

Product Summary

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

Description

This new generation MOSFET is 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

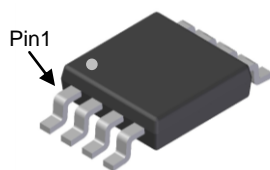
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

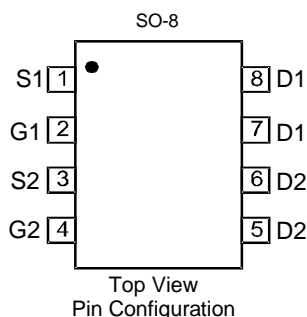
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

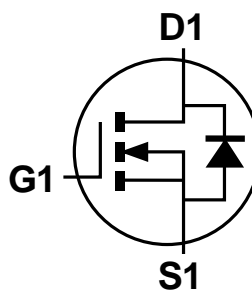
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208(3)
- Weight: 0.074 grams (Approximate)



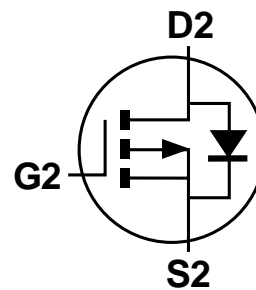
Top View



Top View
Pin Configuration



Q N-Channel MOSFET



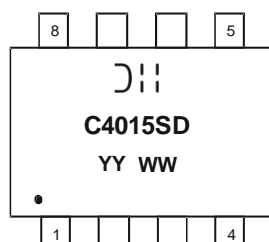
Q2 P-Channel MOSFET

Ordering Information (Note 4)

Part Number	Case	Packaging
DMC4015SSD-13	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 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>.

Marking Information



DII = Manufacturer's Marking
 C4015SD = Product Type Marking Code
 YYWW = Date Code Marking
 YY or YY = Year (ex: 14 = 2014)
 WW = Week (01 - 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value_Q1	Value_Q2	Units
Drain-Source Voltage			V_{DSS}	40	-40	V
Gate-Source Voltage			V_{GSS}	± 20	± 20	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	8.6 6.8	-6.2 -4.9	A
	t<10s	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	12.2 9.8	-8.8 -7.1	A
Maximum Body Diode Forward Current (Note 6)			I_S	2.5	-2.2	A
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)			I_{DM}	80	-50	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	27	-25	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	37	32	mJ

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.2	W
	$T_A = +70^\circ\text{C}$		0.9	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	106	$^\circ\text{C/W}$
	t<10s		45	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	1.7	W
	$T_A = +70^\circ\text{C}$		1.1	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	76	$^\circ\text{C/W}$
	t<10s		37	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	12	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics N-Channel Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	—	15	m Ω	$V_{GS} = 10\text{V}, I_D = 3\text{A}$
		—	—	20		$V_{GS} = 4.5\text{V}, I_D = 3\text{A}$
Diode Forward Voltage	V_{SD}	—	0.7	1.0	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1810	—	pF	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	135	—		
Reverse Transfer Capacitance	C_{rss}	—	112	—		
Gate Resistance	R_G	—	1.7	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	19	—	nC	$V_{DS} = 20\text{V}, I_D = 3\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	40	—		
Gate-Source Charge	Q_{gs}	—	5.5	—		
Gate-Drain Charge	Q_{gd}	—	6.3	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.1	—	nS	$V_{DD} = 20\text{V}, I_D = 3\text{A}, V_{GS} = 10\text{V}, R_G = 3\Omega,$
Turn-On Rise Time	t_r	—	5.7	—		
Turn-Off Delay Time	$t_{D(off)}$	—	23	—		
Turn-Off Fall Time	t_f	—	6.3	—		
Body Diode Reverse Recovery Time	t_{rr}	—	12.2	—	nS	$I_S = 3\text{A}, dI/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{rr}	—	5.4	—	nC	$I_S = 3\text{A}, dI/dt = 100\text{A}/\mu\text{s}$

