

**COMPLEMENTARY PAIR ENHANCEMENT MODE FIELD EFFECT TRANSISTOR**

**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
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

**Mechanical Data**

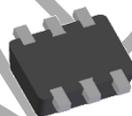
- Package: SOT563
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 <sup>Ⓔ3</sup>
- Weight: 0.006 grams (Approximate)



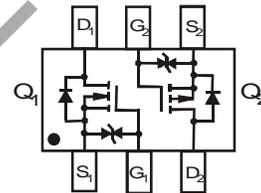
ESD Protected



Top View



Bottom View



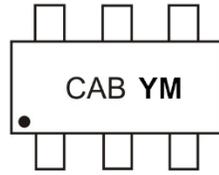
Top View  
Internal Schematic

**Ordering Information** (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMC2004VK-7	SOT563	3000	Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  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



CAB = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: J = 2022)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2007	....	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	U	....	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 N-CHANNEL – Q<sub>1</sub> (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain Source Voltage	V <sub>DSS</sub>	20	V
Gate-Source Voltage	V <sub>GSS</sub>	±8	V
Drain Current (Note 5)	I <sub>D</sub>	T <sub>A</sub> = +25°C	670
		T <sub>A</sub> = +85°C	480

### Maximum Ratings P-CHANNEL – Q<sub>2</sub> (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain Source Voltage	V <sub>DSS</sub>	-20	V
Gate-Source Voltage	V <sub>GSS</sub>	±8	V
Drain Current (Note 5)	I <sub>D</sub>	T <sub>A</sub> = +25°C	-530
		T <sub>A</sub> = +85°C	-380

### Thermal Characteristics

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	0.45	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	281	°C/W
	t < 10s	210	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	129	°C/W
	t < 10s	97	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.  
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

**Electrical Characteristics N-CHANNEL – Q<sub>1</sub>** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1.0	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±1.0	μA	V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</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>	—	0.4	0.55	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 540mA
		—	0.5	0.70		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA
		—	0.7	0.90		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA
Forward Transfer Admittance (Note 8)	Y <sub>fs</sub>	200	—	—	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A
Diode Forward Voltage	V <sub>SD</sub>	0.5	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 115mA
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>iss</sub>	—	—	150	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	—	25	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	—	20	pF	

