



DMC3028LSD

30V COMPLEMENTARY DUAL ENHANCEMENT MODE MOSFET

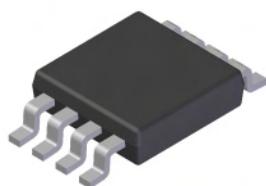
## Product Summary

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

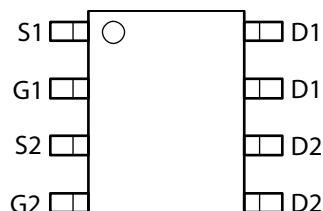
## Description and Applications

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

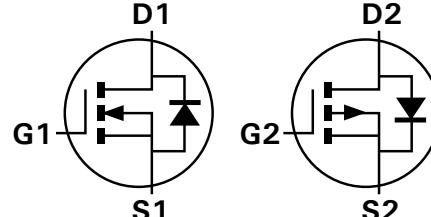
- Motor control
- Backlighting
- DC-DC Converters
- Power management functions



TOP VIEW



Top view



Q1 N-Channel

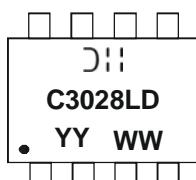
Q2 P-Channel

## 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



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

**Maximum Ratings** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

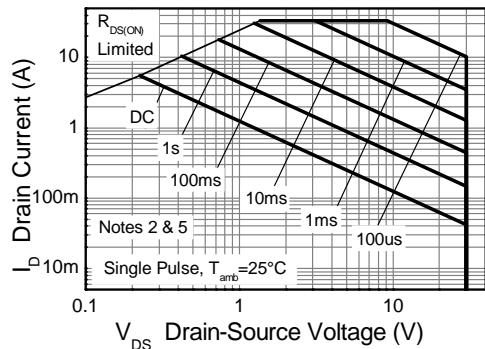
Characteristic		Symbol	N-Channel - Q1	P-Channel - Q2	Units
Drain-Source Voltage		$V_{DSS}$	30	-30	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current	$V_{GS} = 10\text{V}$	(Notes 3 & 5)	$I_D$	7.1	-7.4
		$T_A = 70^\circ\text{C}$ (Notes 3 & 5)		5.7	-5.9
		(Notes 2 & 5)		5.5	-5.8
		(Notes 2 & 6)		6.6	-6.8
Pulsed Drain Current	$V_{GS} = 10\text{V}$	(Notes 4 & 5)	$I_{DM}$	34	-36
Continuous Source Current (Body diode)		(Notes 3 & 5)	$I_S$	3.5	-3.5
Pulsed Source Current (Body diode)		(Notes 4 & 5)	$I_{SM}$	34	-36

**Thermal Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

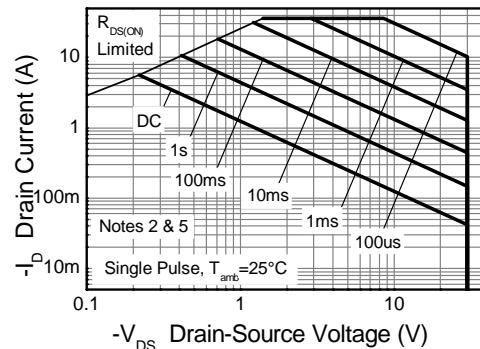
Characteristic		Symbol	N-Channel - Q1	P-Channel - Q2	Unit
Power Dissipation		$P_D$	1.3		W
Linear Derating Factor			10		$\text{mW}/^\circ\text{C}$
Power Dissipation		$P_D$	1.8		W
Linear Derating Factor			14		$\text{mW}/^\circ\text{C}$
Power Dissipation		$P_D$	2.1		W
Linear Derating Factor			17		$\text{mW}/^\circ\text{C}$
Thermal Resistance, Junction to Ambient		$R_{\theta JA}$	100		$^\circ\text{C}/\text{W}$
(Notes 2 & 5)			70		
(Notes 2 & 6)			60		
(Notes 3 & 5)					
Thermal Resistance, Junction to Lead	(Notes 5 & 7)	$R_{\theta JL}$	51	46	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150		$^\circ\text{C}$