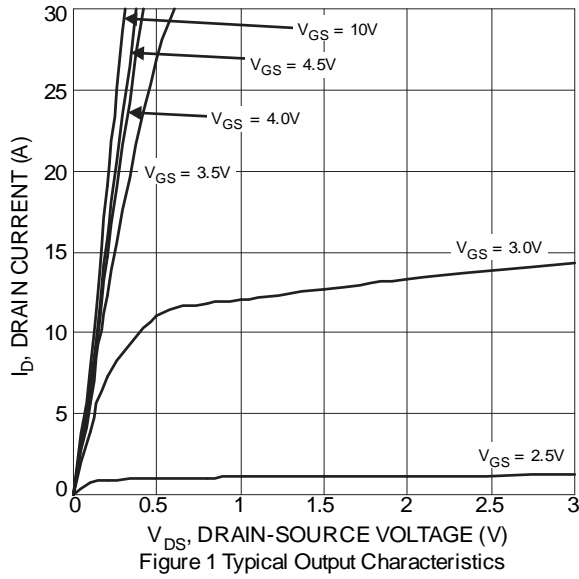


Figure 1 Typical Output Characteristics

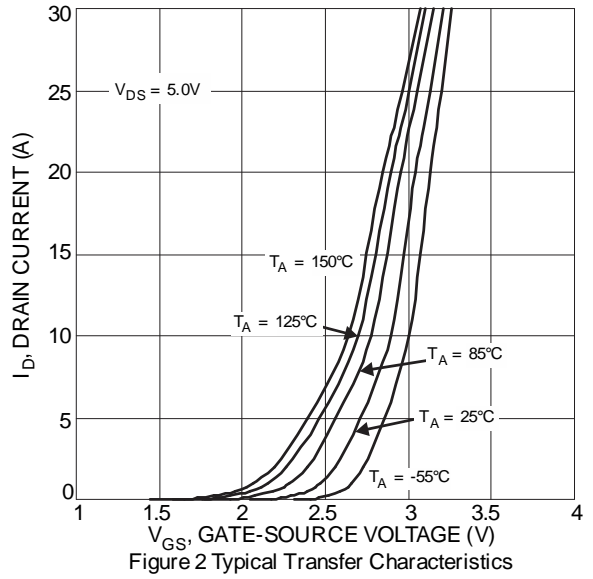


Figure 2 Typical Transfer Characteristics

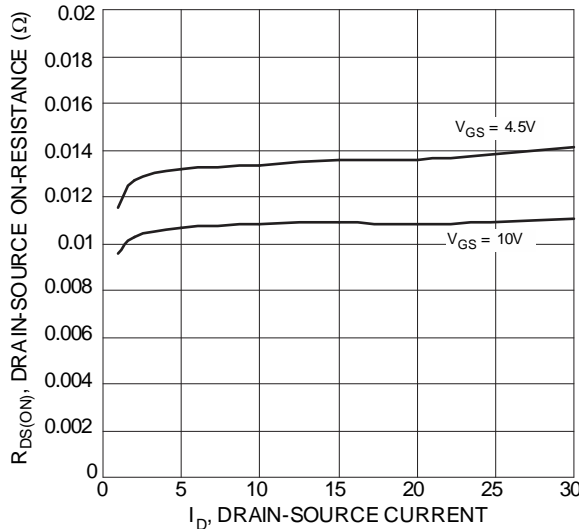


