

## Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = 25^\circ C$
Q1	30V	28m $\Omega$ @ $V_{GS} = 10V$	7.1A
		45m $\Omega$ @ $V_{GS} = 4.5V$	5.6A
Q2	-30V	25m $\Omega$ @ $V_{GS} = -10V$	-7.4A
		41m $\Omega$ @ $V_{GS} = -4.5V$	-5.7A

## Description and Applications

This new generation complementary dual MOSFET features low on-resistance and fast switching, making it ideal for high efficiency power management applications.

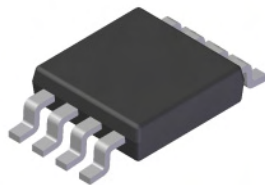
- Motor control
- Backlighting
- DC-DC Converters
- Power management functions

## Features and Benefits

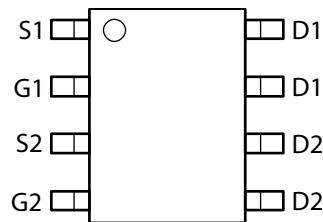
- Low on-resistance
- Fast switching speed
- "Green" Component and RoHS Compliant (Note 1)

## Mechanical Data

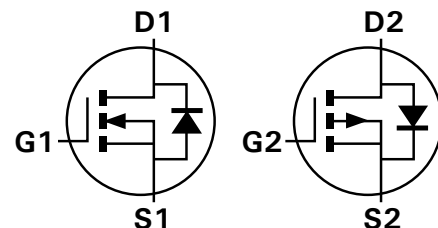
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals Connections: See Diagram
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202,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



TOP VIEW



Top view



Q1 N-Channel

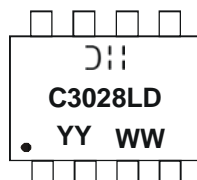
Q2 P-Channel

## Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMC3028LSD-13	C3028LD	13	12	2,500

Note: 1. Diodes, Inc. defines "Green" products as those which are Eu RoHS compliant and contain no halogens or antimony compounds; further information about Diodes Inc.'s "Green" Policy can be found on our website. For packaging details, go to our website

## Marking Information



D = Manufacturer's Marking  
C3028LD = Product Type Marking Code  
YYWW = Date Code Marking  
YY = Year (ex: 09 = 2009)  
WW = Week (01-52)

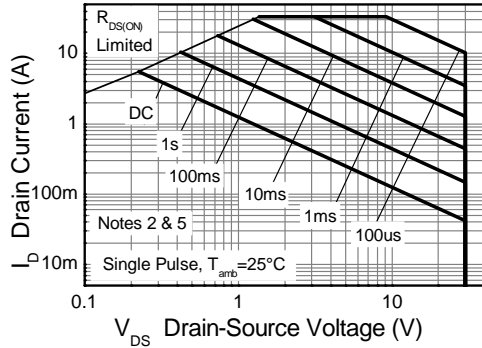
**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic			Symbol	N-Channel - Q1	P-Channel - Q2	Units
Drain-Source Voltage			V <sub>DSS</sub>	30	-30	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	±20	V
Continuous Drain Current	V <sub>GS</sub> = 10V	(Notes 3 & 5)	I <sub>D</sub>	7.1	-7.4	A
		T <sub>A</sub> = 70°C (Notes 3 & 5)		5.7	-5.9	
		(Notes 2 & 5)		5.5	-5.8	
		(Notes 2 & 6)		6.6	-6.8	
Pulsed Drain Current	V <sub>GS</sub> = 10V	(Notes 4 & 5)	I <sub>DM</sub>	34	-36	A
Continuous Source Current (Body diode)		(Notes 3 & 5)	I <sub>S</sub>	3.5	-3.5	A
Pulsed Source Current (Body diode)		(Notes 4 & 5)	I <sub>SM</sub>	34	-36	A

