

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
Q1	20V	0.4Ω @ V _{GS} = 4.5V	870mA
		0.5Ω @ V _{GS} = 2.5V	780mA
		0.7Ω @ V _{GS} = 1.8V	640mA
Q2	-20V	0.7Ω @ V _{GS} = -4.5V	-640mA
		0.9Ω @ V _{GS} = -2.5V	-580mA
		1.3Ω @ V _{GS} = -1.8V	-465mA

Features

- Low On-Resistance
- Low Gate Threshold Voltage V_{GS(TH)} < 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 DIODES™ 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/>

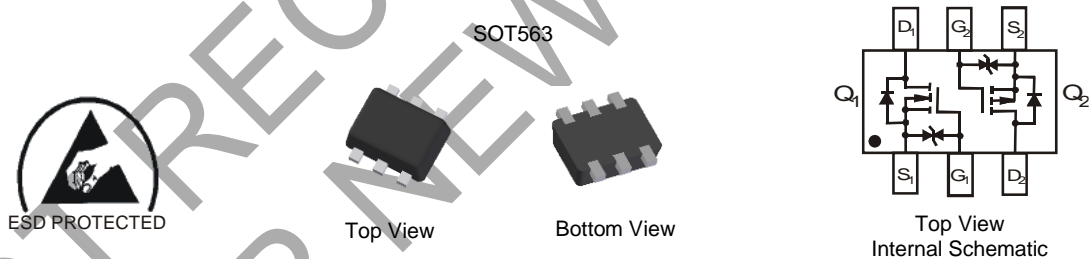
Description and Applications

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

- Switches

Mechanical Data

- Package: SOT563
- Package 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 (E)
- Weight: 0.006 grams (Approximate)

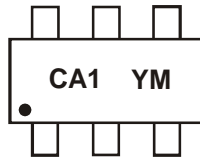


Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMG1016VQ-7	SOT563	3,000	Tape & Reel
DMG1016VQ-13	SOT563	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: J = 2022)
 M = Month (ex: 9 = September)

Date Code Key

Year	2015	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	C	J	K	L	M	N	O	P	R	S	T
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°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain Source Voltage	V _{DSS}	20	V
Gate-Source Voltage	V _{GSS}	±6	V
Drain Current (Note 5)	I _D	870 630	mA
		T _A = +25°C	
		T _A = +85°C	

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

Characteristic	Symbol	Value	Unit
Drain Source Voltage	V _{DSS}	-20	V
Gate-Source Voltage	V _{GSS}	±6	V
Drain Current (Note 5)	I _D	-640 -460	mA
		T _A = +25°C	
		T _A = +85°C	

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	530	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	235	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

Note: 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
OFF CHARACTERISTICS (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}	—	—	± 1.0	μA	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.3	0.4	Ω	$V_{GS} = 4.5V, I_D = 600mA$
		—	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	$V_{GS} = 0V, I_S = 150mA$
DYNAMIC CHARACTERISTICS						
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
OFF CHARACTERISTICS (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}	—	—	± 2.0	μA	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.5	—	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.5	0.7	Ω	$V_{GS} = -4.5V, I_D = -430mA$
		—	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	$V_{GS} = 0V, I_S = -150mA$
DYNAMIC CHARACTERISTICS						
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	—		

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

Typical Characteristics (Q1 N-Channel)