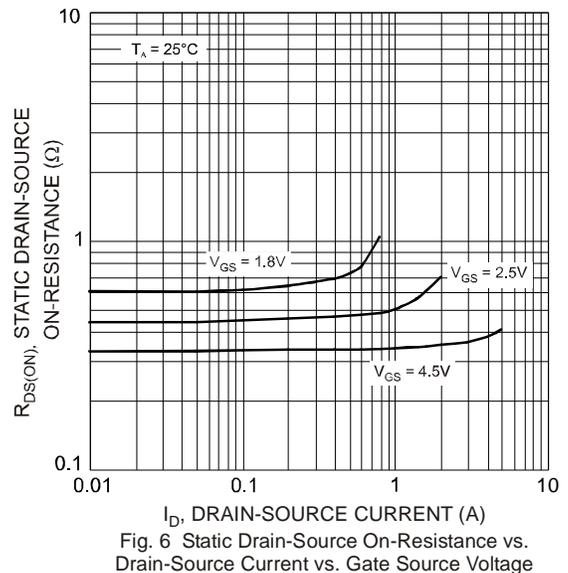
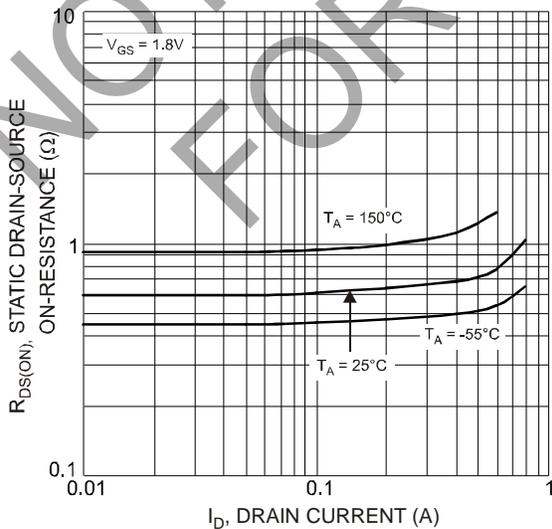
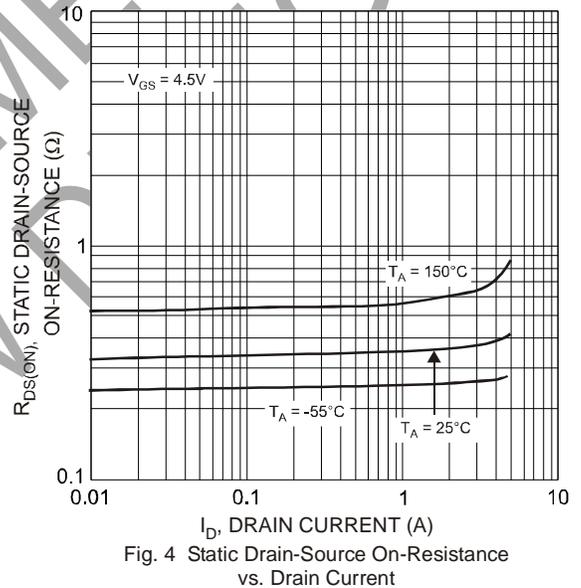
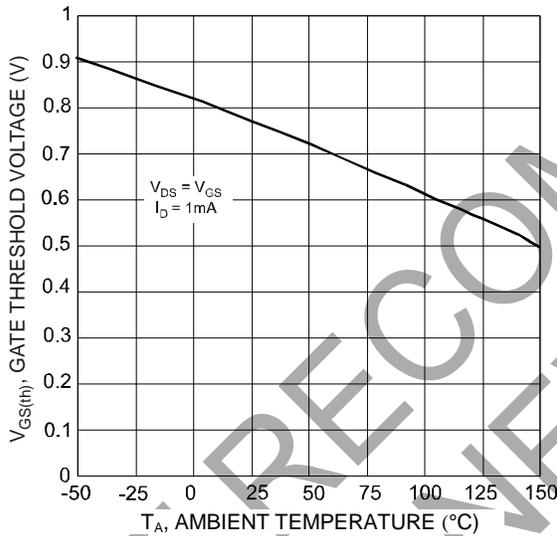
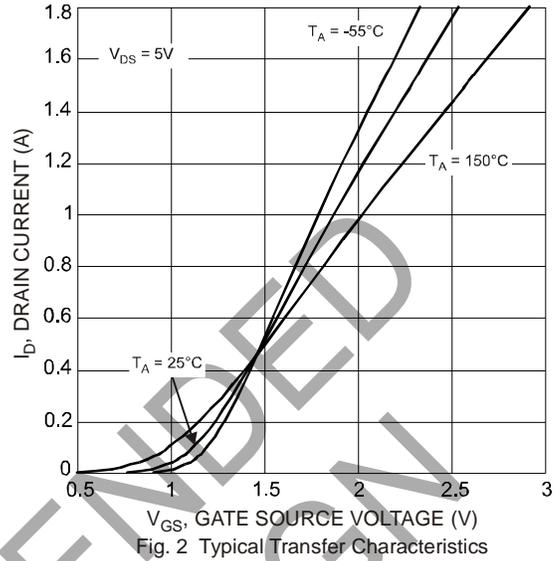
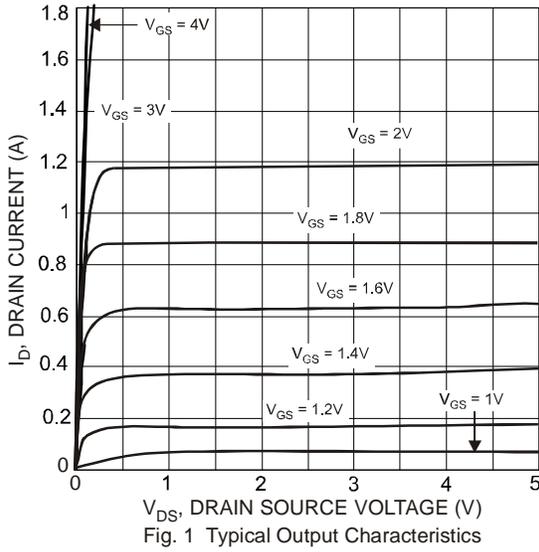
**Electrical Characteristics P-CHANNEL – Q<sub>2</sub>** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</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>	—	—	-1.0	μA	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±1.0	μA	V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</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>	—	0.7	0.9	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -430mA
		—	1.1	1.4		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -300mA
		—	1.7	2.0		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -150mA
Forward Transfer Admittance	Y <sub>fs</sub>	200	—	—	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A
Diode Forward Voltage	V <sub>SD</sub>	-0.5	—	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -115mA
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	—	175	pF	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	—	30	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	—	20	pF	