Notes:

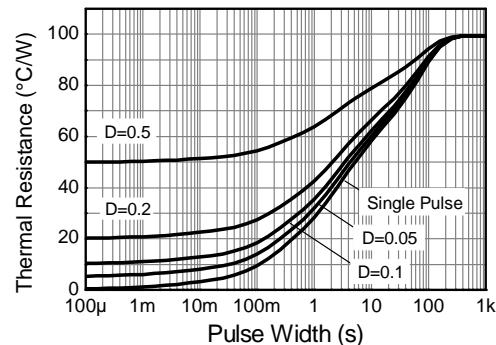
2. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
3. Same as note (2), except the device is measured at  $t \leq 10$  sec.
4. Same as note (2), except the device is pulsed with  $D = 0.02$  and pulse width 300  $\mu\text{s}$ . 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).



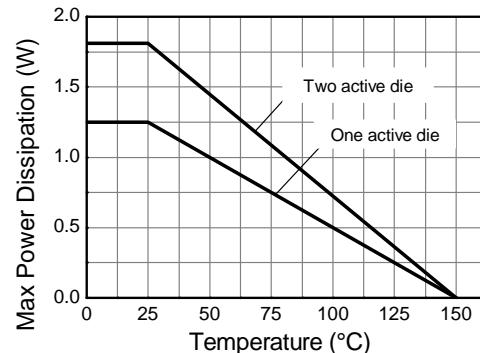
**N-channel Safe Operating Area**



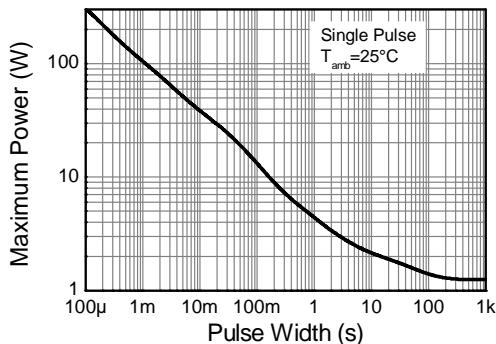
**P-channel Safe Operating Area**



**Transient Thermal Impedance**



**Derating Curve**



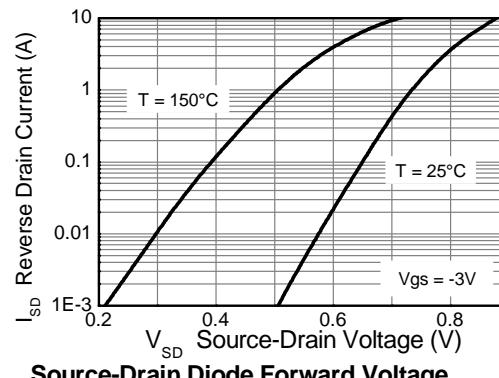
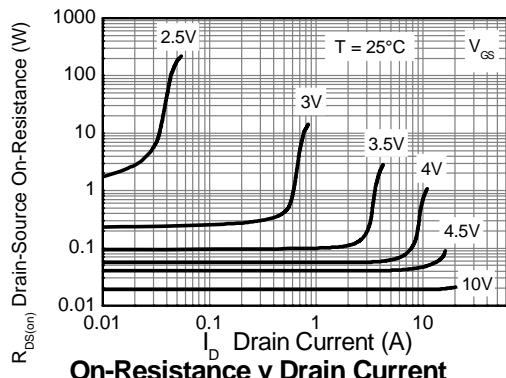
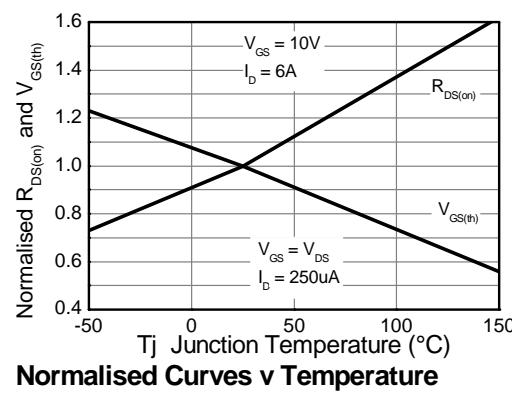
