COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = +25°C
Q1	20V	0.5Ω @ V_{GS} = 4.5V	1030mA
		0.9Ω @ V_{GS} = 1.8V	740mA
Q2	-20V	1.0Ω @ V_{GS} = -4.5V	-700mA
		2.0Ω @ V_{GS} = -1.8V	-460mA

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

- Power management functions
- Battery Operated Systems and Solid-State Relays
- Load switch

Features and Benefits

- 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 to 2kV HBM**
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

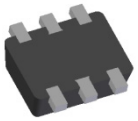
Mechanical Data

- Case: SOT563
- 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
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.003 grams (approximate)

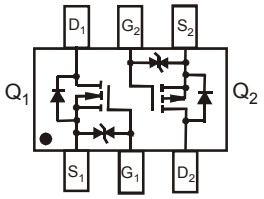
SOT563

ESD PROTECTED TO 2kV

Top View



Bottom View



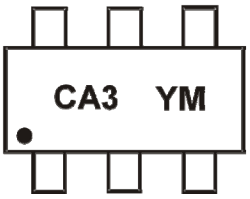
Top View
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMC2400UV-7	SOT563	3000/Tape & Reel
DMC2400UV-13	SOT563	10000/Tape & Reel

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



CA3 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	1030 800	mA
	t<10s	T_A = +25°C T_A = +70°C	I_D	1150 900	mA
Continuous Drain Current (Note 6) V_{GS} = 1.8V	Steady State	T_A = +25°C T_A = +70°C	I_D	740 570	mA
	t<10s	T_A = +25°C T_A = +70°C	I_D	870 700	mA
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	3	A
Maximum Body Diode Continuous Current			I_S	800	mA

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 6) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-700 -550	mA
	t<10s	T_A = +25°C T_A = +70°C	I_D	-820 -640	mA
Continuous Drain Current (Note 6) V_{GS} = -1.8V	Steady State	T_A = +25°C T_A = +70°C	I_D	-460 -350	mA
	t<10s	T_A = +25°C T_A = +70°C	I_D	-550 -420	mA
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	-2	A
Maximum Body Diode Continuous Current			I_S	-800	mA

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	0.45	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	281	°C/W
	t<10s		210	°C/W
Total Power Dissipation (Note 6)		P_D	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	129	°C/W
	t<10s		97	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	100	nA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±1	μA	V_{GS} = ±5V, V_{DS} = 0V
		—	—	±4.0		V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	0.9	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.3	0.48	Ω	V_{GS} = 5.0V, I_D = 200mA
		—	0.35	0.5		V_{GS} = 4.5V, I_D = 200mA
		—	0.45	0.7		V_{GS} = 2.5V, I_D = 200mA
		—	0.55	0.9		V_{GS} = 1.8V, I_D = 100mA
		—	0.65	1.5		V_{GS} = 1.5V, I_D = 50mA
		—	2	—		V_{GS} = 1.2V, I_D = 1mA
Forward Transfer Admittance	$\|Y_{fs}\|$	—	1.4	—	S	V_{DS} = 3V, I_D = 200mA
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 500mA,
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	37.1	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	6.5	—		
Reverse Transfer Capacitance	C_{rss}	—	4.8	—		
Gate Resistance	R_g	—	68	—	Ω	V_{DS} = 0V, V_{GS} = 0V,
Total Gate Charge	Q_g	—	0.5	—	nC	V_{GS} = 4.5V, V_{DS} = 10V, I_D = 250mA
Gate-Source Charge	Q_{gs}	—	0.07	—		
Gate-Drain Charge	Q_{gd}	—	0.1	—		
Turn-On Delay Time	$t_{D(on)}$	—	4.06	—	ns	V_{DD} = 10V, V_{GS} = 4.5V, R_L = 47Ω, R_G = 10Ω, I_D = 200mA
Turn-On Rise Time	t_r	—	7.28	—		
Turn-Off Delay Time	$t_{D(off)}$	—	13.74	—		
Turn-Off Fall Time	t_f	—	10.54	—		

