

## Product Summary

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> max T <sub>A</sub> = +25°C
Q1	20V	0.4Ω @ V <sub>GS</sub> = 4.5V	870mA
		0.5Ω @ V <sub>GS</sub> = 2.5V	780mA
		0.7Ω @ V <sub>GS</sub> = 1.8V	640mA
Q2	-20V	0.7Ω @ V <sub>GS</sub> = -4.5V	-640mA
		0.9Ω @ V <sub>GS</sub> = -2.5V	-580mA
		1.3Ω @ V <sub>GS</sub> = -1.8V	-465mA

## Features

- Low On-Resistance
- Low Gate Threshold Voltage V<sub>GS(th)</sub> <1V
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMG1016VQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Description and Applications

This MOSFET is designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

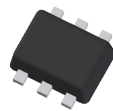
- Switches

## Mechanical Data

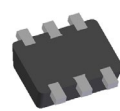
- Case: SOT-563
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 Ⓜ3
- Weight: 0.006 grams (Approximate)



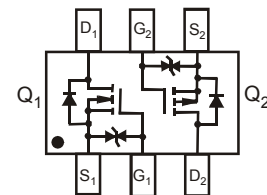
SOT-563



Top View



Bottom View



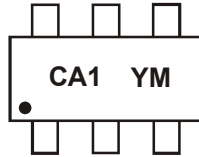
Top View  
Internal Schematic

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMG1016VQ-7	SOT-563	3,000/Tape & Reel
DMG1016VQ-13	SOT-563	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



CA1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: 1 = 2021)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2009	.....	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	W	.....	I	J	K	L	M	N	O	P	R	S
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

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

Characteristic	Symbol	Value	Unit
Drain Source Voltage	$V_{DSS}$	20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V
Drain Current (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	870
		$T_A = +85^\circ\text{C}$	630

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

Characteristic	Symbol	Value	Unit
Drain Source Voltage	$V_{DSS}$	-20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V
Drain Current (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	-640
		$T_A = +85^\circ\text{C}$	-460

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	530	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	235	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

Notes: 5. Device mounted on FR-4 PCB.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 6)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	100	nA	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 1.0$	$\mu A$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	0.3	0.4	$\Omega$	$V_{GS} = 4.5V, I_D = 600mA$
		—	0.4	0.5		$V_{GS} = 2.5V, I_D = 500mA$
		—	0.5	0.7		$V_{GS} = 1.8V, I_D = 350mA$
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	$V_{GS} = 0V, I_S = 150mA$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{iss}$	—	60.67	—	pF	$V_{DS} = 16V, V_{GS} = 0V$ $f = 1.0MHz$
Output Capacitance	$C_{oss}$	—	9.68	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	5.37	—	pF	
Total Gate Charge	$Q_g$	—	736.6	—	pC	$V_{GS} = 4.5V, V_{DS} = 10V,$ $I_D = 250mA$
Gate-Source Charge	$Q_{gs}$	—	93.6	—		
Gate-Drain Charge	$Q_{gd}$	—	116.6	—		
Turn-On Delay Time	$t_{d(on)}$	—	5.1	—	nS	$V_{DD} = 10V, V_{GS} = 4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$ $I_D = 200mA$
Turn-On Rise Time	$t_r$	—	7.4	—		
Turn-Off Delay Time	$t_{d(off)}$	—	26.7	—		
Turn-Off Fall Time	$t_f$	—	12.3	—		

**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> (Note 6)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-20	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-100	nA	$V_{DS} = -20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 2.0$	$\mu A$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.5	—	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	0.5	0.7	$\Omega$	$V_{GS} = -4.5V, I_D = -430mA$
		—	0.7	0.9		$V_{GS} = -2.5V, I_D = -300mA$
		—	1.0	1.3		$V_{GS} = -1.8V, I_D = -150mA$
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	$V_{GS} = 0V, I_S = -150mA$
<b>DYNAMIC CHARACTERISTICS</b>						
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	$Q_g$	—	622.4	—	pC	$V_{GS} = -4.5V, V_{DS} = -10V,$ $I_D = -250mA$
Gate-Source Charge	$Q_{gs}$	—	100.3	—		
Gate-Drain Charge	$Q_{gd}$	—	132.2	—		
Turn-On Delay Time	$t_{d(on)}$	—	5.1	—	nS	$V_{DD} = -10V, V_{GS} = -4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$ $I_D = -200mA$
Turn-On Rise Time	$t_r$	—	8.1	—		
Turn-Off Delay Time	$t_{d(off)}$	—	28.4	—		
Turn-Off Fall Time	$t_f$	—	20.7	—		