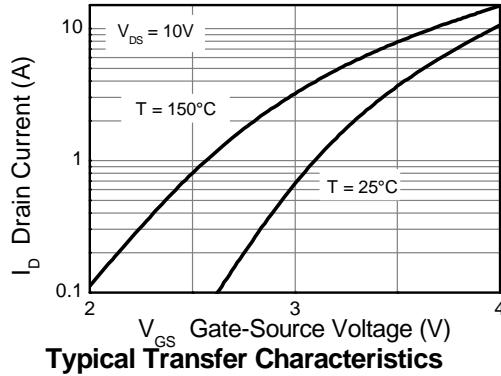
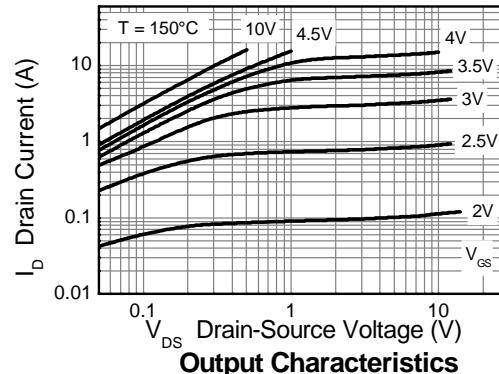
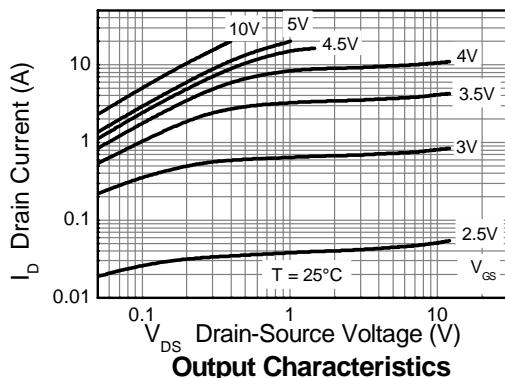
**Pulse Power Dissipation**

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

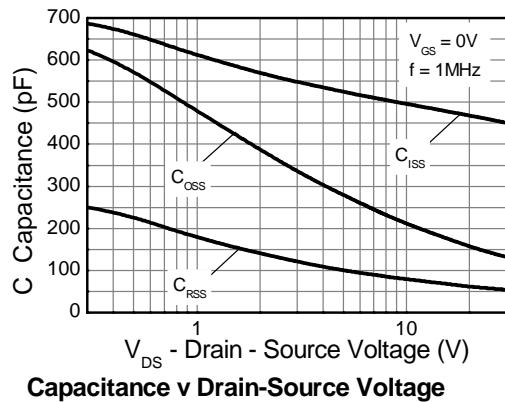
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	30	—	—	V	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	0.5	μA	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V
Gate-Source 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	
Gate-Source Charge	Q <sub>gs</sub>	—	1.86	—	nC	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V I <sub>D</sub> = 6A
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.