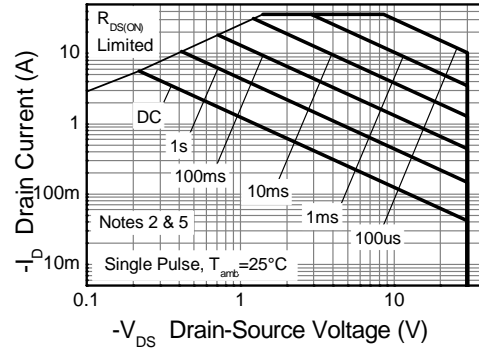
**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic		Symbol	N-Channel - Q1	P-Channel - Q2	Unit
Power Dissipation	(Notes 2 & 5)	P <sub>D</sub>	1.3		W
Linear Derating Factor			10		mW/°C
Power Dissipation	(Notes 2 & 6)	P <sub>D</sub>	1.8		W
Linear Derating Factor			14		mW/°C
Power Dissipation	(Notes 3 & 5)	P <sub>D</sub>	2.1		W
Linear Derating Factor			17		mW/°C
Thermal Resistance, Junction to Ambient	(Notes 2 & 5)	R <sub>θJA</sub>	100		°C/W
	(Notes 2 & 6)		70		
	(Notes 3 & 5)		60		
Thermal Resistance, Junction to Lead	(Notes 5 & 7)	R <sub>θJL</sub>	51	46	°C/W
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150		°C

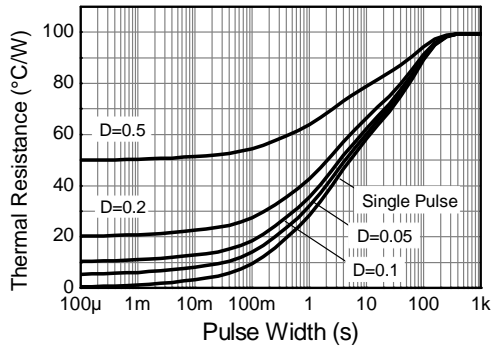
- Notes:
2. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  3. Same as note (2), except the device is measured at t ≤ 10 sec.
  4. Same as note (2), except the device is pulsed with D= 0.02 and pulse width 300 μs. The pulse current is limited by the maximum junction temperature.
  5. For a dual device with one active die.
  6. For a device with two active die running at equal power.
  7. Thermal resistance from junction to solder-point (at the end of the drain lead).