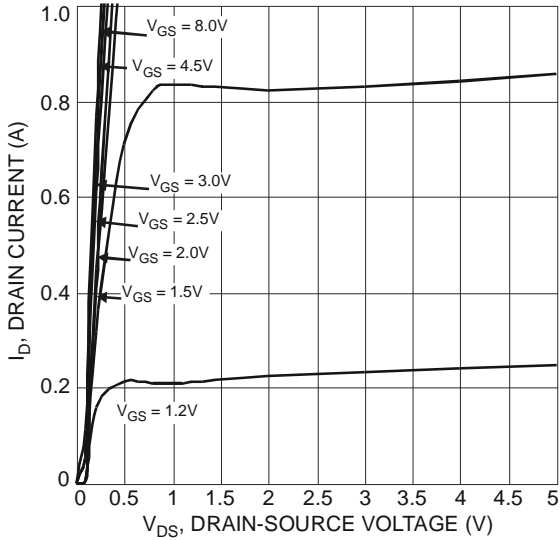


Fig. 1 Typical Output Characteristic

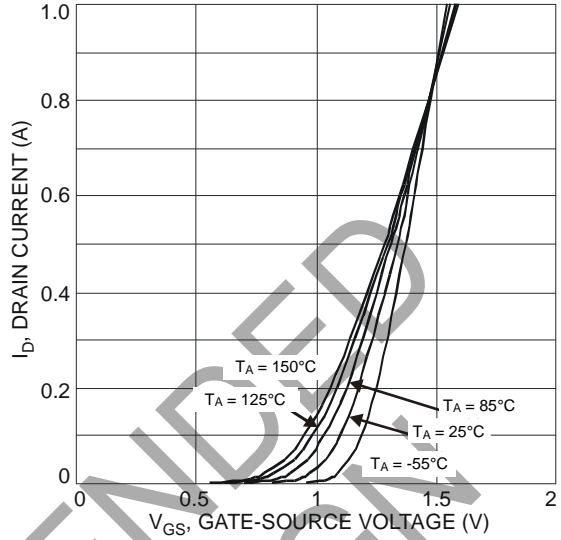


Fig. 2 Typical Transfer Characteristic

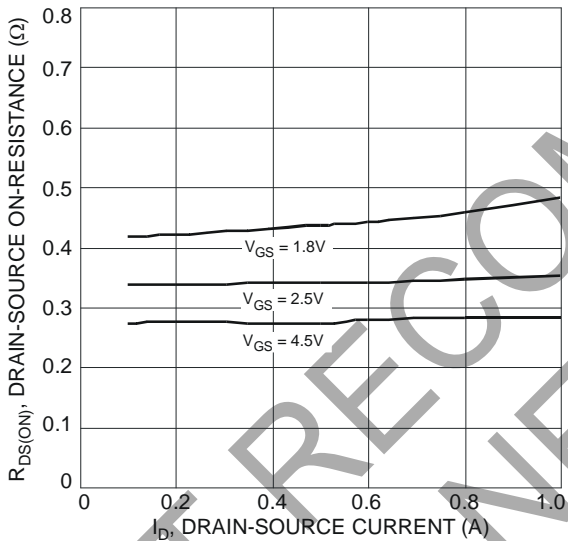


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

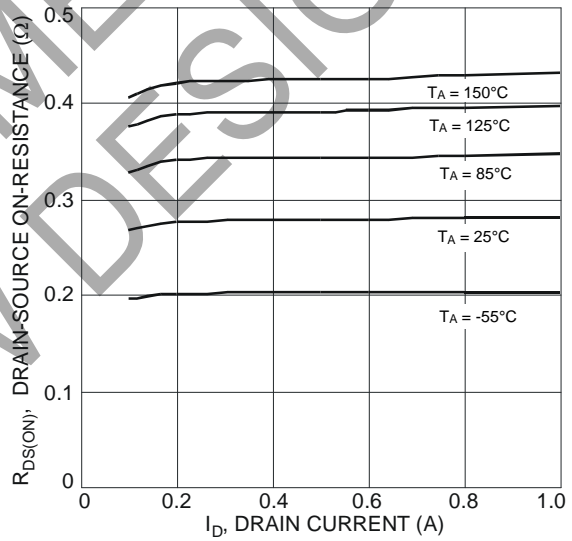


