

## Product Summary

Device	V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>A</sub> = +25°C
Q1	20V	0.45Ω @ V <sub>GS</sub> = 4.5V	1066mA
Q2		0.75Ω @ V <sub>GS</sub> = -4.5V	-845mA

## Description

This new generation MOSFET has been designed to minimize the on-state resistance (R<sub>DS(on)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

- Battery Operated Systems and Solid-State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Power Supply Converter Circuits

## Features and Benefits

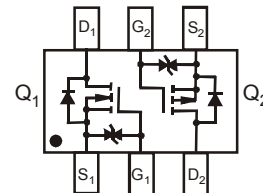
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected Up to 2.5kV
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.006 grams (approximate)



Top View



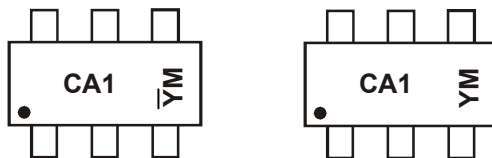
Top View  
Internal Schematic

## Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
DMG1016UDW-7	Standard	SOT363	3000/Tape & Reel
DMG1016UDWQ-7	Automotive	SOT363	3000/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



CA1 = Product Type Marking Code  
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 YM = Date Code Marking for CAT (Chengdu Assembly/ Test site)  
 Y or Ȳ = Year (ex: A = 2013)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Code	V	W	X	Y	Z	A	B	C	D

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	$P_D$	330	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	379	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	$V_{DSS}$	20	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V	
Continuous Drain Current (Note 5)	Steady State	$T_A = +25^\circ\text{C}$	1066	mA
		$T_A = +85^\circ\text{C}$	690	

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	$V_{DSS}$	-20	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V	
Continuous Drain Current (Note 5)	Steady State	$T_A = +25^\circ\text{C}$	-845	mA
		$T_A = +85^\circ\text{C}$	-548	

**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	$BV_{DSS}$	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	100	nA	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 1.0$	$\mu\text{A}$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	0.3	0.45	$\Omega$	$V_{GS} = 4.5V, I_D = 600\text{mA}$
			0.4	0.6		$V_{GS} = 2.5V, I_D = 500\text{mA}$
			0.5	0.75		$V_{GS} = 1.8V, I_D = 350\text{mA}$
						$V_{GS} = 1.8V, I_D = 350\text{mA}$
Forward Transfer Admittance	$ Y_{fs} $	—	1.4	—	S	$V_{DS} = 10V, I_D = 400\text{mA}$
Diode Forward Voltage (Note 6)	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0V, I_S = 150\text{mA}$
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	$C_{iss}$	—	60.67	—	pF	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	9.68	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	5.37	—	pF	
Total Gate Charge (4.5V)	$Q_g$	—	736.6	—	nC	$V_{GS} = 4.5V, V_{DS} = 10V,$ $I_D = 250\text{mA}$
Gate-Source Charge	$Q_{gs}$	—	93.6	—	nC	
Gate-Drain Charge	$Q_{gd}$	—	116.6	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	5.1	—	ns	$V_{DD} = 10V, V_{GS} = 4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$
Turn-On Rise Time	$t_r$	—	7.4	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	26.7	—	ns	
Turn-Off Fall Time	$t_f$	—	12.3	—	ns	

