COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET H-BRIDGE

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_A = +25°C
N-Channel	60V	0.3Ω @ V_{GS} = 10V	1.8A
		0.45Ω @ V_{GS} = 4.5V	1.4A
P-Channel	-60V	0.425Ω @ V_{GS} = -10V	-1.5A
		0.63Ω @ V_{GS} = -4.5V	-1.2A

Description

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

Applications

- DC Motor Control
- DC-AC Inverters

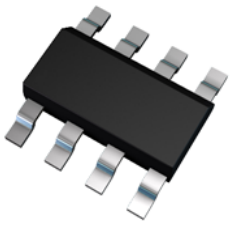
Features

- 2 x N + 2 x P Channels in a SOIC Package
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

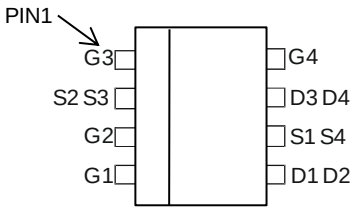
Mechanical Data

- Case: SM-8 (8 LEAD SOT223)
- 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: 0.117 grams (Approximate)

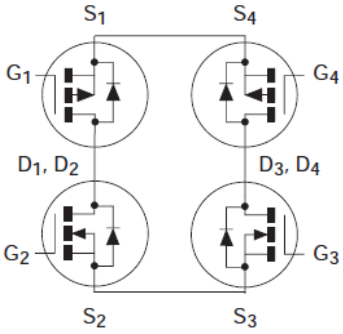
SM-8



Top View



Top View Pin Configuration



Internal Schematic

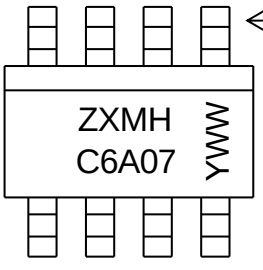
Ordering Information (Note 4)

Part Number	Reel Size	Tape Width	Quantity Per Reel
ZXMHC6A07T8TA	7"	12mm	1,000 units
ZXMHC6A07T8TC	13"	12mm	4,000 units

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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

SM-8



ZXMHC6A07 = Product Type Marking Code
YWW = Date Code Marking
Y or $\overline{Y}$ = Last Digit of Year (ex: 5= 2015)
WW or $\overline{WW}$ = Week Code (01~53)

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

Characteristic			Symbol	N-channel	P-channel	Units
Drain-Source Voltage			V_{DSS}	60	-60	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Continuous Drain Current, V_{GS} = 10V (Note 8)	Steady State	T_A = +25°C (Note 6) T_A = +70°C (Note 6) T_A = +25°C (Note 5)	I_D	1.8 1.4 1.6	-1.5 -1.2 -1.3	A
Maximum Body Diode Forward Current (Note 6)			I_S	2.3	-2.1	A
Pulsed Drain Current (Note 7)			I_{DM}	8.4	-7.2	A
Pulsed Source Current (Note 7)			I_{SM}	8.4	-7.2	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 8) Linear Derating Factor	T_A = +25°C (Note 5)	P_D	1.3 10.4	W mW/°C
Total Power Dissipation (Note 8) Linear Derating Factor	T_A = +25°C (Note 6)	P_D	1.7 13.6	W mW/°C
Thermal Resistance, Junction to Ambient (Note 8)	Steady State (Note 5)	$R_{\theta JA}$	94.5	°C/W
	Steady State (Note 6)		73.3	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes:
5. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions, with the heat sink split into two equal areas one for each drain connection.
6. For a device surface mounted on FR4 PCB measured at t ≤10 seconds.
7. Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB, D = 0.02, pulse width 300µs - pulse width limited by maximum junction temperature. Refer to Transient Thermal Impedance graph.
8. For device with one active die.

