

Product Summary

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

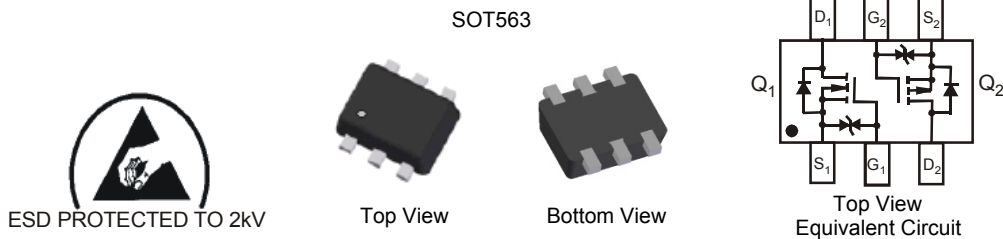
- Power management functions
- Battery Operated Systems and Solid-State Relays
- Load switch

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage $V_{GS(th)} < 1\text{V}$
- 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 ③
- Weight: 0.003 grams (approximate)

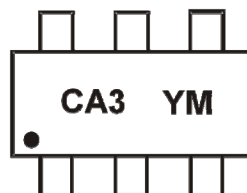


Ordering Information (Note 4)

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

Month Code	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 _{θJA}	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 _{θJA}	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
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.

