

## Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ C$
Q1	60V	85 mΩ @ $V_{GS} = 10V$	3.1A
		120 mΩ @ $V_{GS} = 4.5V$	2.7A
Q2	-60V	150 mΩ @ $V_{GS} = -10V$	-2.4A
		250 mΩ @ $V_{GS} = -4.5V$	-1.8A

## Description

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

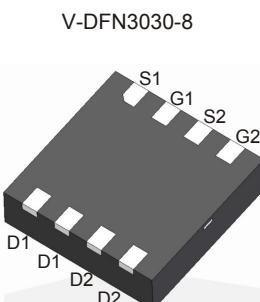
- Power Management Functions
- Analog Switch

## Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- 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

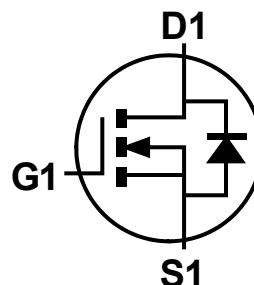
## Mechanical Data

- Case: V-DFN3030-8
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Weight: 0.02 grams (approximate)

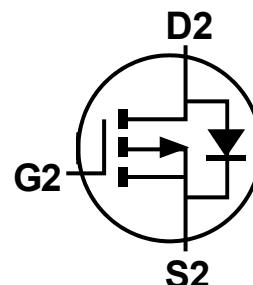


V-DFN3030-8

Bottom View



N-Channel MOSFET



P-Channel MOSFET

Equivalent Circuit

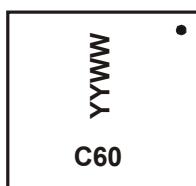
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC6070LFDH-7	V-DFN3030-8	3,000/Tape & Reel

Notes:

- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- See [http://www.diodes.com/quality/lead\\_free.html](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.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



C60 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 12 for 2012)  
 WW = Week Code (01 ~ 53)

**Maximum Ratings Q1 N-CHANNEL (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)**

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	3.1 2.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	3.9 3.1	A
Maximum Body Diode Forward Current (Note 5)			$I_S$	2	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, Duty cycle = 1%)			$I_{DM}$	15	A

**Maximum Ratings Q2 P-CHANNEL (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)**

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	-60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-2.4 -1.9	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-2.9 -2.3	A
Maximum Body Diode Forward Current (Note 5)			$I_S$	-2	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, Duty cycle = 1%)			$I_{DM}$	-12	A

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

Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 5)			$P_D$	1.4	W
Thermal Resistance, Junction to Ambient (Note 5)		Steady state	$R_{\theta JA}$	91	$^\circ\text{C/W}$
		$t < 10\text{s}$		60	
Thermal Resistance, Junction to Case (Note 5)			$R_{\theta JC}$	32	
Operating and Storage Temperature Range			$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate