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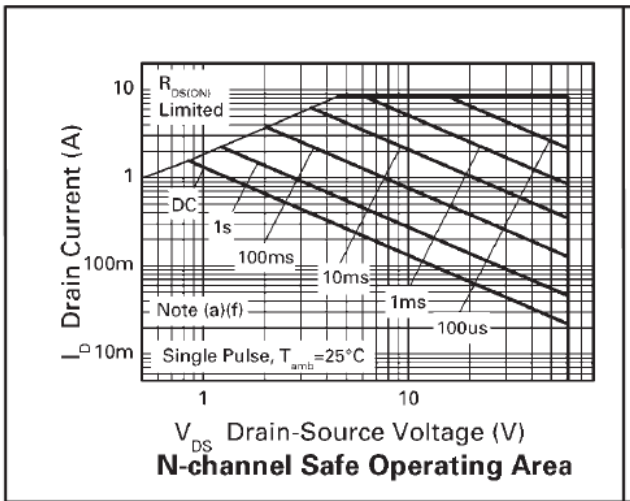
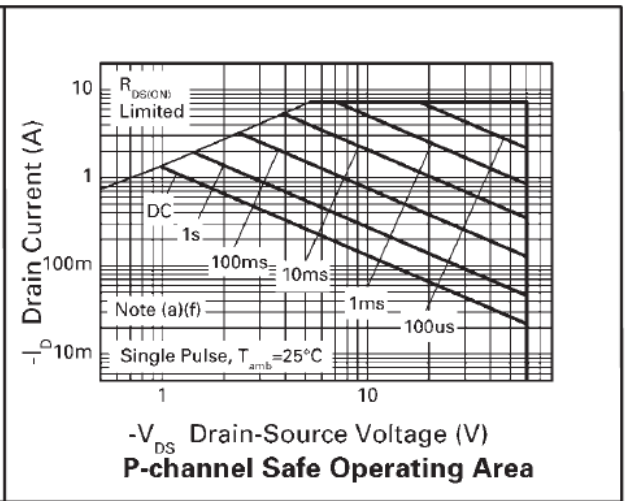
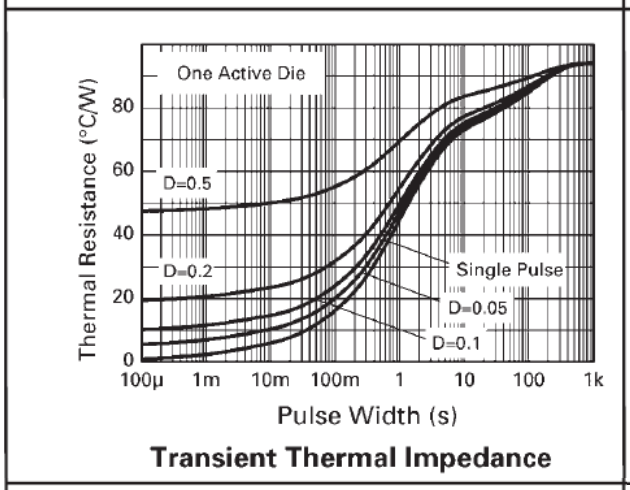
Typical Characteristics