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

**Typical Characteristics (Q1 N-Channel)**

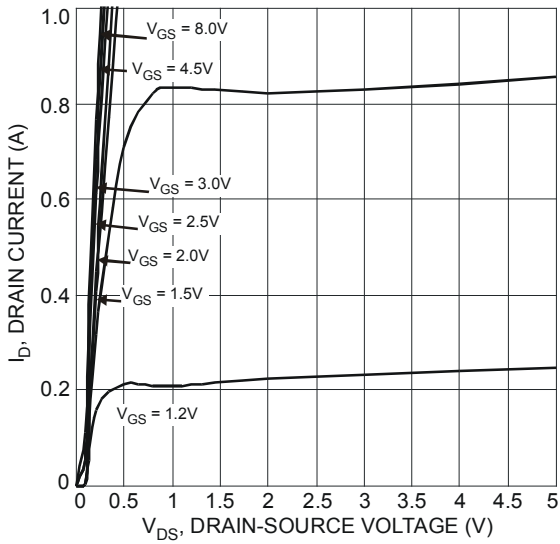


Fig. 1 Typical Output Characteristic

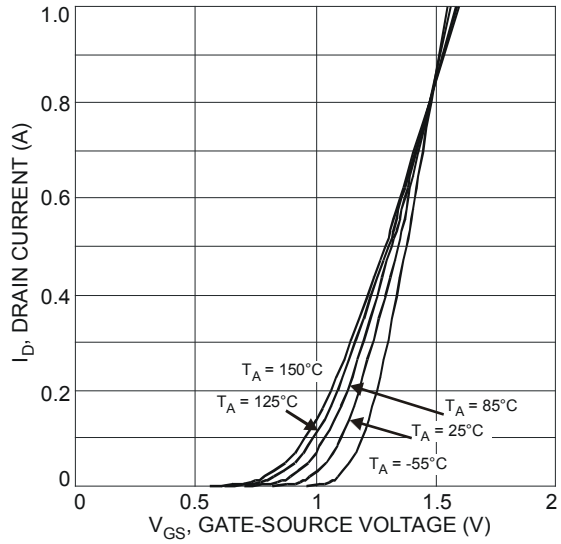


Fig. 2 Typical Transfer Characteristic

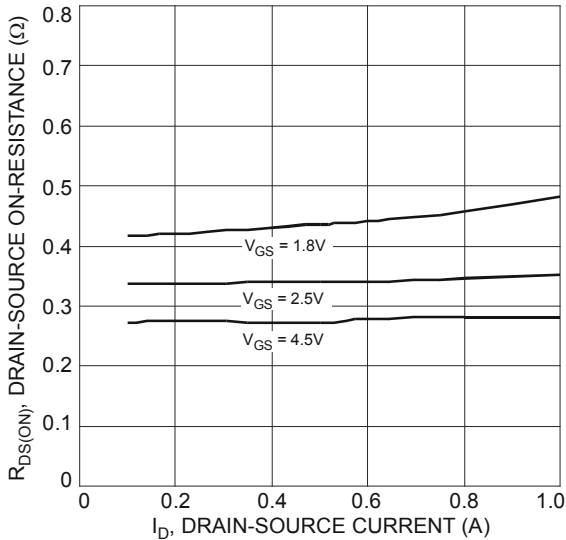


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