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

**N-CHANNEL - Q1**

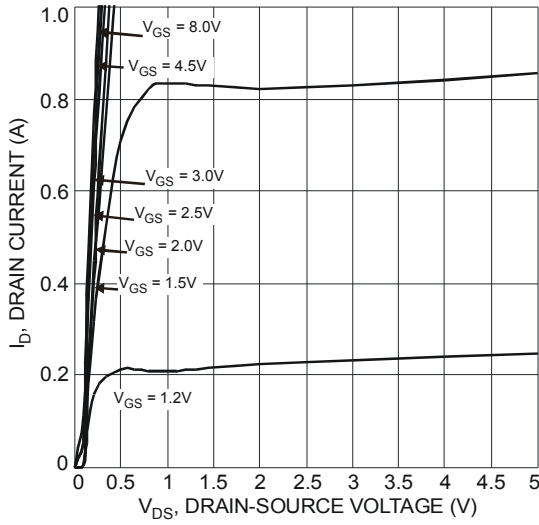


Fig. 1 Typical Output Characteristic

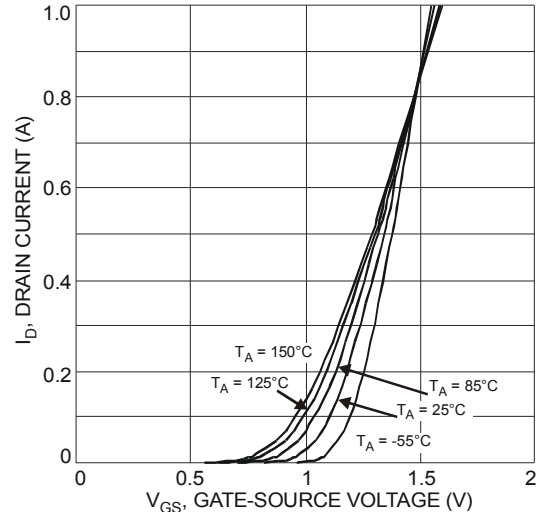


Fig. 2 Typical Transfer Characteristic

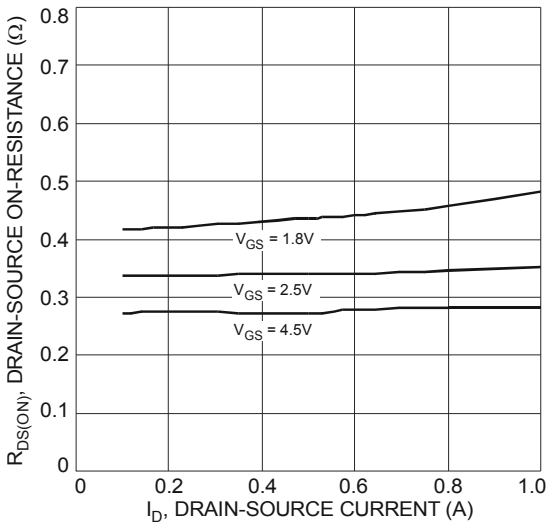


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

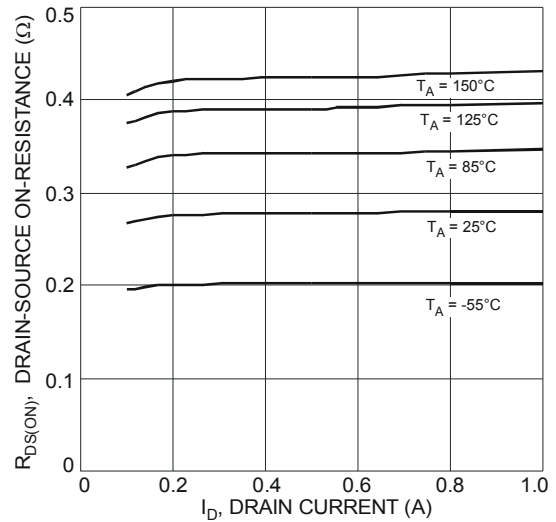


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

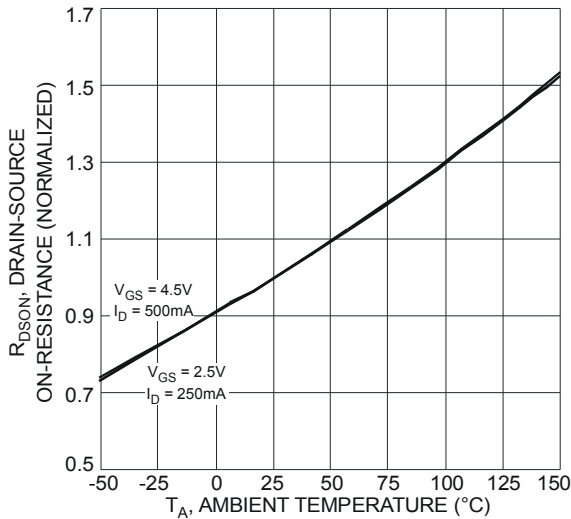


Fig. 5 On-Resistance Variation with Temperature

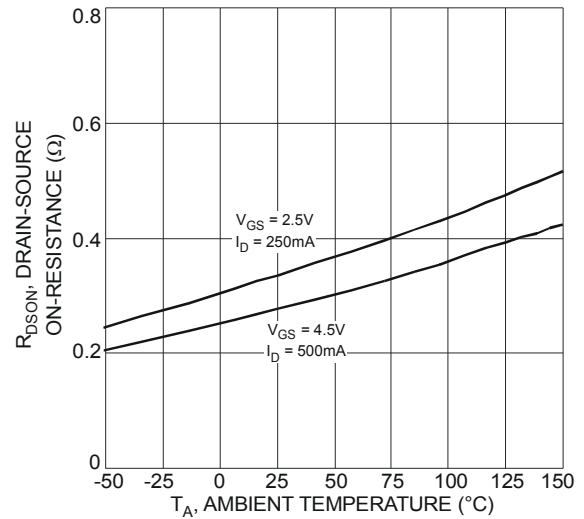


Fig. 6 On-Resistance Variation with Temperature

**N-CHANNEL – Q1 (cont.)**

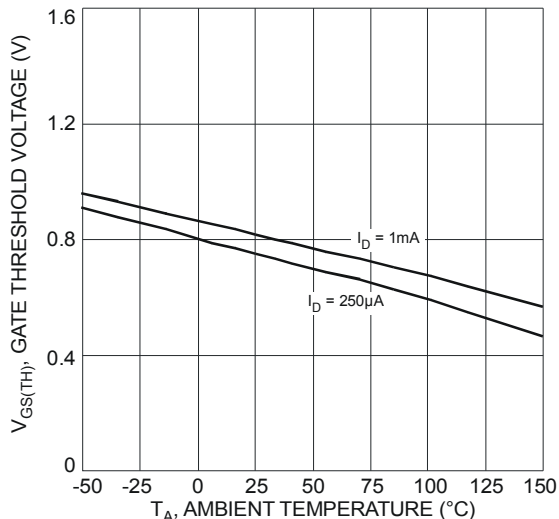


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

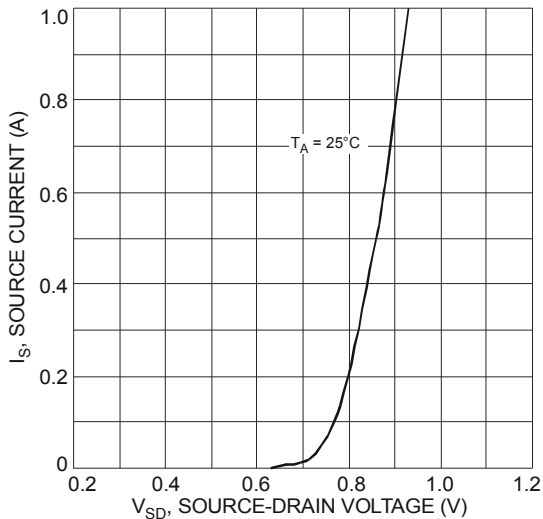


Fig. 8 Diode Forward Voltage vs. Current

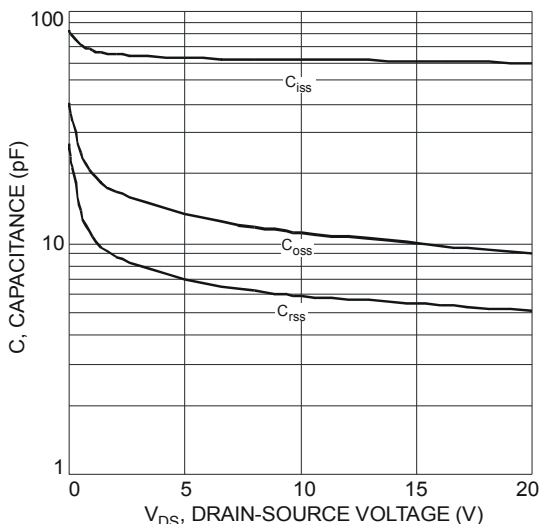