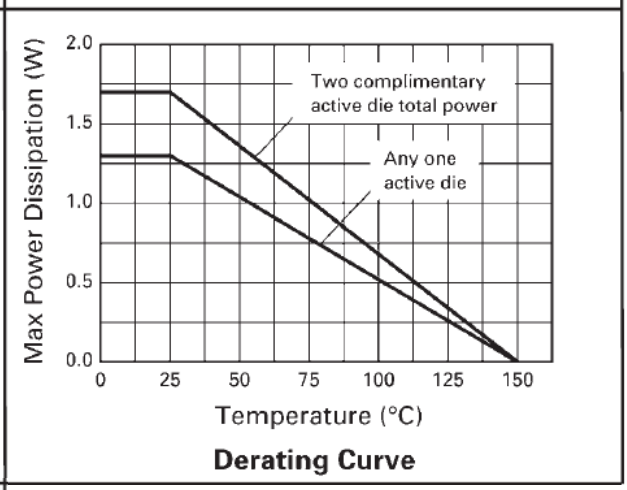
N-channel Safe Operating Area



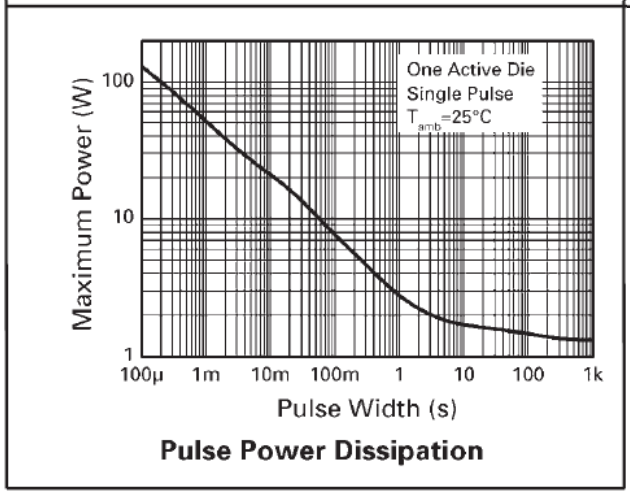
P-channel Safe Operating Area



Transient Thermal Impedance



Derating Curve



Pulse Power Dissipation

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 10)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	µA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 10)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance (Note 9)	$R_{DS\ (ON)}$	—	—	0.3	Ω	V_{GS} = 10V, I_D = 1.8A
		—	—	0.45		V_{GS} = 4.5V, I_D = 1.3A
Forward Transfer Admittance (Notes 9 & 11)	g_{fs}	—	2.3	—	S	V_{DS} = 15V, I_D = 1.8A
Diode Forward Voltage (Note 9)	V_{SD}	—	0.85	0.95	V	T_J = +25°C, V_{GS} = 0V, I_S = 0.45A
DYNAMIC CHARACTERISTICS (Note 11)						
Input Capacitance	C_{iss}	—	166	—	pF	V_{DS} = 40V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	19.5	—		
Reverse Transfer Capacitance	C_{rss}	—	8.7	—		
Gate Charge (V_{GS} = -5.0V)	Q_g	—	1.65	—	nC	V_{DS} = 30V, I_D = 1.8A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	3.2	—	nC	
Gate-Source Charge	Q_{gs}	—	0.67	—		
Gate-Drain Charge	Q_{gd}	—	0.82	—		
Turn-On Delay Time	$t_{D(on)}$	—	1.8	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 1.8A, R_G = 6.0Ω
Turn-On Rise Time	t_r	—	1.4	—		
Turn-Off Delay Time	$t_{D(off)}$	—	4.9	—		
Turn-Off Fall Time	t_f	—	2.0	—		
Reverse Recovery Time	t_{rr}	—	20.5	—	ns	T_J = +25°C, I_S = 1.8A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{rr}	—	21.3	—	nC	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 10)						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1.0	µA	V_{DS} = -60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 10)						
Gate Threshold Voltage	$V_{GS(th)}$	-1.0	—	—	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance (Note 9)	$R_{DS\ (ON)}$	—	—	0.425	Ω	V_{GS} = -10V, I_D = -0.9A
		—	—	0.63		V_{GS} = -4.5V, I_D = -0.8A
Forward Transfer Admittance (Notes 9 & 11)	g_{fs}	—	1.8	—	S	V_{DS} = -15V, I_D = -0.9A
Diode Forward Voltage (Note 9)	V_{SD}	—	-0.85	-0.95	V	T_J = +25°C, V_{GS} = 0V, I_S = -0.8A
DYNAMIC CHARACTERISTICS (Note 11)						
Input Capacitance	C_{iss}	—	233	—	pF	V_{DS} = -30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	17.4	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	9.6	—	pF	
Gate Charge (V_{GS} = -5.0V)	Q_g	—	2.4	—	nC	V_{DS} = -30V, I_D = -0.9A,
Total Gate Charge (V_{GS} = -10V)	Q_g	—	5.1	—	nC	
Gate-Source Charge	Q_{gs}	—	0.7	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.7	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	1.6	—	ns	V_{DD} = -30V, V_{GS} = -10V, R_G = 6.0Ω, I_D = -1.0A
Turn-On Rise Time	t_r	—	2.3	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	13	—	ns	
Turn-Off Fall Time	t_f	—	5.8	—	ns	
Reverse Recovery Time	t_{rr}	—	22.6	—	ns	T_J = +25°C, I_S = -0.9A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{rr}	—	23.2	—	nC	