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

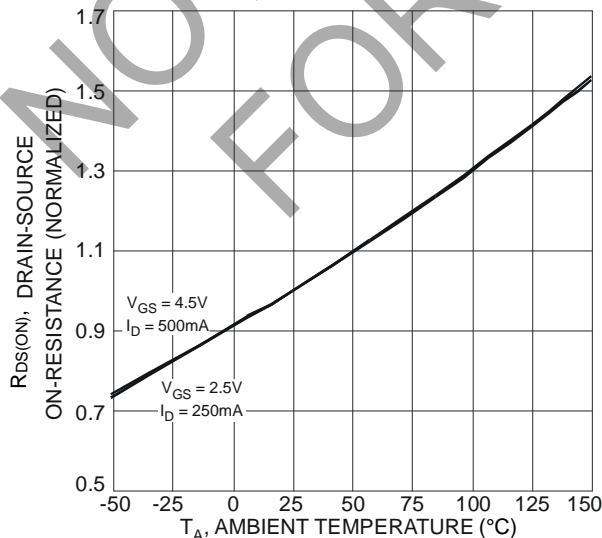


Fig. 5 On-Resistance Variation with Temperature

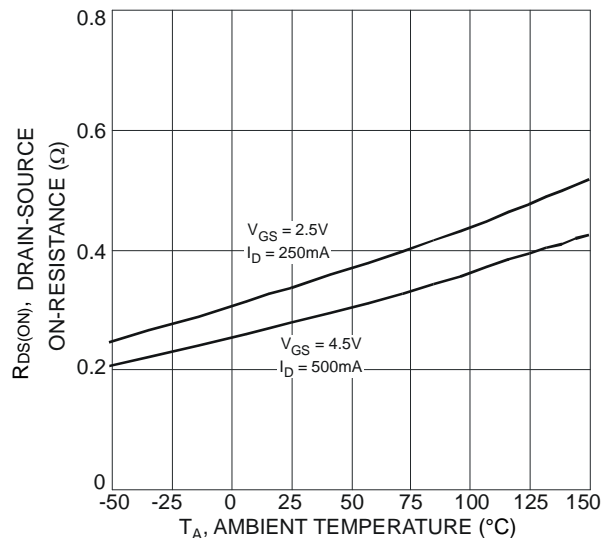


Fig. 6 On-Resistance Variation with Temperature

Typical Characteristics (Q1 N-Channel) (continued)