Fig. 9 Typical Total Capacitance

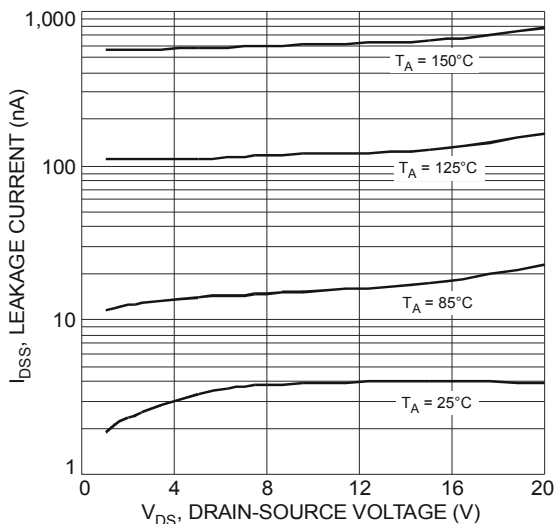


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

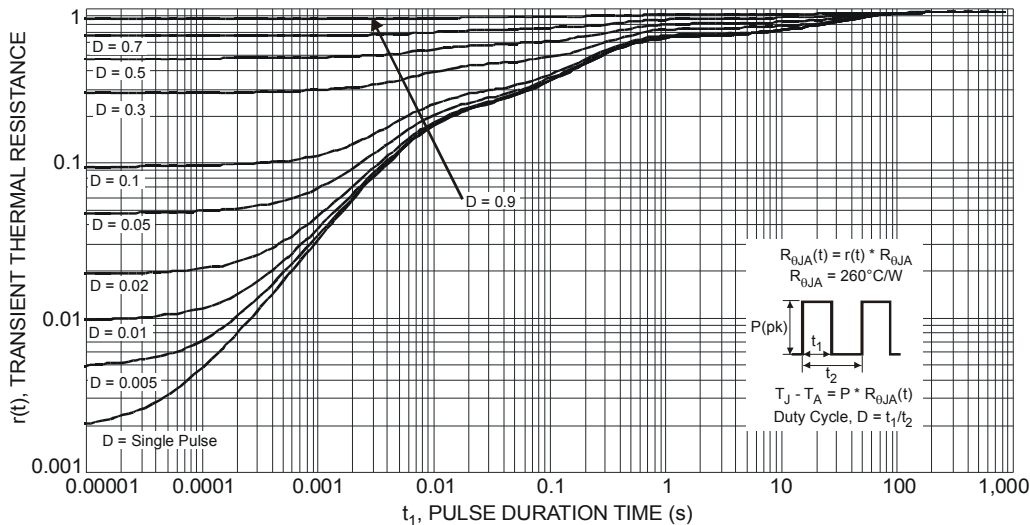


Fig. 11 Transient Thermal Response

**Electrical Characteristics P-CHANNEL – Q2** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-100	nA	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±2.0	μA	V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.5	—	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	0.5	0.75	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -430mA
			0.7	1.05		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -300mA
			1.0	1.5		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -150mA
Forward Transfer Admittance	Y <sub>fs</sub>	—	0.9	—	S	V <sub>DS</sub> = -10V, I <sub>D</sub> = -250mA
Diode Forward Voltage (Note 6)	V <sub>SD</sub>	—	-0.8	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -150mA
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	C <sub>iss</sub>	—	59.76	—	pF	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	12.07	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	6.36	—	pF	
Total Gate Charge (4.5V)	Q <sub>g</sub>	—	622.4	—	pC	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V, I <sub>D</sub> = -250mA
Gate-Source Charge	Q <sub>gs</sub>	—	100.3	—	pC	
Gate-Drain Charge	Q <sub>gd</sub>	—	132.2	—	pC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.1	—	ns	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 10Ω, R <sub>L</sub> = 47Ω
Turn-On Rise Time	t <sub>r</sub>	—	8.1	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	28.4	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	20.72	—	ns	

Notes: 6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to production testing