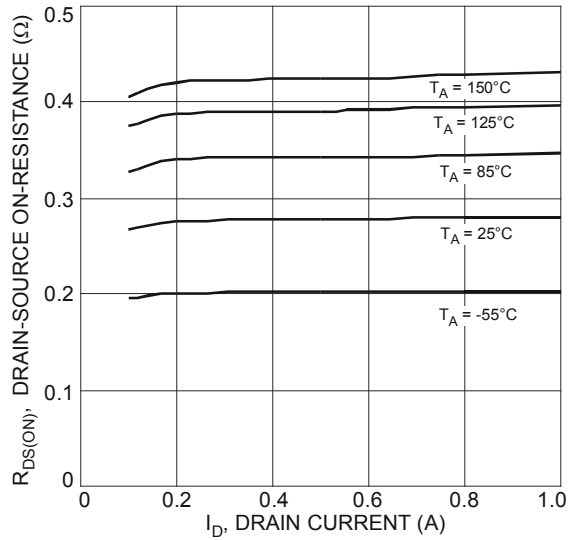


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

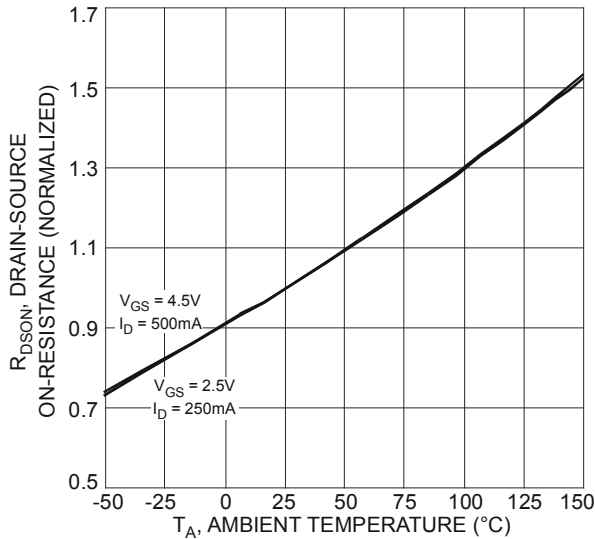


Fig. 5 On-Resistance Variation with Temperature

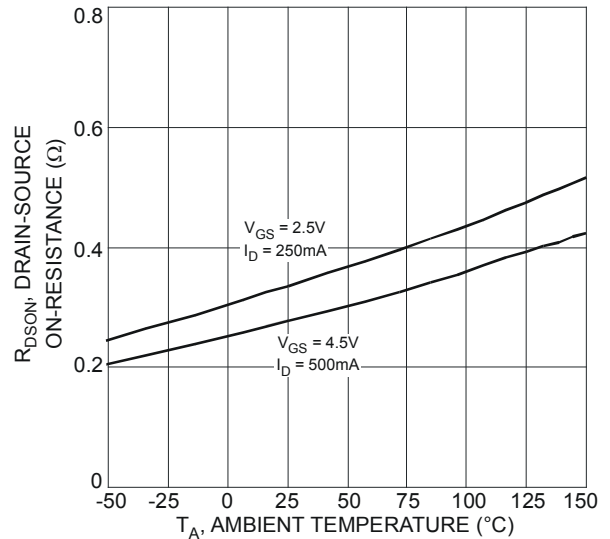


Fig. 6 On-Resistance Variation with Temperature

**Typical Characteristics** (Q1 N-Channel) (continued)

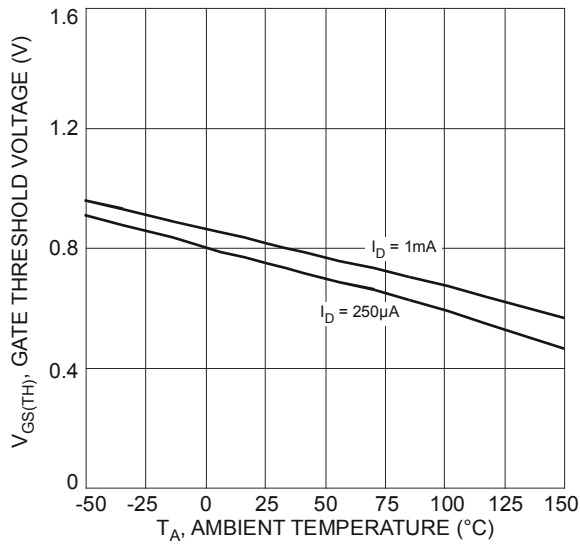


