Lead-free Green

DMG1016UDW

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D T_A = +25°C
Q1	20V	0.45Ω @ V_{GS} = 4.5V	1066mA
Q2		0.75Ω @ V_{GS} = -4.5V	-845mA

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

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

Features and Benefits

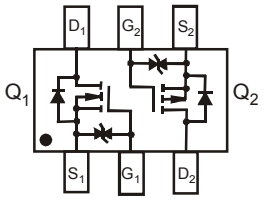
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected Up to 2.5kV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony 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 e3
- Terminal Connections: See Diagram
- Weight: 0.006 grams (approximate)


ESD PROTECTED


Top View



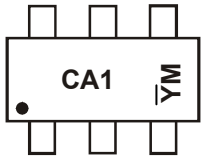
Top View
Internal Schematic

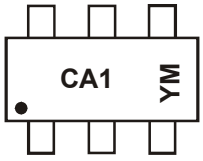
Ordering Information (Note 4)

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

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
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





CA1 = Product Type Marking Code
YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)
$\overline{Y}$M = Date Code Marking for CAT (Chengdu Assembly/ Test site)
Y or $\overline{Y}$ = 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°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	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Maximum Ratings N-CHANNEL – Q1 (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±6	V
Continuous Drain Current (Note 5)	Steady State	T_A = +25°C T_A = +85°C	I_D	1066 690	mA

Maximum Ratings P-CHANNEL – Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±6	V
Continuous Drain Current (Note 5)	Steady State	T_A = +25°C T_A = +85°C	I_D	-845 -548	mA

Electrical Characteristics N-CHANNEL – Q1 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	—	—	100	nA	V_{DS} =20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±1.0	µA	V_{GS} = ±4.5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.3	0.45	Ω	V_{GS} = 4.5V, I_D = 600mA
			0.4	0.6		V_{GS} = 2.5V, I_D = 500mA
			0.5	0.75		V_{GS} = 1.8V, I_D = 350mA
Forward Transfer Admittance	$\|Y_{fs}\|$	—	1.4	—	S	V_{DS} = 10V, I_D = 400mA
Diode Forward Voltage (Note 6)	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 150mA
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	60.67	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
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 = 250mA
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 = 47Ω, R_G = 10Ω,
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: 5. Device mounted on FR-4 PCB with minimum recommended pad layout.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to production testing.