**P-CHANNEL – Q2**

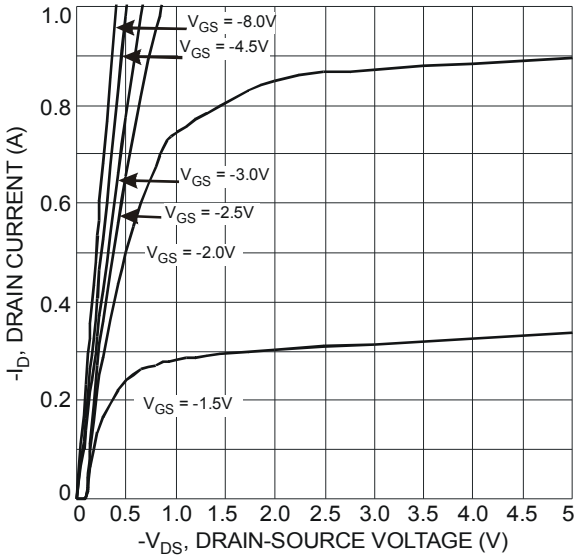


Fig. 12 Typical Output Characteristic

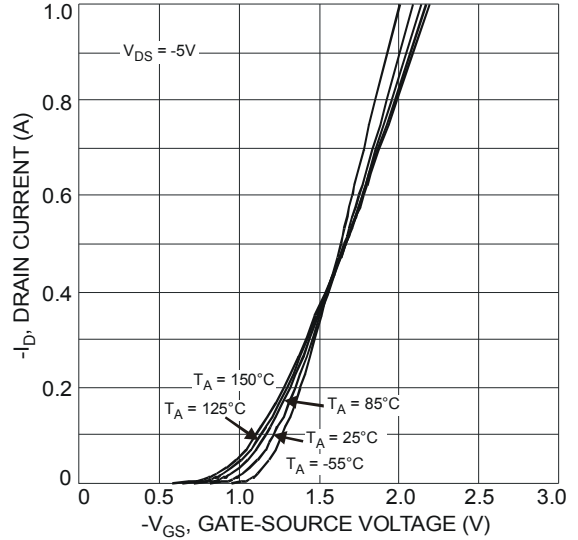


Fig. 13 Typical Transfer Characteristic

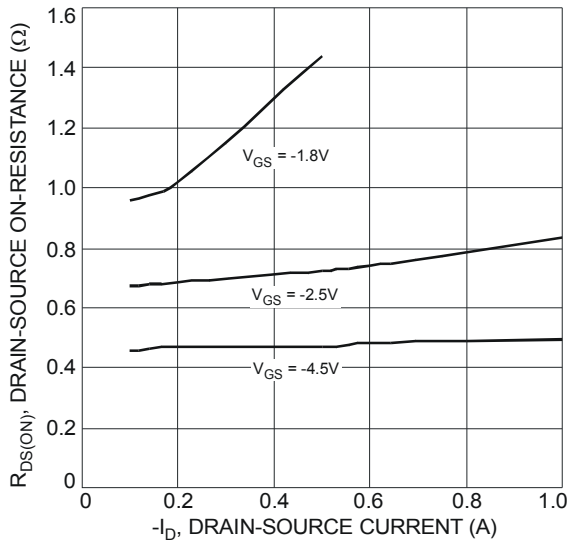


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

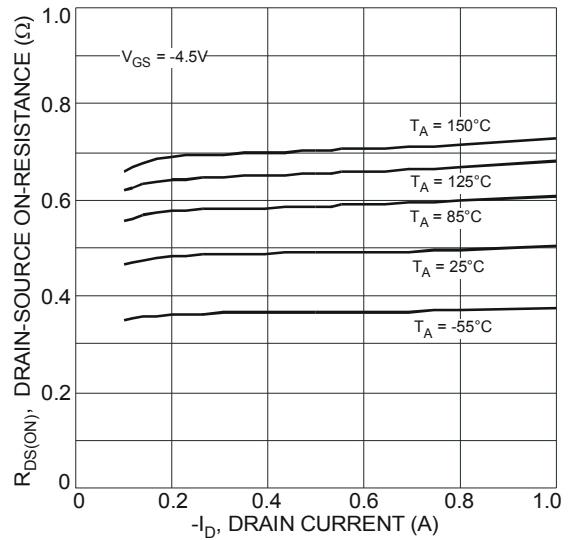


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

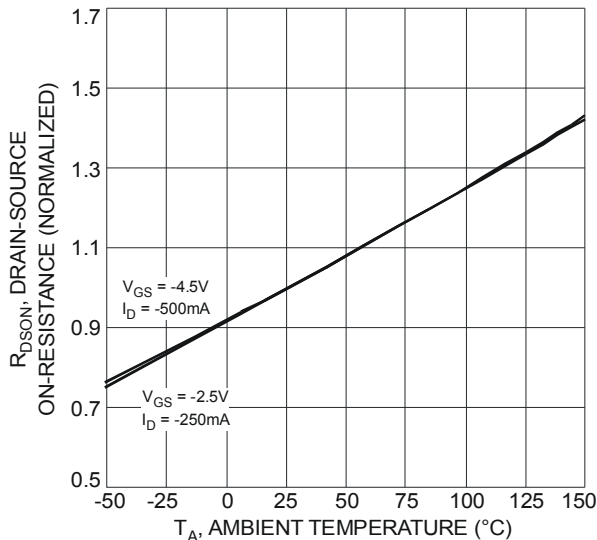


Fig. 16 On-Resistance Variation with Temperature