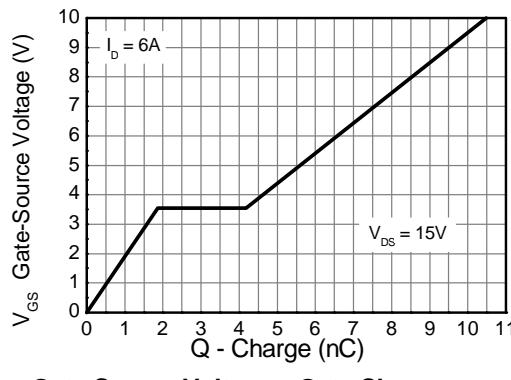
## Q1 N-Channel



## Q1 N-Channel continued

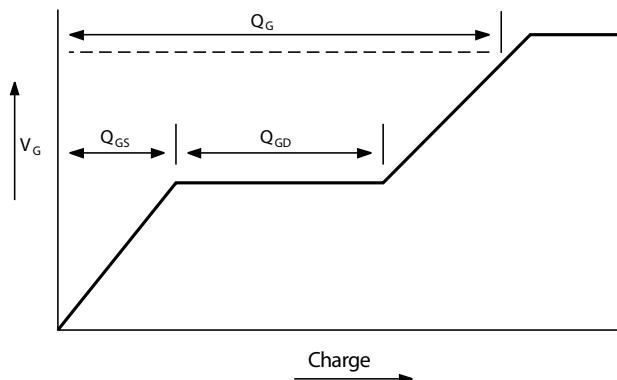


Capacitance v Drain-Source Voltage

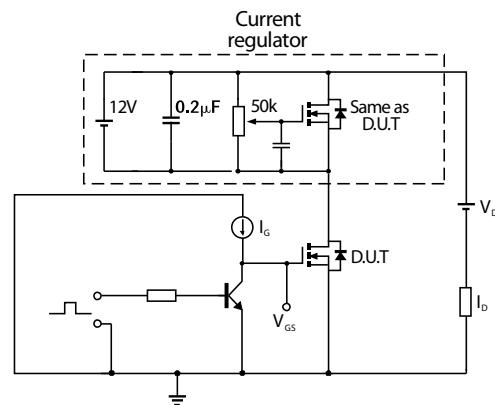


Gate-Source Voltage v Gate Charge

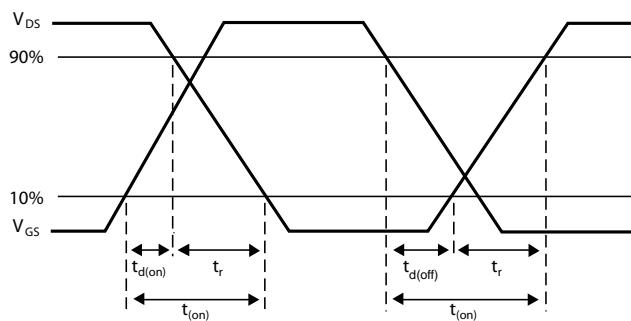
## Test Circuits – Q1 N-Channel



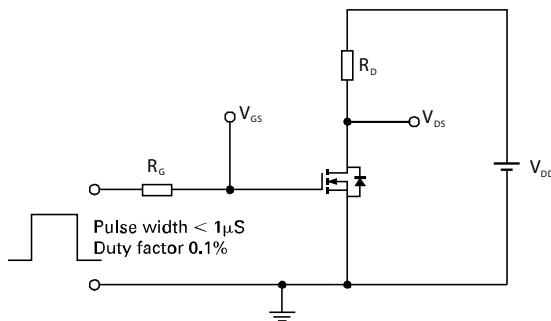
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