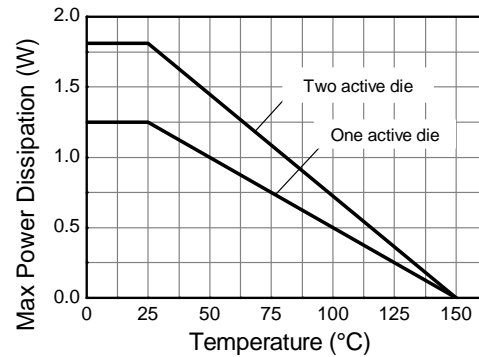
**N-channel Safe Operating Area**



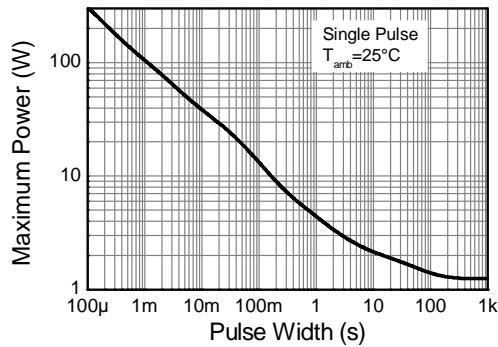
**P-channel Safe Operating Area**



**Transient Thermal Impedance**



**Derating Curve**



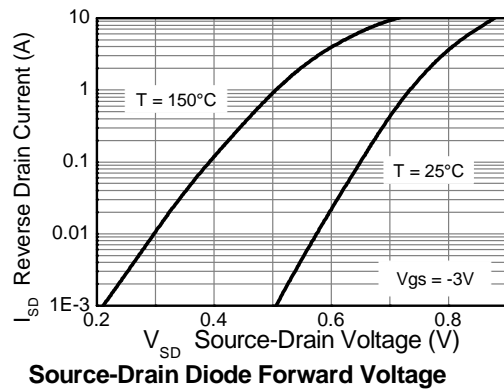
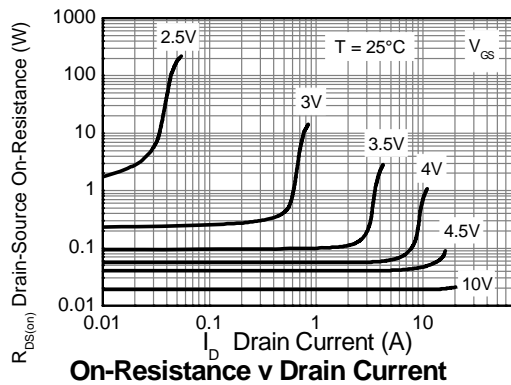
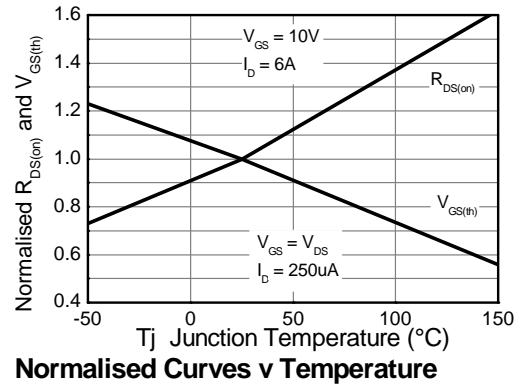
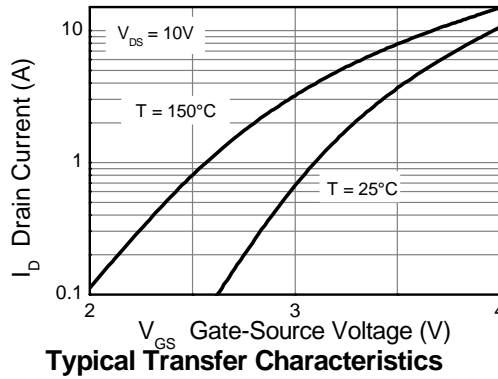
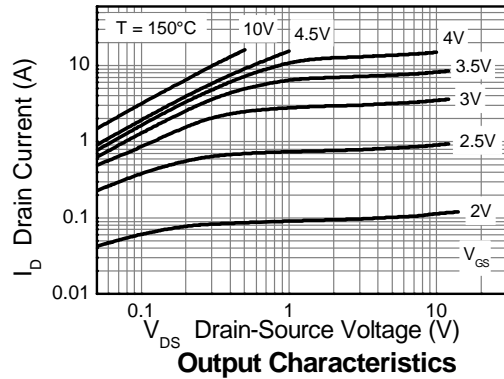
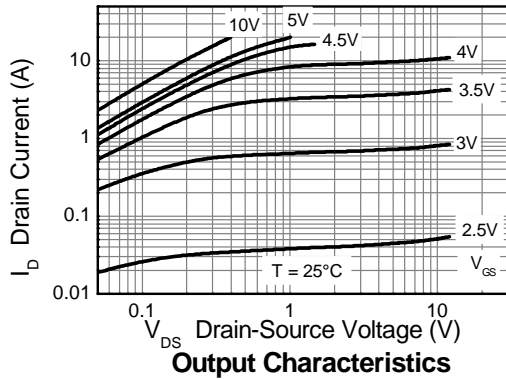
**Pulse Power Dissipation**