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

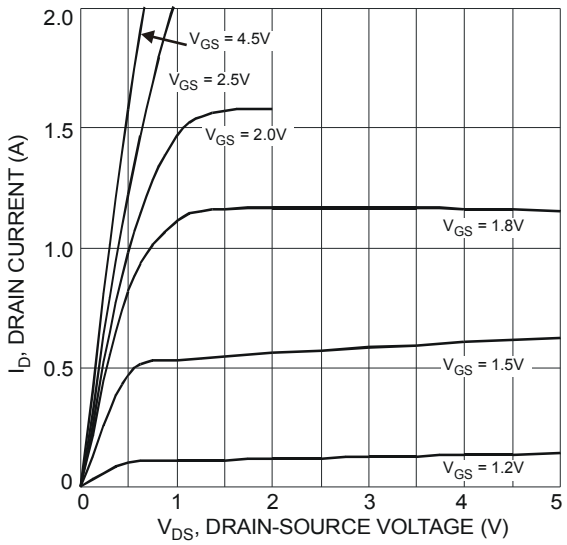


Fig. 1 Typical Output Characteristics

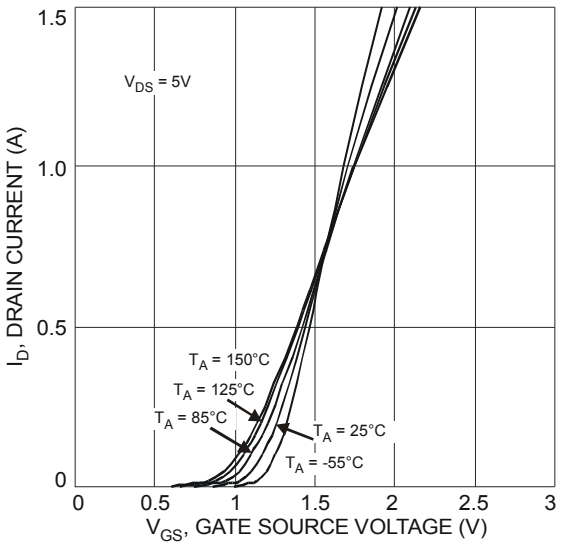


Fig. 2 Typical Transfer Characteristics

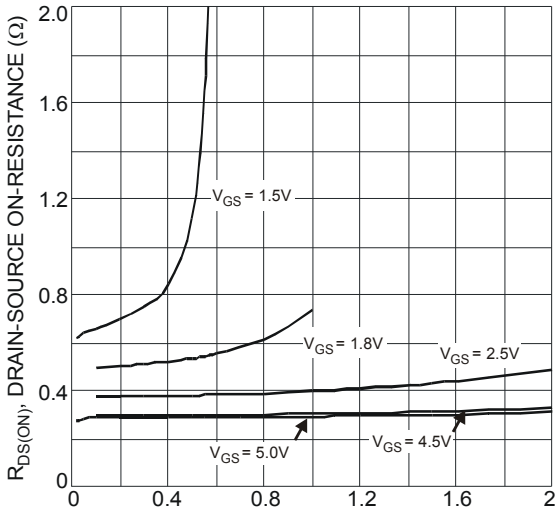


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

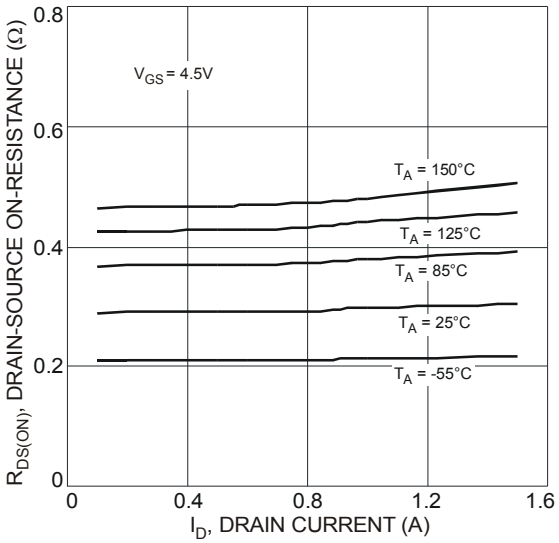


Fig. 4 Typical Drain-Source On-Resistance
vs. Drain Current and Temperature

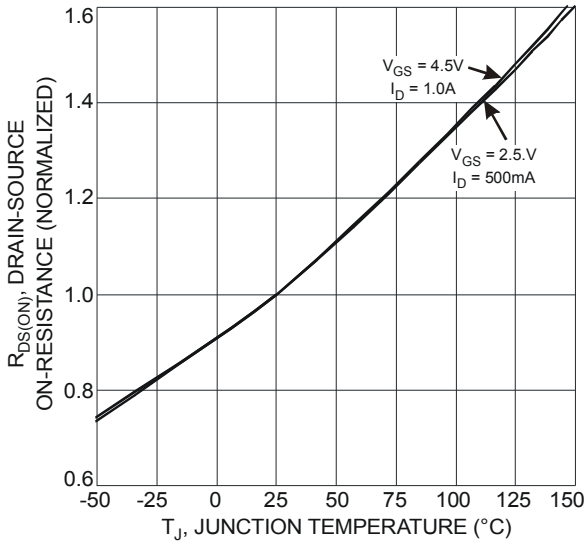


Fig. 5 On-Resistance Variation with Temperature

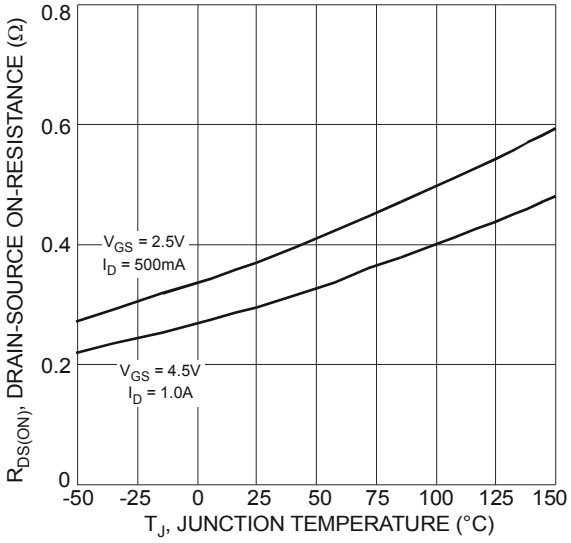


Fig. 6 On-Resistance Variation with Temperature

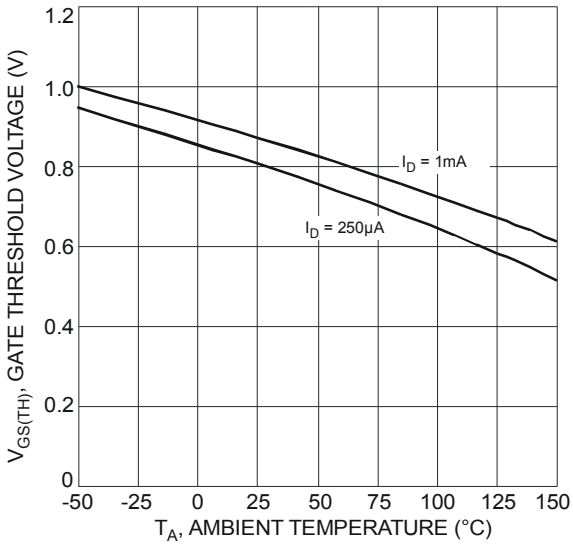


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

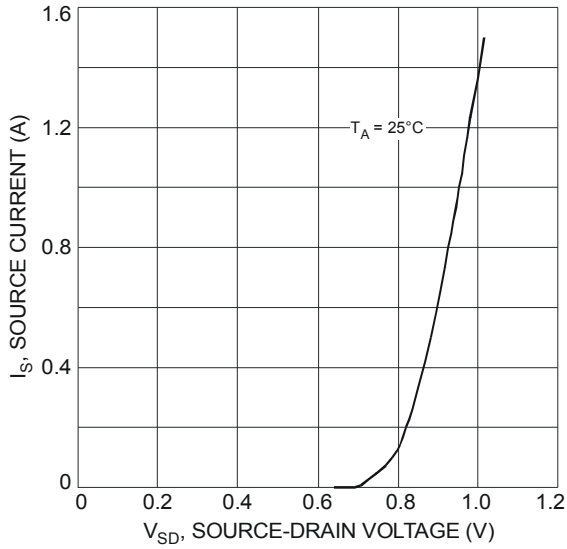


Fig. 8 Diode Forward Voltage vs. Current

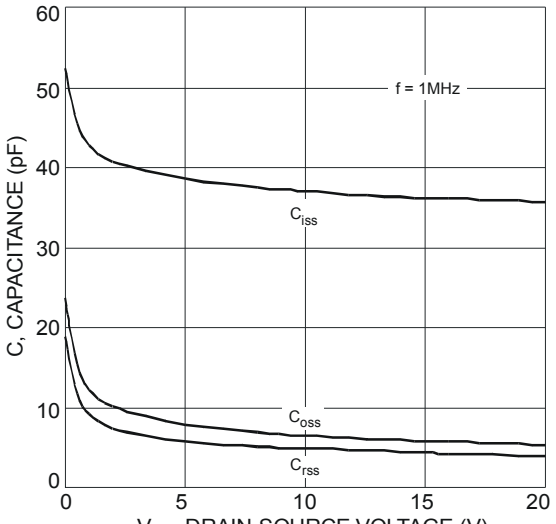