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

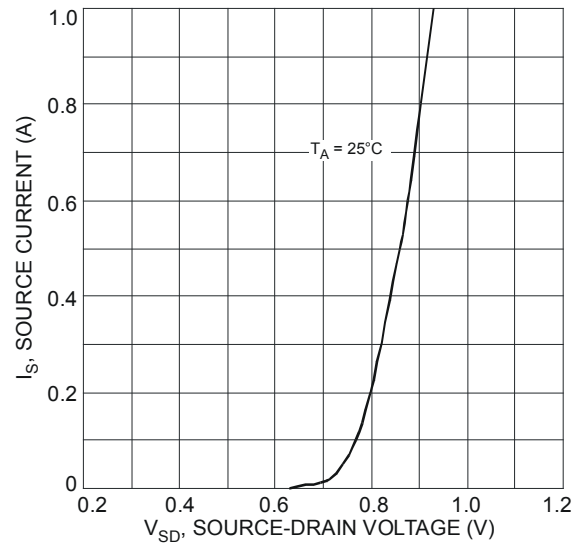


Fig. 8 Diode Forward Voltage vs. Current

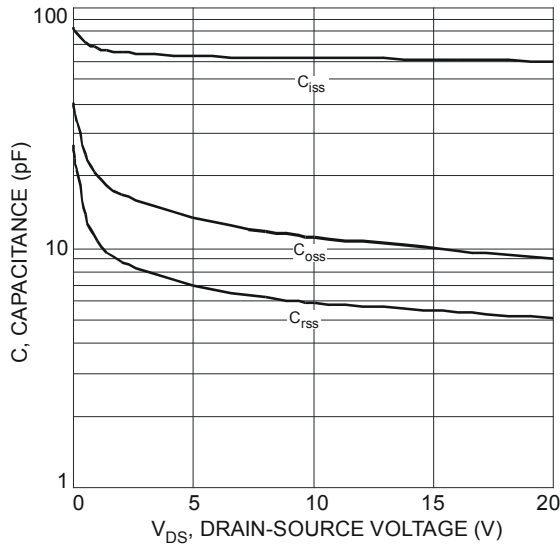


Fig. 9 Typical Total Capacitance

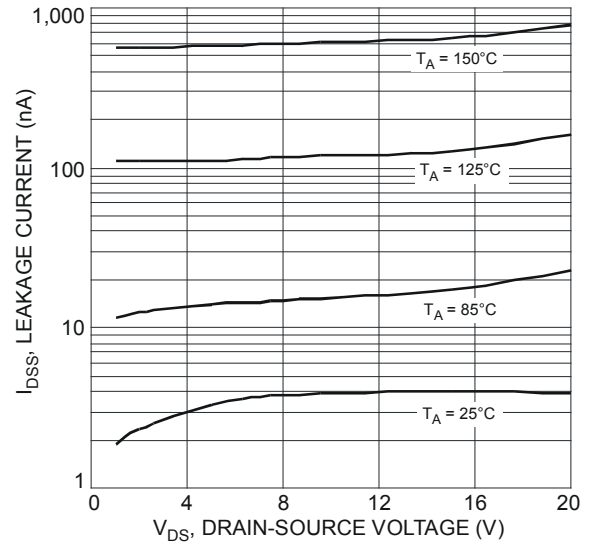


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

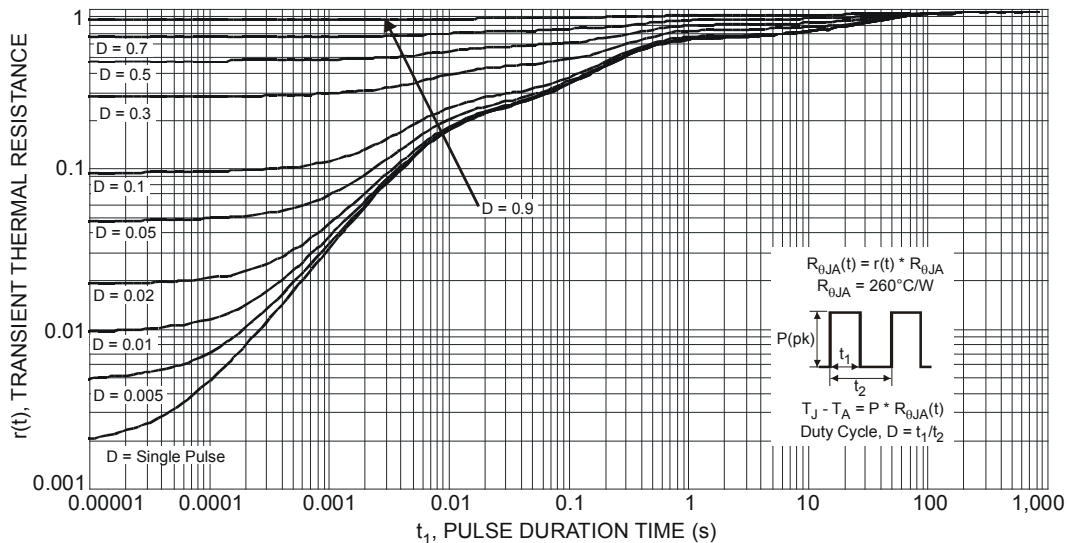