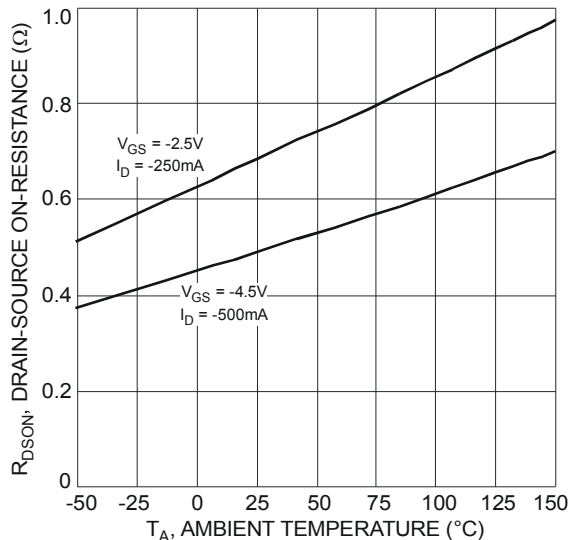


Fig. 17 On-Resistance Variation with Temperature

**P-CHANNEL – Q2 (cont.)**

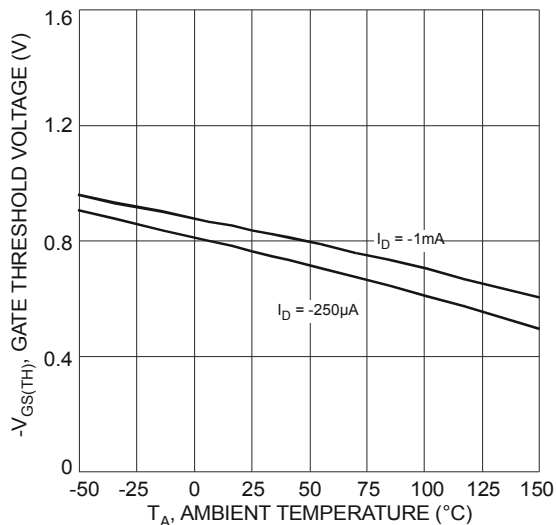


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

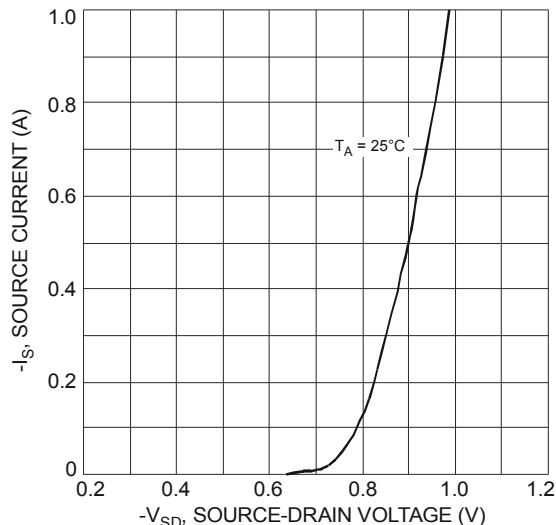


Fig. 19 Diode Forward Voltage vs. Current

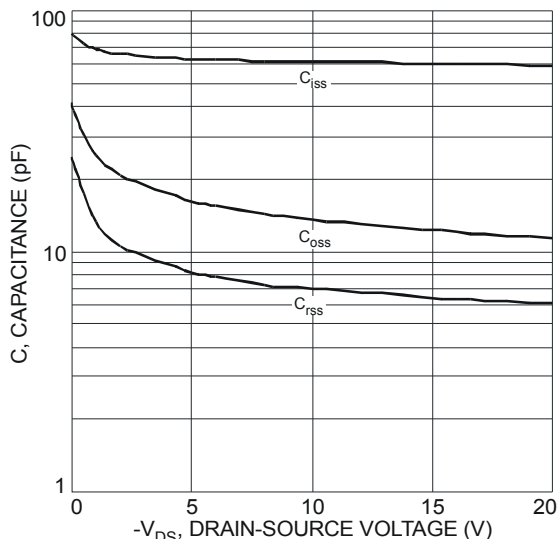


Fig. 20 Typical Total Capacitance

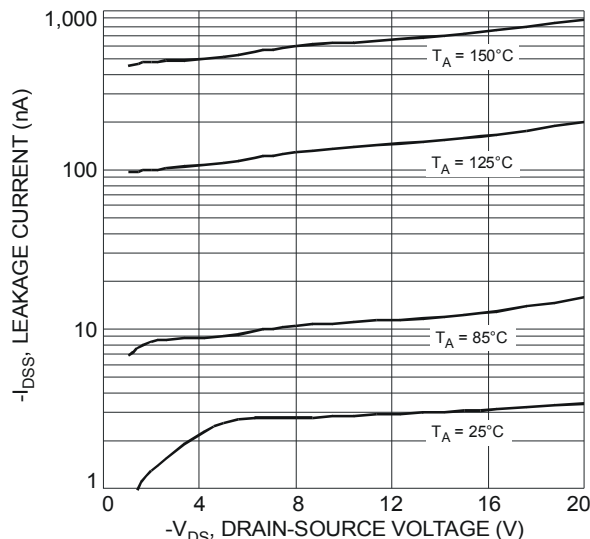


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

