

60V COMPLEMENTARY ENHANCEMENT MODE MOSFET H-BRIDGE
Product Summary

Device	V _{(BR)DSS}	R _{DS(ON)} Max	I _D Max T _A = 25°C
N-Channel	60V	100mΩ @ V _{GS} = 10V	4.1A
		120mΩ @ V _{GS} = 4.5V	3.7A
P-Channel	-60V	170mΩ @ V _{GS} = -10V	3.1A
		250mΩ @ V _{GS} = -4.5V	2.6A

Description

This new generation complementary MOSFET H-Bridge features low on-resistance achievable with low gate drive.

Applications

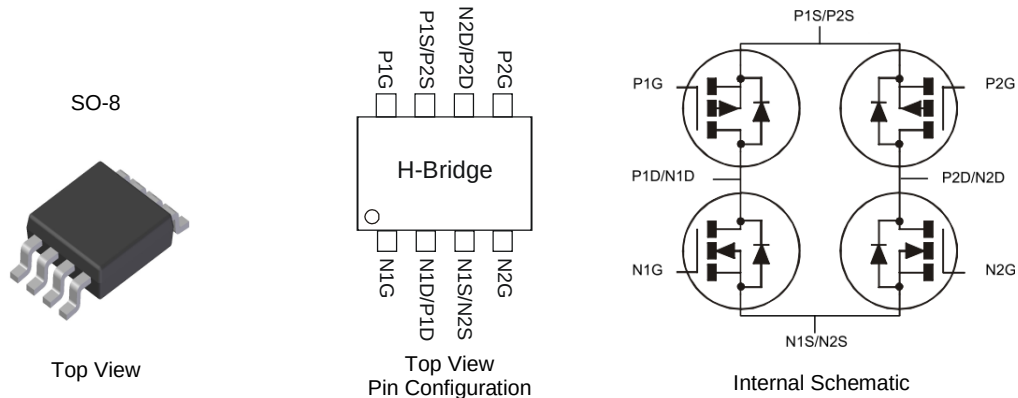
- DC Motor Control
- DC-AC Inverters

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)**

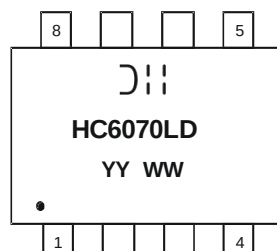
Mechanical Data

- 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 4)

Part Number	Case	Packaging
DMHC6070LSD-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
 HC6070LD = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 16 = 2016)
 WW = Week (01 - 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	60	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current (Note 5) V _{GS} = 10V	Steady State	T _A = +25°C T _A = +70°C	I _D	3.1 2.5	A
	t<10s	T _A = +25°C T _A = +70°C	I _D	4.1 3.3	A
Maximum Continuous Body Diode Forward Current (Note 5)			I _S	2.0	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I _{DM}	15	A
Avalanche Current (Note 6) L = 0.1mH			I _{AS}	12	A
Avalanche Energy (Note 6) L = 0.1mH			E _{AS}	8	mJ

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	-60	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current (Note 5) V _{GS} = -10V	Steady State	T _A = 25°C T _A = 70°C	I _D	-2.4 -1.9	A
	t<10s	T _A = 25°C T _A = 70°C	I _D	-3.1 -2.5	A
Maximum Continuous Body Diode Forward Current (Note 5)			I _S	-2.0	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I _{DM}	-12	A
Avalanche Current (Note 6) L = 0.1mH			I _{AS}	-12	A
Avalanche Energy (Note 6) L = 0.1mH			E _{AS}	8	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P _D	1.6	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	75	°C/W
	t<10s		45	
Thermal Resistance, Junction to Case (Note 5)		R _{θJC}	11	
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