Fig. 9 Typical Capacitance

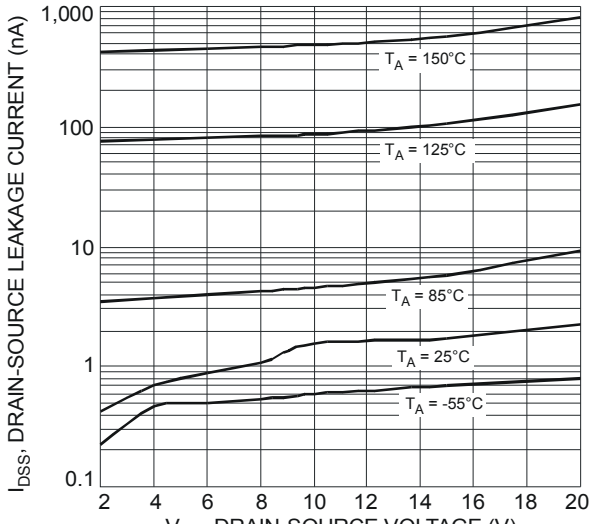


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

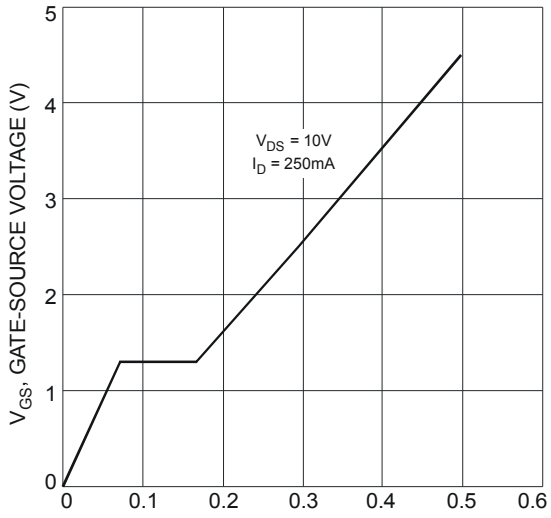


Fig. 11 Gate-Charge Characteristics

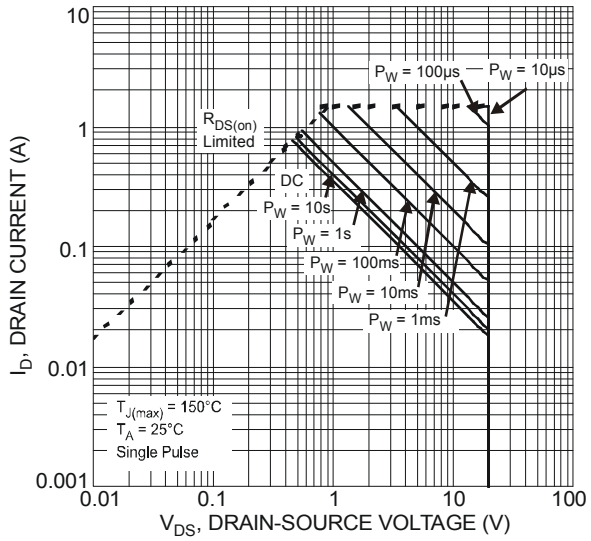


Fig. 12 SOA, Safe Operation Area

Electrical Characteristics - Q2 P-CHANNEL (@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 = -1mA
Zero Gate Voltage Drain Current T_J = 25°C	I_{DSS}	—	—	-100	nA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±1.0	µA	V_{GS} = ±5V, V_{DS} = 0V
		—	—	±5.0		V_{GS} = ±8V, 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	$R_{DS\ (ON)}$	—	0.67	0.97	Ω	V_{GS} = -5V, I_D = -100mA
		—	0.7	1.0		V_{GS} = -4.5V, I_D = -100mA
		—	0.9	1.5		V_{GS} = -2.5V, I_D = -80mA
		—	1.2	2.0		V_{GS} = -1.8V, I_D = -40mA
		—	1.5	3.0		V_{GS} = -1.5V, I_D = -30mA