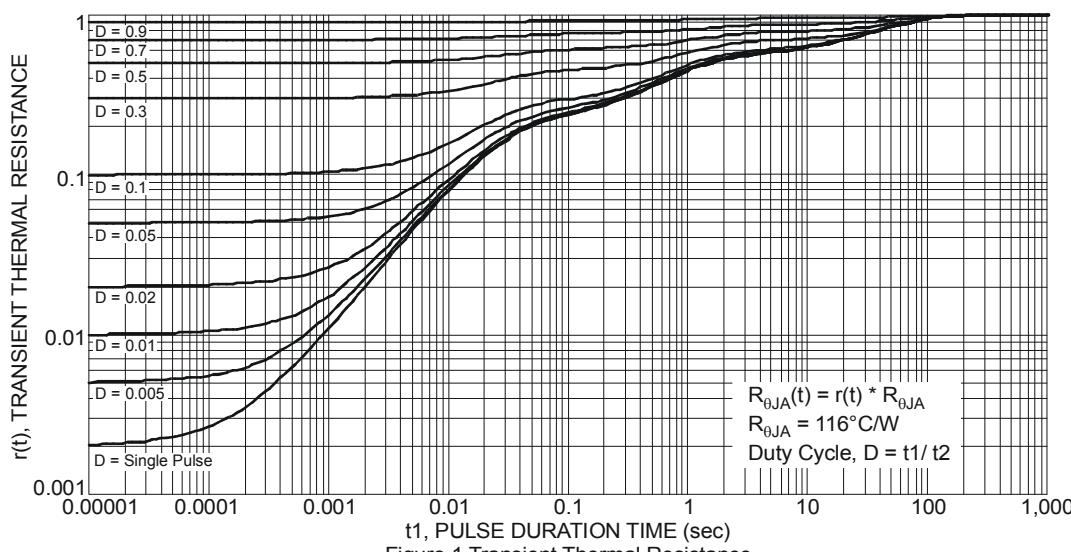


Figure 1 Transient Thermal Resistance

**Electrical Characteristics N-CHANNEL – Q1** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	60	–	–	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$\text{I}_{\text{DSS}}$	–	–	1	$\mu\text{A}$	$\text{V}_{\text{DS}} = 60\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	$\text{I}_{\text{GSS}}$	–	–	$\pm 100$	nA	$\text{V}_{\text{GS}} = \pm 16\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	1	–	3	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS (ON)}}$	–	60	85	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 10\text{V}$ , $\text{I}_D = 1.5\text{A}$
–			72	120		$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{I}_D = 0.5\text{A}$
Forward Transfer Admittance	$ \text{Y}_{\text{fs}} $	–	3.7	–	S	$\text{V}_{\text{DS}} = 5\text{V}$ , $\text{I}_D = 1.5\text{A}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	–	0.7	1.2	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = 3\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	$\text{C}_{\text{iss}}$	–	731	–	$\text{pF}$	$\text{V}_{\text{DS}} = 20\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	–	34	–	$\text{pF}$	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	–	23	–	$\text{pF}$	$\text{V}_{\text{DS}} = 0\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Gate Resistance	$\text{R}_{\text{g}}$	–	1.3	–	$\Omega$	
Total Gate Charge ( $\text{V}_{\text{GS}} = 10\text{V}$ )	$\text{Q}_{\text{g}}$	–	11.5	–	$\text{nC}$	$\text{V}_{\text{DS}} = 30\text{V}$ , $\text{I}_D = 3\text{A}$
Total Gate Charge ( $\text{V}_{\text{GS}} = 4.5\text{V}$ )	$\text{Q}_{\text{g}}$	–	5.2	–	$\text{nC}$	
Gate-Source Charge	$\text{Q}_{\text{gs}}$	–	2.1	–	$\text{nC}$	$\text{V}_{\text{DS}} = 30\text{V}$ , $\text{I}_D = 3\text{A}$
Gate-Drain Charge	$\text{Q}_{\text{gd}}$	–	1.5	–	$\text{nC}$	
Turn-On Delay Time	$\text{t}_{\text{D(on)}}$	–	9.6	–	$\text{ns}$	$\text{V}_{\text{GS}} = 10\text{V}$ , $\text{V}_{\text{DS}} = 30\text{V}$ , $\text{R}_{\text{G}} = 50\Omega$ , $\text{R}_{\text{L}} = 20\text{V}$
Turn-On Rise Time	$\text{t}_{\text{f}}$	–	11	–	$\text{ns}$	
Turn-Off Delay Time	$\text{t}_{\text{D(off)}}$	–	61	–	$\text{ns}$	$\text{V}_{\text{GS}} = 10\text{V}$ , $\text{V}_{\text{DS}} = 30\text{V}$ , $\text{R}_{\text{G}} = 50\Omega$ , $\text{R}_{\text{L}} = 20\text{V}$
Turn-Off Fall Time	$\text{t}_{\text{f}}$	–	21	–	$\text{ns}$	

