

30V COMPLEMENTARY ENHANCEMENT MODE MOSFET H-BRIDGE
Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON) \max}$	$I_D \max$ $T_A = +25^\circ\text{C}$
N-Channel	30V	25m Ω @ $V_{GS} = 10\text{V}$	6.0
		40m Ω @ $V_{GS} = 4.5\text{V}$	4.6
P-Channel	-30V	50m Ω @ $V_{GS} = -10\text{V}$	-4.2
		80m Ω @ $V_{GS} = -4.5\text{V}$	-3.2

Description and Applications

This new generation complementary MOSFET H-Bridge features 2 N and 2 P channel in an SOIC package. Qualified to AECQ101 the H bridge is ideally suited to driving :

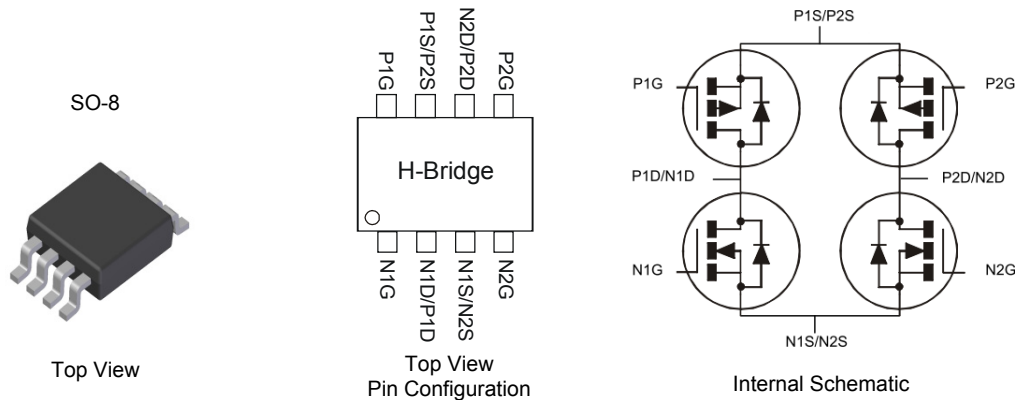
- Solenoids
- DC Motors
- Audio Outputs

Features

- 2 x N + 2 x P channels in a SOIC package
- Low On-Resistance
- Low Input Capacitance
- 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**
- **PPAP Capable (Note 4)**

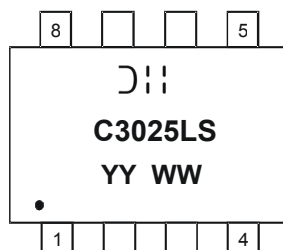
Mechanical Data

- 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 Indicator: See diagram
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (approximate)


Ordering Information (Note 5)

Part Number	Compliance	Case	Packaging
DMHC3025LSDQ-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 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/.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information


$\text{D} \parallel \parallel$ = Manufacturer's Marking
 C3025LS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 09 = 2009)
 WW = Week (01 - 53)

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 6)	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	83	$^\circ\text{C/W}$
	$t < 10\text{s}$	50	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	14.5	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	V_{DSS}	30	V	
Gate-Source Voltage	V_{GSS}	± 20	V	
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	6.0 4.8	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	7.8 6.1	A
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	4.6 3.6	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	6.1 4.8	A
Maximum Continuous Body Diode Forward Current (Note 5)	I_S	2.5	A	
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)	I_{DM}	60	A	

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	V_{DSS}	30	V	
Gate-Source Voltage	V_{GSS}	± 20	V	
Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-4.2 -3.3	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-5.4 -4.3	A
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-3.2 -2.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	-4.3 -3.3	A
Maximum Continuous Body Diode Forward Current (Note 6)	I_S	-2.5	A	
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)	I_{DM}	-30	A	