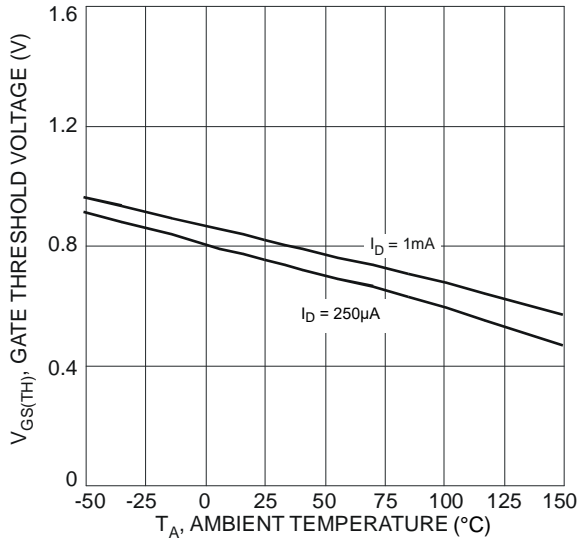


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

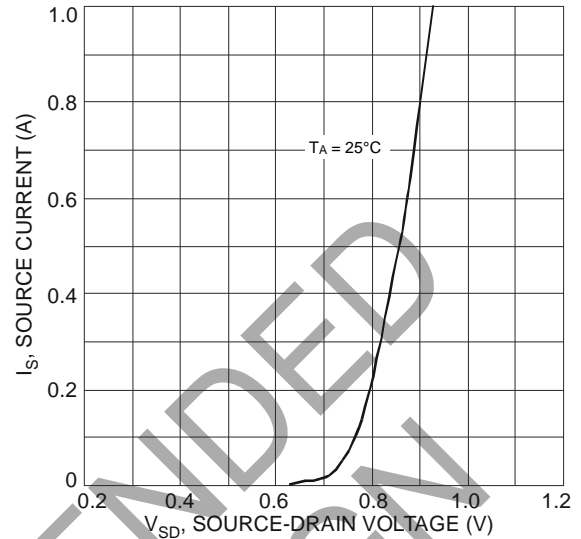


Fig. 8 Diode Forward Voltage vs. Current

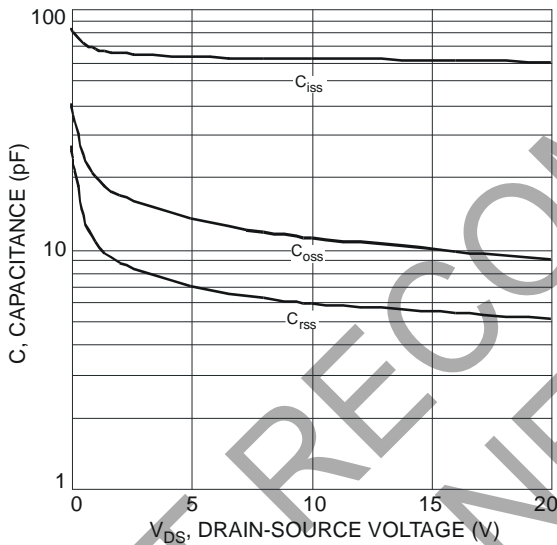


Fig. 9 Typical Total Capacitance

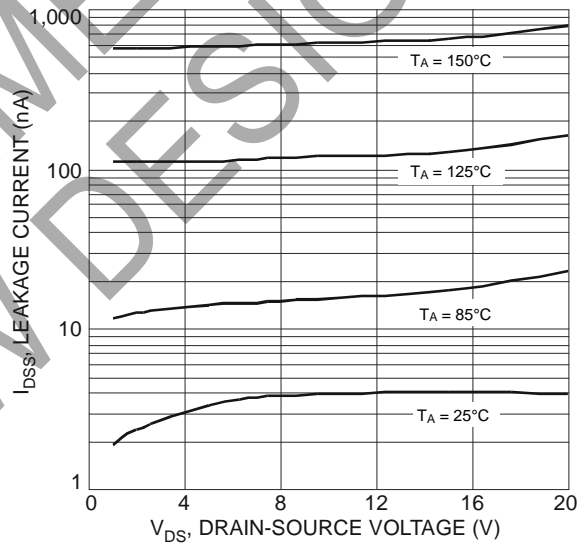


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

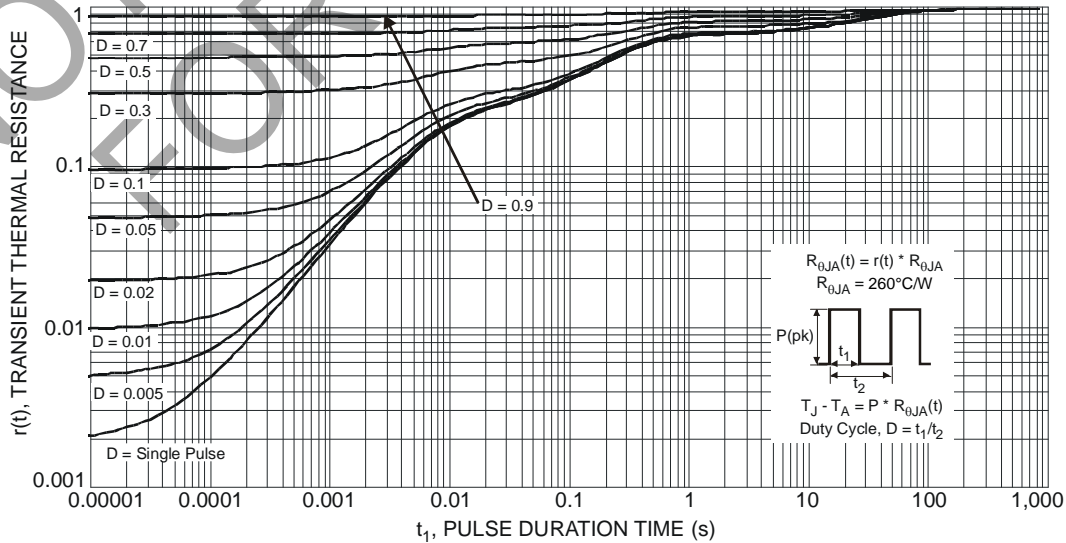


Fig. 11 Transient Thermal Response

Typical Characteristics (Q2 P-Channel)

