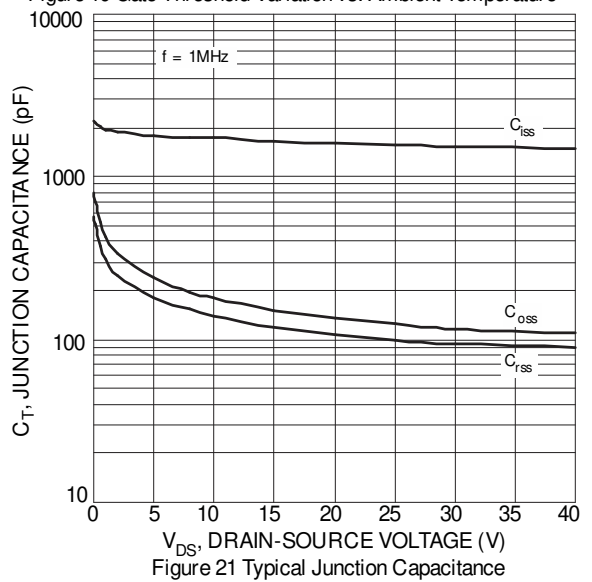
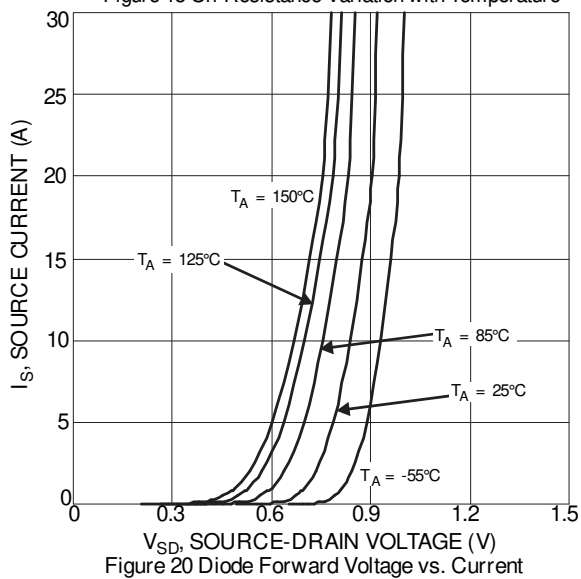
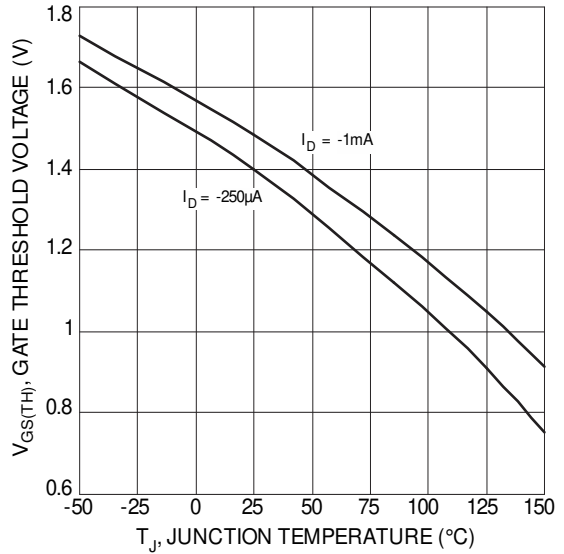
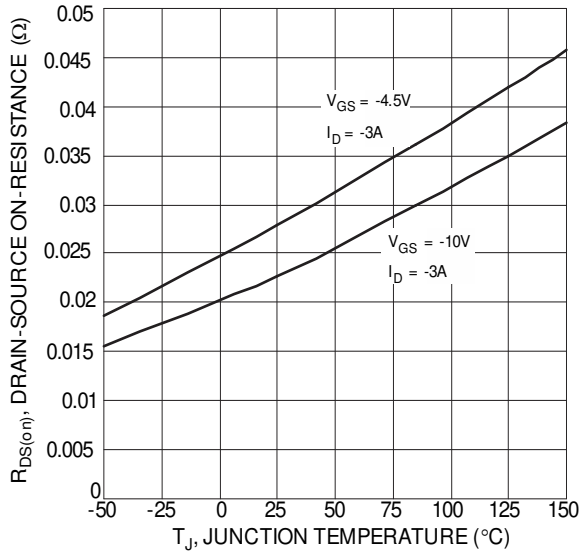