Note: 6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

Electrical Characteristics 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	I _{DSS}	—	—	0.5	μA	V _{DS} = 30V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±1	μA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	1	—	2	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(on)}	—	19	25	mΩ	V _{GS} = 10V, I _D = 5A
		—	26	40		V _{GS} = 4.5V, I _D = 4A
Forward Transfer Admittance	Y _{fs}	—	4	—	S	V _{DS} = 5V, I _D = 5A
Diode Forward Voltage	V _{SD}	—	0.70	1.2	V	V _{GS} = 0V, I _S = 1.7A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	590	—	pF	V _{DS} = 15V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{oss}	—	122	—		
Reverse Transfer Capacitance	C _{rss}	—	58	—		
Gate resistance	R _g	—	1.5	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	5.4	—	nC	V _{DS} = 15V, I _D = 7.8A
Total Gate Charge (V _{GS} = 10V)	Q _g	—	11.7	—		
Gate-Source Charge	Q _{gs}	—	1.8	—		
Gate-Drain Charge	Q _{gd}	—	2.1	—		
Turn-On Delay Time	t _{D(on)}	—	11.2	—	ns	V _{DD} = 15V, V _{GS} = 4.5V, R _L = 2.4Ω, R _G = 1Ω,
Turn-On Rise Time	t _r	—	15	—		
Turn-Off Delay Time	t _{D(off)}	—	17.5	—		
Turn-Off Fall Time	t _f	—	8.7	—		
Reverse Recovery Time	t _{rr}	—	18.3	—	ns	I _F = 12A, di/dt = 500A/μs
Reverse Recovery Charge	Q _{rr}	—	12	—	nC	

Electrical Characteristics 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	I _{DSS}	—	—	-0.5	μA	V _{DS} = -30V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±1	μA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	-1	—	-2	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(on)}	—	43	50	mΩ	V _{GS} = -10V, I _D = -5A
		—	68	80		V _{GS} = -4.5V, I _D = -4A
Forward Transfer Admittance	Y _{fs}	—	3.5	—	S	V _{DS} = -5V, I _D = -5A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -1.7A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	631	—	pF	V _{DS} = -15V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{oss}	—	137	—		
Reverse Transfer Capacitance	C _{rss}	—	70	—		
Gate resistance	R _g	—	10.8	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	5.5	—	nC	V _{DS} = -15V, I _D = -6A
Total Gate Charge (V _{GS} = 10V)	Q _g	—	11.4	—		
Gate-Source Charge	Q _{gs}	—	1.8	—		
Gate-Drain Charge	Q _{gd}	—	2.4	—		
Turn-On Delay Time	t _{D(on)}	—	7.5	—	ns	V _{DD} = -15V, V _{GS} = -10V, R _G = 6Ω, I _D = -1A
Turn-On Rise Time	t _r	—	4.9	—		
Turn-Off Delay Time	t _{D(off)}	—	28.2	—		
Turn-Off Fall Time	t _f	—	13.5	—		
Reverse Recovery Time	t _{rr}	—	15.1	—	ns	I _F = 12A, di/dt = 500A/μs
Reverse Recovery Charge	Q _{rr}	—	15.3	—		

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Typical Characteristics - N-CHANNEL