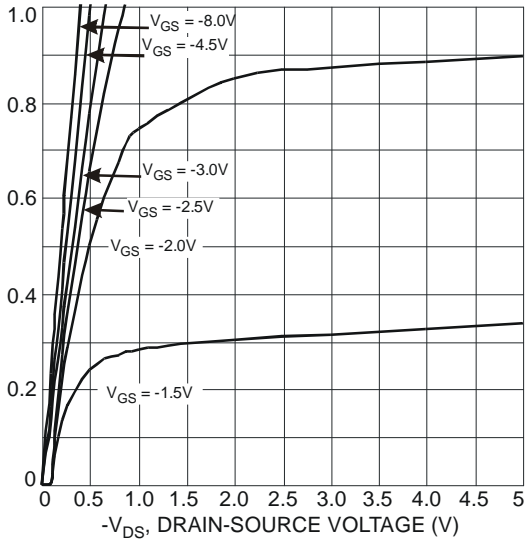


Fig. 12 Typical Output Characteristic

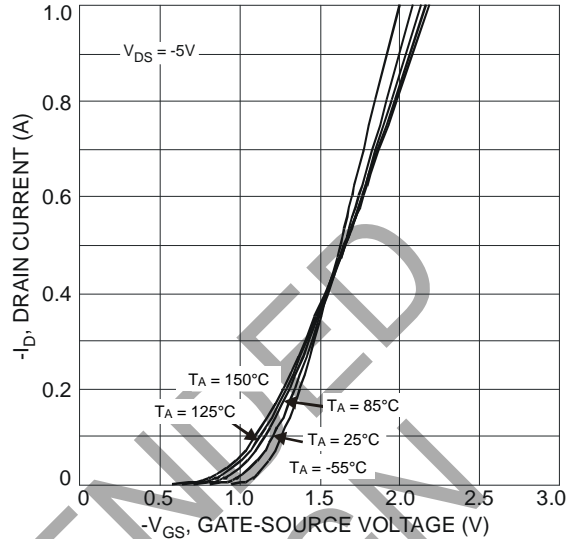


Fig. 13 Typical Transfer Characteristic

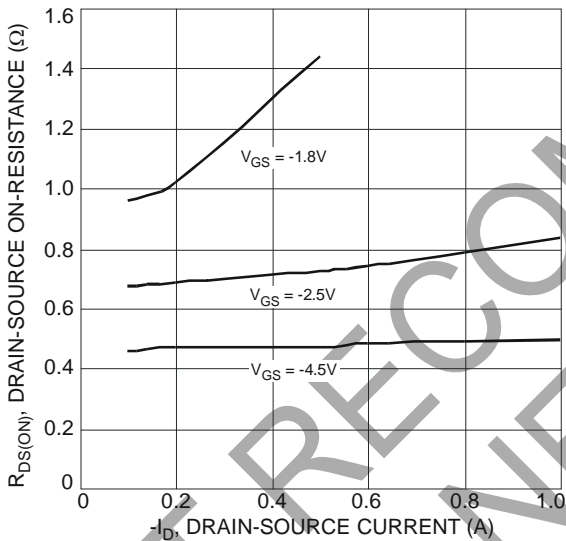


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

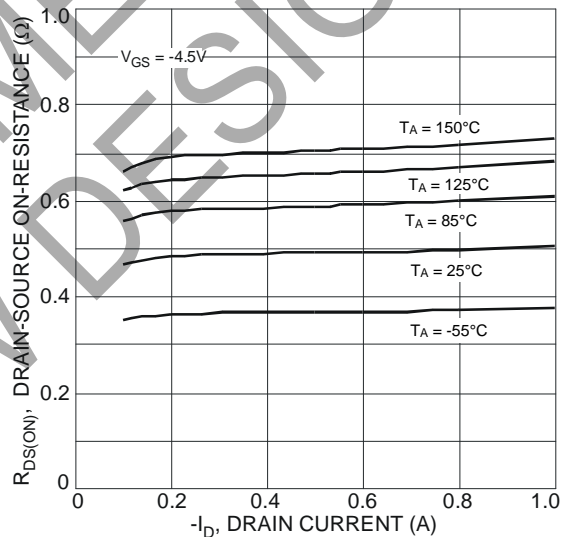