		—	5	—		V_{GS} = -1.2V, I_D = -1mA
Forward Transfer Admittance	$\|Y_{fs}\|$	—	0.7	—	S	V_{DS} = -3V, I_D = -100mA
Diode Forward Voltage	V_{SD}	—	-0.75	-1.2	V	V_{GS} = 0V, I_S = -330mA,
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	46.1	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	7.2	—		
Reverse Transfer Capacitance	C_{rss}	—	4.9	—		
Gate Resistance	R_g	—	14.3	—	Ω	V_{DS} = 0V, V_{GS} = 0V,
Total Gate Charge V_{GS} = -4.5V	Q_g	—	0.5	—	nC	V_{DS} = -10V, I_D = -250mA
Total Gate Charge V_{GS} = -10V	Q_g	—	0.85	—		
Gate-Source Charge	Q_{gs}	—	0.09	—		
Gate-Drain Charge	Q_{gd}	—	0.09	—		
Turn-On Delay Time	$t_{D(on)}$	—	8.5	—	ns	V_{DD} = -3V, V_{GS} = -2.5V, R_L = 300Ω, R_G = 25Ω, I_D = -100mA
Turn-On Rise Time	t_r	—	4.3	—		
Turn-Off Delay Time	$t_{D(off)}$	—	20.2	—		
Turn-Off Fall Time	t_f	—	19.2	—		