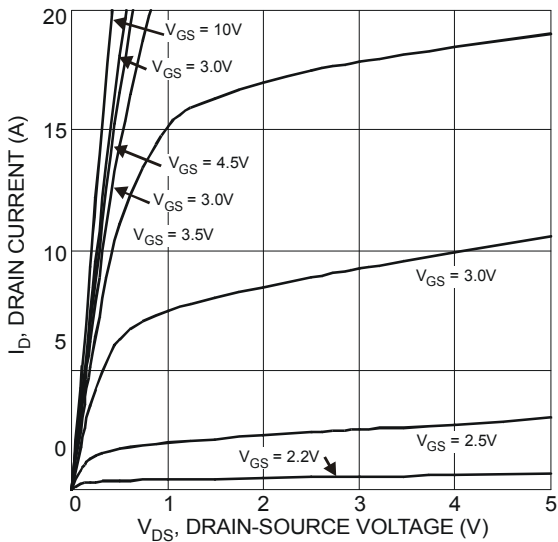


Figure 1 Typical Output Characteristic

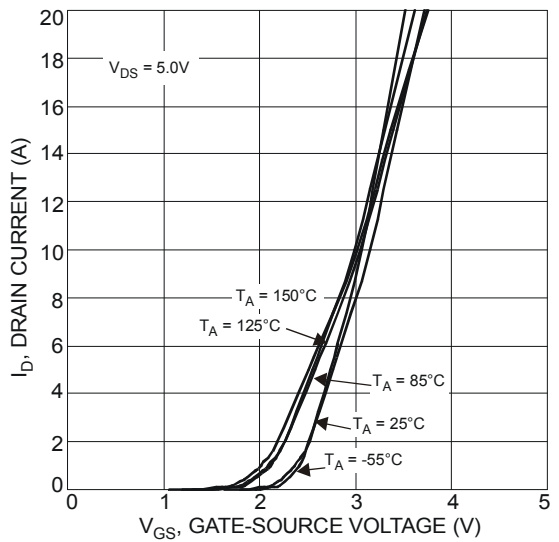


Figure 2 Typical Transfer Characteristics

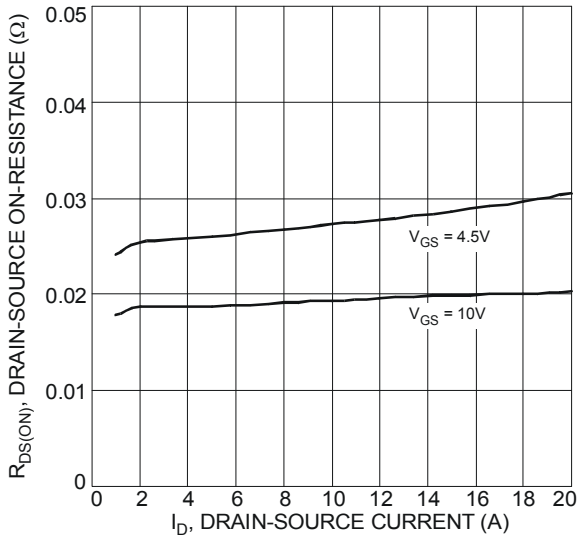


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

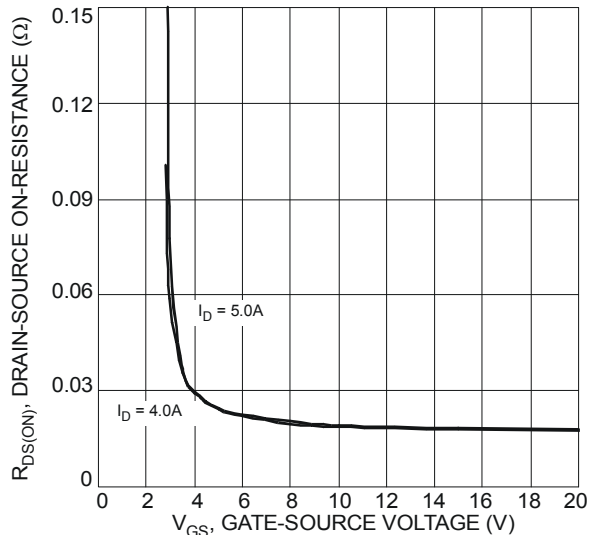


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