Fig. 11 Transient Thermal Response

**Typical Characteristics (Q2 P-Channel)**

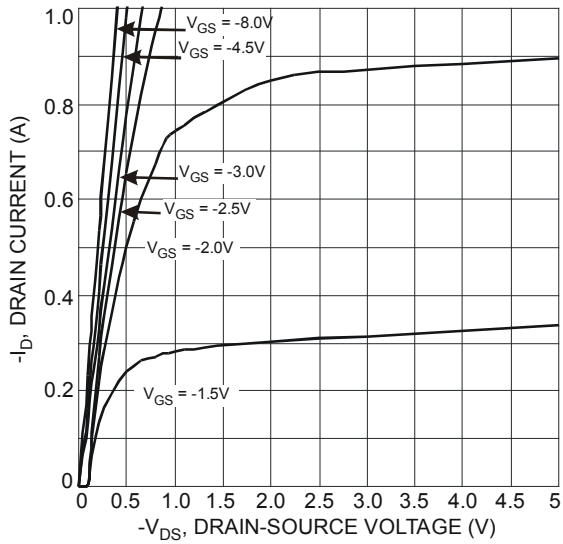


Fig. 12 Typical Output Characteristic

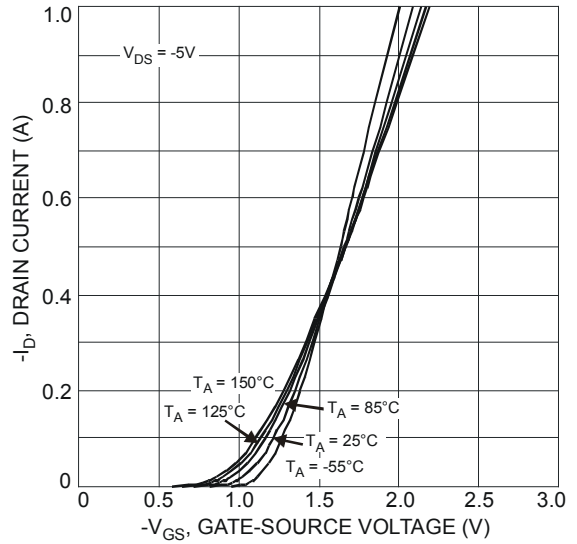


Fig. 13 Typical Transfer Characteristic

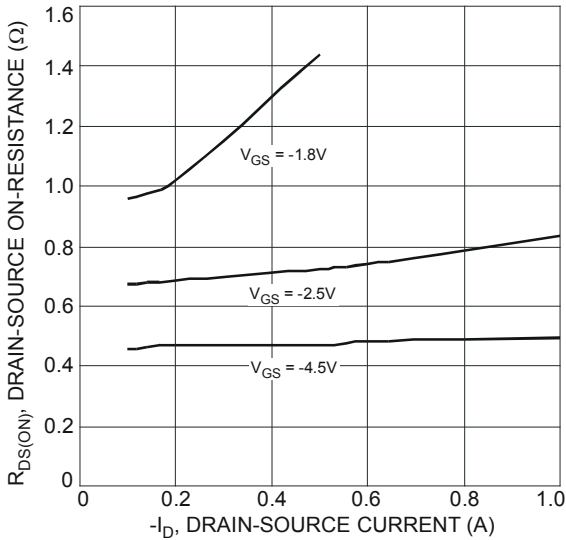


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

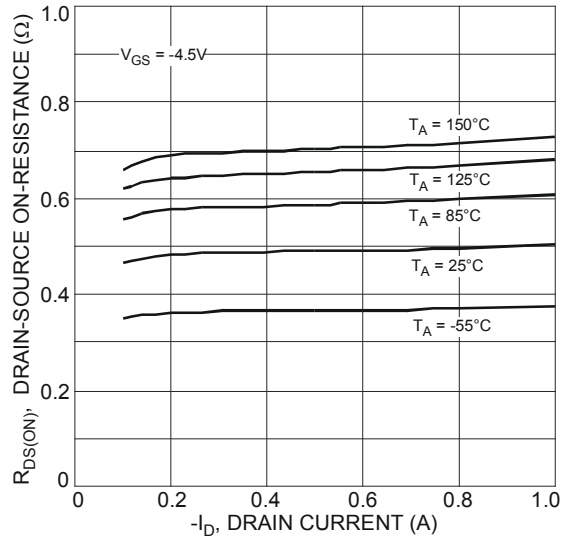