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

NOT FOR RECOMMENDED DESIGN

**Q1, N-CHANNEL**



**Q1, N-CHANNEL** (Continued)

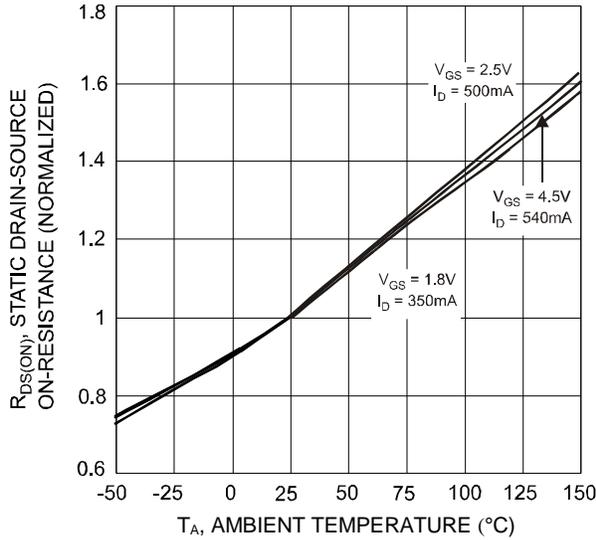


Fig. 7 Static Drain-Source On-State Resistance vs. Ambient Temperature

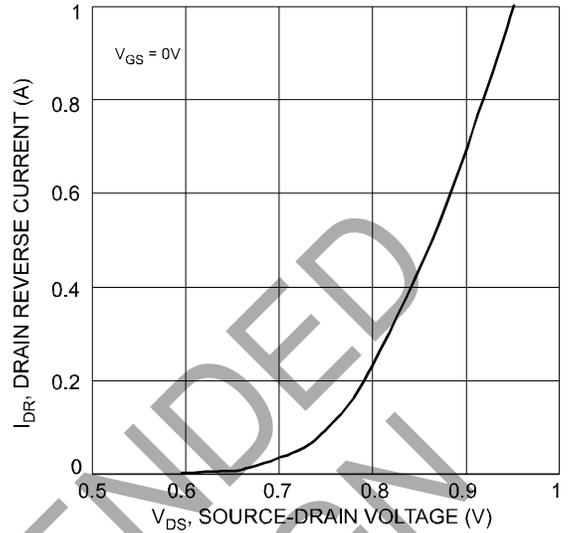


Fig. 8 Drain Reverse Current vs. Source-Drain Voltage

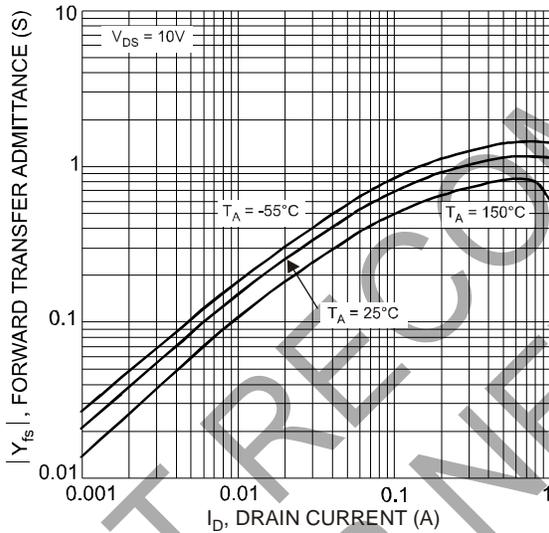