Notes: 9. Measured under pulsed conditions. Width≤300µs. Duty cycle ≤ 2%.
10. Short duration pulse test used to minimize self-heating effect.
11. Guaranteed by design. Not subject to product testing.

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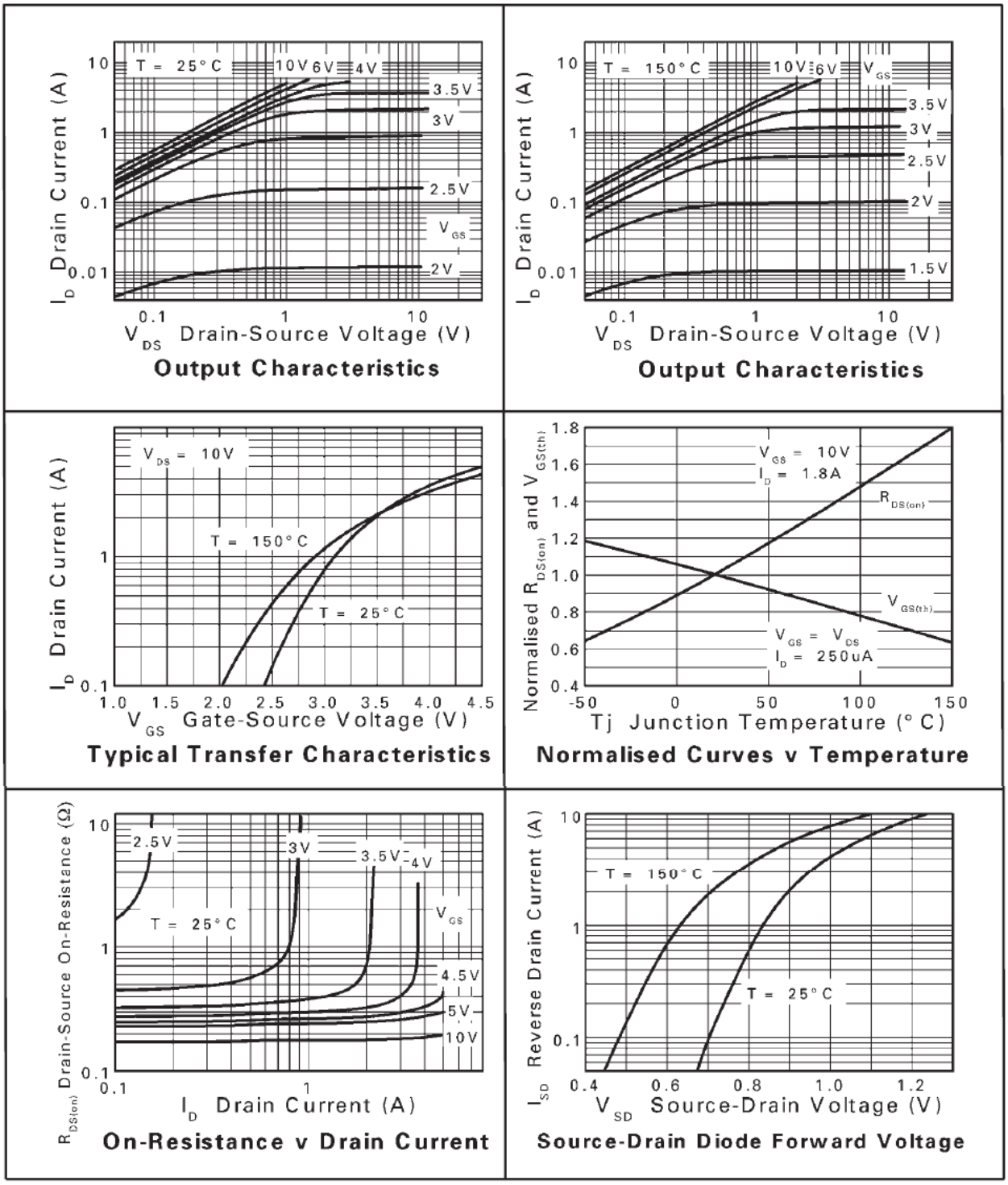
Typical Characteristics (N-Channel)