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

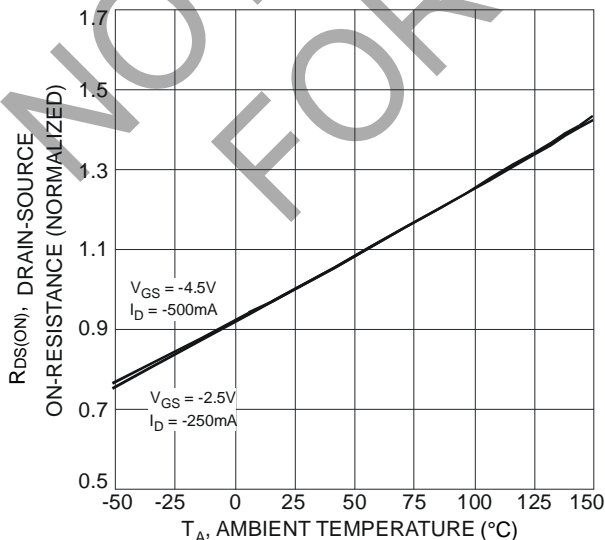


Fig. 16 On-Resistance Variation with Temperature

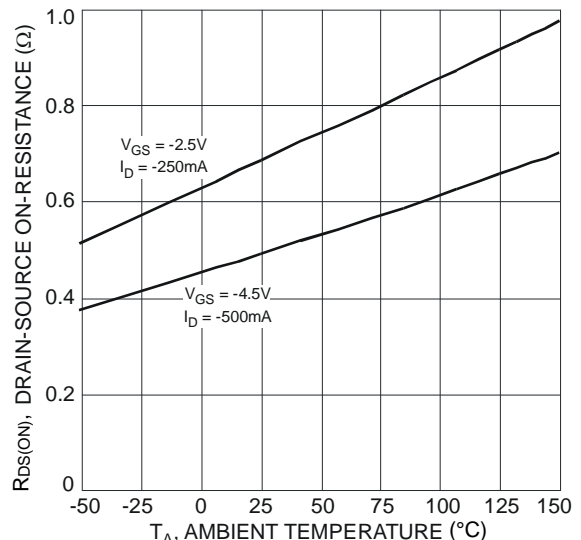


Fig. 17 On-Resistance Variation with Temperature

Typical Characteristics (Q2 P-Channel) (continued)