Switching time test circuit

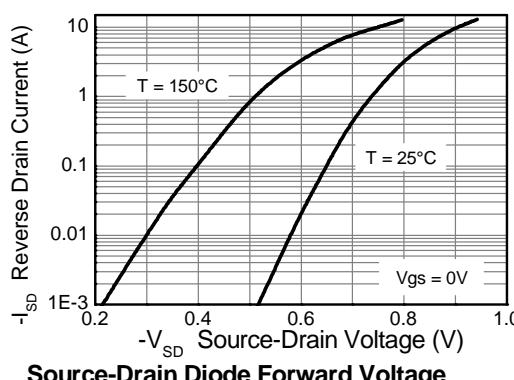
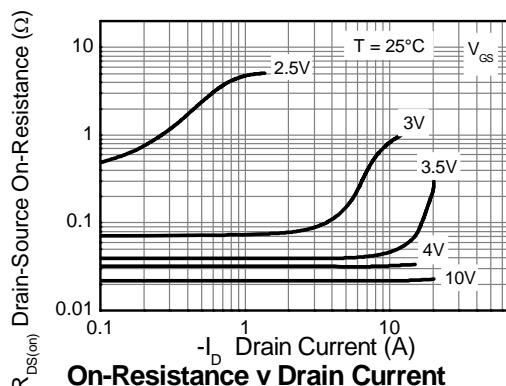
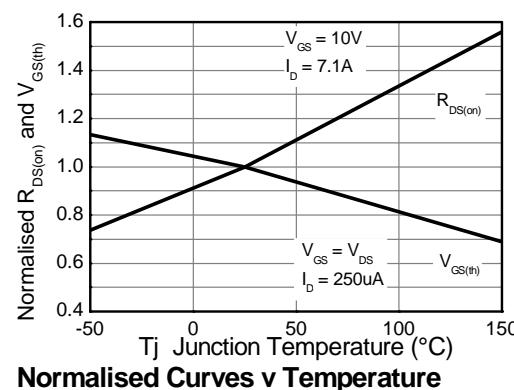
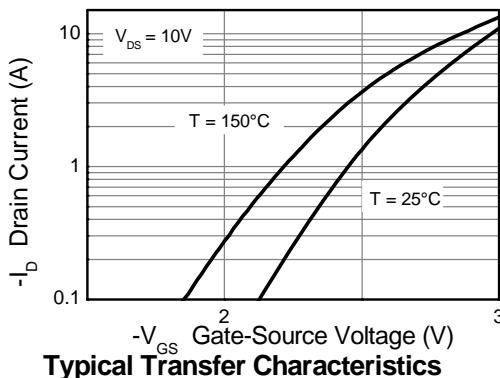
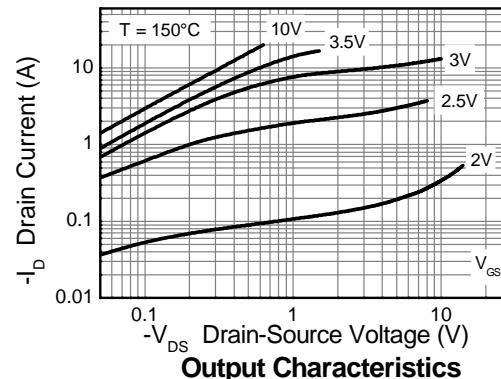
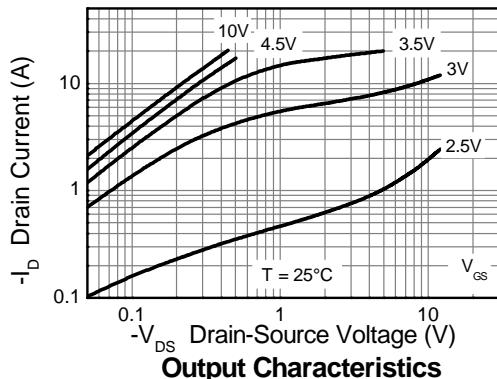
## Electrical Characteristics – Q2 P-Channel @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	-30	—	—	V	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-0.5	$\mu\text{A}$	$V_{DS} = -30\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	-1.0	—	-3.0	V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 8)	$R_{DS(\text{ON})}$	—	—	0.025	$\Omega$	$V_{GS} = -10\text{V}$ , $I_D = -7.1\text{A}$
				0.041		$V_{GS} = -4.5\text{V}$ , $I_D = -5.5\text{A}$
Forward Transconductance (Notes 8 & 9)	$g_{fs}$	—	18.6	—	S	$V_{DS} = -15\text{V}$ , $I_D = -7.1\text{A}$
Diode Forward Voltage (Note 8)	$V_{SD}$	—	-0.80	-1.2	V	$I_S = -1.7\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time (Note 9)	$t_{rr}$	—	16.2	—	ns	$I_S = -2.2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge (Note 9)	$Q_{rr}$	—	10	—	nC	
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	1678	—	pF	$V_{DS} = -15\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	303	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	178	—	pF	$V_{DS} = -15\text{V}$ , $V_{GS} = -4.5\text{V}$ $I_D = -7.1\text{A}$
Total Gate Charge	$Q_g$	—	16.4	—	nC	
Total Gate Charge	$Q_g$	—	31.6	—	nC	$V_{DS} = -15\text{V}$ , $V_{GS} = -10\text{V}$ $I_D = -7.1\text{A}$
Gate-Source Charge	$Q_{gs}$	—	4.3	—	nC	
Gate-Drain Charge	$Q_{gd}$	—	6.2	—	nC	$V_{DD} = -15\text{V}$ , $V_{GS} = -10\text{V}$ $I_D = -1\text{A}$ , $R_G \geq 6.0\Omega$
Turn-On Delay Time (Note 10)	$t_{D(\text{on})}$	—	3.5	—	ns	
Turn-On Rise Time (Note 10)	$t_r$	—	4.9	—	ns	
Turn-Off Delay Time (Note 10)	$t_{D(\text{off})}$	—	44	—	ns	
Turn-Off Fall Time (Note 10)	$t_f$	—	28	—	ns	