Notes: 6. Short duration pulse test used to minimize self-heating effect

7. Guaranteed by design. Not subject to production testing

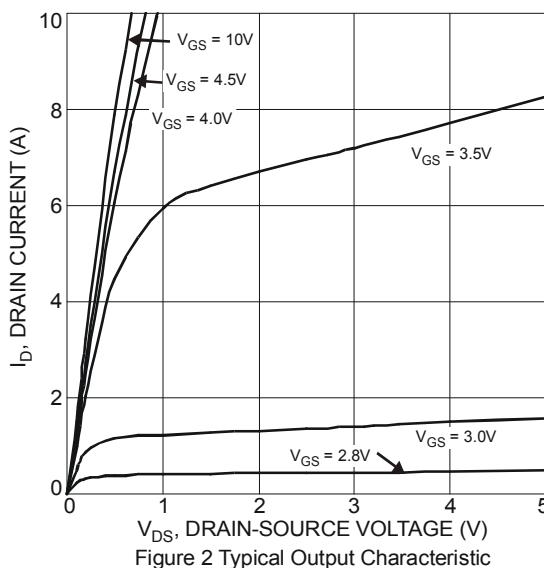


Figure 2 Typical Output Characteristic

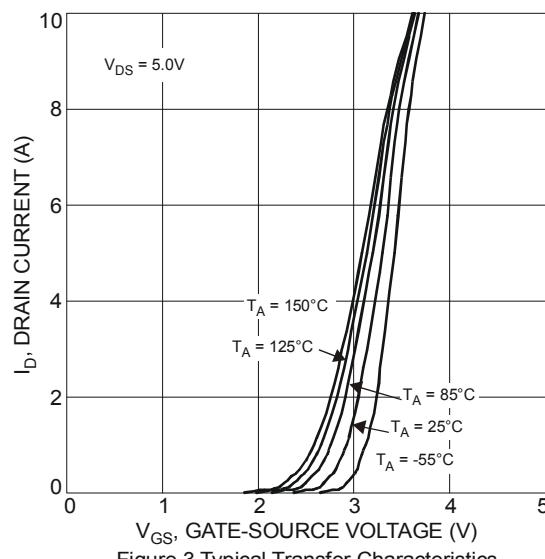


Figure 3 Typical Transfer Characteristics

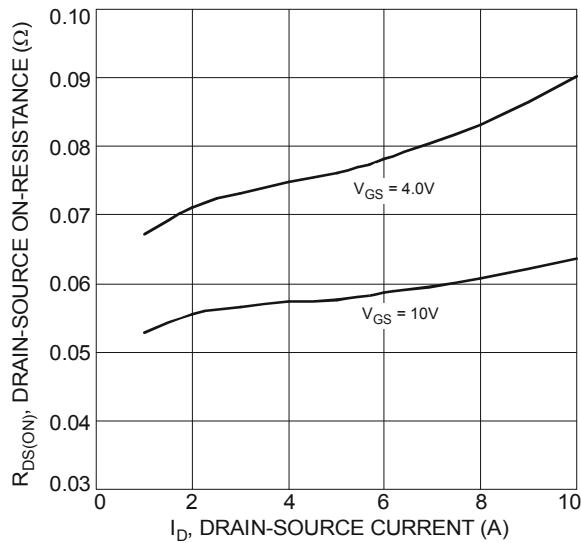


Figure 4 Typical On-Resistance vs.  
Drain Current and Gate Voltage

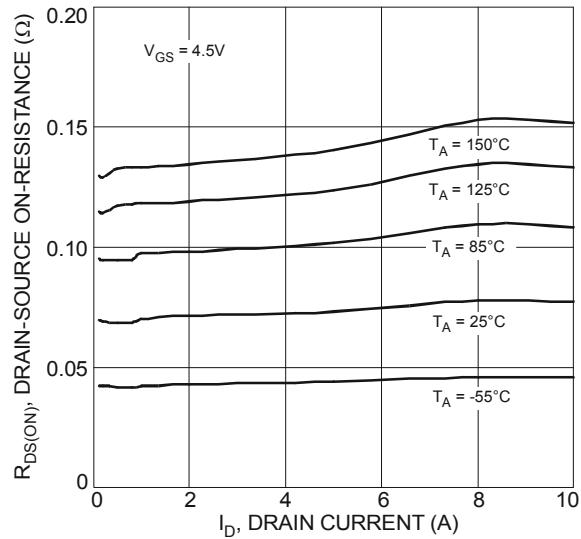


Figure 6 Typical On-Resistance vs.  
Drain Current and Temperature

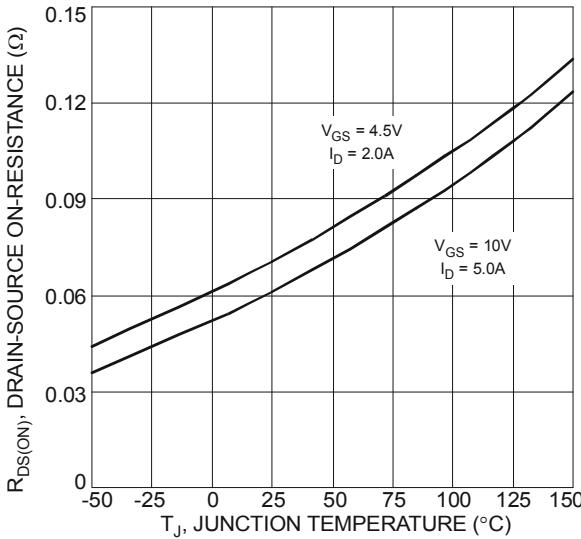


Figure 8 On-Resistance Variation with Temperature

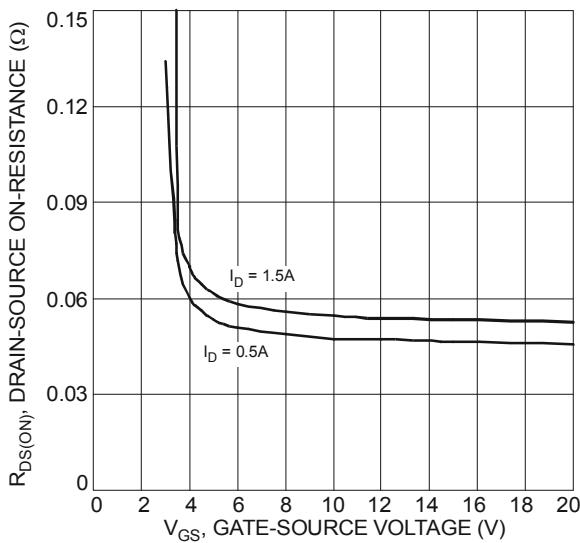


Figure 5 Typical Drain-Source On-Resistance  
vs. Gate-Source Voltage

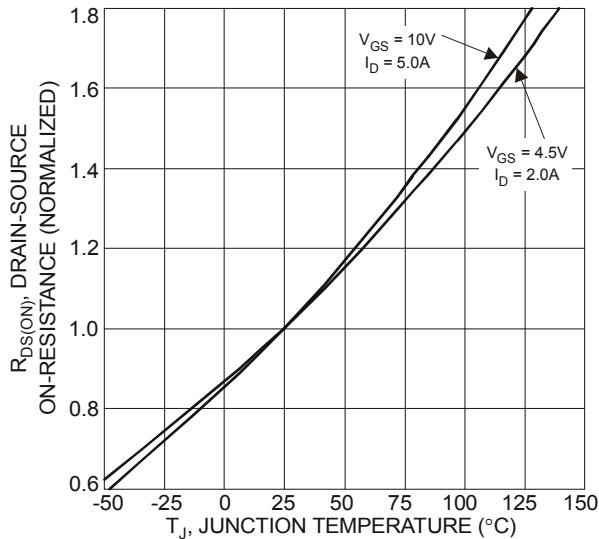


Figure 7 On-Resistance Variation with Temperature

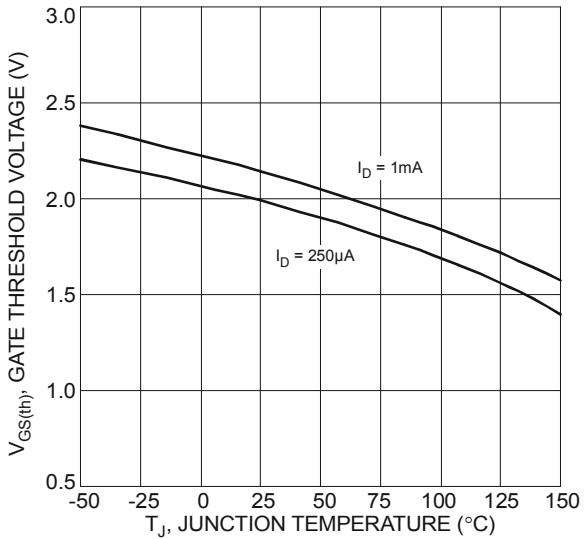


Figure 9 Gate Threshold Variation vs. Ambient Temperature

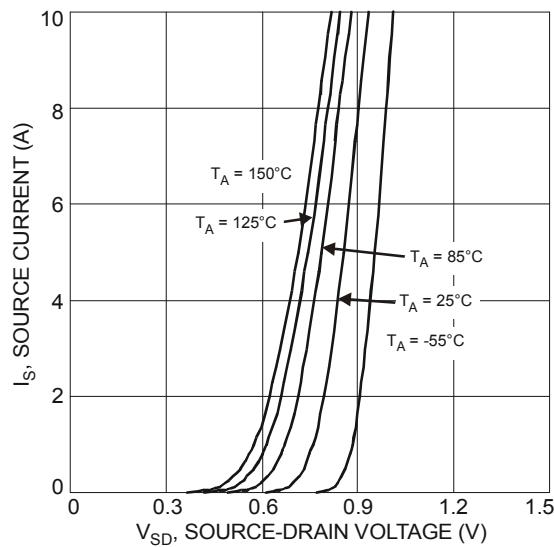


Figure 10 Diode Forward Voltage vs. Current

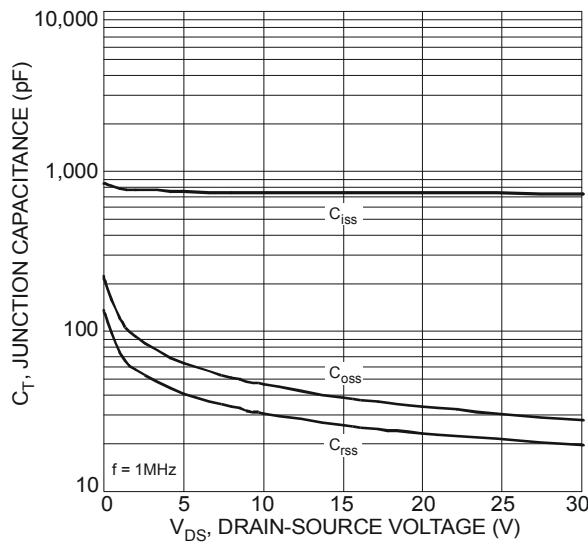


Figure 11 Typical Junction Capacitance

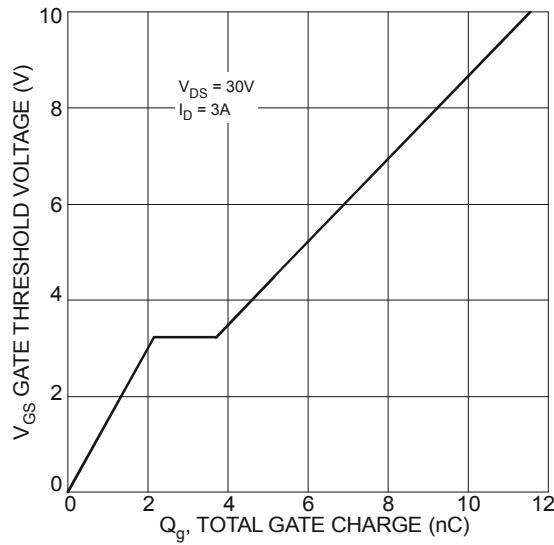


Figure 12 Gate Charge