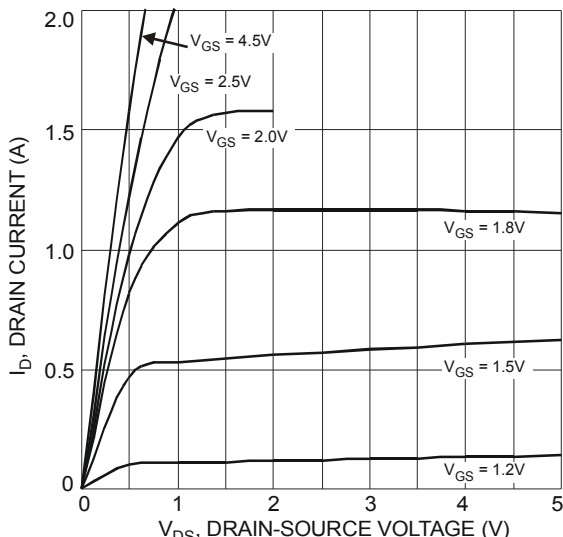


Fig. 1 Typical Output Characteristics

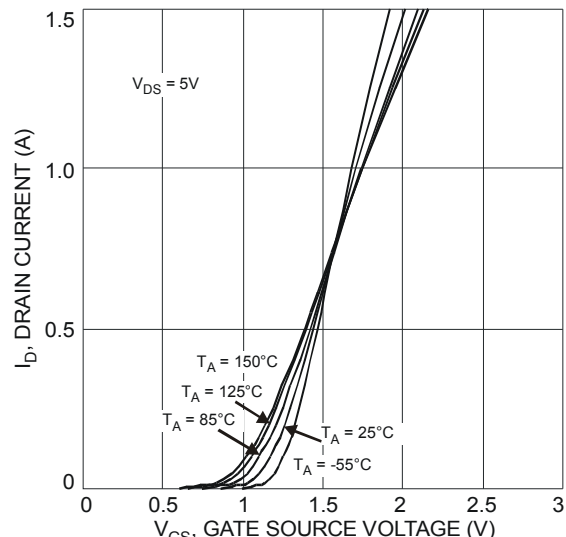


Fig. 2 Typical Transfer Characteristics

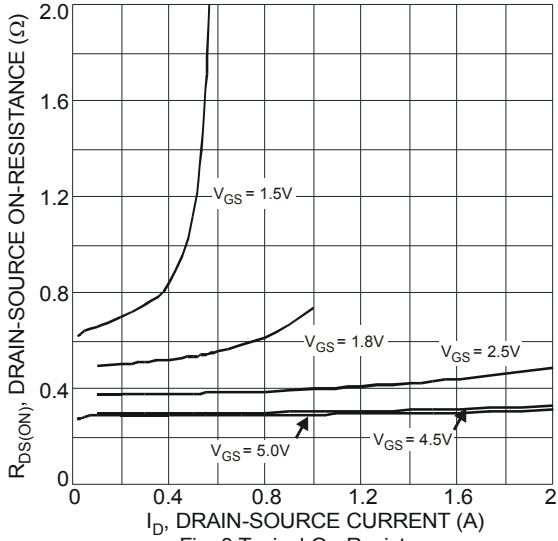


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

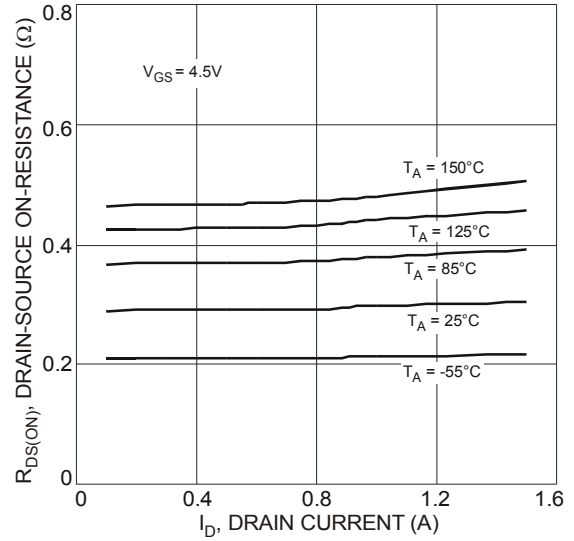


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

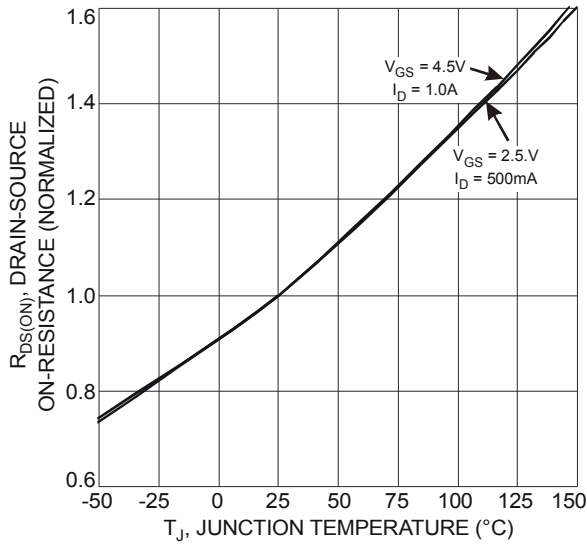


Fig. 5 On-Resistance Variation with Temperature

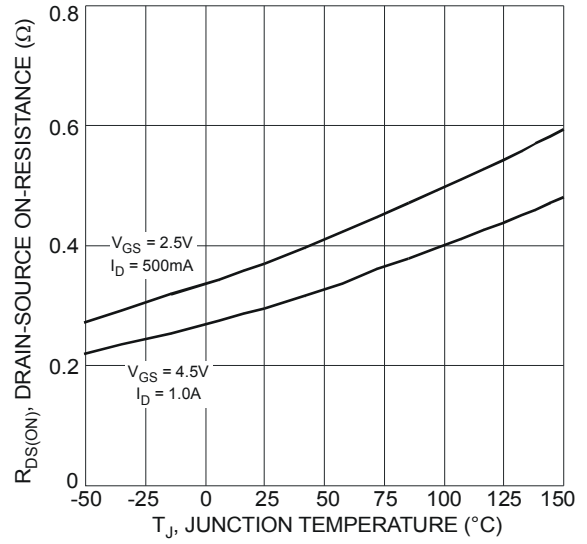


Fig. 6 On-Resistance Variation with Temperature