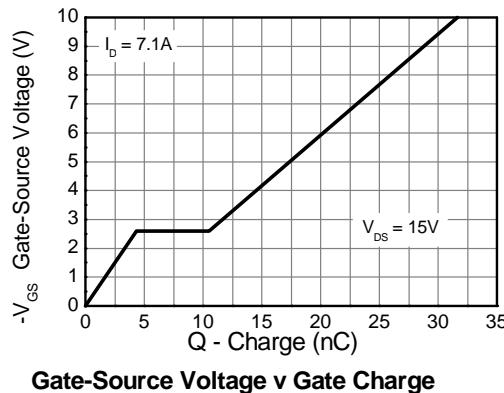
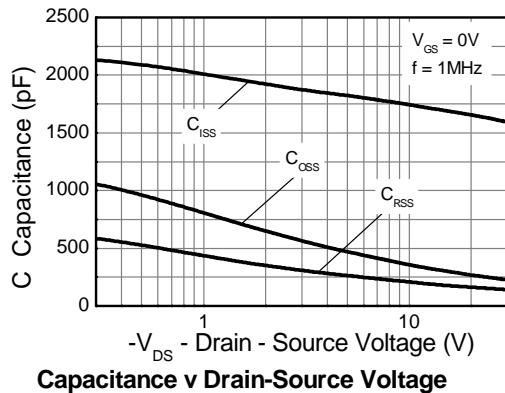
Notes:

- 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$
- 9. For design aid only, not subject to production testing.
- 10. Switching characteristics are independent of operating junction temperatures.