**Electrical Characteristics P-CHANNEL – Q2 (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)**

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	-60	–	–	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = -250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$\text{I}_{\text{DSS}}$	–	–	-1	$\mu\text{A}$	$\text{V}_{\text{DS}} = -60\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	$\text{I}_{\text{GSS}}$	–	–	$\pm 100$	nA	$\text{V}_{\text{GS}} = \pm 16\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	-1	–	-3	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS}}(\text{ON})$	–	115	150	$\text{m}\Omega$	$\text{V}_{\text{GS}} = -10\text{V}$ , $\text{I}_D = -1\text{A}$
			170	250		$\text{V}_{\text{GS}} = -4.5\text{V}$ , $\text{I}_D = -0.5\text{A}$
Forward Transfer Admittance	$ \text{Y}_{\text{fs}} $	–	2.8	–	S	$\text{V}_{\text{DS}} = -5\text{V}$ , $\text{I}_D = -1\text{A}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	–	-0.7	-1.2	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_s = -2\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$\text{C}_{\text{iss}}$	–	612	–	pF	$\text{V}_{\text{DS}} = -20\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	–	36	–	pF	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	–	26	–	pF	$\text{V}_{\text{DS}} = 0\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Gate Resistance	$\text{R}_g$	–	13	–	$\Omega$	
Total Gate Charge ( $\text{V}_{\text{GS}} = -10\text{V}$ )	$\text{Q}_g$	–	8.9	–	nC	$\text{V}_{\text{DS}} = -30\text{V}$ , $\text{I}_D = -2\text{A}$
Total Gate Charge ( $\text{V}_{\text{GS}} = -4.5\text{V}$ )	$\text{Q}_g$	–	4.3	–	nC	
Gate-Source Charge	$\text{Q}_{\text{gs}}$	–	1.4	–	nC	$\text{V}_{\text{DS}} = -10\text{V}$ , $\text{V}_{\text{DS}} = -30\text{V}$ , $\text{R}_g = 50\Omega$ , $\text{I}_D = -1\text{A}$
Gate-Drain Charge	$\text{Q}_{\text{gd}}$	–	1.7	–	nC	
Turn-On Delay Time	$\text{t}_{\text{D(on)}}$	–	7.6	–	ns	$\text{V}_{\text{GS}} = -10\text{V}$ , $\text{V}_{\text{DS}} = -30\text{V}$ , $\text{R}_g = 50\Omega$ , $\text{I}_D = -1\text{A}$
Turn-On Rise Time	$\text{t}_r$	–	11.6	–	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(off)}}$	–	79.8	–	ns	$\text{V}_{\text{GS}} = -10\text{V}$ , $\text{V}_{\text{DS}} = -30\text{V}$ , $\text{R}_g = 50\Omega$ , $\text{I}_D = -1\text{A}$
Turn-Off Fall Time	$\text{t}_f$	–	37.8	–	ns	