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

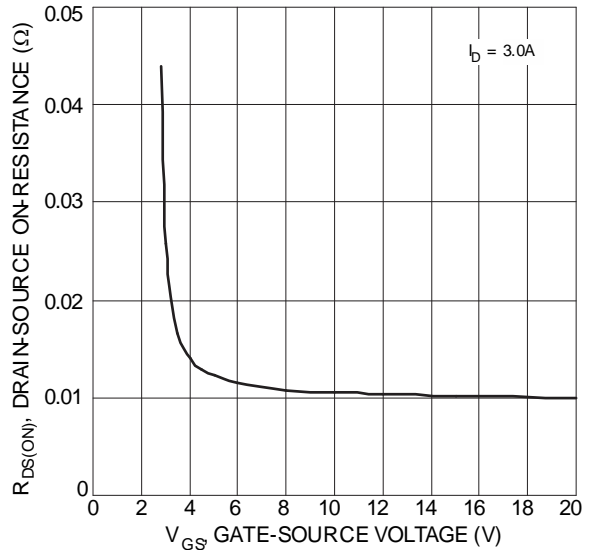


Figure 4 Typical Transfer Characteristic

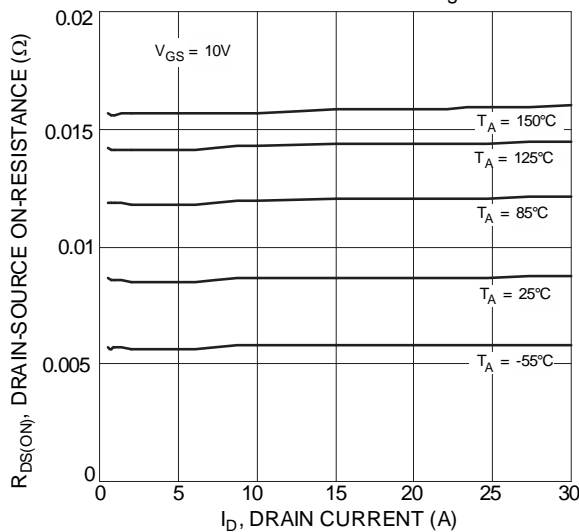


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