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

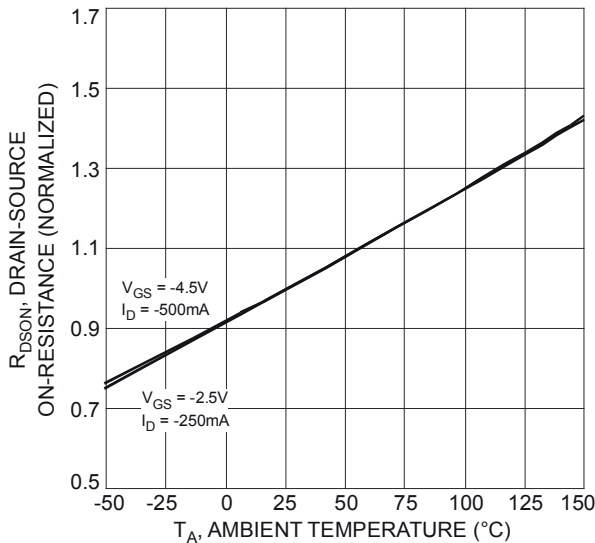


Fig. 16 On-Resistance Variation with Temperature

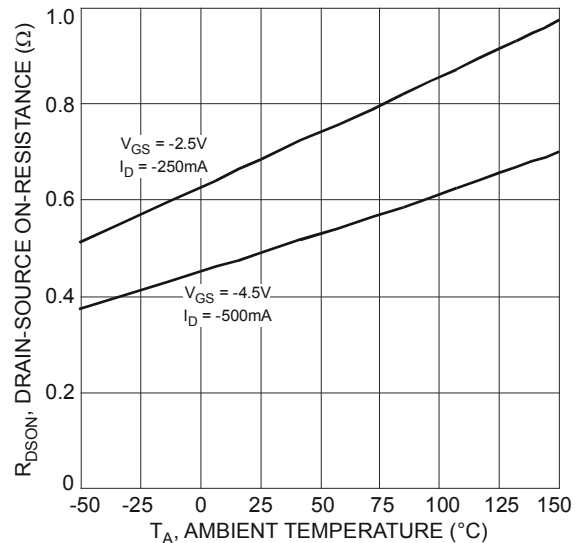


Fig. 17 On-Resistance Variation with Temperature

**Typical Characteristics** (Q2 P-Channel) (continued)

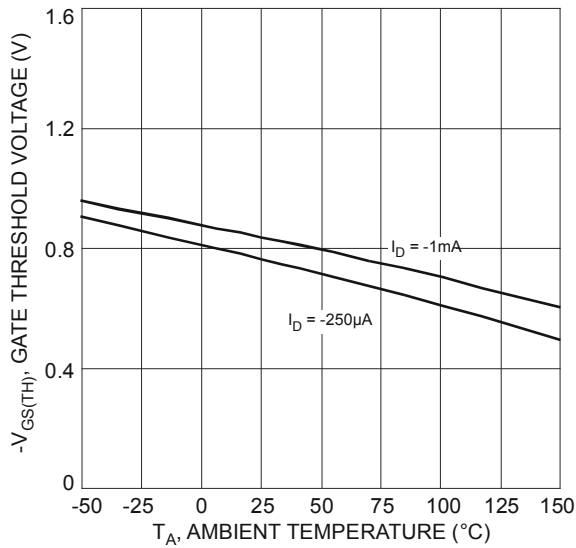


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