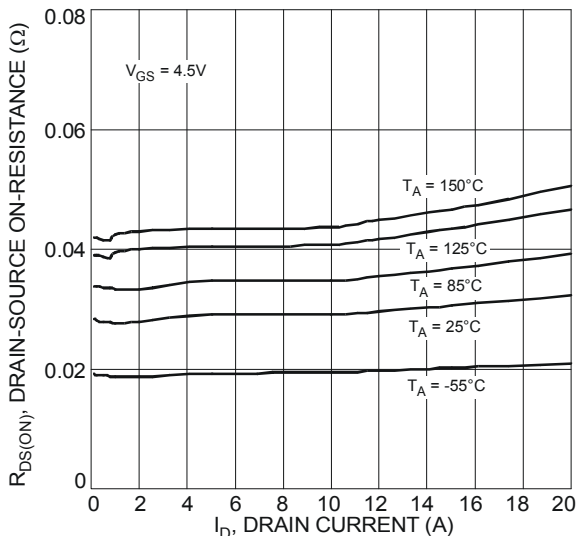


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

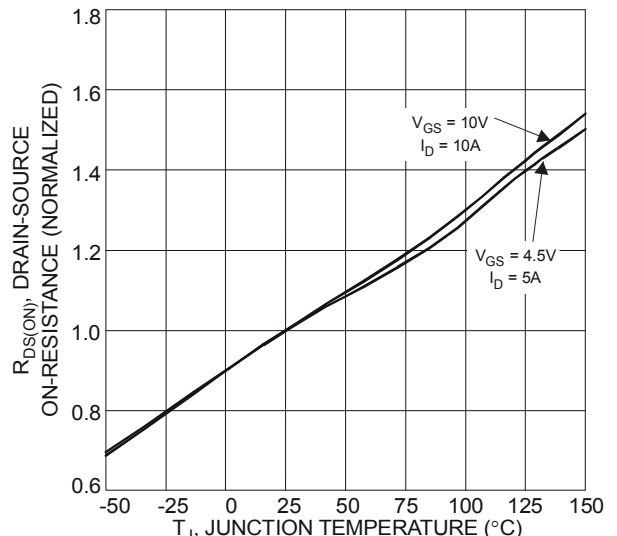


Figure 6 On-Resistance Variation with Temperature

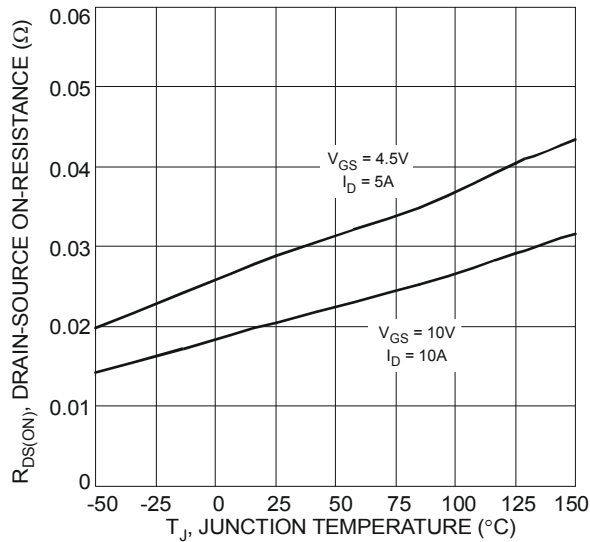


Figure 7 On-Resistance Variation with Temperature

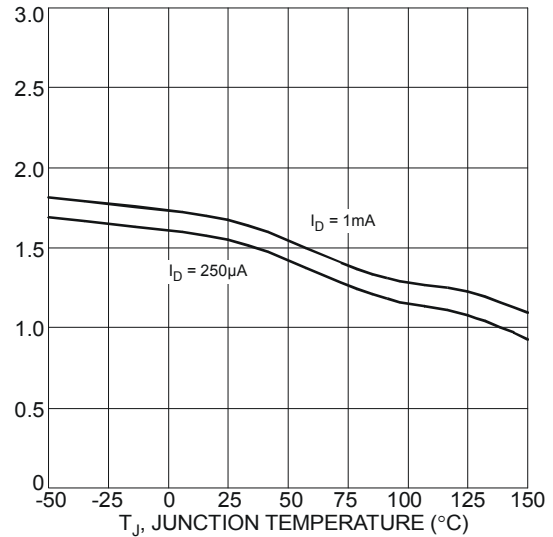