Fig. 9 Forward Transfer Admittance vs. Drain Current

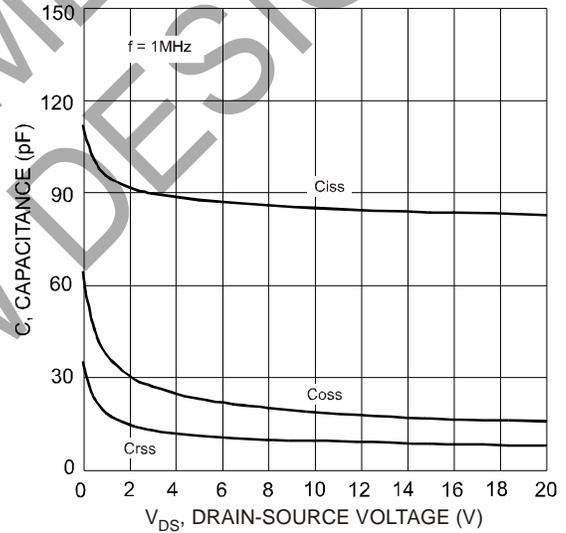


Fig. 10 Typical Capacitance

**Q2, P-CHANNEL**

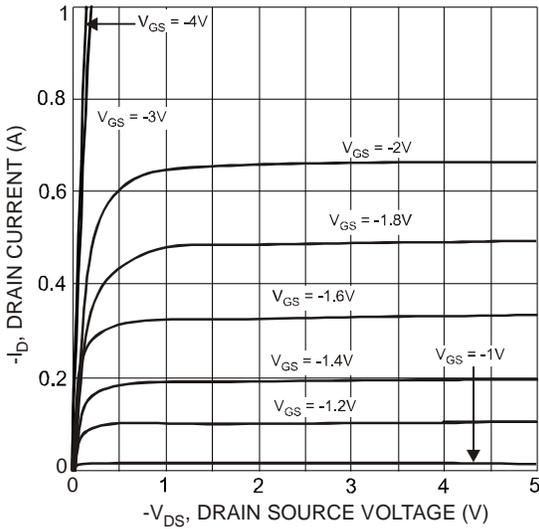


Fig. 11 Typical Output Characteristics

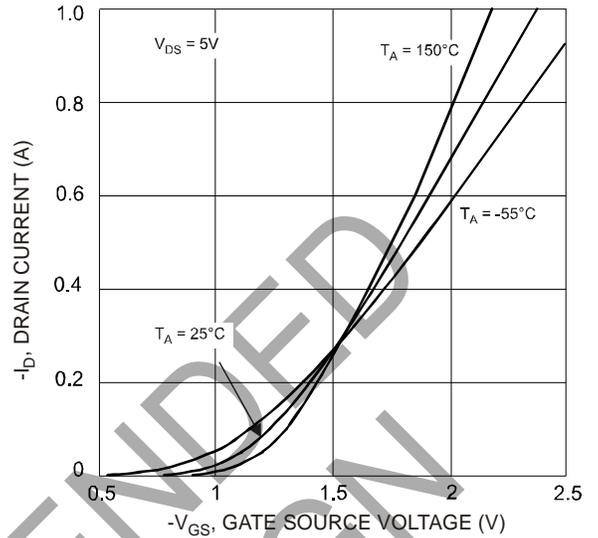


Fig. 12 Typical Transfer Characteristics

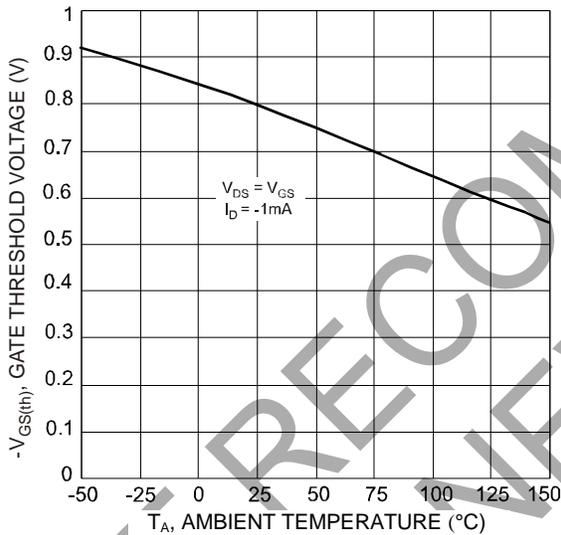