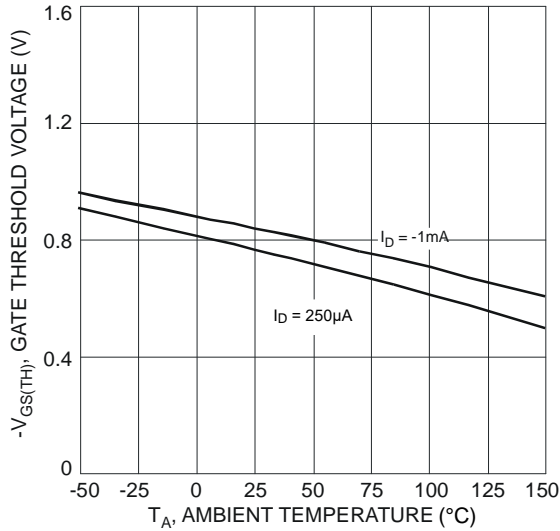


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

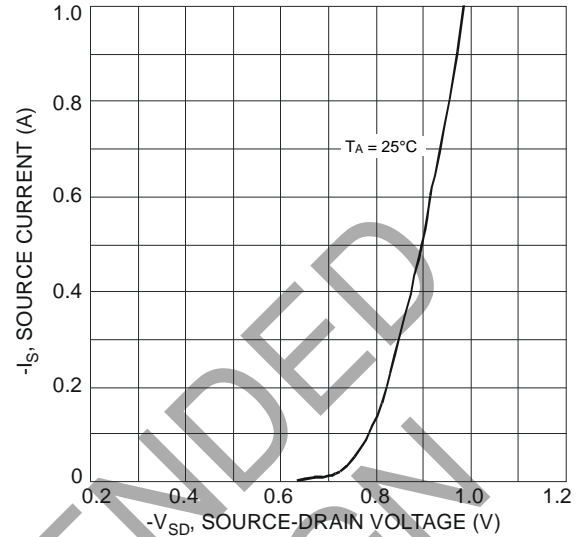


Fig. 19 Diode Forward Voltage vs. Current

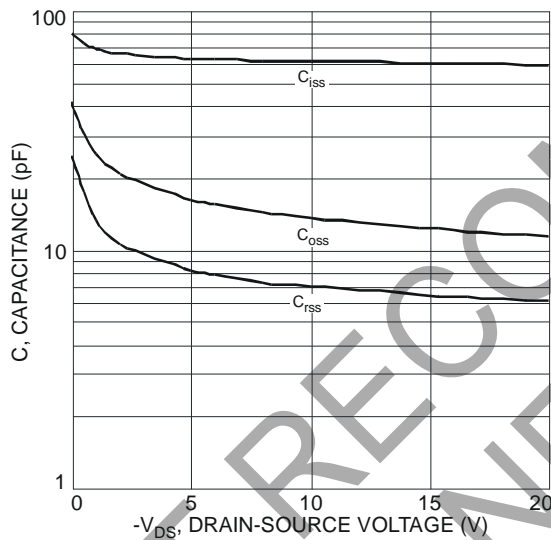


Fig. 20 Typical Total Capacitance

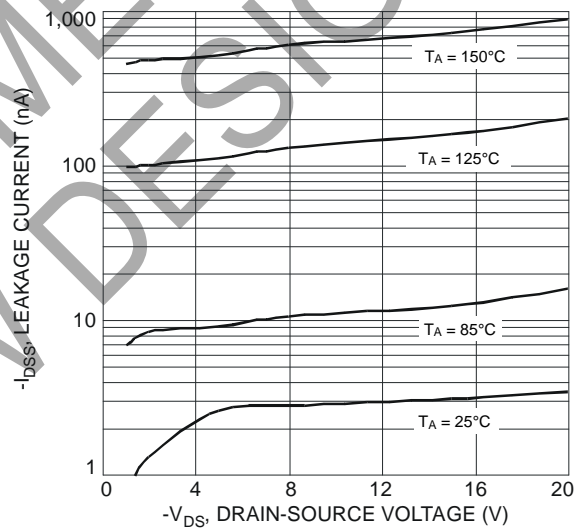


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

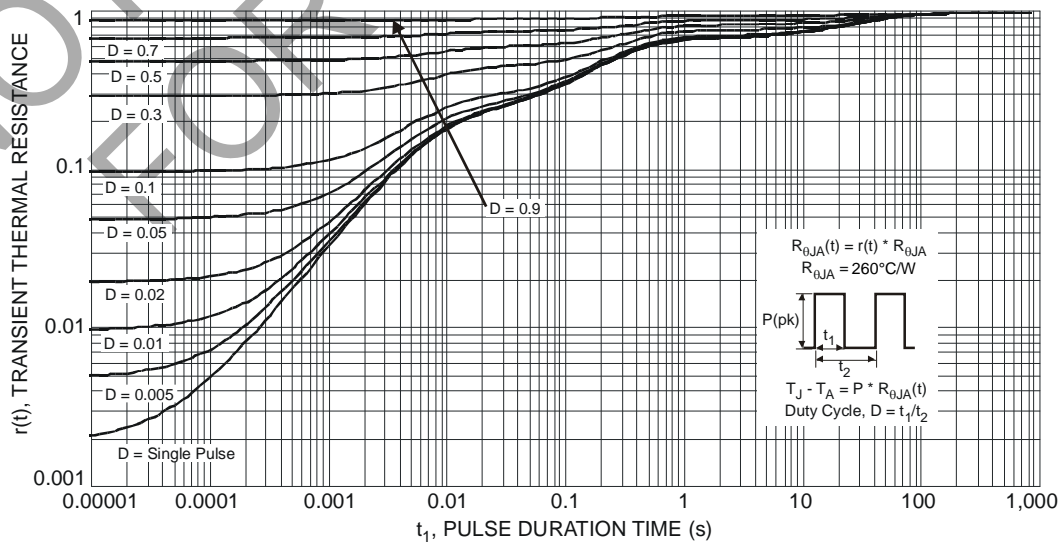