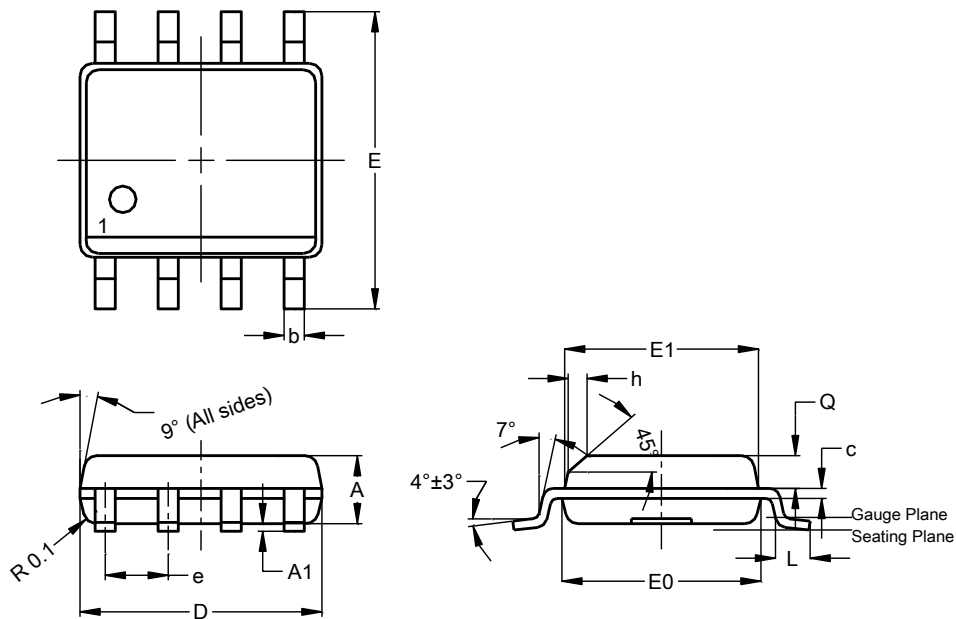
Figure 17 On-Resistance Variation with Temperature



**Package Outline Dimensions**

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

SO-8

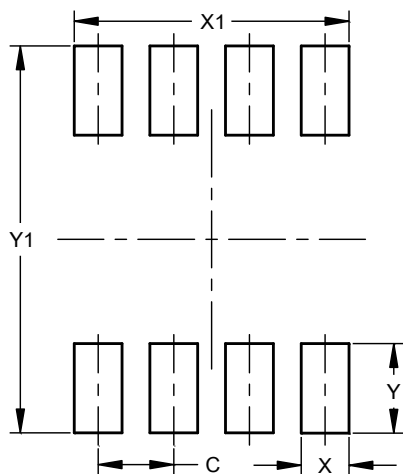


SO-8			
Dim	Min	Max	Typ
<b>A</b>	1.40	1.50	1.45
<b>A1</b>	0.10	0.20	0.15
<b>b</b>	0.30	0.50	0.40
<b>c</b>	0.15	0.25	0.20
<b>D</b>	4.85	4.95	4.90
<b>E</b>	5.90	6.10	6.00
<b>E1</b>	3.80	3.90	3.85
<b>E0</b>	3.85	3.95	3.90
<b>e</b>	—	—	1.27
<b>h</b>	—	—	0.35
<b>L</b>	0.62	0.82	0.72
<b>Q</b>	0.60	0.70	0.65
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

SO-8



Dimensions	Value (in mm)
<b>C</b>	1.27
<b>X</b>	0.802
<b>X1</b>	4.612
<b>Y</b>	1.505
<b>Y1</b>	6.50



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