Fig. 13 Gate Threshold Voltage vs. Ambient Temperature

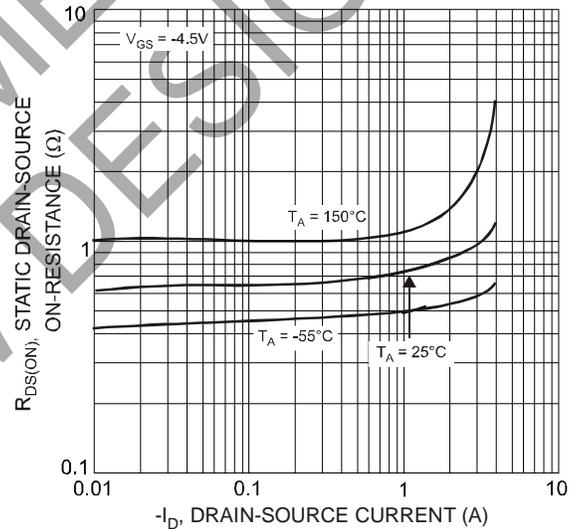


Fig. 14 Static Drain-Source On-Resistance vs. Drain Current

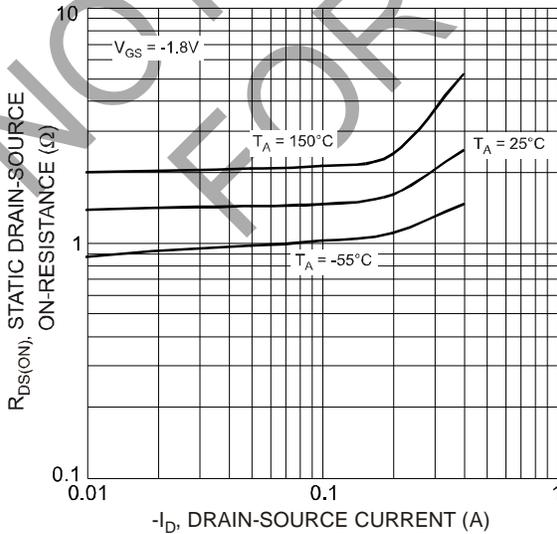


Fig. 15 Static Drain-Source On-Resistance vs. Drain Current

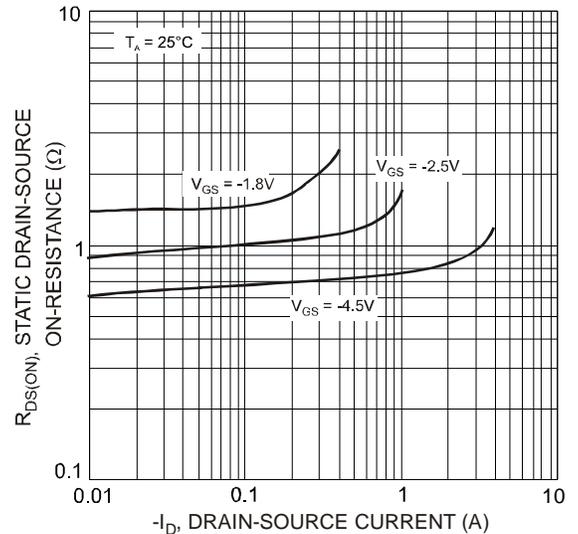


Fig. 16 Static Drain-Source On-Resistance vs. Drain-Source Current vs. Gate Source Voltage