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

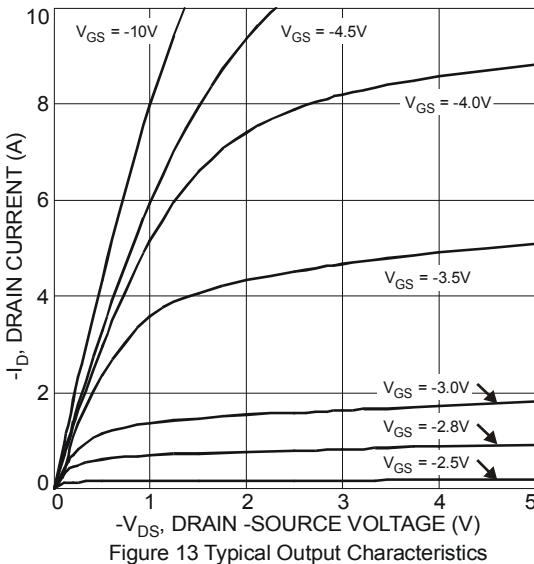


Figure 13 Typical Output Characteristics

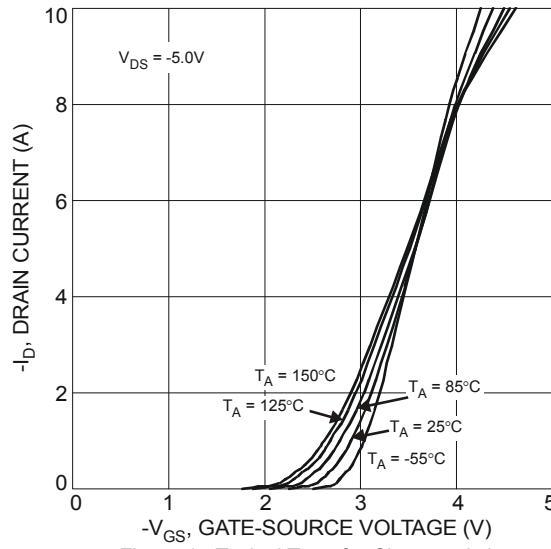


Figure 14 Typical Transfer Characteristics

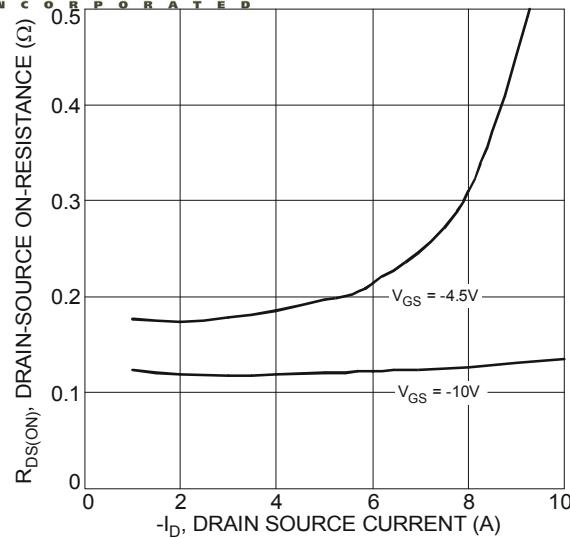


Figure 15 Typical On-Resistance vs.  
Drain Current and Gate Voltage

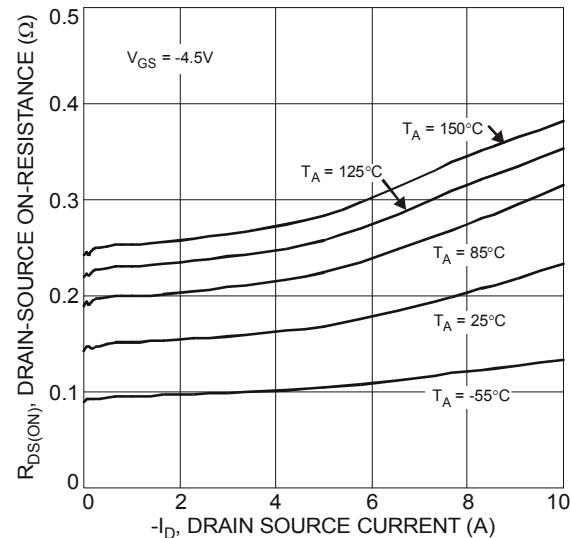


Figure 17 Typical On-Resistance vs.  
Drain Current and Temperature

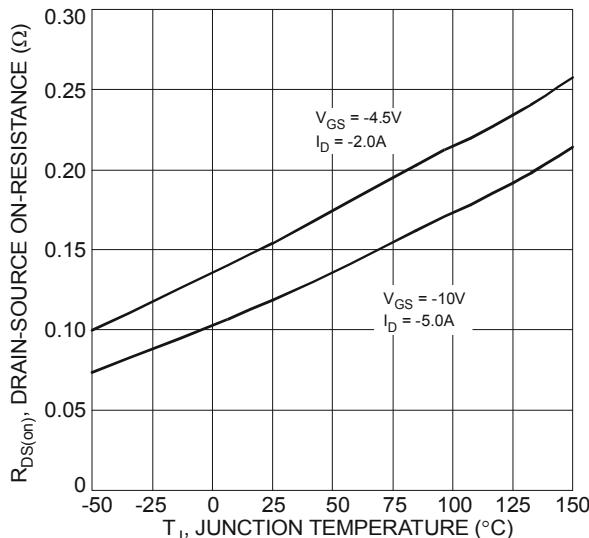


Figure 19 On-Resistance Variation with Temperature