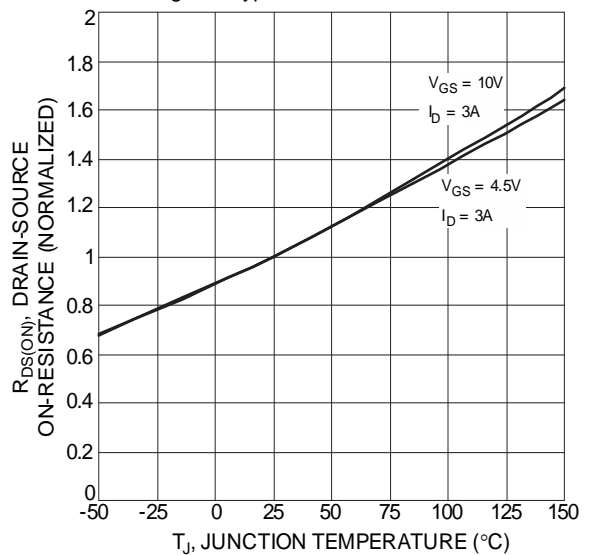
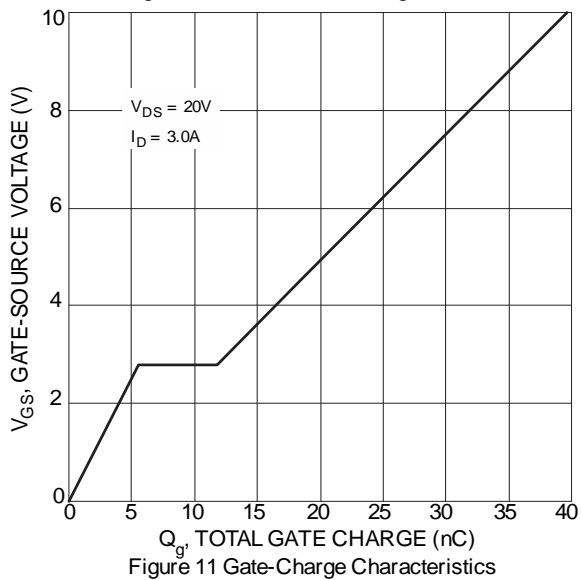
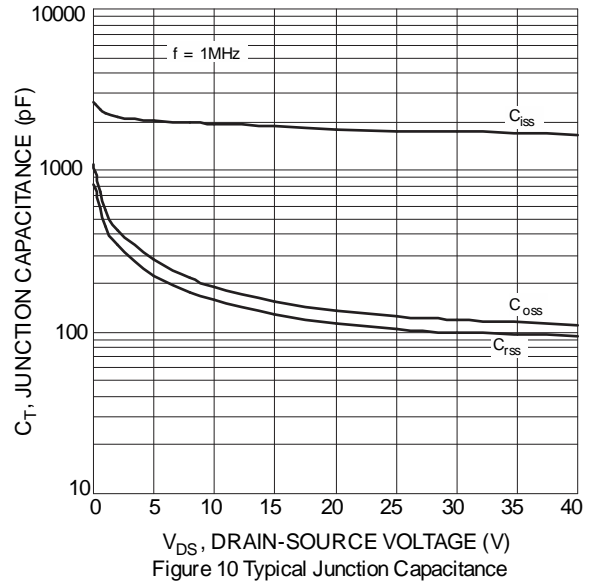
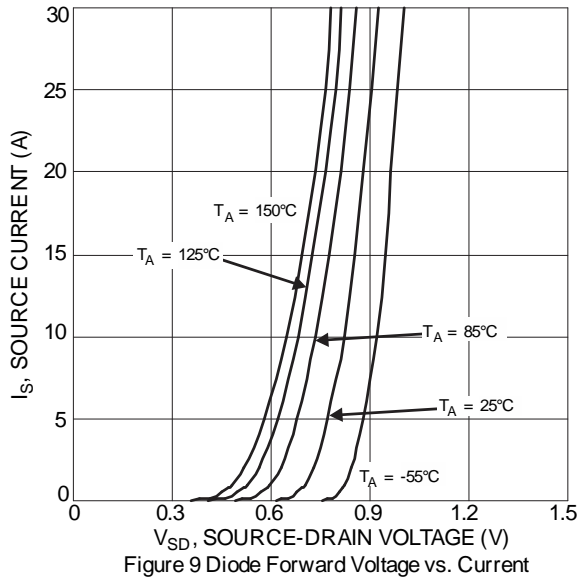
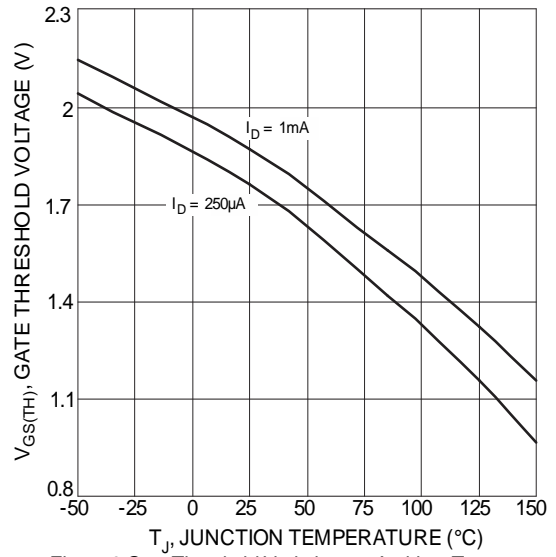
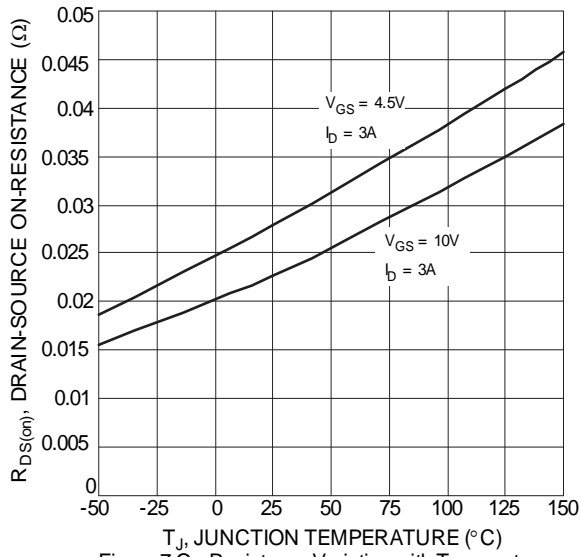