**Q2, P-CHANNEL** (Continued)

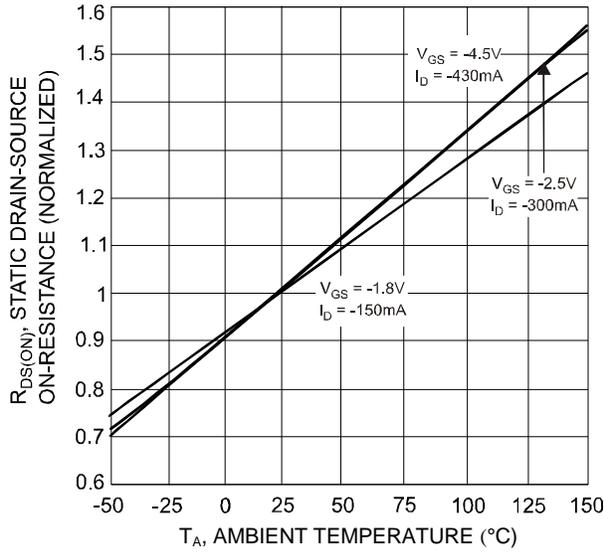


Fig. 17 Static Drain-Source On-State Resistance vs. Ambient Temperature

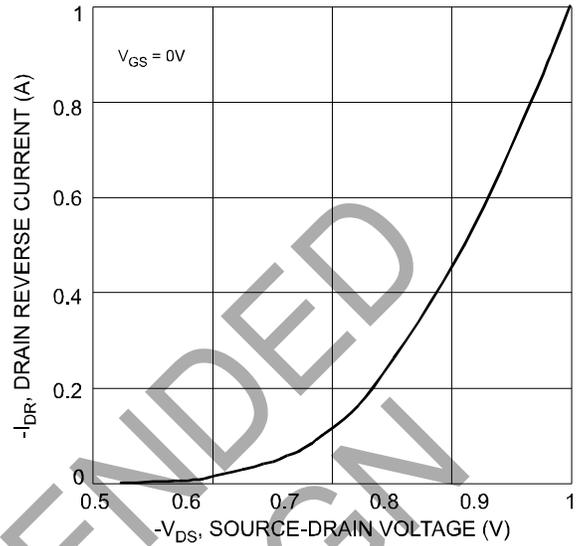


Fig. 18 Drain Reverse Current vs. Source-Drain Voltage

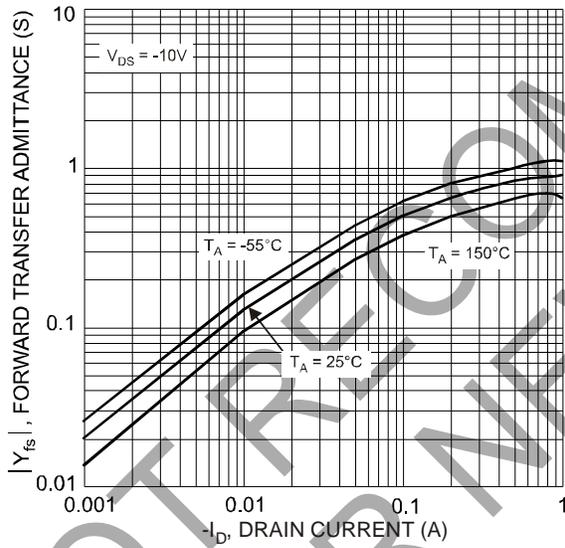


Fig. 19 Forward Transfer Admittance vs. Drain Current

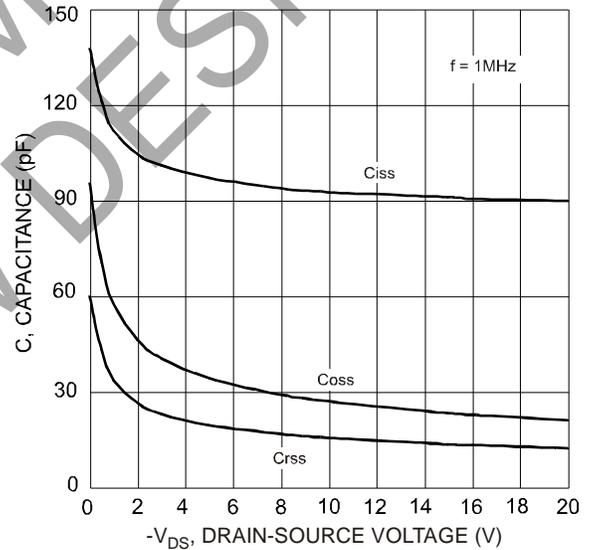
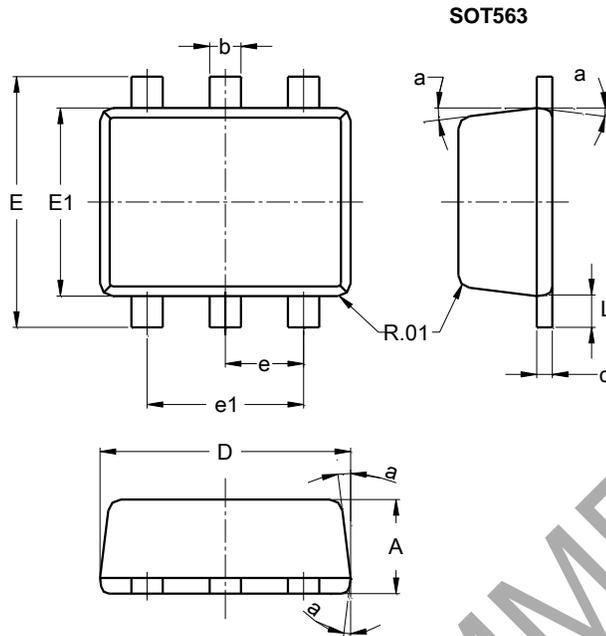


Fig. 20 Typical Capacitance

## Package Outline Dimensions

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

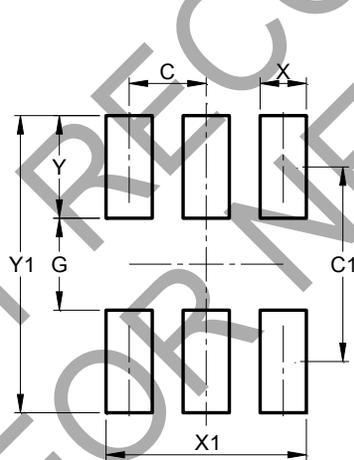


SOT563			
Dim	Min	Max	Typ
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°

All Dimensions in mm

## Suggested Pad Layout

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



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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