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

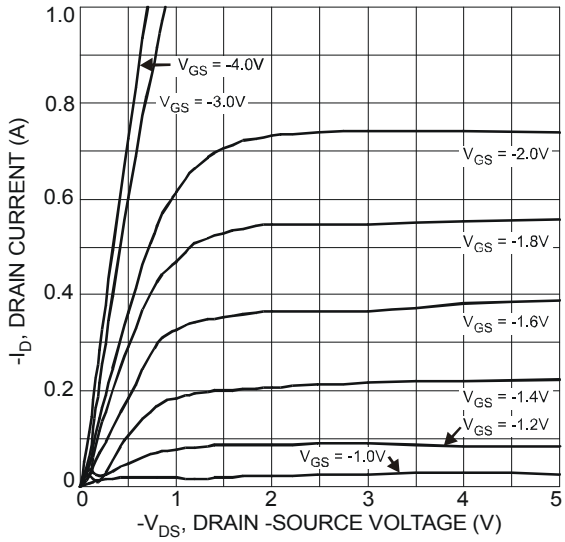


Fig. 13 Typical Output Characteristics

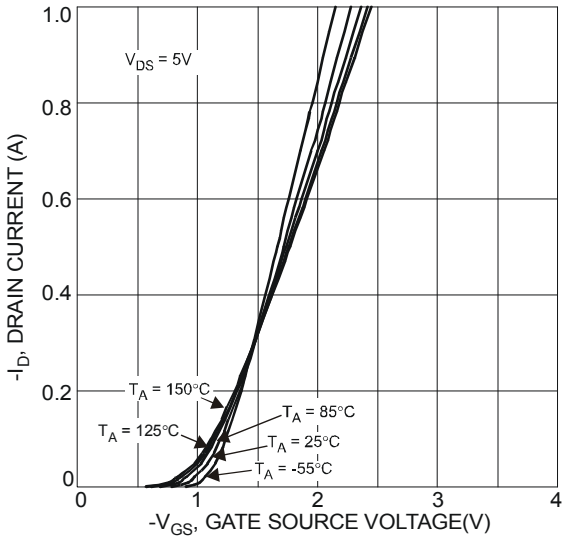


Fig. 14 Typical Transfer Characteristics

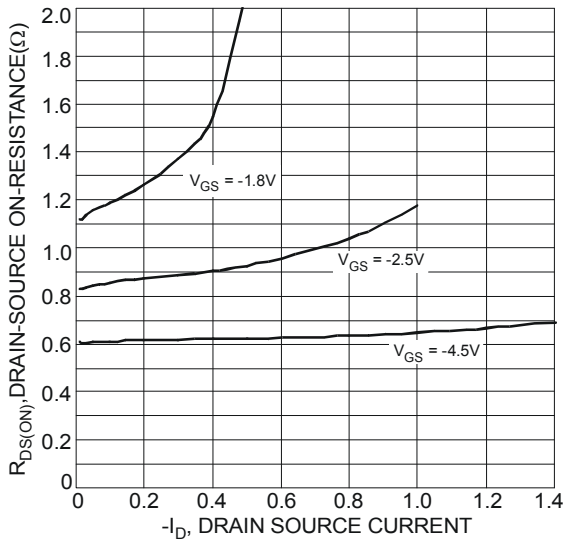


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

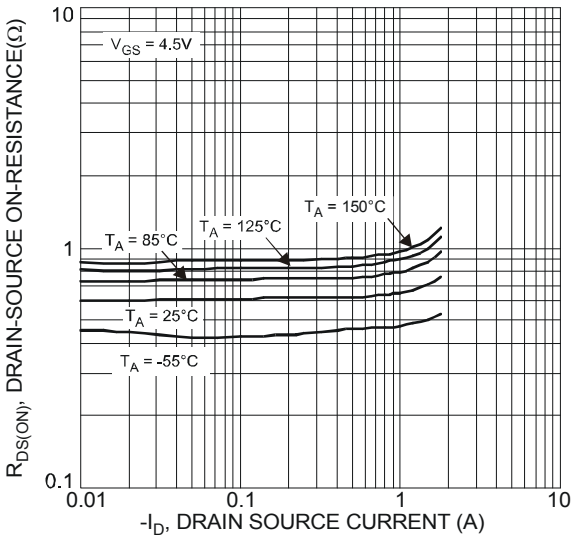


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