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

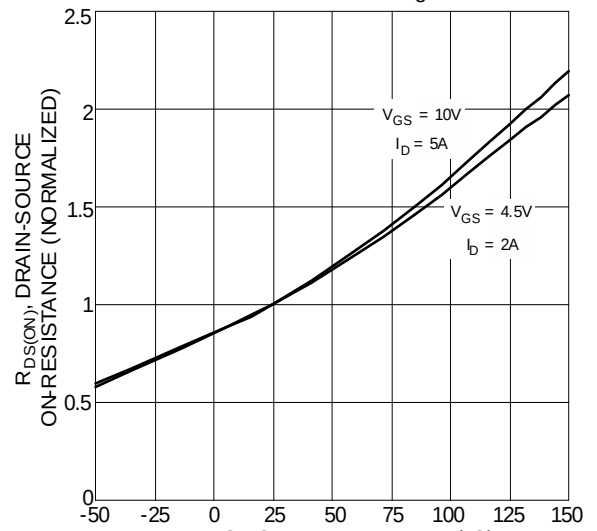
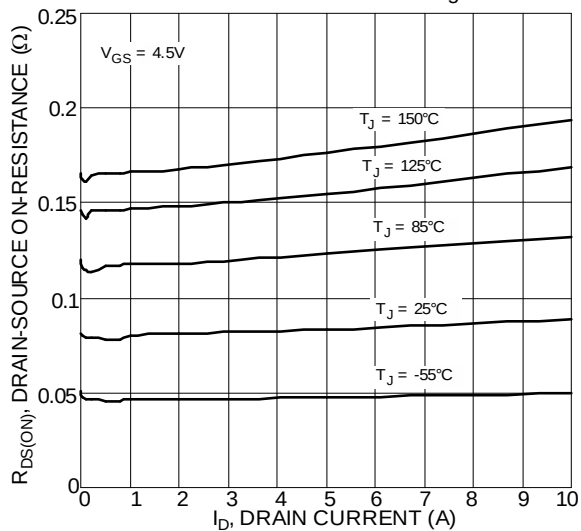
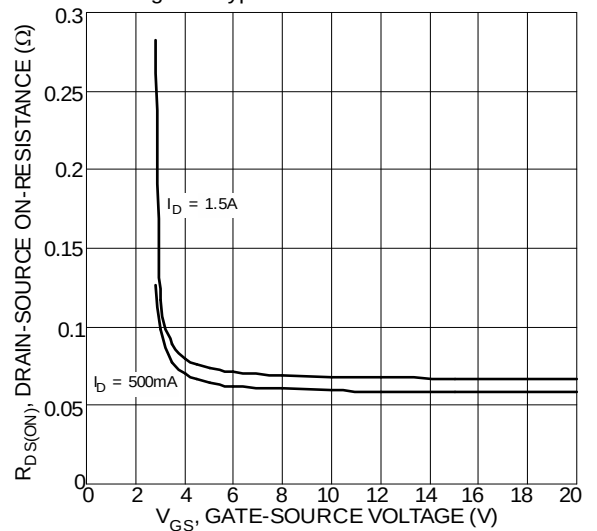
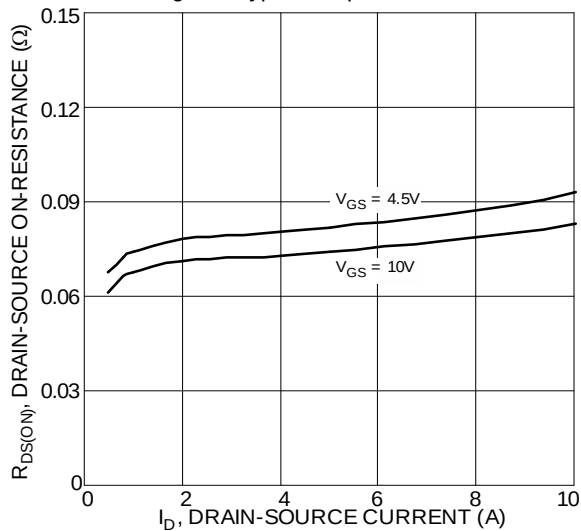
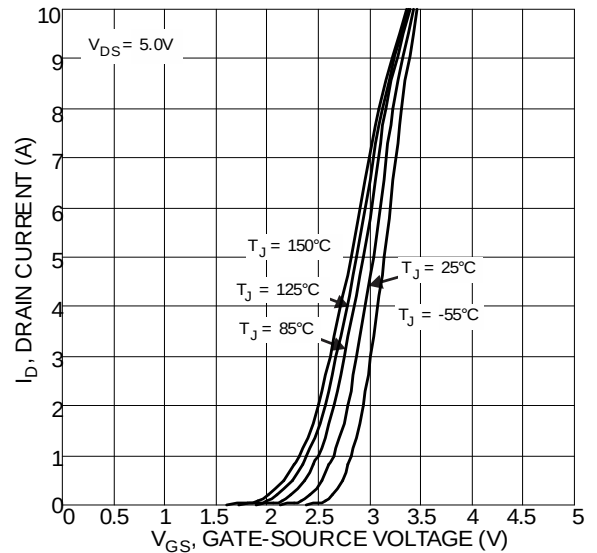
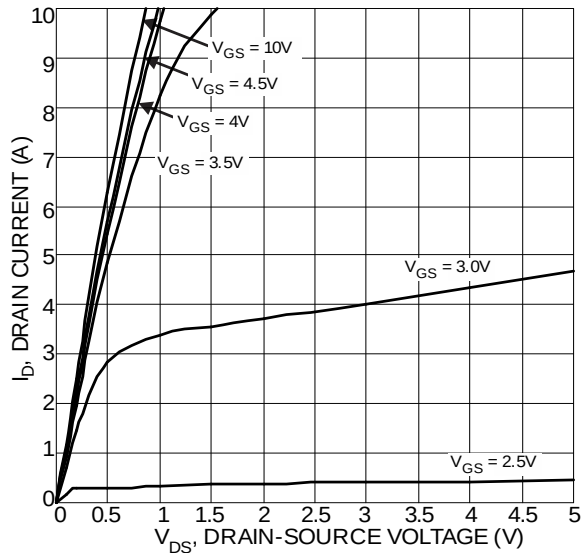
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV _{DSS}	60	—	—	V	I _D = 250μA, V _{GS} = 0V
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	1.0	—	3.0	V	I _D = 250μA, V _{DS} = V _{GS}
Static Drain-Source On-Resistance	R _{DS(ON)}	—	60	100	mΩ	V _{GS} = 10V, I _D = 1.0A
			70	120		V _{GS} = 4.5V, I _D = 0.5A
Diode Forward Voltage	V _{SD}	—	0.8	1.2	V	V _{GS} = 0V, I _S = 3A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{ISS}	—	731	—	pF	V _{DS} = 20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{OSS}	—	34	—		
Reverse Transfer Capacitance	C _{RSS}	—	23	—		
Gate resistance	R _G	—	1.3	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge	Q _G	—	5.2	—	nC	V _{GS} = 4.5V V _{DS} = 30V I _D = 3A
Total Gate Charge	Q _G	—	11.5	—		
Gate-Source Charge	Q _{GS}	—	2.1	—		
Gate-Drain Charge	Q _{GD}	—	1.5	—		
Turn-On Delay Time	t _{D(ON)}	—	9.6	—	ns	V _{DD} = 30V, V _{GS} = 10V R _L ≅ 50Ω, R _G ≅ 20Ω
Turn-On Rise Time	t _R	—	11	—		
Turn-Off Delay Time	t _{D(OFF)}	—	61	—		
Turn-Off Fall Time	t _F	—	21	—		
Body Diode Reverse Recovery Time	t _{RR}	—	10.5	—	ns	I _S = 1.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _{RR}	—	4.0	—	nC	I _S = 1.0A, dI/dt = 100A/μs