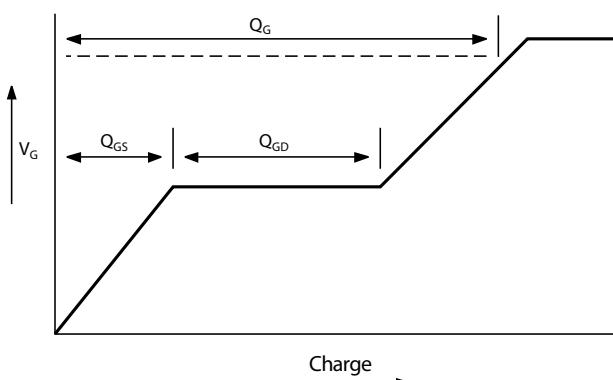
## Q2 P-Channel



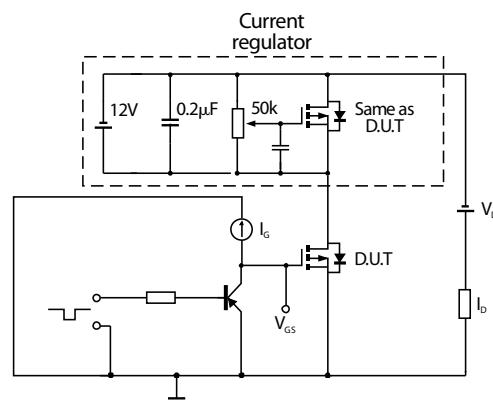
## Q2 P-Channel continued



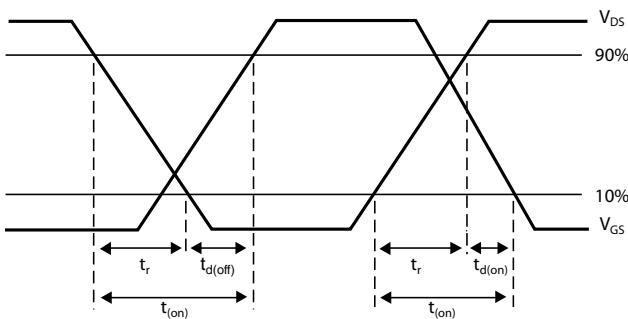
## Test Circuits – Q2 P-Channel



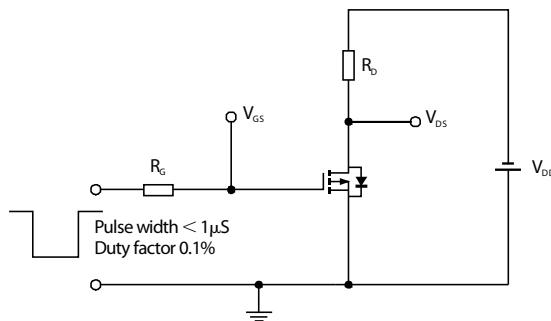
Basic gate charge waveform



Gate charge test circuit

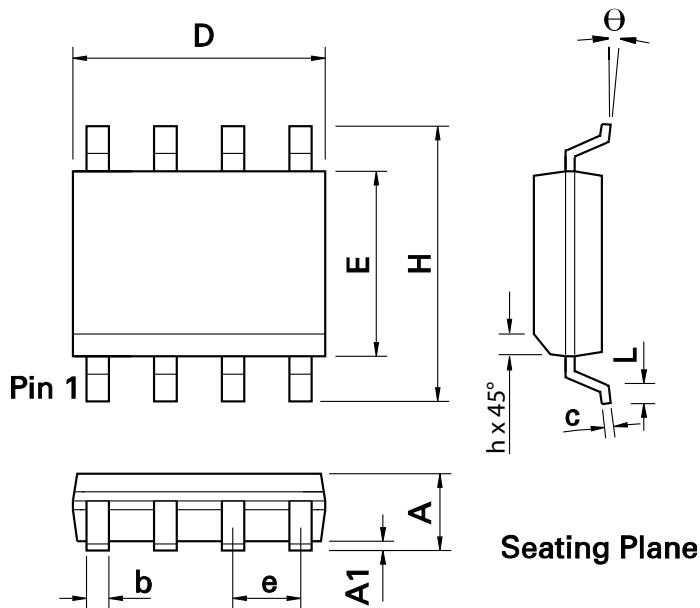


Switching time waveforms



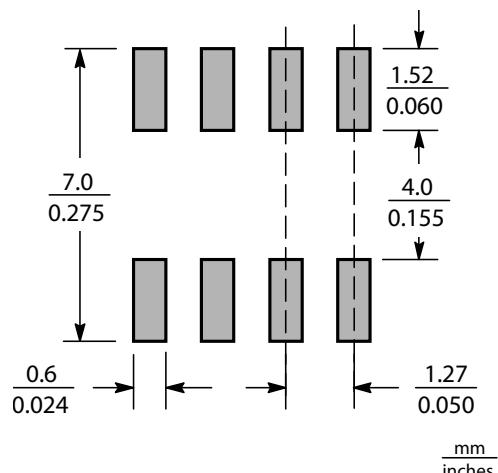
Switching time test circuit

## 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	θ	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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