**Electrical Characteristics – Q1 N-Channel** @T<sub>A</sub> = 25°C unless otherwise specified

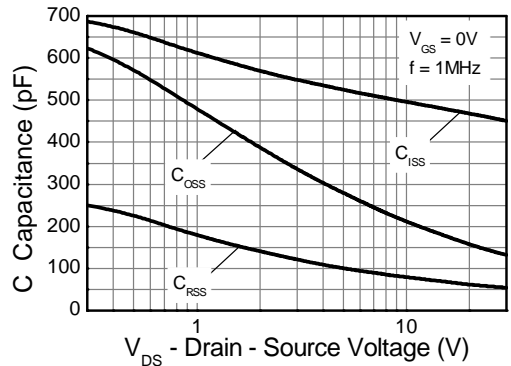
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	30	—	—	V	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	0.5	μA	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	—	3.0	V	I <sub>D</sub> = 250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 8)	R <sub>DS(ON)</sub>	—	—	0.028	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 6.0A
				0.045		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.9A
Forward Transconductance (Notes 8 & 9)	g <sub>fs</sub>	—	12	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 6.0A
Diode Forward Voltage (Note 8)	V <sub>SD</sub>	—	0.68	1.2	V	I <sub>S</sub> = 1.7A, V <sub>GS</sub> = 0V
Reverse recovery time (Note 9)	t <sub>rr</sub>	—	11.5	—	ns	I <sub>S</sub> = 1.7A, di/dt = 100A/μs
Reverse recovery charge (Note 9)	Q <sub>rr</sub>	—	4.4	—	nC	
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	472	—	pF	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	178	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	65	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	5.2	—	nC	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 4.5V I <sub>D</sub> = 6A
Total Gate Charge	Q <sub>g</sub>	—	10.5	—	nC	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V I <sub>D</sub> = 6A
Gate-Source Charge	Q <sub>gs</sub>	—	1.86	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	2.3	—	nC	
Turn-On Delay Time (Note 10)	t <sub>D(on)</sub>	—	2.5	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V I <sub>D</sub> = 1A, R <sub>G</sub> = 6.0Ω
Turn-On Rise Time (Note 10)	t <sub>r</sub>	—	3.1	—	ns	
Turn-Off Delay Time (Note 10)	t <sub>D(off)</sub>	—	14	—	ns	
Turn-Off Fall Time (Note 10)	t <sub>f</sub>	—	9.7	—	ns	

- Notes:
8. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
  9. For design aid only, not subject to production testing.
  10. Switching characteristics are independent of operating junction temperatures.