N-CHANNEL – Q1

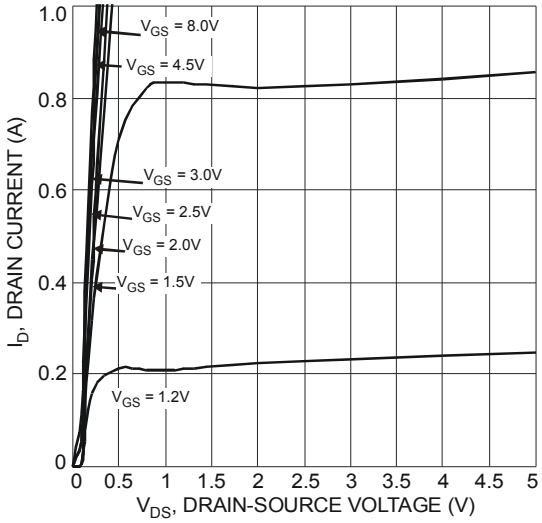


Fig. 1 Typical Output Characteristic

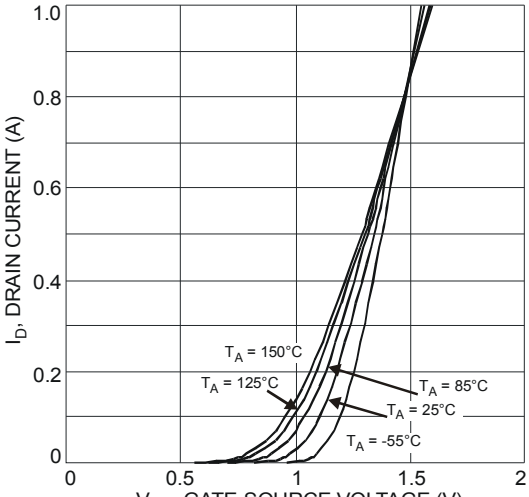


Fig. 2 Typical Transfer Characteristic

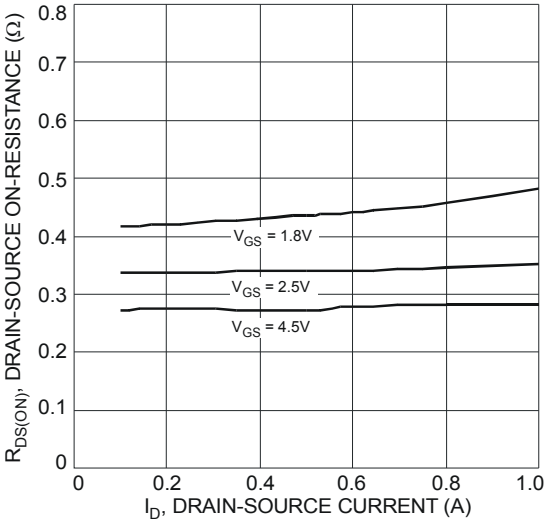


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

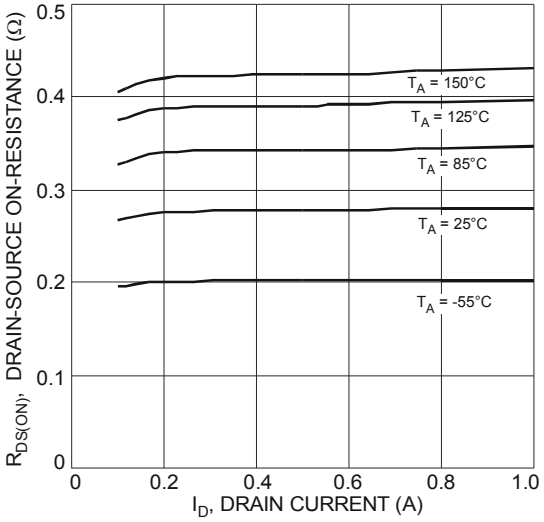


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

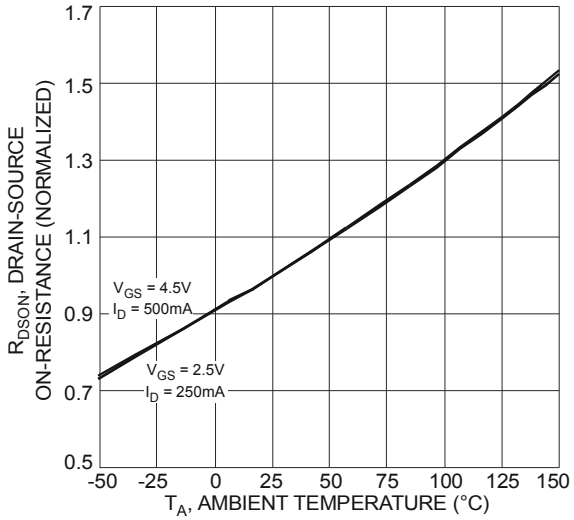


Fig. 5 On-Resistance Variation with Temperature

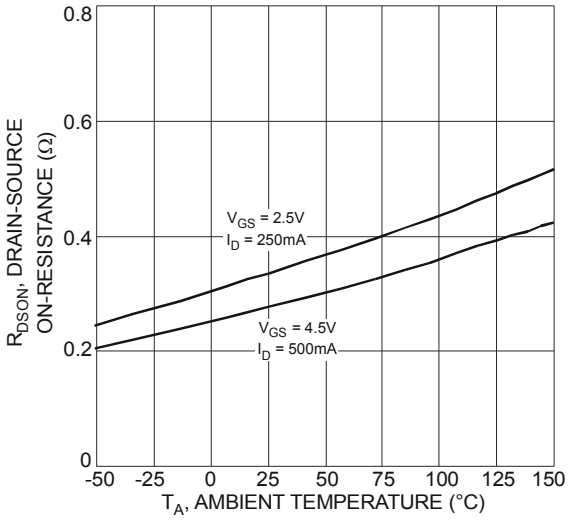


Fig. 6 On-Resistance Variation with Temperature

N-CHANNEL – Q1 (cont.)