Figure 8 Gate Threshold Variation vs. Ambient Temperature

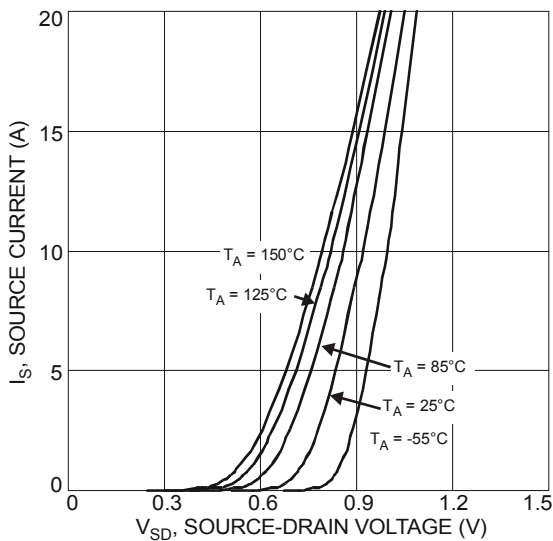


Figure 9 Diode Forward Voltage vs. Current

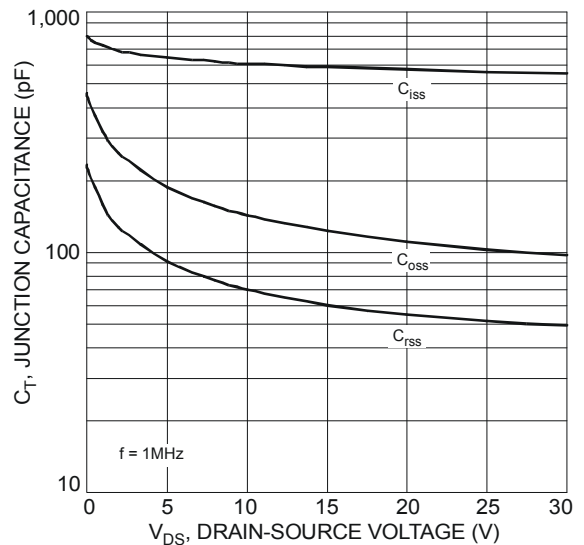


Figure 10 Typical Junction Capacitance

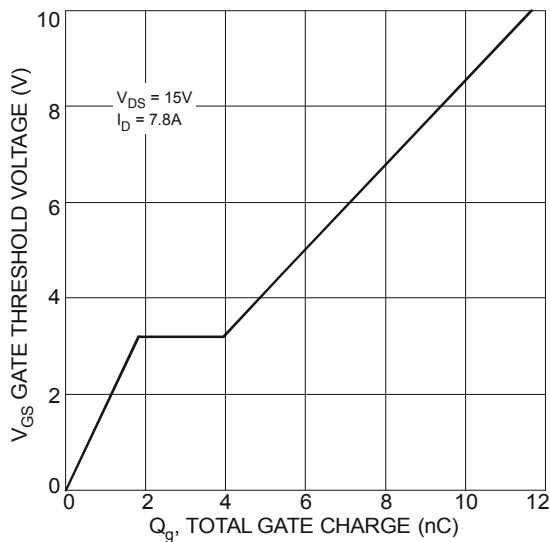


Figure 11 Gate Charge

Typical Characteristics - P-CHANNEL