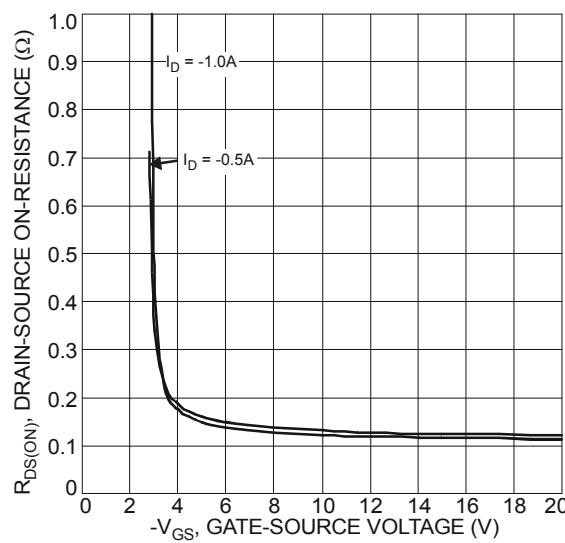


Figure 16 Typical Drain-Source On-Resistance  
vs. Gate-Source Voltage

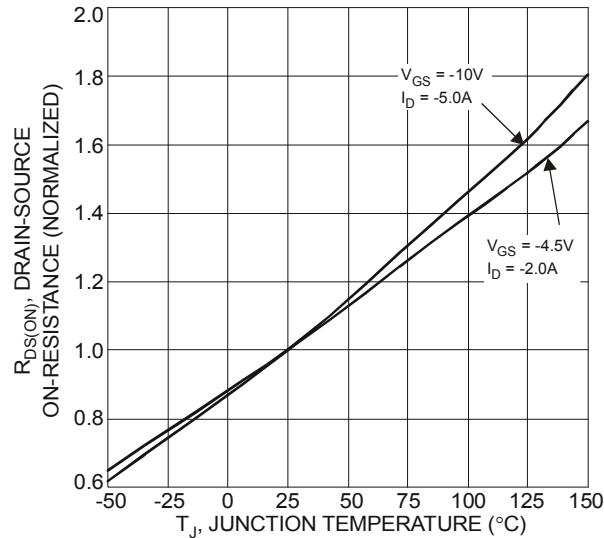


Figure 18 On-Resistance Variation with Temperature

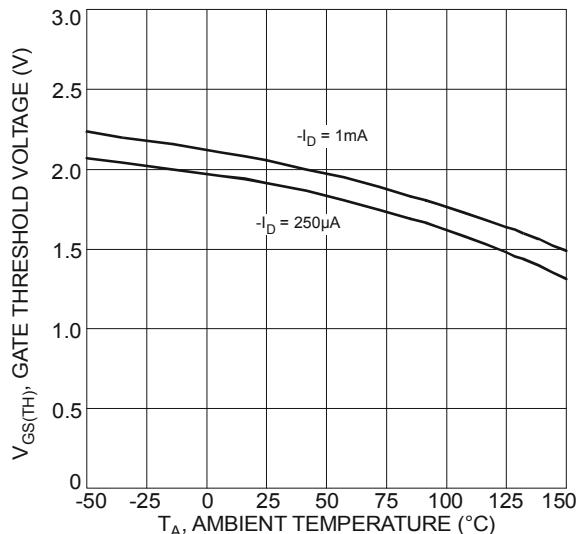


Figure 20 Gate Threshold Variation vs. Ambient Temperature

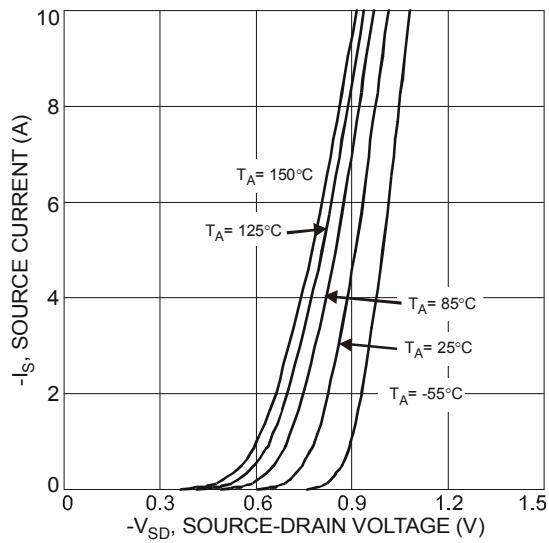


Figure 21 Diode Forward Voltage vs. Current

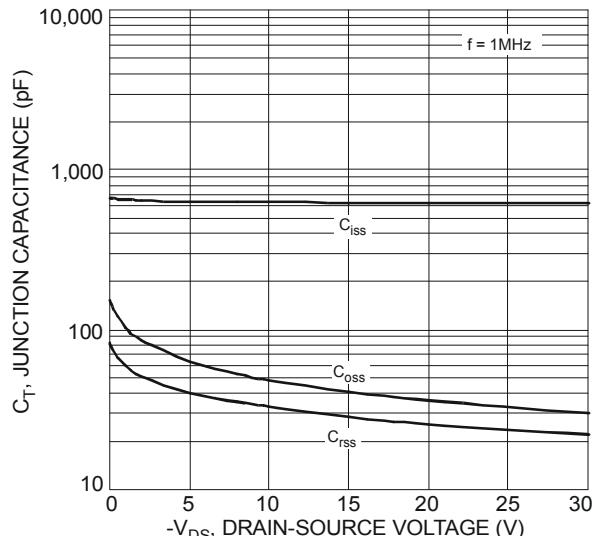


Figure 22 Typical Junction Capacitance

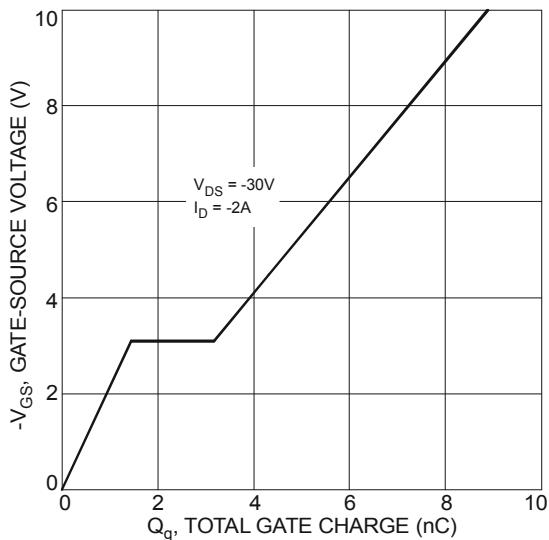