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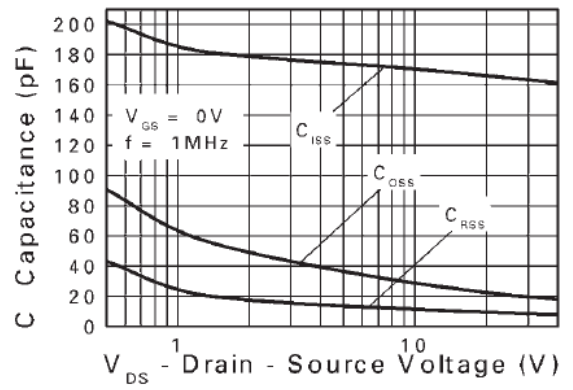
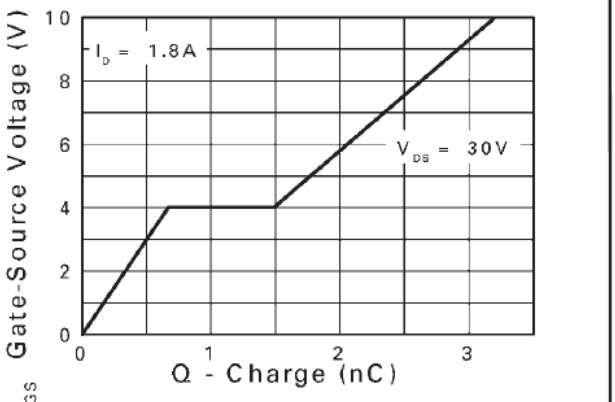
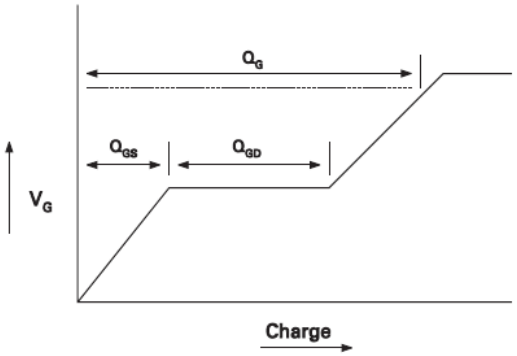
Typical Characteristics (N-Channel)