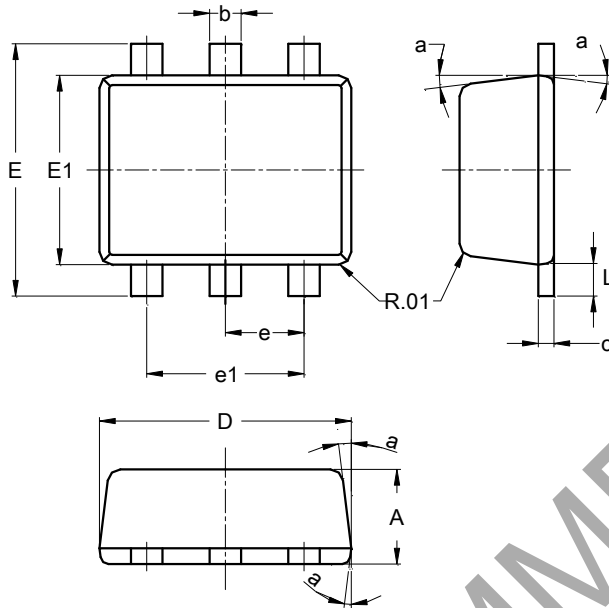


Fig. 22 Transient Thermal Response

Package Outline Dimensions

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

SOT563



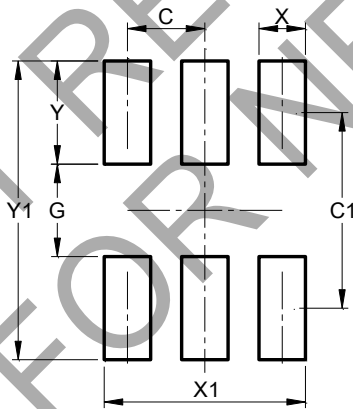
SOT563			
Dim	Min	Max	Typ
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°

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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