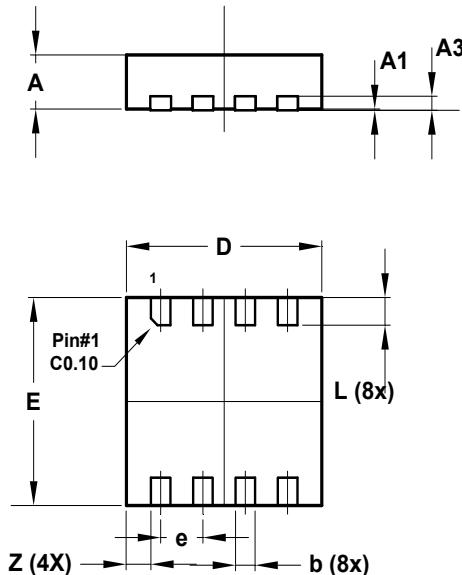


Figure 23 Gate-Charge Characteristics

## Package Outline Dimensions

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

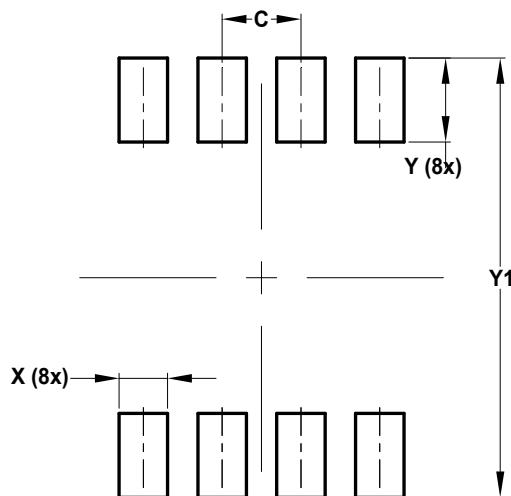


V-DFN3030-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	—	—	0.203
b	0.25	0.35	0.30
D	2.95	3.05	3.00
E	2.95	3.05	3.00
e	—	—	0.65
L	0.55	0.65	0.60
Z	—	—	0.375

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	0.650
X	0.400
Y	0.850
Y1	3.400

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