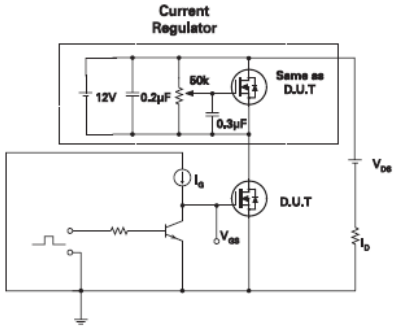
Capacitance v Drain-Source Voltage



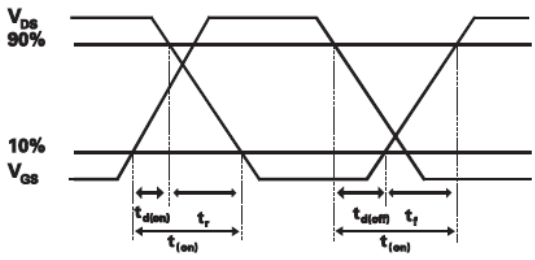
Gate-Source Voltage v Gate Charge



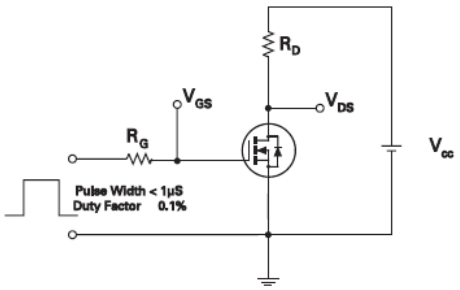
Basic Gate Charge Waveform



Gate Charge Test Circuit



Switching Time Waveforms



Switching Time Test Circuit

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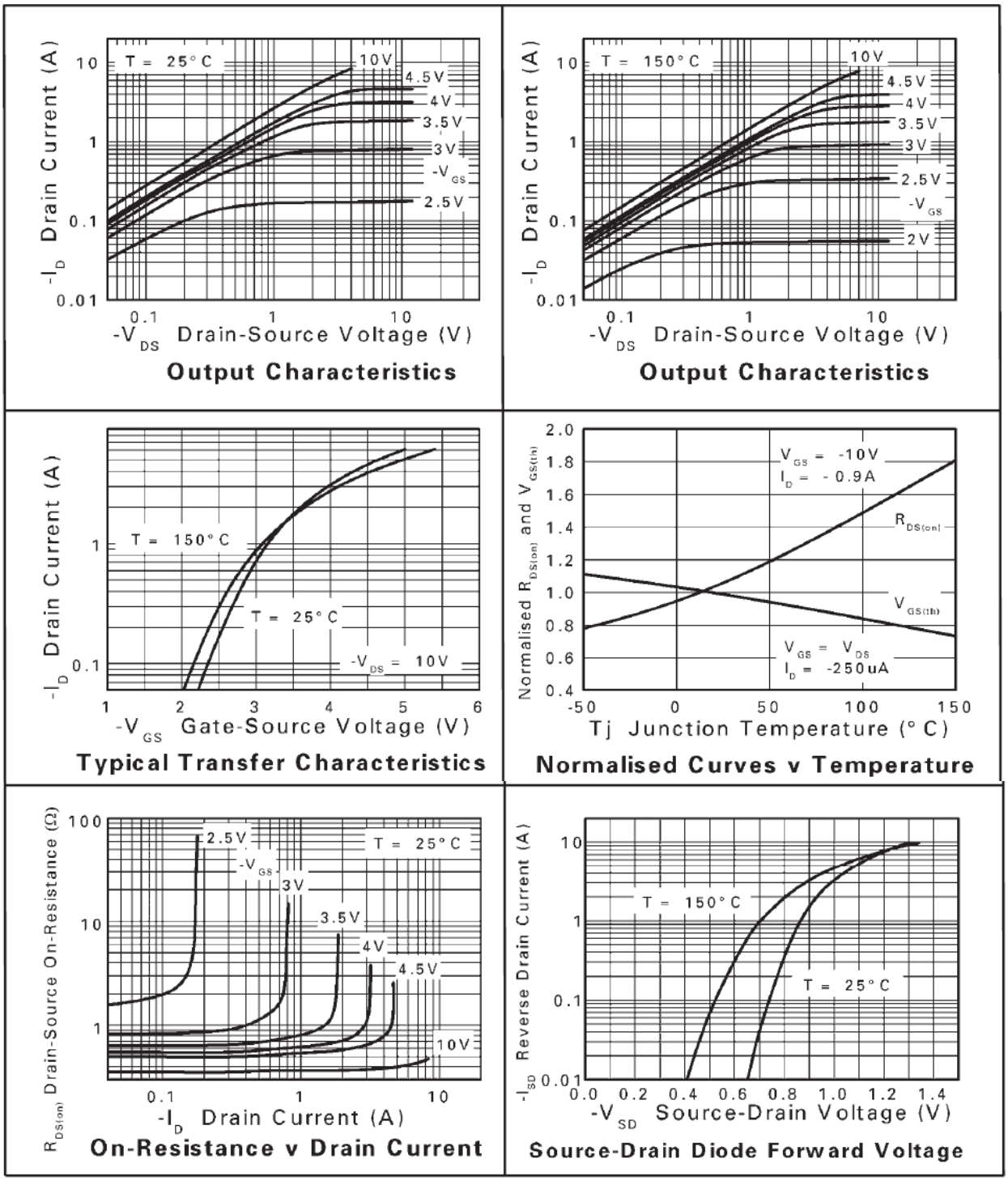
Typical Characteristics (P-Channel)