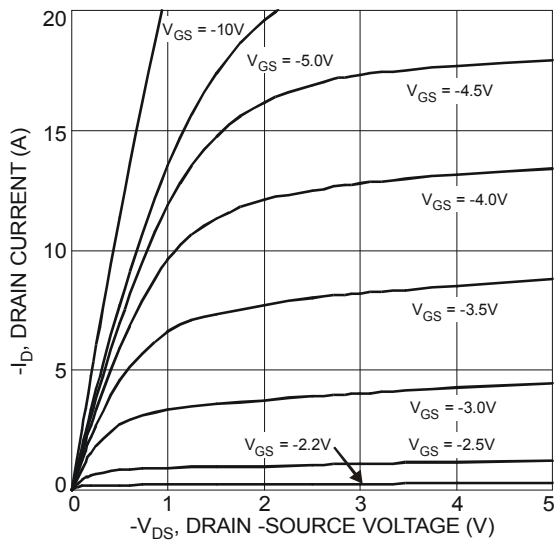


Figure 12 Typical Output Characteristics

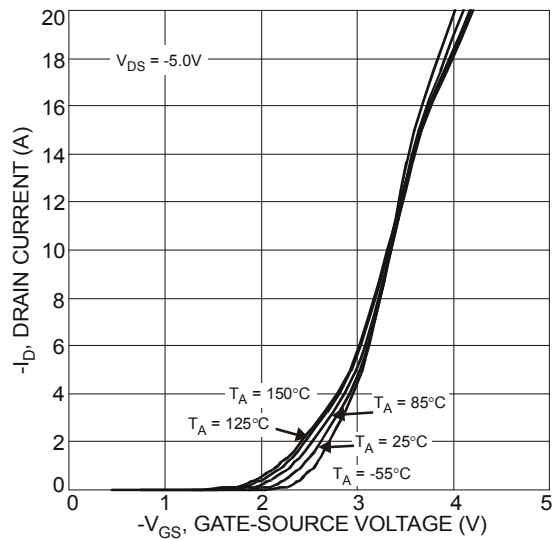


Figure 13 Typical Transfer Characteristics

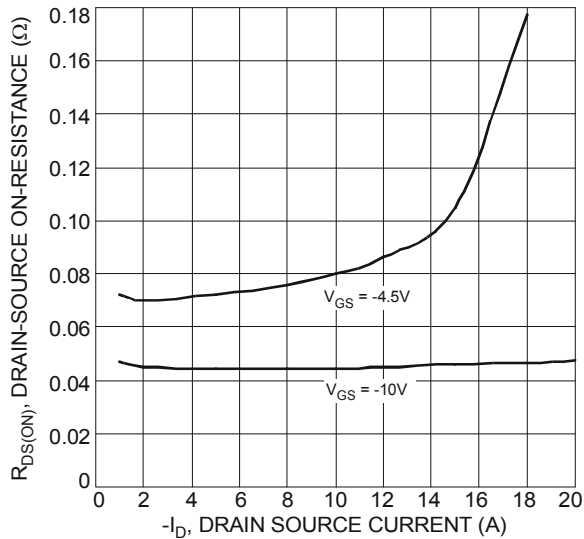


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

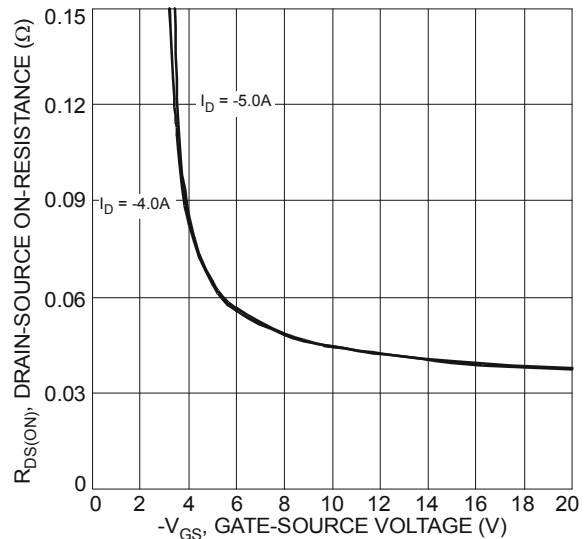