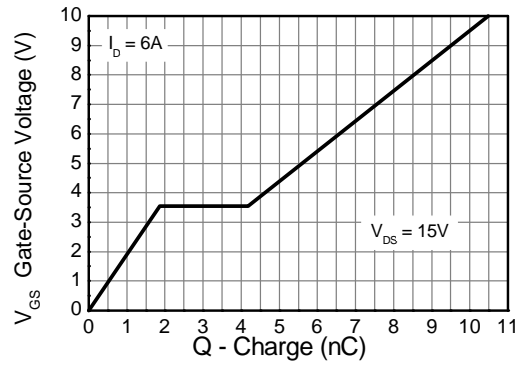
**Q1 N-Channel**



**Q1 N-Channel continued**

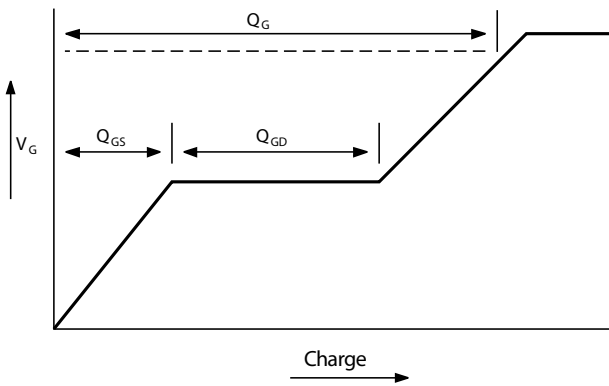


**Capacitance v Drain-Source Voltage**

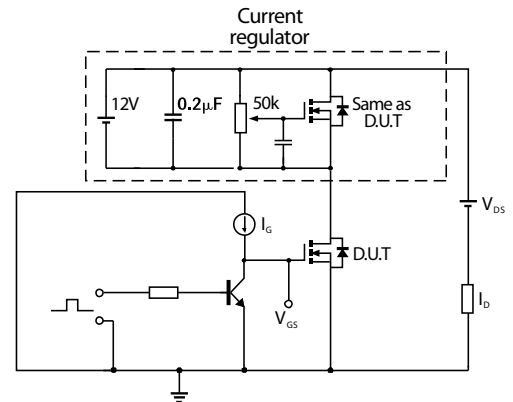


**Gate-Source Voltage v Gate Charge**

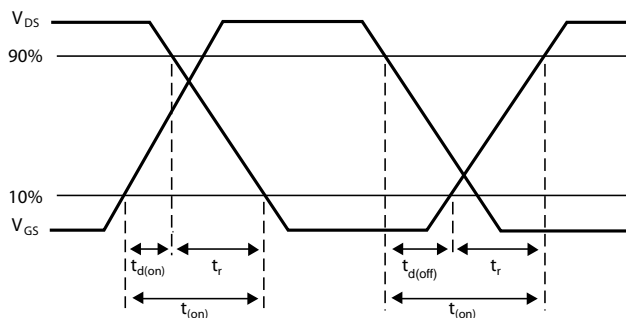
**Test Circuits – Q1 N-Channel**



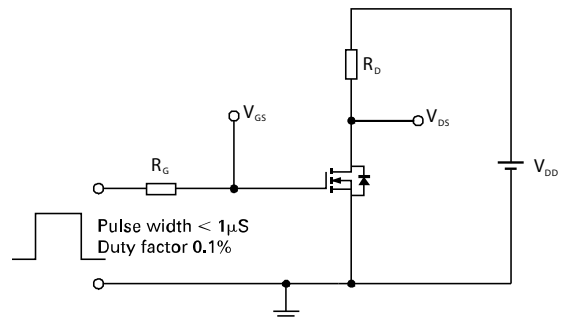
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**