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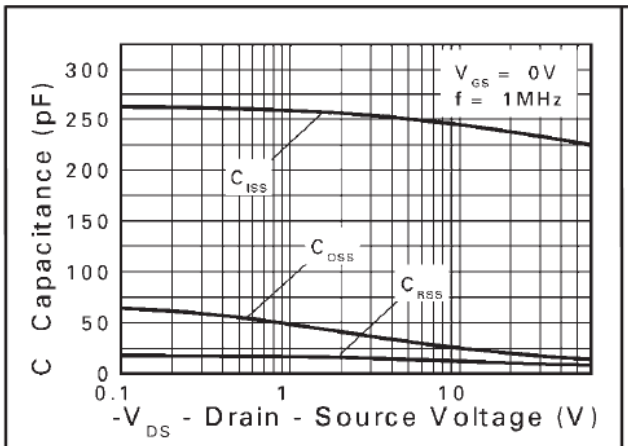
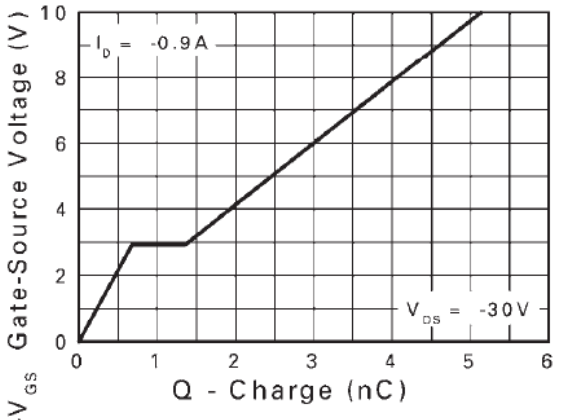
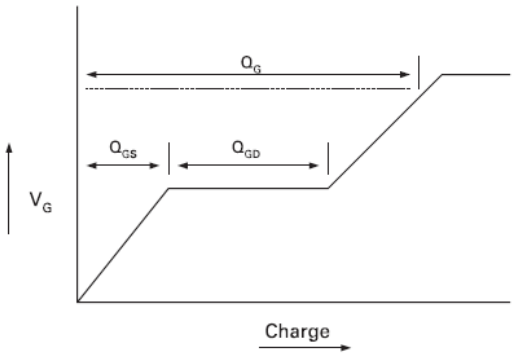
Typical Characteristics (P-Channel)