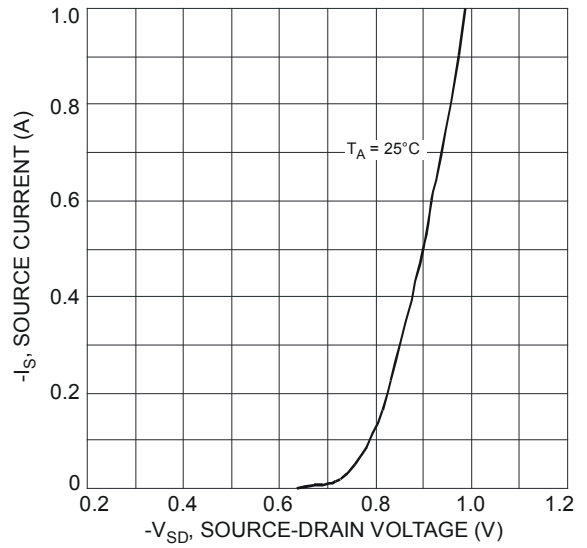


Fig. 19 Diode Forward Voltage vs. Current

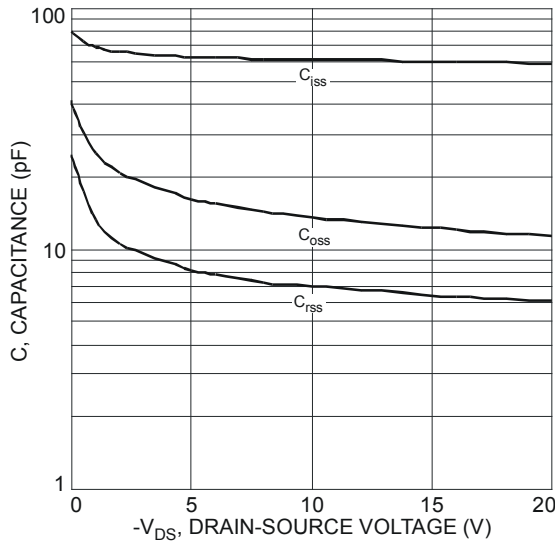


Fig. 20 Typical Total Capacitance

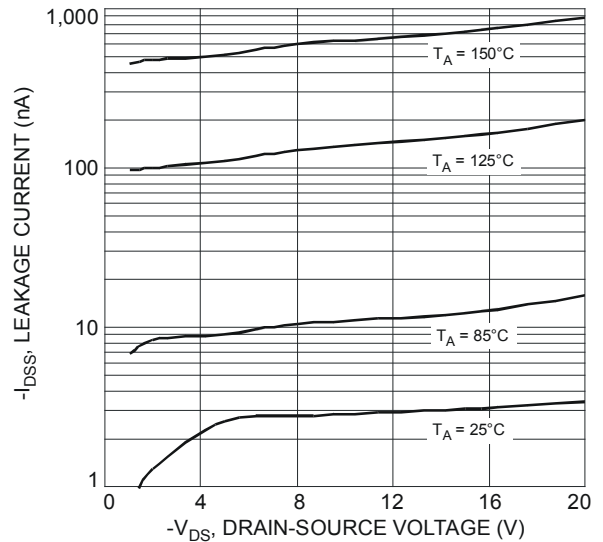


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

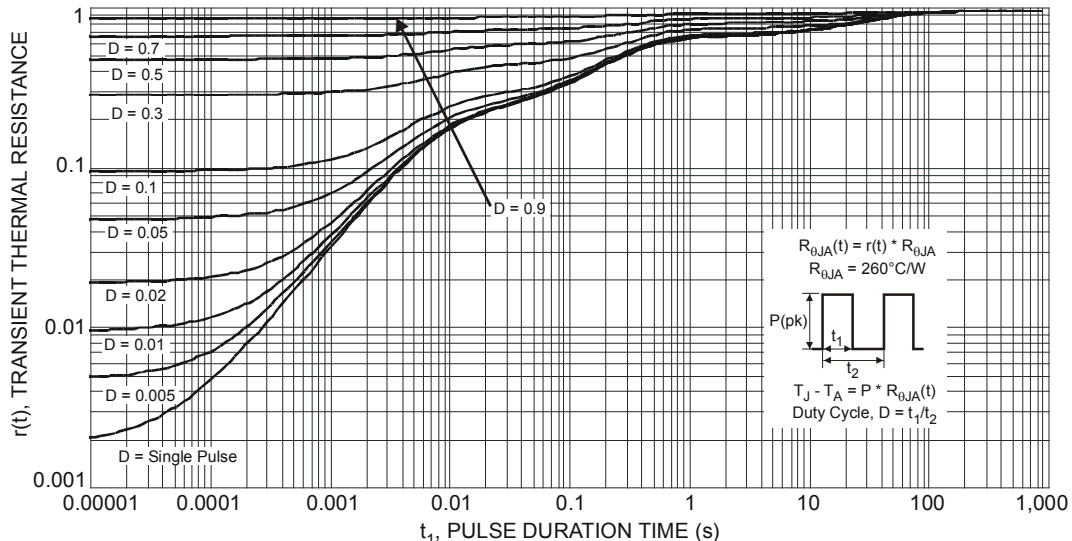
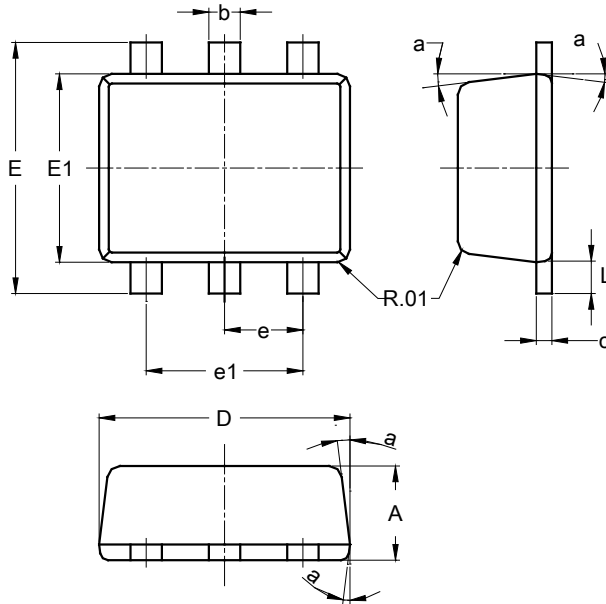


Fig. 22 Transient Thermal Response

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT563**

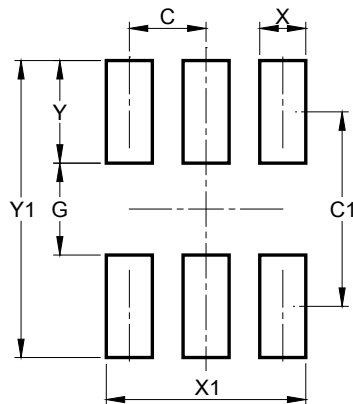


SOT563			
Dim	Min	Max	Typ
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT563**



Dimensions	Value (in mm)
C	0.500
C1	1.270
G	0.600
X	0.300
X1	1.300
Y	0.670
Y1	1.940



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