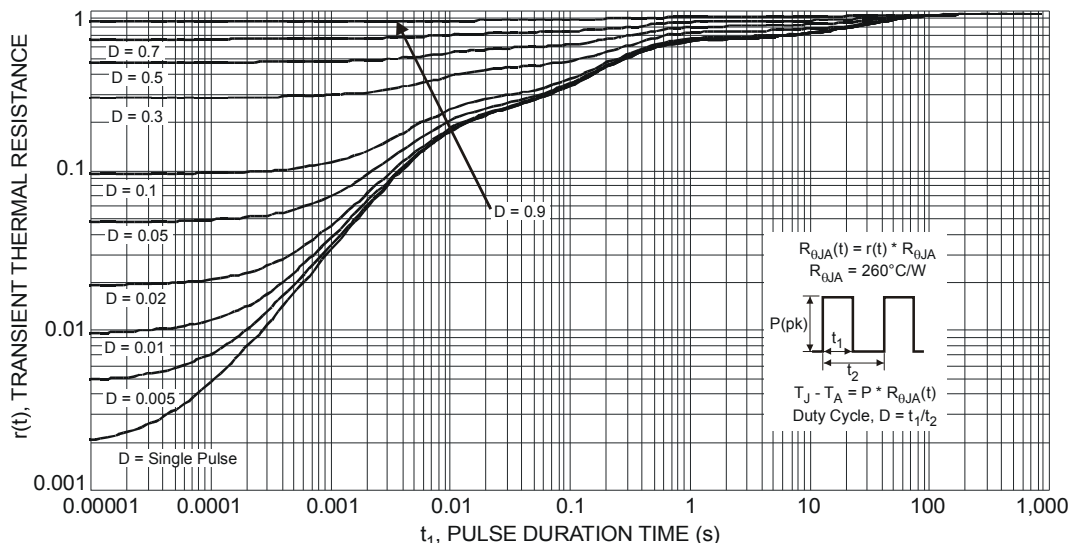
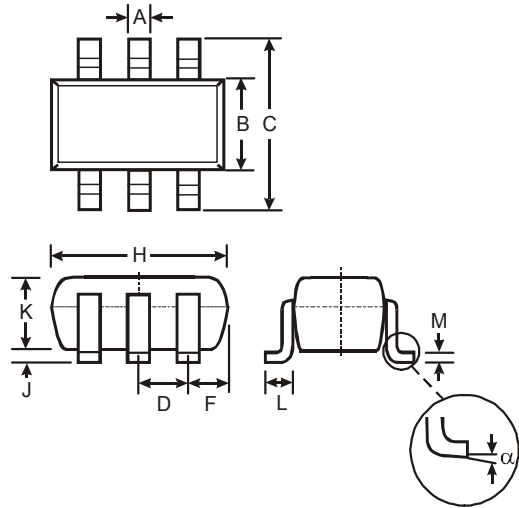


Fig. 22 Transient Thermal Response

**Package Outline Dimensions**

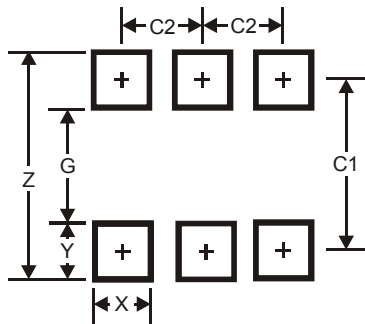
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
<b>All Dimensions in mm</b>		

**Suggested Pad Layout**

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



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65



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