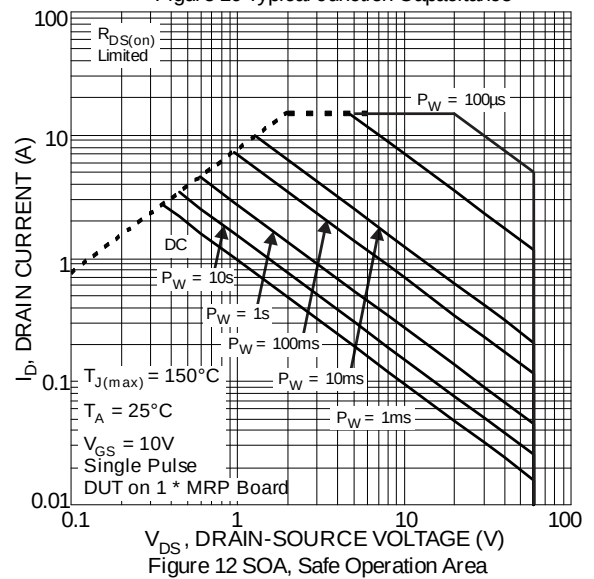
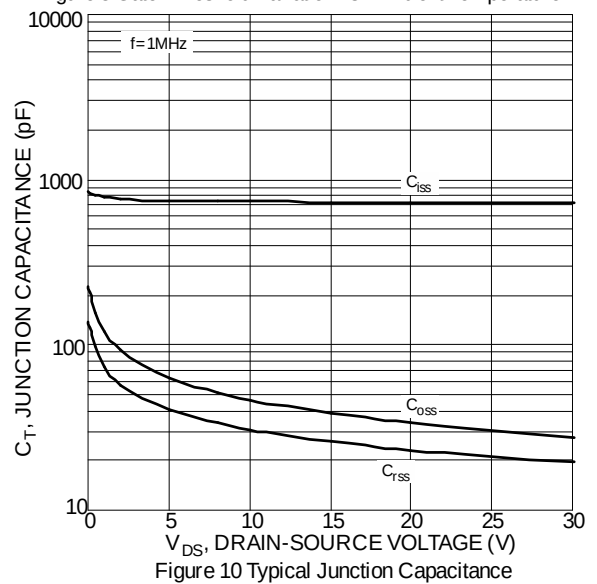
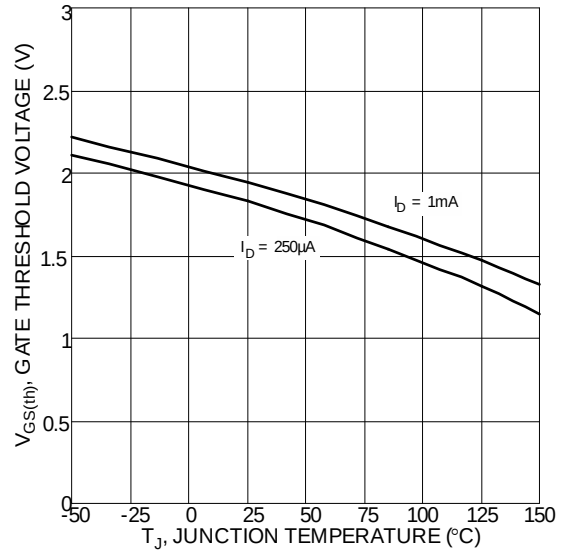
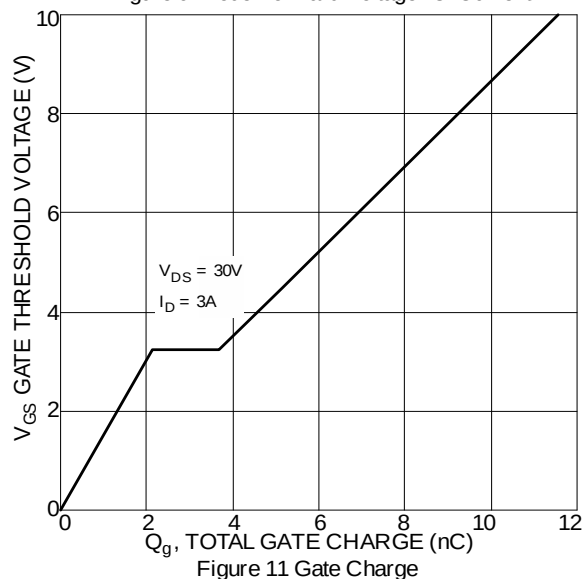
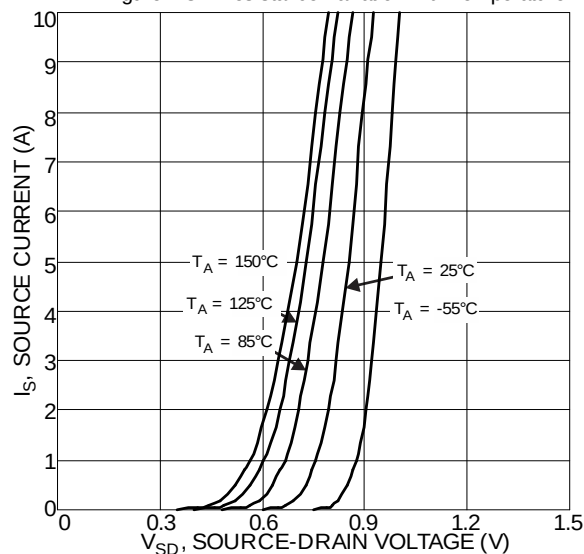
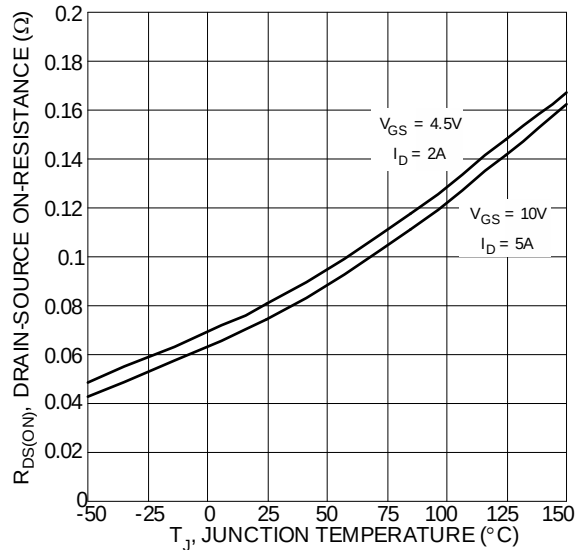
Electrical Characteristics – P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV _{DSS}	-60	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	-1	—	-3	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	120	170	mΩ	V _{GS} = -10V, I _D = -1.0A
			170	250		V _{GS} = -4.5V, I _D = -0.5A
Diode Forward Voltage	V _{SD}	—	-0.8	-1.2	V	V _{GS} = 0V, I _S = -2A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{ISS}	—	618	—	pF	V _{DS} = -20V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{OSS}	—	36	—		
Reverse Transfer Capacitance	C _{RSS}	—	26	—		
Gate resistance	R _G	—	13	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge	Q _G	—	4.3	—	nC	V _{GS} = -4.5V V _{DS} = -30V I _D = -2A
Total Gate Charge	Q _G	—	8.9	—		
Gate-Source Charge	Q _{GS}	—	1.4	—		
Gate-Drain Charge	Q _{GD}	—	1.7	—		
Turn-On Delay Time	t _{D(ON)}	—	7.6	—	ns	V _{DD} = -30V, V _{GS} = -10V R _L ≅ 50Ω, R _G ≅ 20Ω
Turn-On Rise Time	t _R	—	11.6	—		
Turn-Off Delay Time	t _{D(OFF)}	—	79.8	—		
Turn-Off Fall Time	t _F	—	37.8	—		
Body Diode Reverse Recovery Time	t _{RR}	—	10.8	—	ns	I _S = -1.0A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _{RR}	—	3.8	—	nC	I _S = -1.0A, dI/dt = 100A/μs