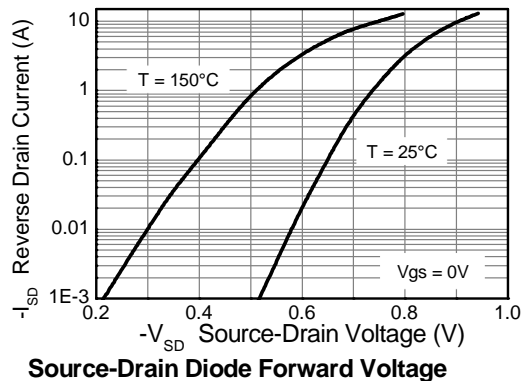
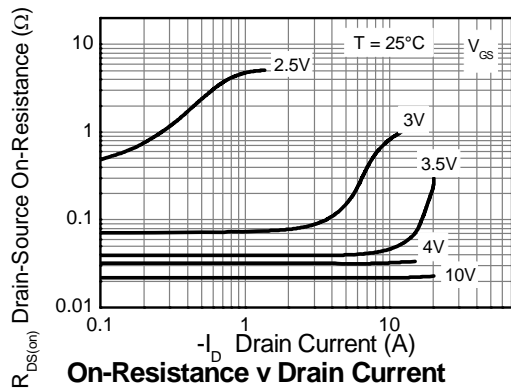
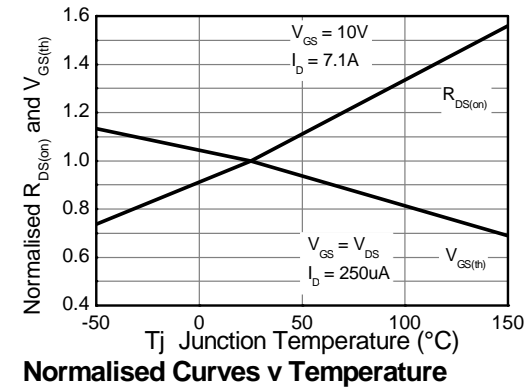
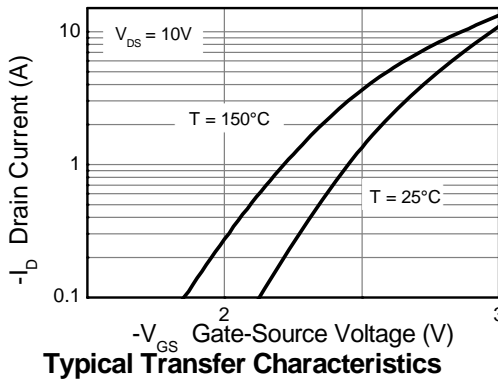
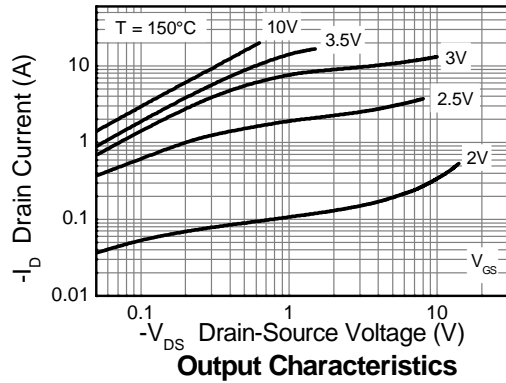
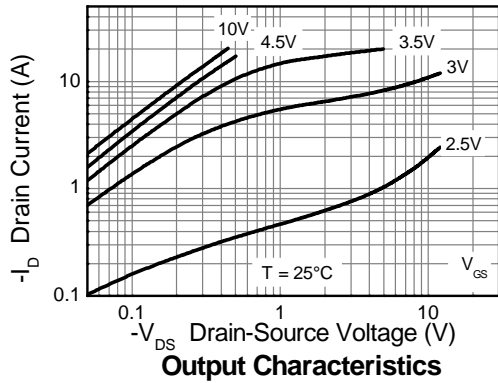
**Switching time test circuit**

**Electrical Characteristics – Q2 P-Channel** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-30	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-0.5	μA	V <sub>DS</sub> = -30V, 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</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.0	—	-3.0	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 8)	R <sub>DS(ON)</sub>	—	—	0.025	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -7.1A
				0.041		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5.5A
Forward Transconductance (Notes 8 & 9)	g <sub>fs</sub>	—	18.6	—	S	V <sub>DS</sub> = -15V, I <sub>D</sub> = -7.1A
Diode Forward Voltage (Note 8)	V <sub>SD</sub>	—	-0.80	-1.2	V	I <sub>S</sub> = -1.7A, V <sub>GS</sub> = 0V
Reverse recovery time (Note 9)	t <sub>rr</sub>	—	16.2	—	ns	I <sub>S</sub> = -2.2A, di/dt = 100A/μs
Reverse recovery charge (Note 9)	Q <sub>rr</sub>	—	10	—	nC	
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	1678	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	303	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	178	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	16.4	—	nC	V <sub>DS</sub> = -15V, V <sub>GS</sub> = -4.5V I <sub>D</sub> = -7.1A
Total Gate Charge	Q <sub>g</sub>	—	31.6	—	nC	V <sub>DS</sub> = -15V, V <sub>GS</sub> = -10V I <sub>D</sub> = -7.1A
Gate-Source Charge	Q <sub>gs</sub>	—	4.3	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	6.2	—	nC	
Turn-On Delay Time (Note 10)	t <sub>D(on)</sub>	—	3.5	—	ns	V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V I <sub>D</sub> = -1A, R <sub>G</sub> = 6.0Ω
Turn-On Rise Time (Note 10)	t <sub>r</sub>	—	4.9	—	ns	
Turn-Off Delay Time (Note 10)	t <sub>D(off)</sub>	—	44	—	ns	
Turn-Off Fall Time (Note 10)	t <sub>f</sub>	—	28	—	ns	