Figure 15 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

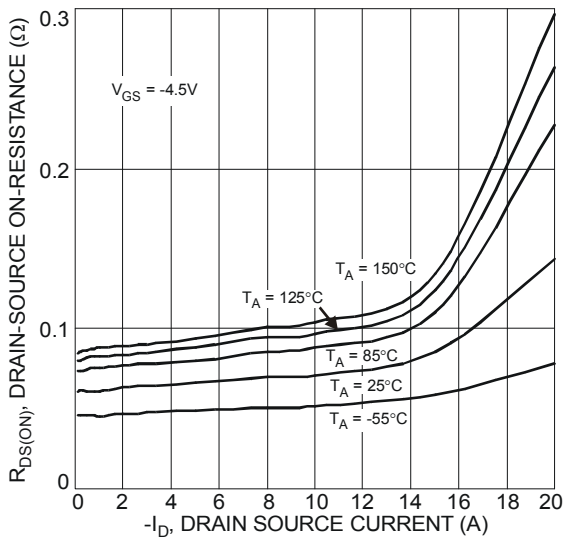


Figure 16 Typical On-Resistance vs. Drain Current and Temperature

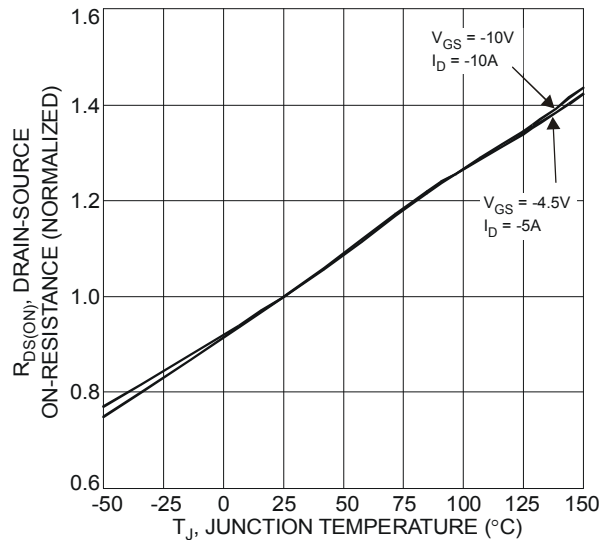
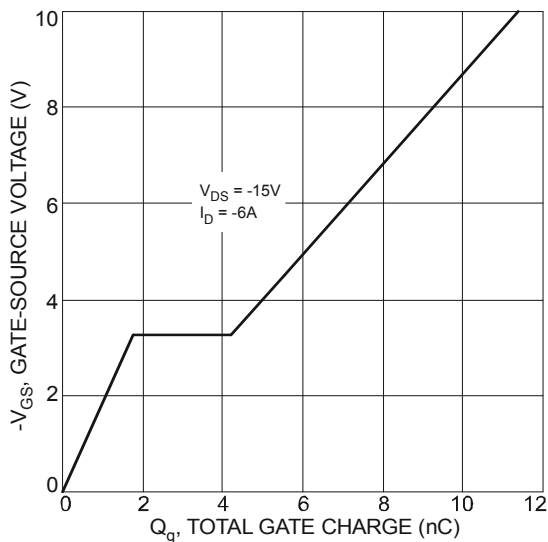
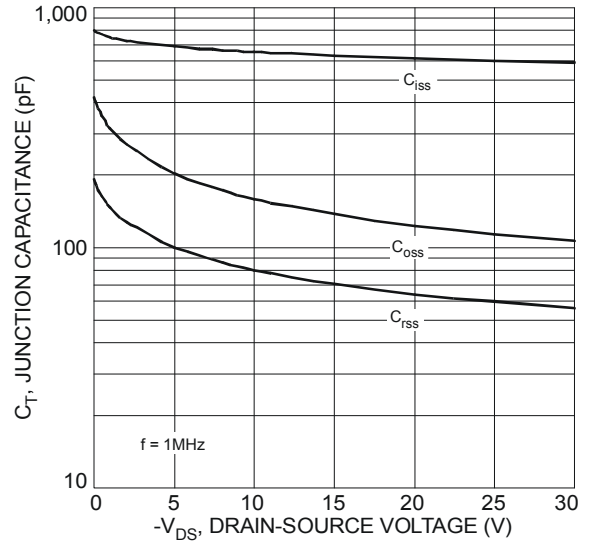
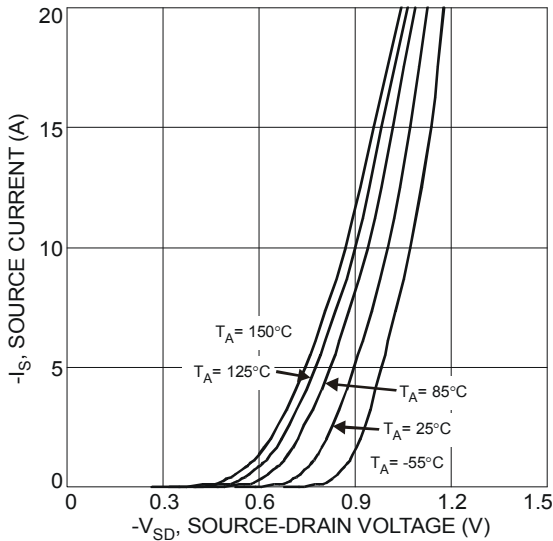