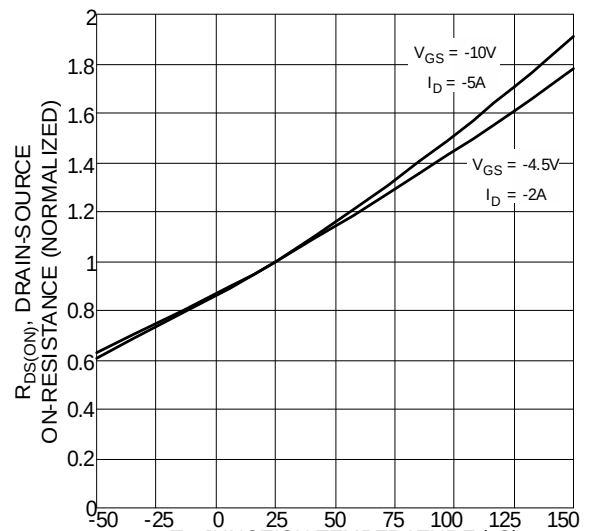
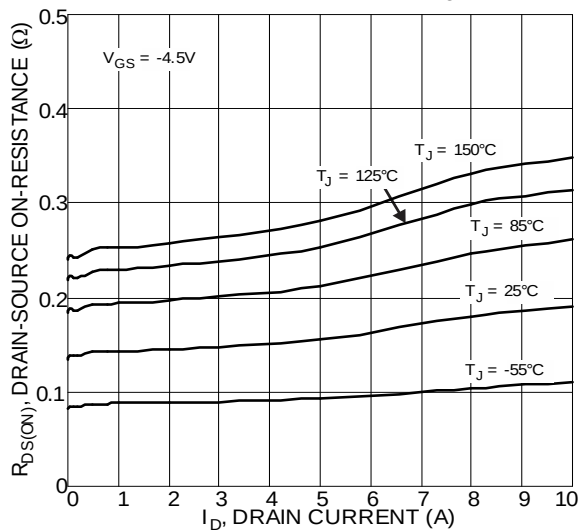
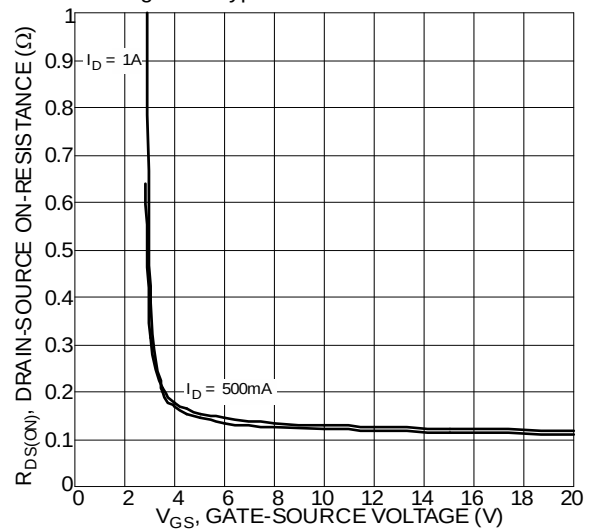
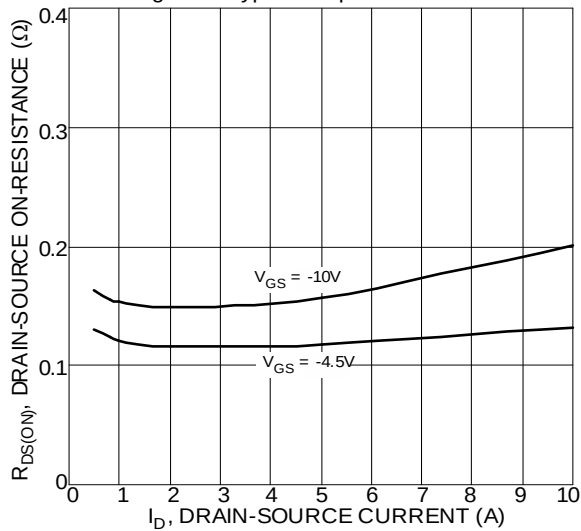
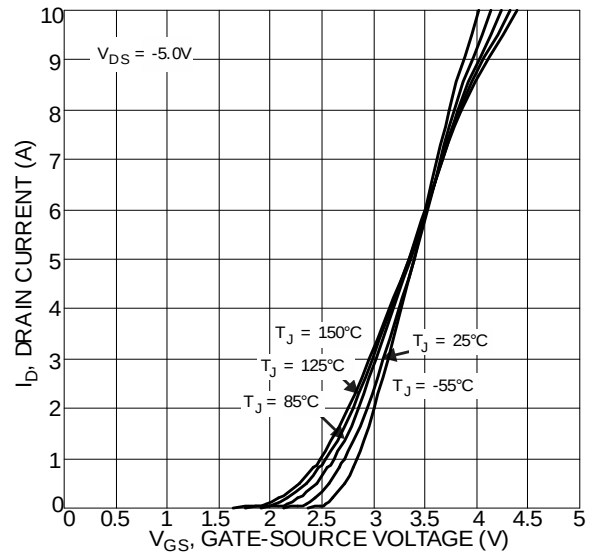
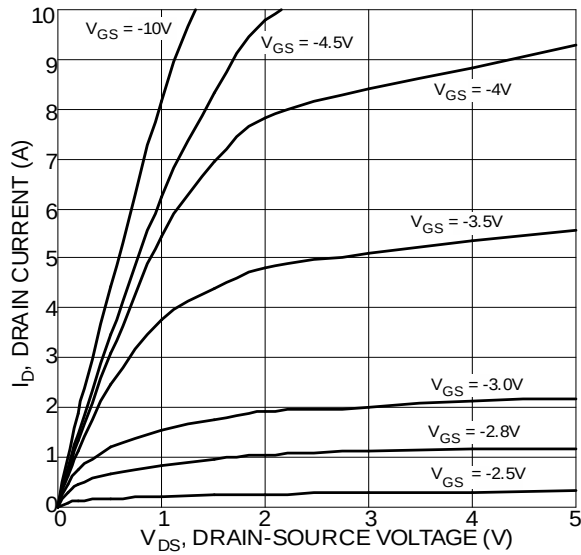
- Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product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