Figure 6 On-Resistance Variation with Temperature



Electrical Characteristics P-Channel Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(th)}	-1	—	-3	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	—	29	mΩ	V _{GS} = -10V, I _D = -3A
		—	—	45		V _{GS} = -4.5V, I _D = -3A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	1626	—	pF	V _{DS} = -20V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	135	—		
Reverse Transfer Capacitance	C _{rss}	—	107	—		
Gate Resistance	R _G	—	11	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	17	—	nC	V _{DS} = -20V, I _D = -3A
Total Gate Charge (V _{GS} = -10V)	Q _g	—	34	—		
Gate-Source Charge	Q _{gs}	—	3.7	—		
Gate-Drain Charge	Q _{gd}	—	6.0	—		
Turn-On Delay Time	t _{D(on)}	—	3.9	—	nS	V _{DD} = -20V, R _L = 1.6Ω V _{GS} = -10V, R _G = 3Ω, I _D = -3A
Turn-On Rise Time	t _r	—	2.8	—		
Turn-Off Delay Time	t _{D(off)}	—	83	—		
Turn-Off Fall Time	t _f	—	30	—		
Body Diode Reverse Recovery Time	t _{rr}	—	17.3	—	nS	I _S = -3A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _{rr}	—	7.2	—	nC	I _S = -3A, dI/dt = 100A/μs

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 7. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.
 8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design. Not subject to product testing.