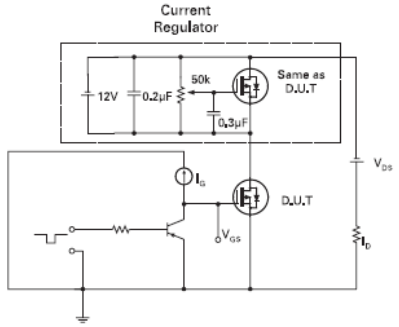
Capacitance v Drain-Source Voltage



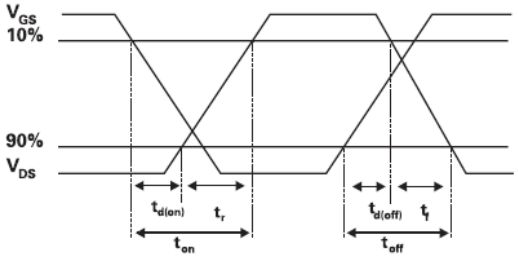
Gate-Source Voltage v Gate Charge



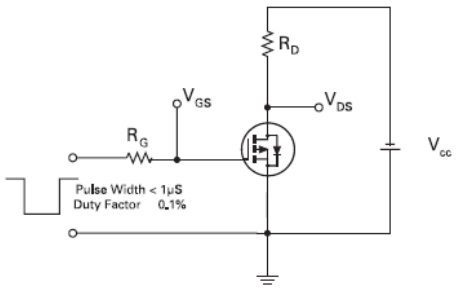
Basic Gate Charge Waveform



Gate Charge Test Circuit



Switching Time Waveforms



Switching Time Test Circuit

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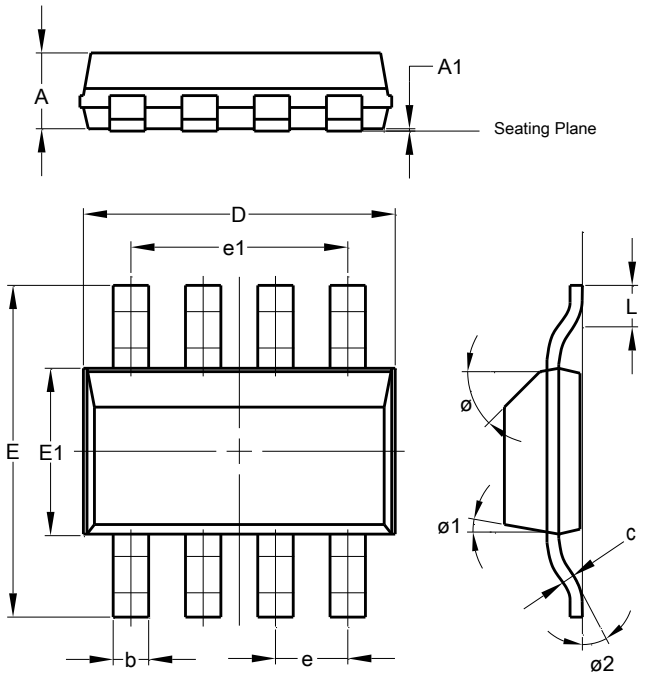
Package Outline Dimensions

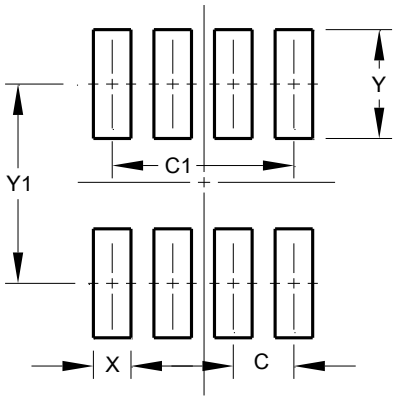
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



SM-8			
Dim	**Min**	**Max**	**Typ**
A	--	1.70	1.60
A1	0.02	0.10	0.04
b	0.70	0.90	0.80
c	0.24	0.32	0.28
D	6.30	6.70	6.60
e	1.53 REF		
e1	4.59 REF		
E	6.70	7.30	7.00
E1	3.30	3.70	3.50
L	0.75	1.00	0.90
Ø	--	--	45°
Ø1	--	15°	--
Ø2	--	--	10°
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)
C	1.52
C1	4.60
X	0.95
Y	2.80
Y1	6.80

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