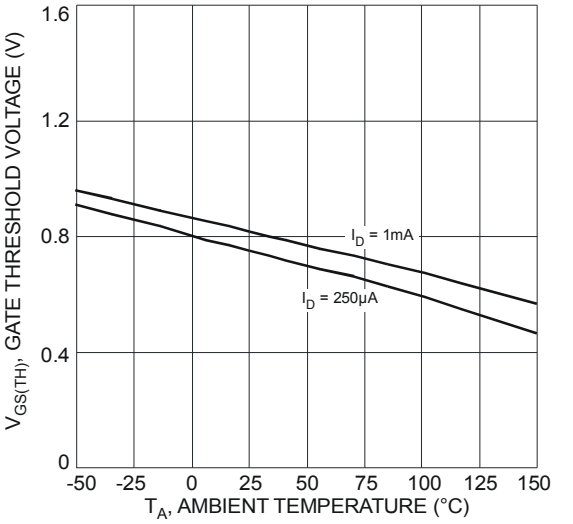


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

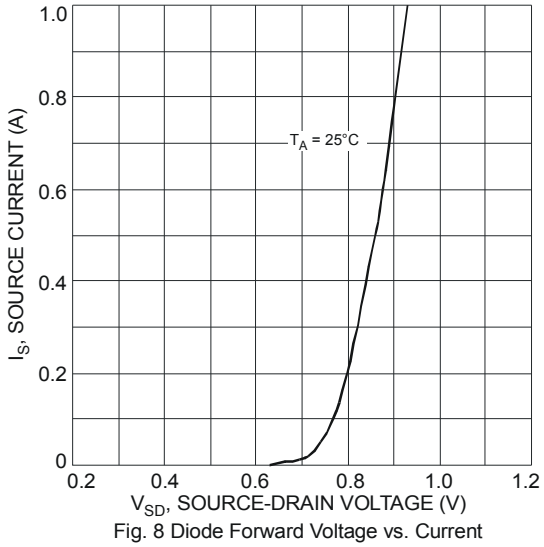


Fig. 8 Diode Forward Voltage vs. Current

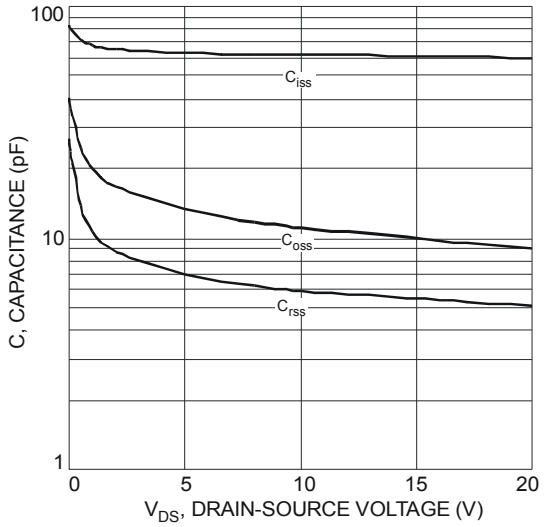


Fig. 9 Typical Total Capacitance

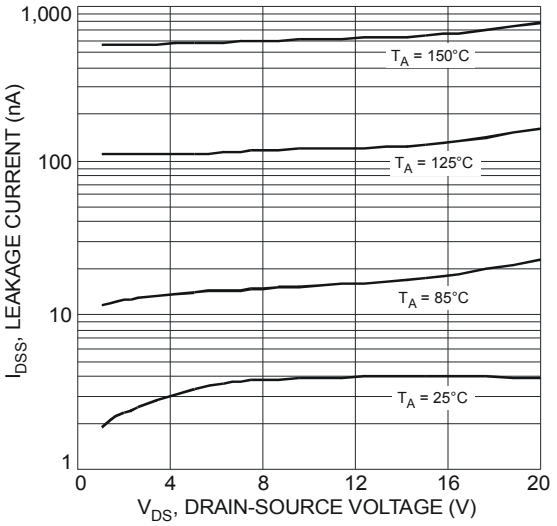


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

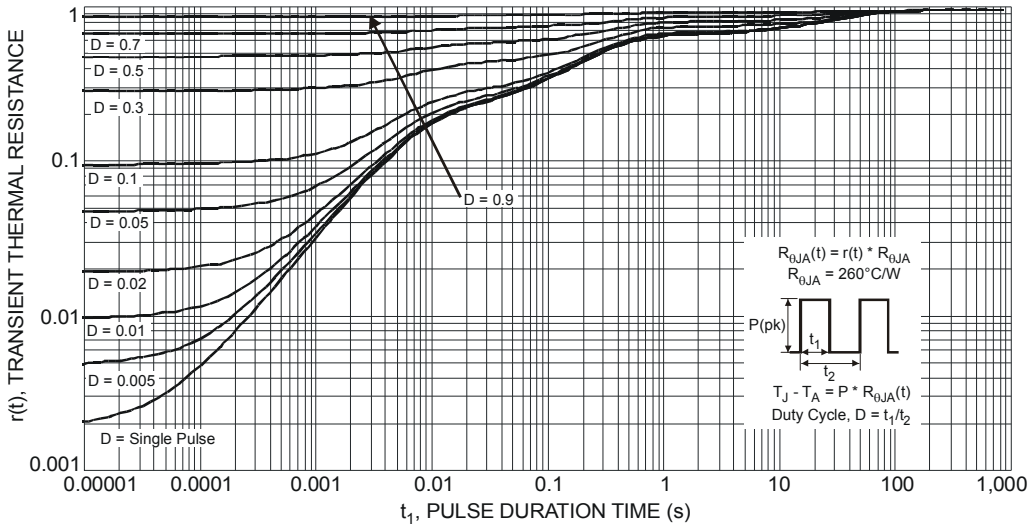


Fig. 11 Transient Thermal Response

Electrical Characteristics P-CHANNEL – Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	V	V_{GS} = 0V, I_D = -250μA
Zero Gate Voltage Drain Current @T_c = +25°C	I_{DSS}	—	—	-100	nA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±2.0	μA	V_{GS} = ±4.5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.5	—	-1.0	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	—	0.5	0.75	Ω	V_{GS} = -4.5V, I_D = -430mA
			0.7	1.05		V_{GS} = -2.5V, I_D = -300mA
			1.0	1.5		V_{GS} = -1.8V, I_D = -150mA
Forward Transfer Admittance	$\|Y_{fs}\|$	—	0.9	—	S	V_{DS} = -10V, I_D = -250mA
Diode Forward Voltage (Note 6)	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -150mA
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	59.76	—	pF	V_{DS} = -16V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	12.07	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	6.36	—	pF	
Total Gate Charge (4.5V)	Q_g	—	622.4	—	pC	V_{GS} = -4.5V, V_{DS} = -10V, I_D = -250mA
Gate-Source Charge	Q_{gs}	—	100.3	—	pC	
Gate-Drain Charge	Q_{gd}	—	132.2	—	pC	
Turn-On Delay Time	$t_{D(on)}$	—	5.1	—	ns	V_{DS} = -10V, V_{GS} = -4.5V, R_G = 10Ω, R_L = 47Ω
Turn-On Rise Time	t_r	—	8.1	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	28.4	—	ns	
Turn-Off Fall Time	t_f	—	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