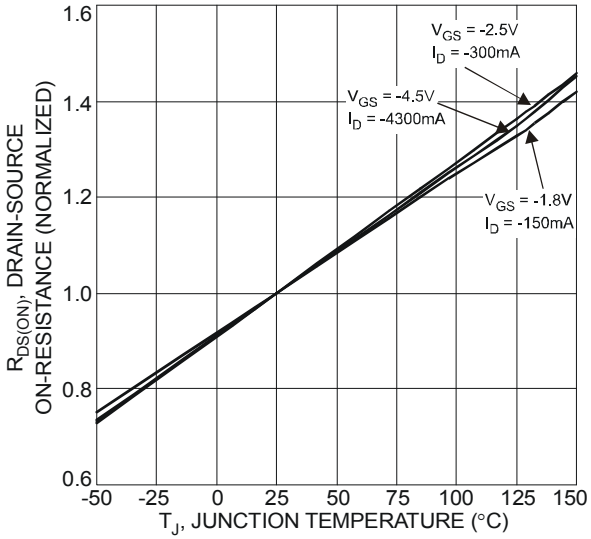


Fig. 17 On-Resistance Variation with Temperature

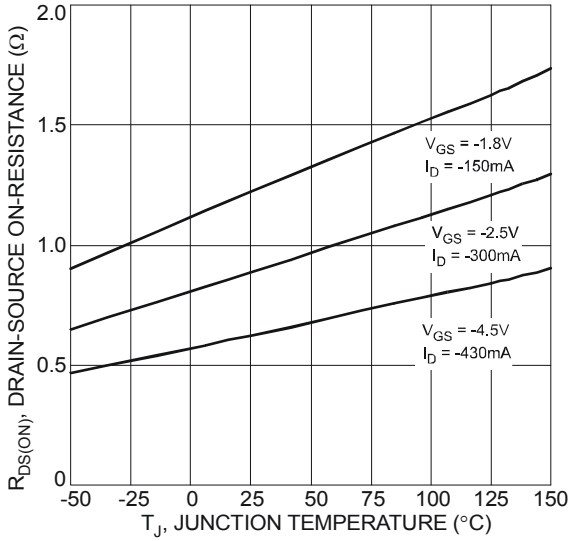


Fig. 18 On-Resistance vs.Temperature

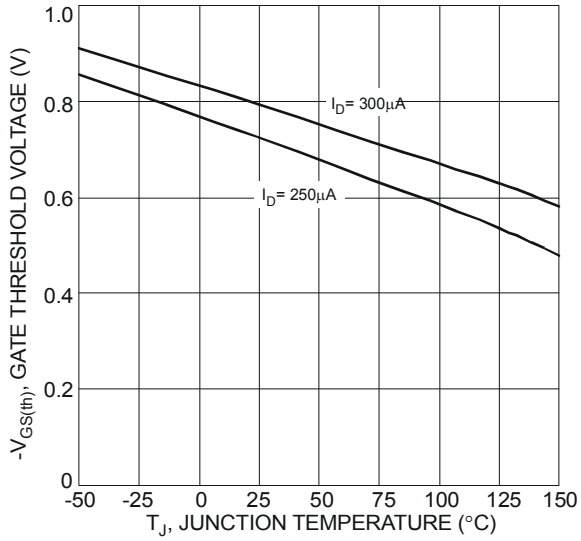


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

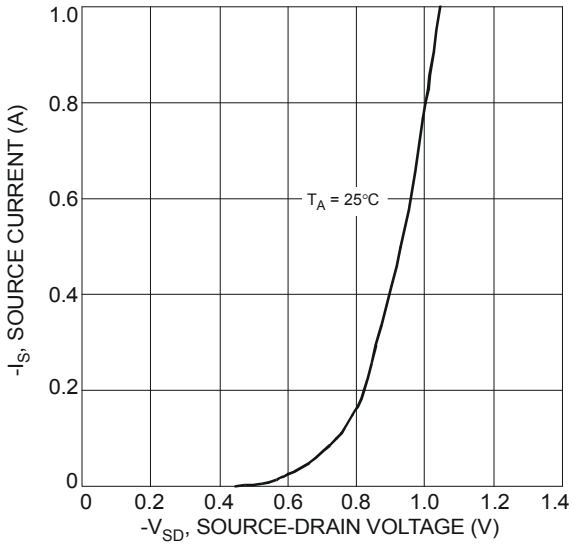


Fig. 20 Diode Forward Voltage vs. Current

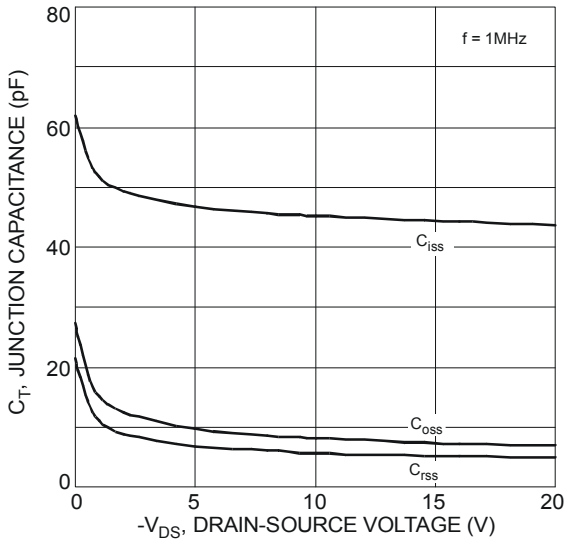


Fig. 21 Typical Junction Capacitance