Typical Performance Characteristics – N-Channel





Typical Performance Characteristics – P-Channel



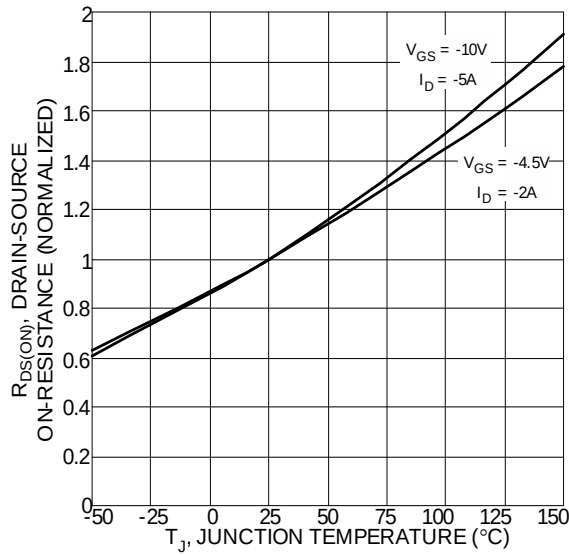


Figure 18 On-Resistance Variation with Temperature

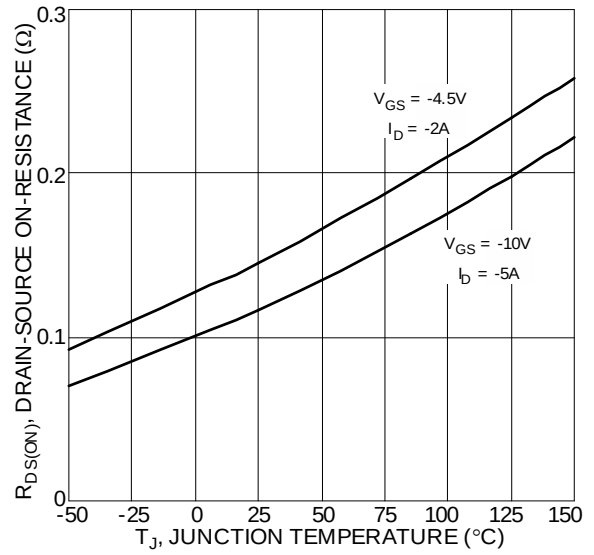


Figure 19 On-Resistance Variation with Temperature

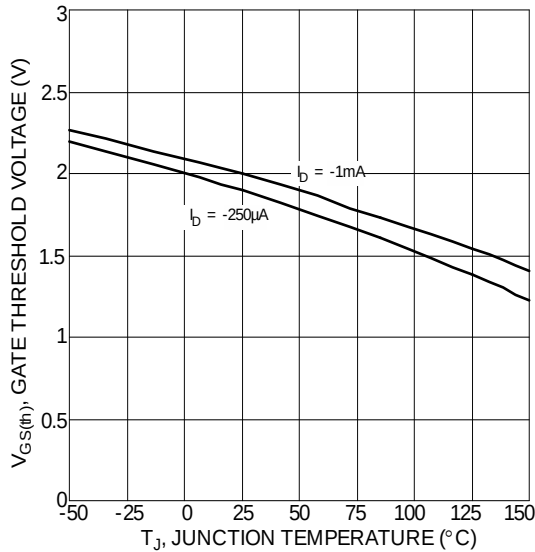


Figure 20 Gate Threshold Variation vs. Ambient Temperature

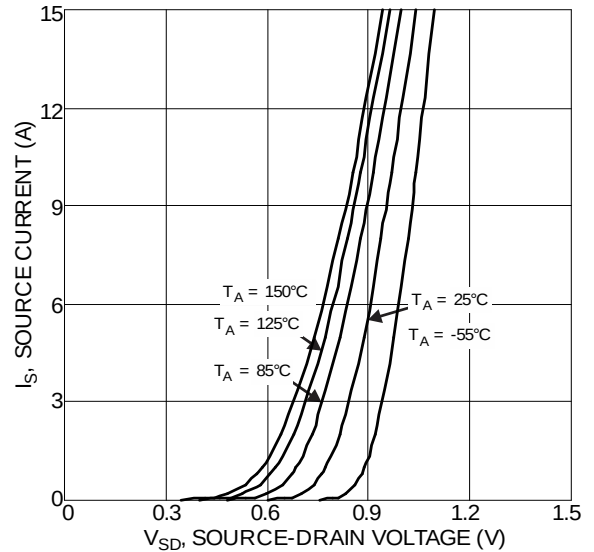


Figure 21 Diode Forward Voltage vs. Current

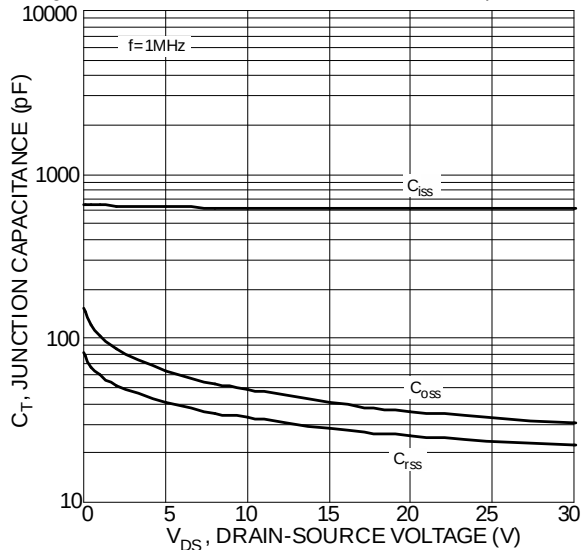


Figure 22 Typical Junction Capacitance

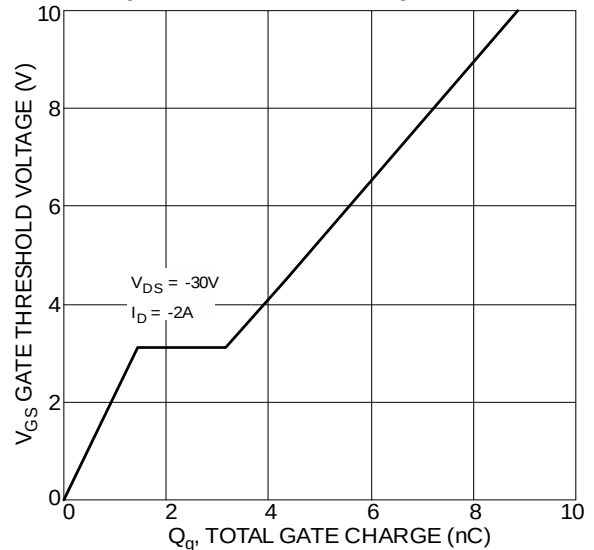