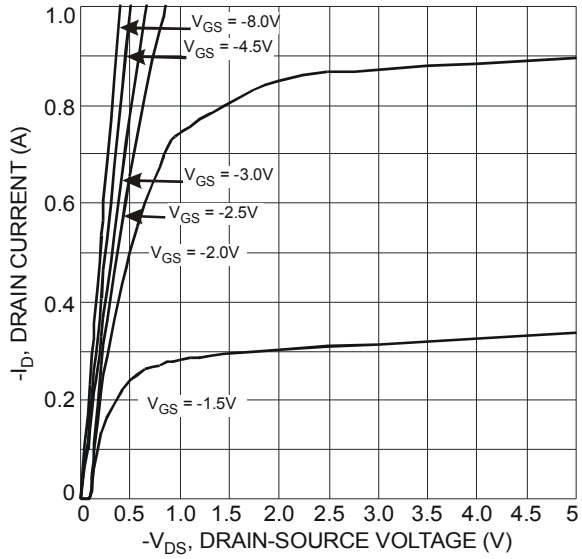


Fig. 12 Typical Output Characteristic

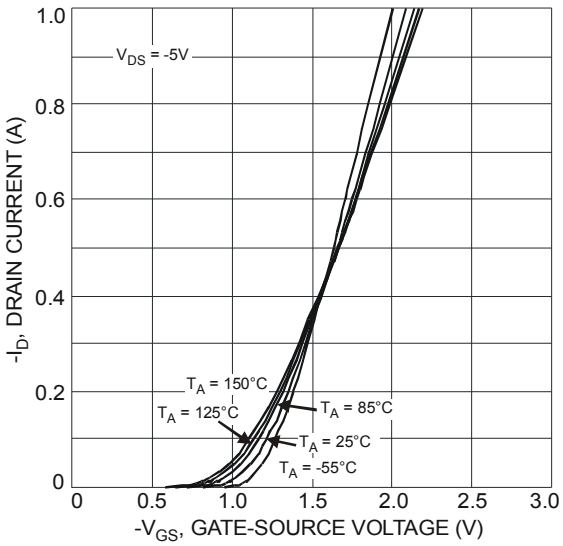


Fig. 13 Typical Transfer Characteristic

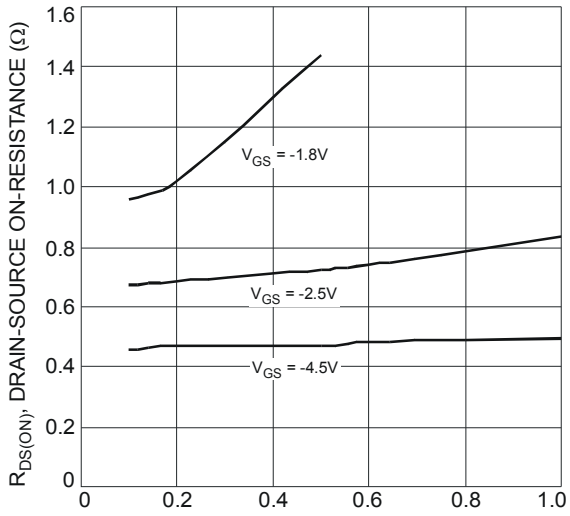


Fig. 14 Typical On-Resistance
vs. Drain Current and Gate Voltage

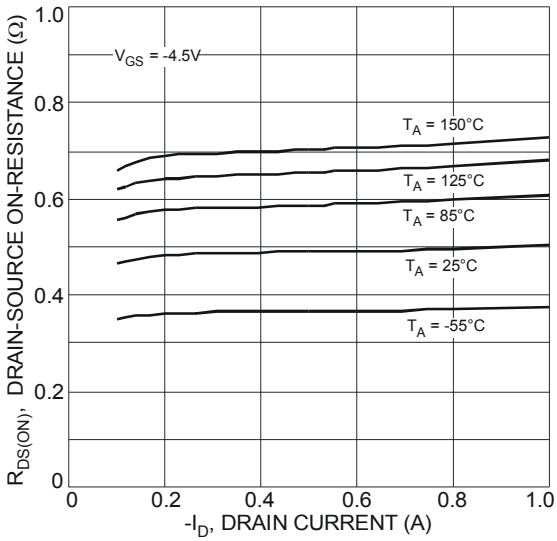


Fig. 15 Typical On-Resistance
vs. Drain Current and Temperature

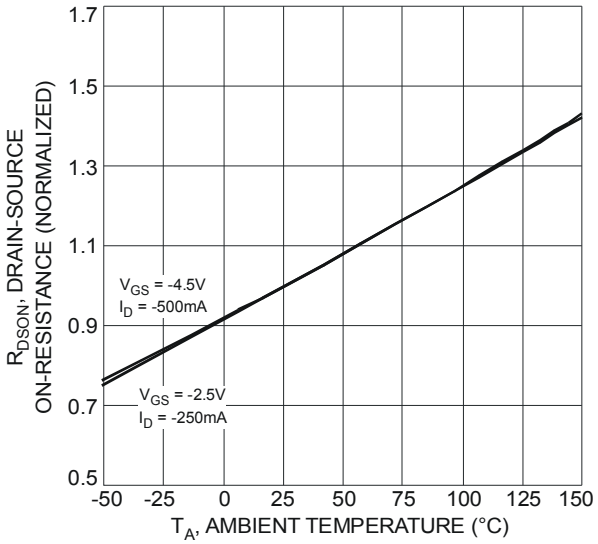


Fig. 16 On-Resistance Variation with Temperature

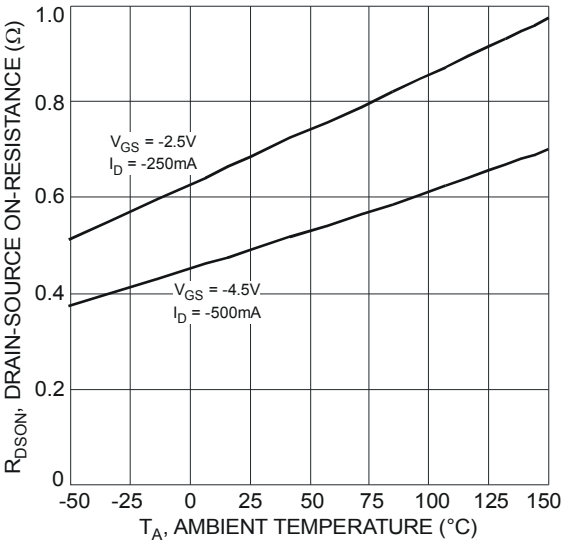


Fig. 17 On-Resistance Variation with Temperature

P-CHANNEL – Q2 (cont.)