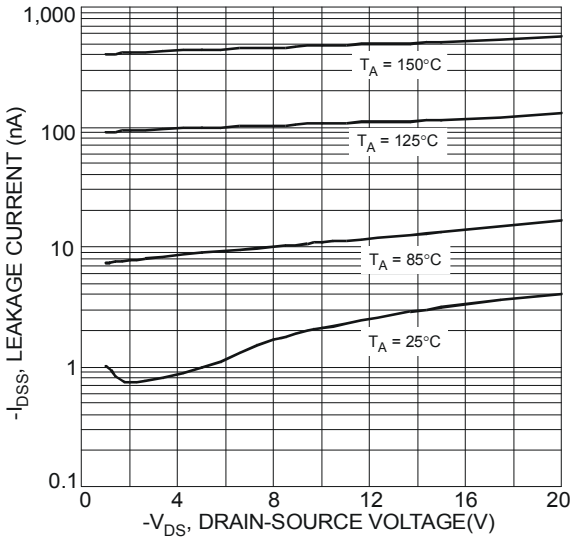


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

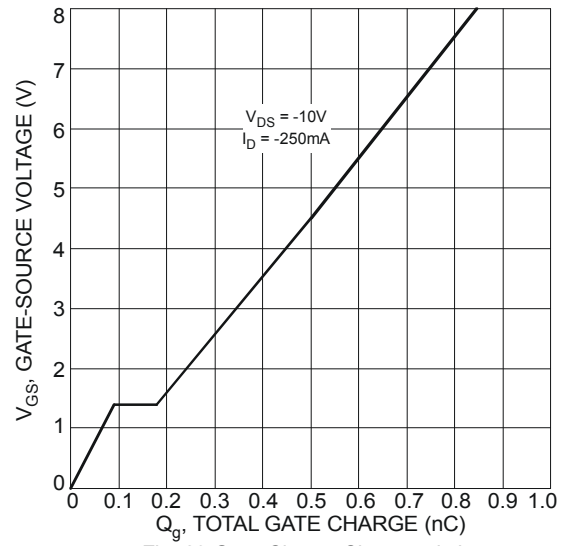


Fig. 23 Gate-Charge Characteristics

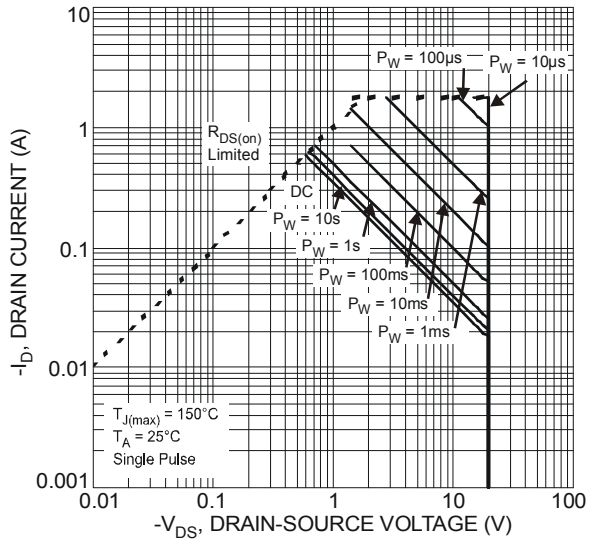


Fig. 24 SOA, Safe Operation Area

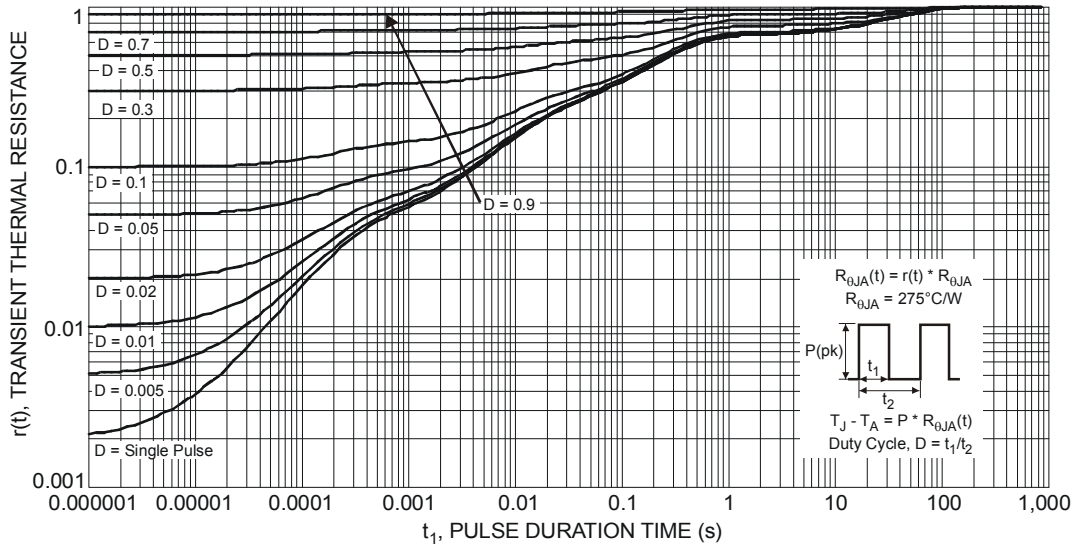
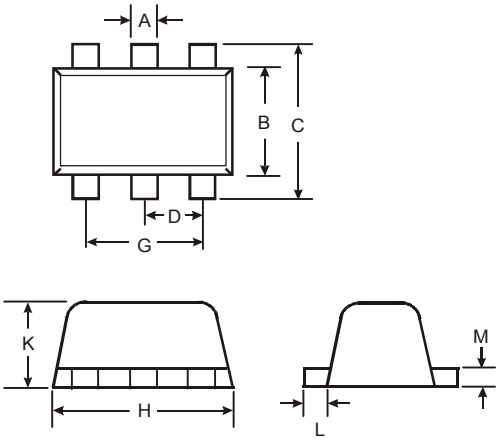


Fig. 25 Transient Thermal Response

Package Outline Dimensions

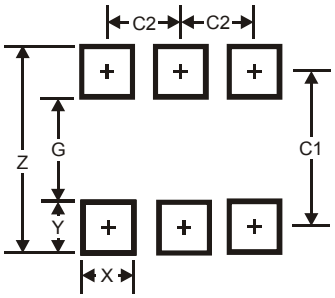
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SOT563			
Dim	**Min**	**Max**	**Typ**
A	0.15	0.30	0.20
B	1.10	1.25	1.20
C	1.55	1.70	1.60
D	-	-	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
K	0.55	0.60	0.60
L	0.10	0.30	0.20
M	0.10	0.18	0.11
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	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5

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