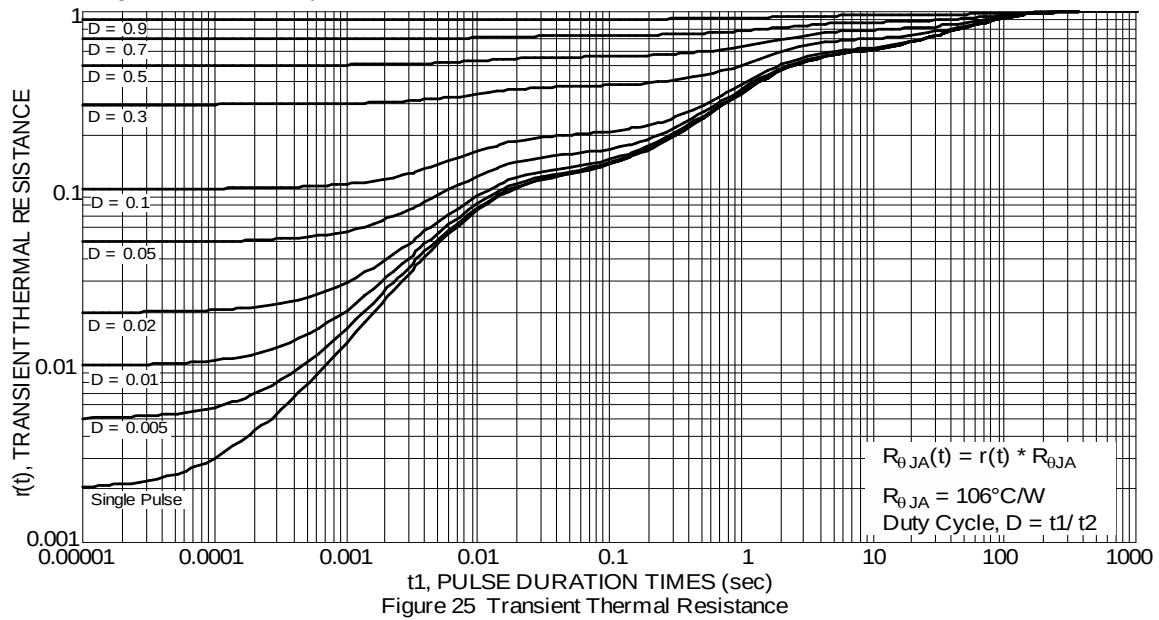
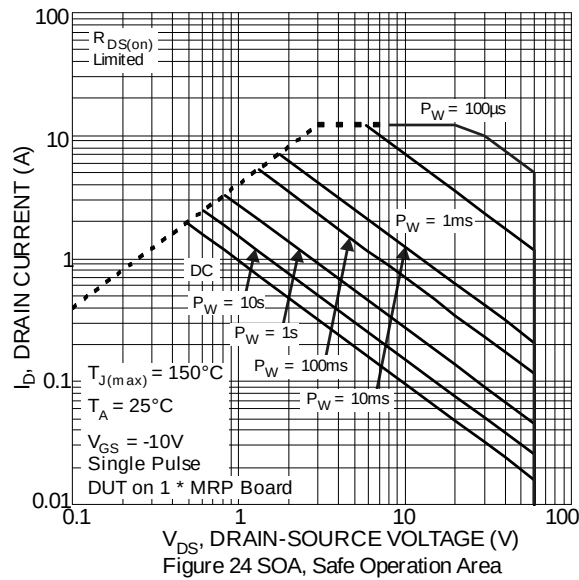


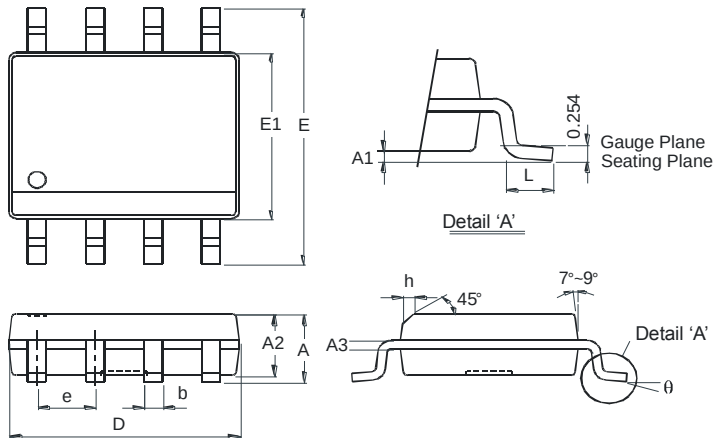
Figure 23 Gate Charge



Package Outline Dimensions

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

SO-8

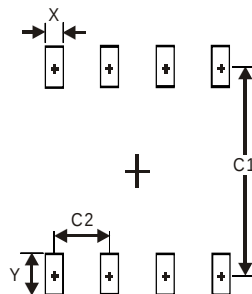


SO-8		
Dim	Min	Max
A	—	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	—	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout

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

SO-8



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

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