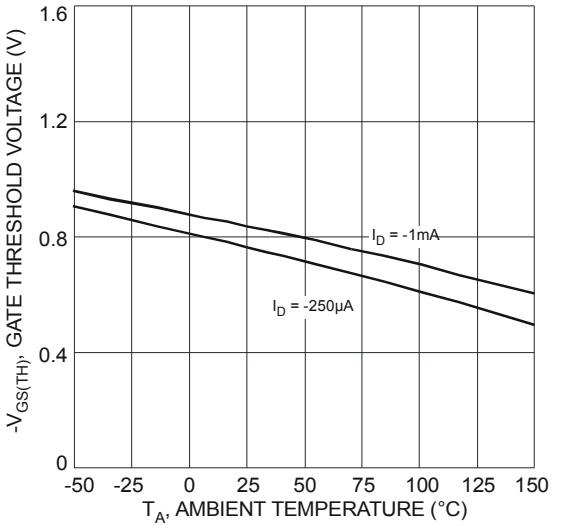


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

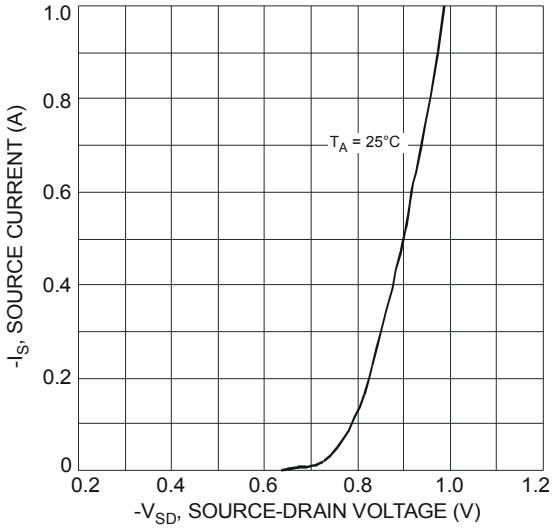


Fig. 19 Diode Forward Voltage vs. Current

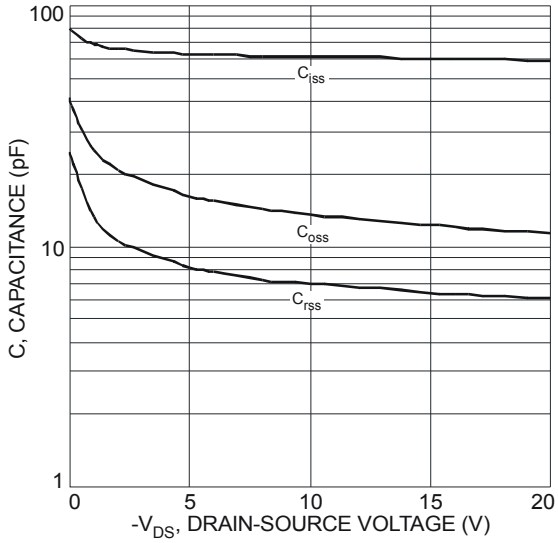


Fig. 20 Typical Total Capacitance

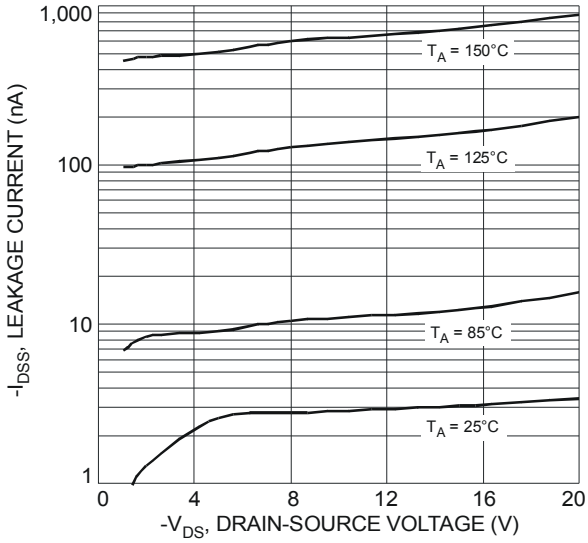


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

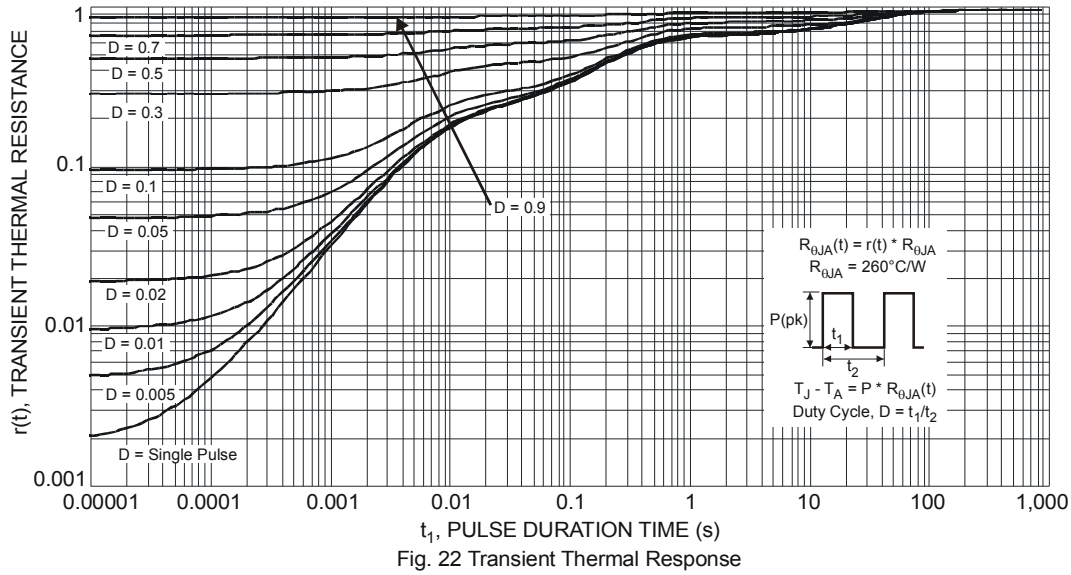
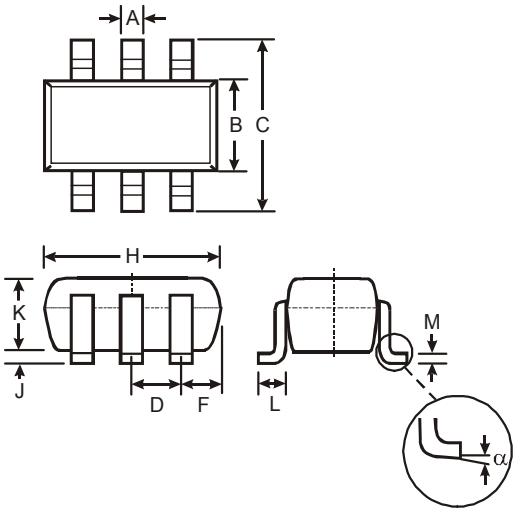


Fig. 22 Transient Thermal Response

Package Outline Dimensions

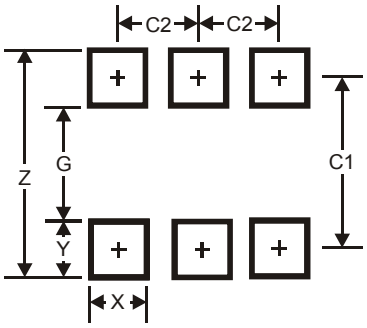
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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°
All Dimensions in mm		

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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1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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