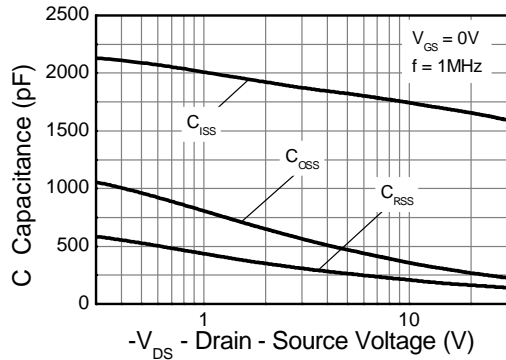
- Notes:
8. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
  9. For design aid only, not subject to production testing.
  10. Switching characteristics are independent of operating junction temperatures.

**Q2 P-Channel**

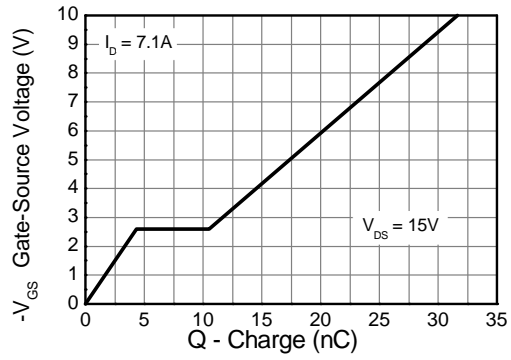




**Q2 P-Channel continued**

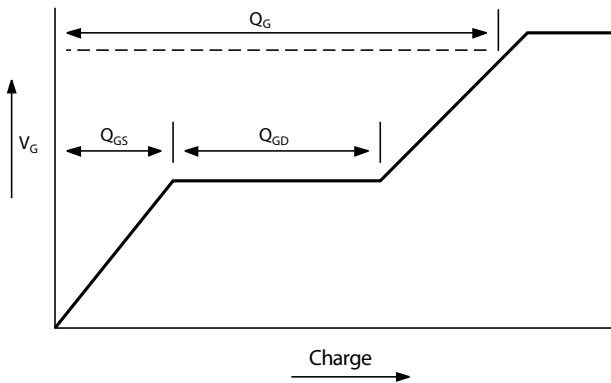


**Capacitance v Drain-Source Voltage**

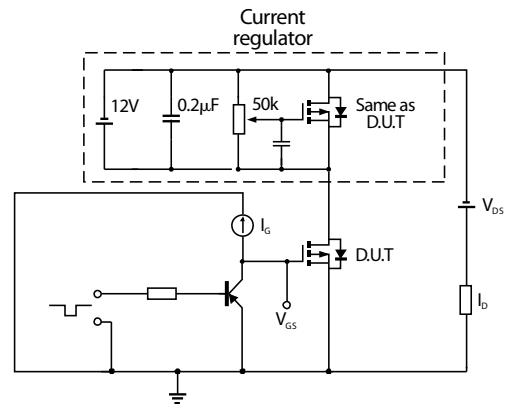


**Gate-Source Voltage v Gate Charge**

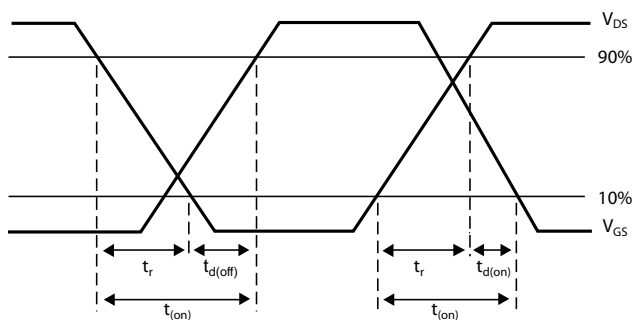
**Test Circuits – Q2 P-Channel**



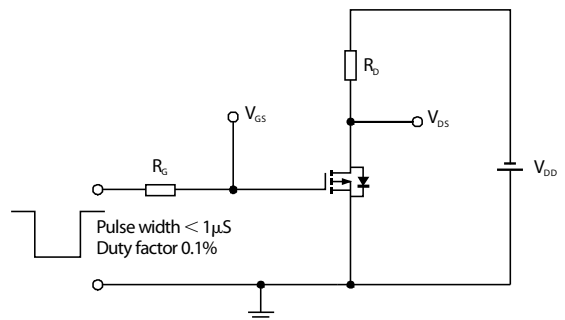
**Basic gate charge waveform**



**Gate charge test circuit**

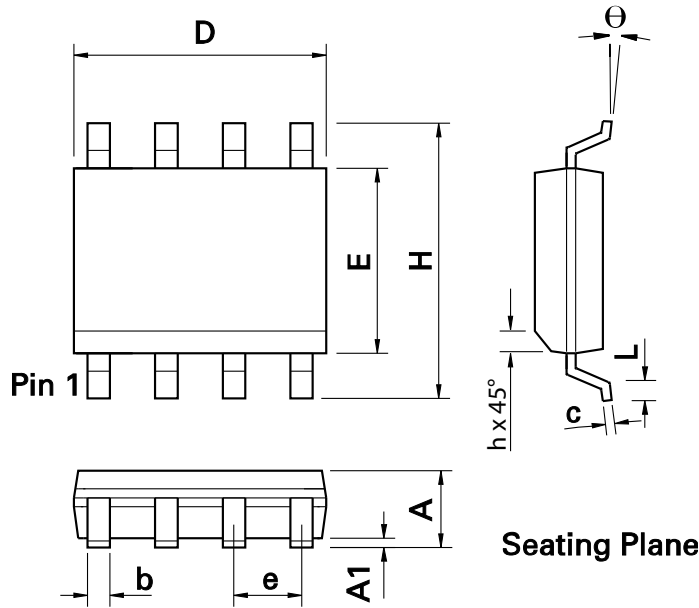


**Switching time waveforms**



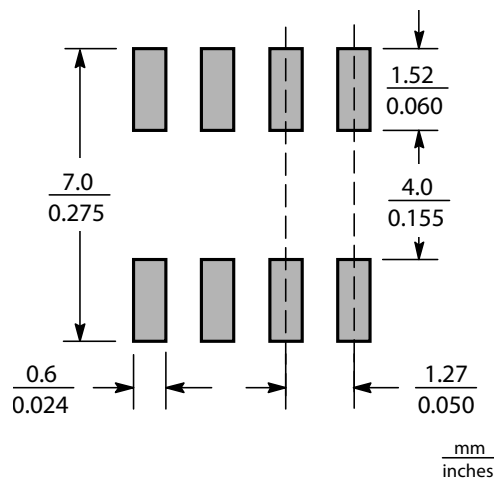
**Switching time test circuit**

**Package Outline Dimensions**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	e	0.050 BSC		1.27 BSC	
A1	0.004	0.010	0.10	0.25	b	0.013	0.020	0.33	0.51
D	0.189	0.197	4.80	5.00	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	$\theta$	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27	-	-	-	-	-

**Suggested Pad Layout**



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[BC858C-7-F](#) [BCX53TA](#) [B550C-13-F](#) [BAV20W-7-F](#) [6A6-T](#) [BZT52C15T-7](#) [BZX84C5V1TS-7-F](#) [DMP6180SK3-13](#) [BZT52C15LP-7](#)  
[74LVC1G58W6-7](#) [DDTC114ELP-7](#) [BAS40](#) [1N5402-T](#) [ZMR330FTA](#) [ZVN4525E6TA](#) [SBR40100CT](#) [FZT605TA](#) [BZT52C15SQ-7-F](#)  
[BZT52C6V2-13-F](#) [BZT52C24-13-F](#) [BC807-25](#) [BC807-40](#) [BC847BS-13-F](#) [BSS123Q-7](#) [BZT52C2V4Q-7-F](#)