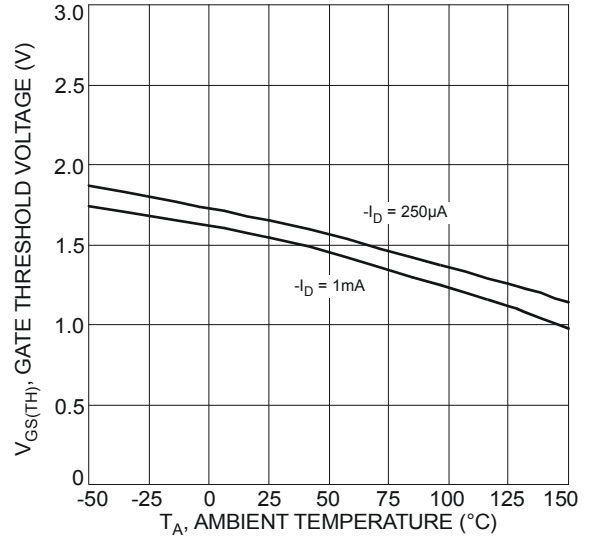
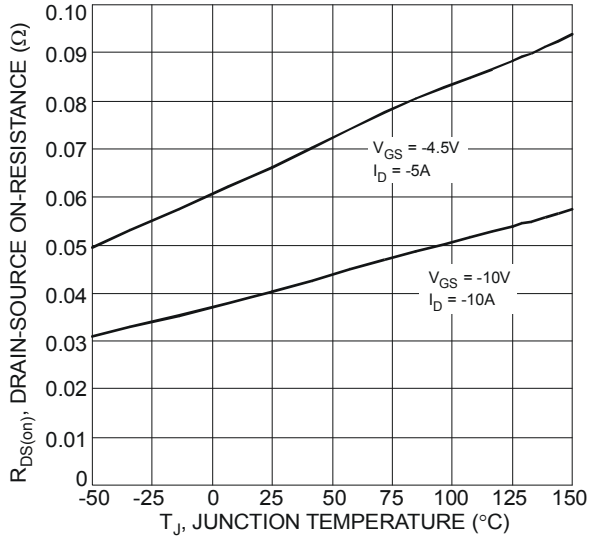
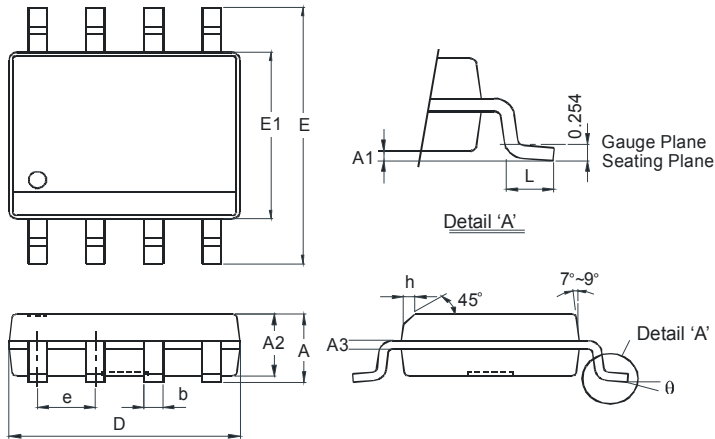


Figure 17 On-Resistance Variation with Temperature



Package Outline Dimensions

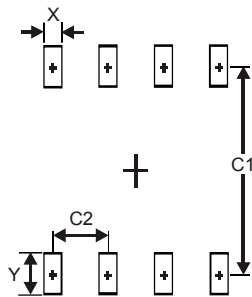
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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