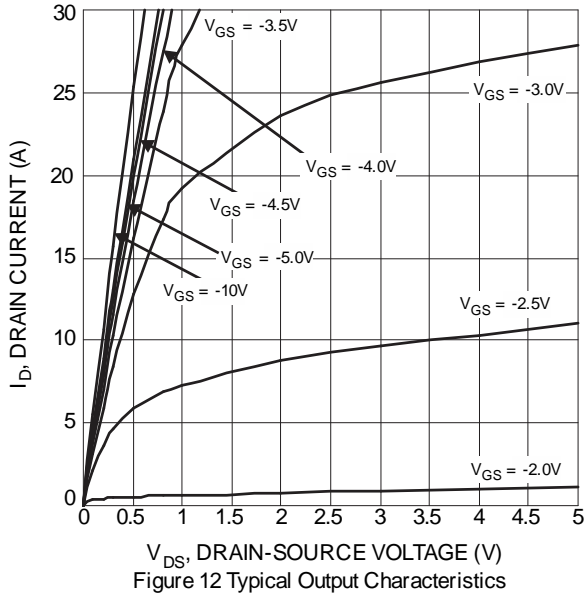


Figure 12 Typical Output Characteristics

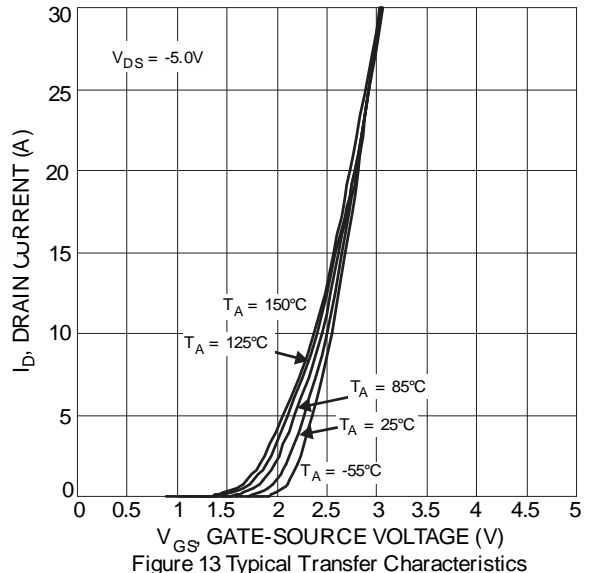


Figure 13 Typical Transfer Characteristics

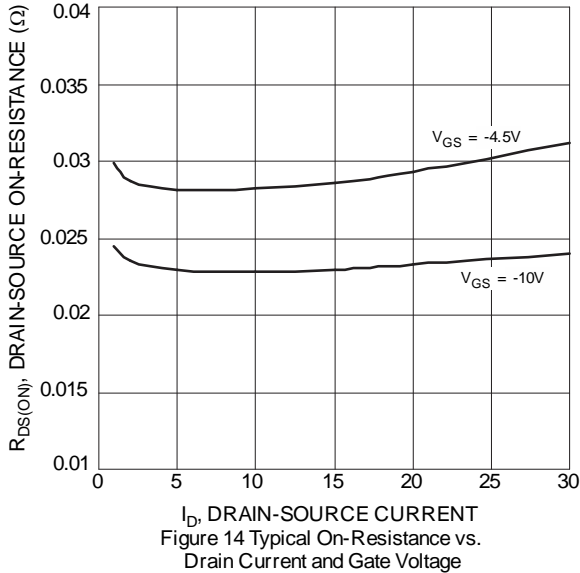


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

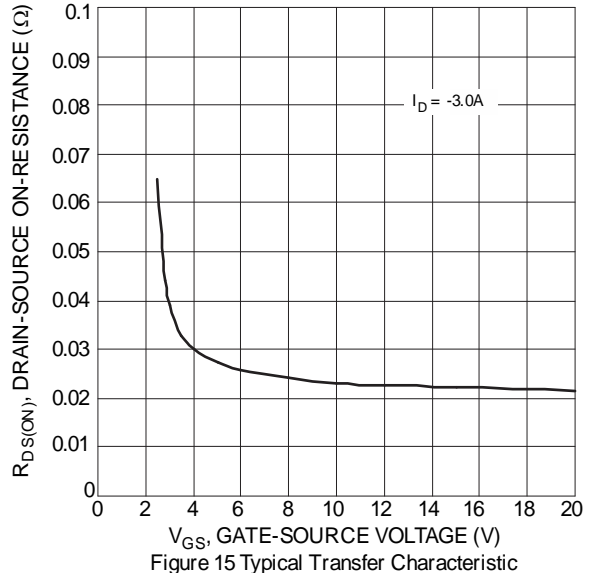


Figure 15 Typical Transfer Characteristic

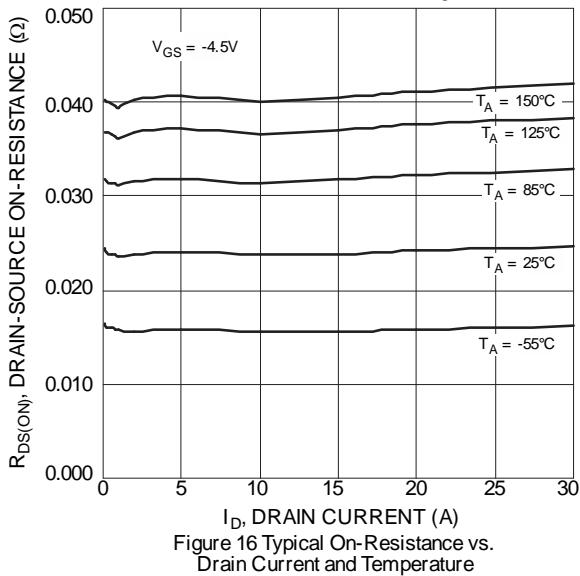


Figure 16 Typical On-Resistance vs. Drain Current and Temperature

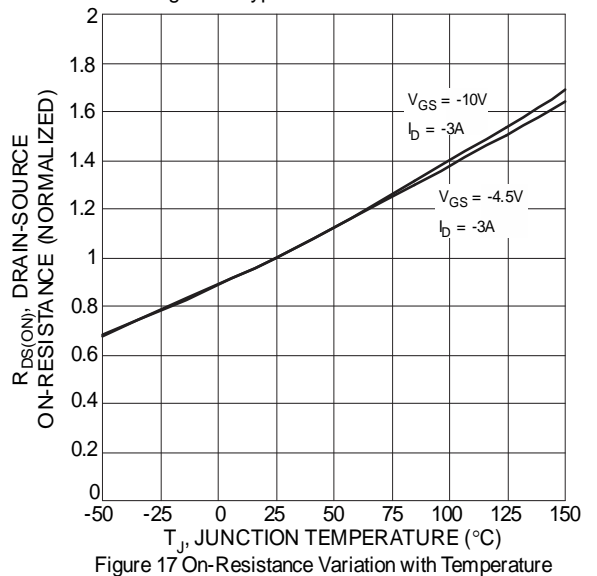
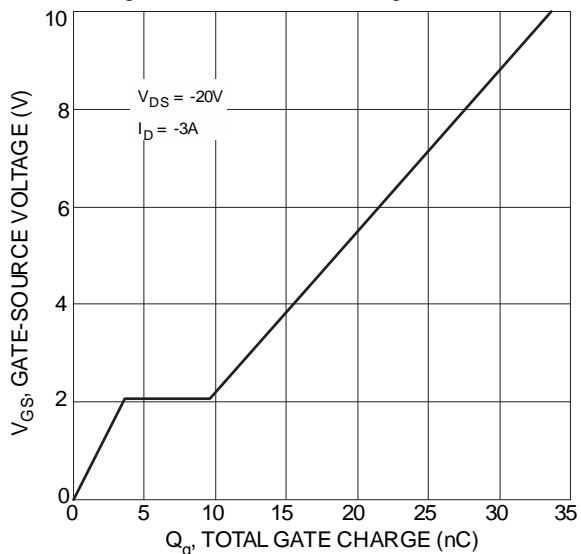
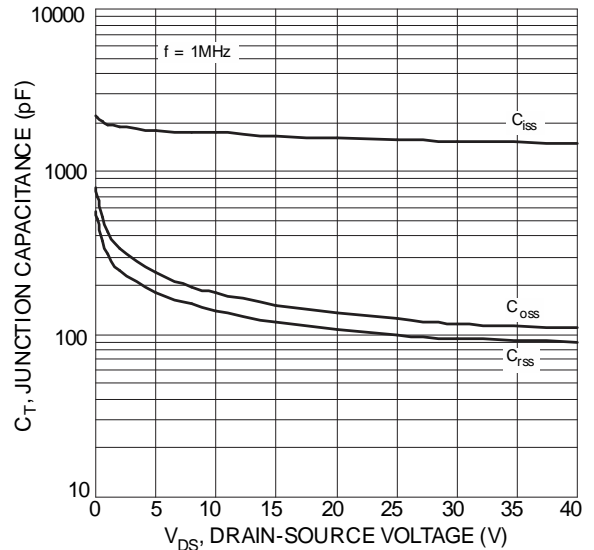
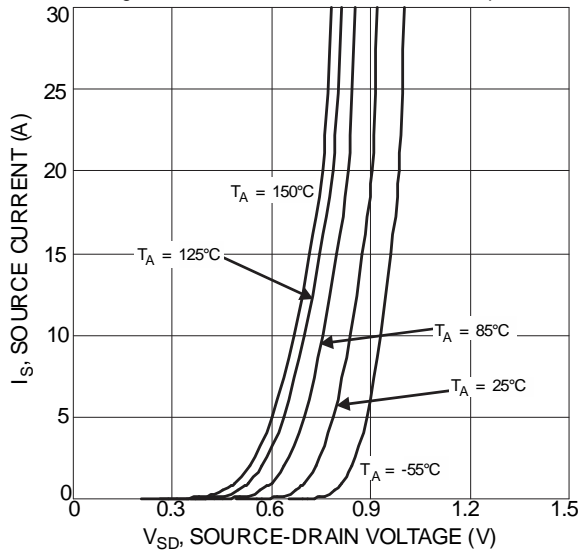
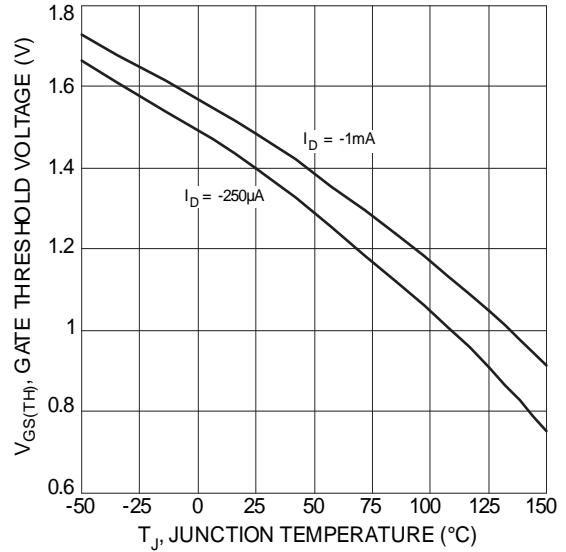
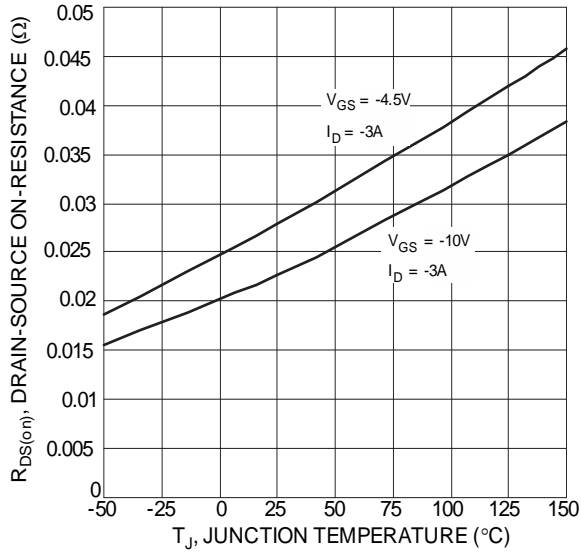
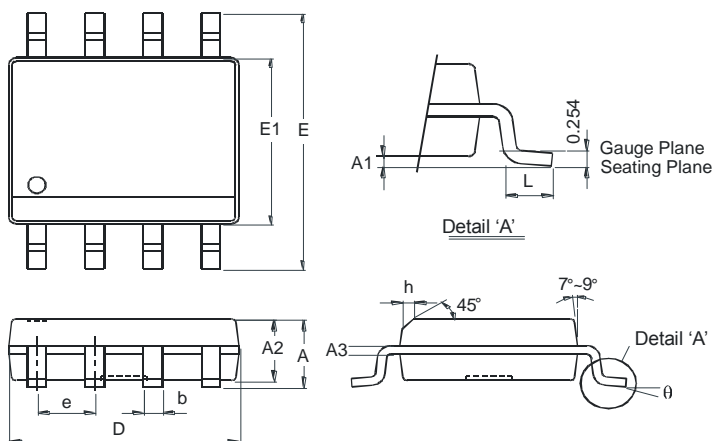


Figure 17 On-Resistance Variation with Temperature



Package Outline Dimensions

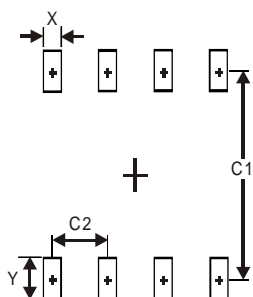
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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 the latest version.



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

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