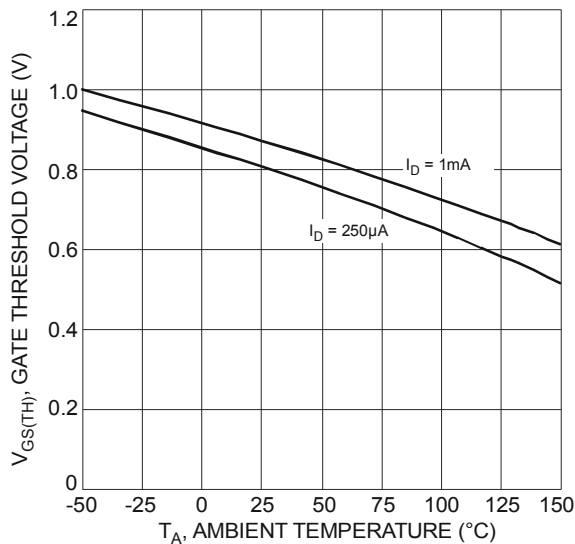


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

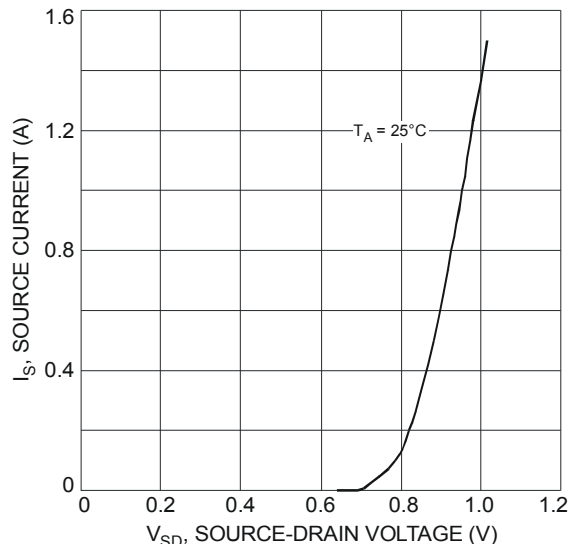


Fig. 8 Diode Forward Voltage vs. Current

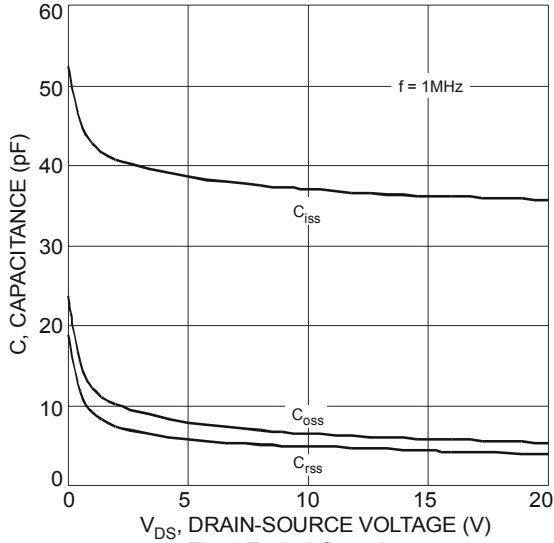


Fig. 9 Typical Capacitance

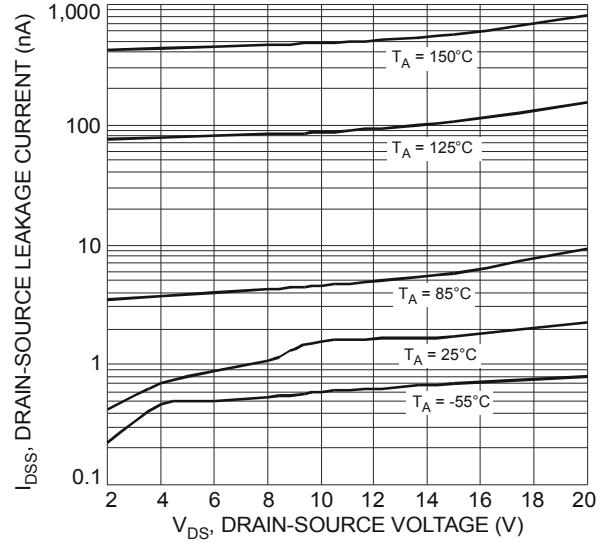


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

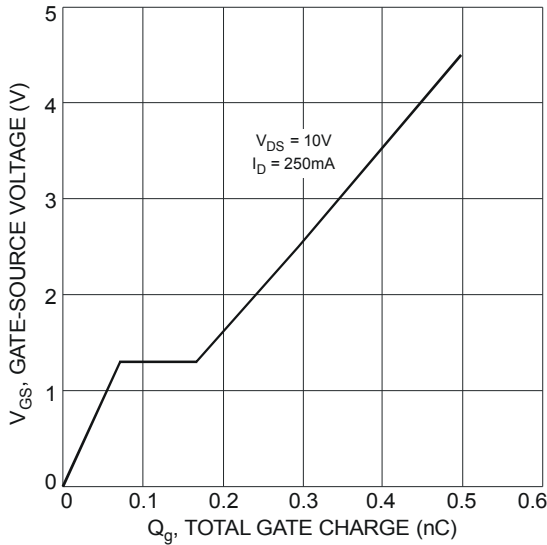


Fig. 11 Gate-Charge Characteristics

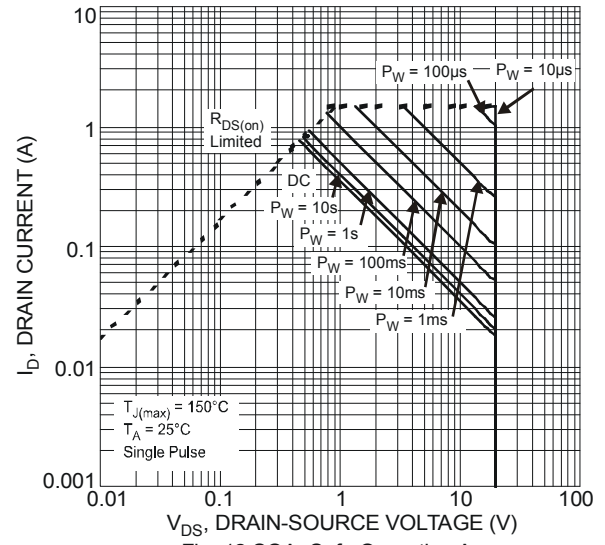


Fig. 12 SOA, Safe Operation Area

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.

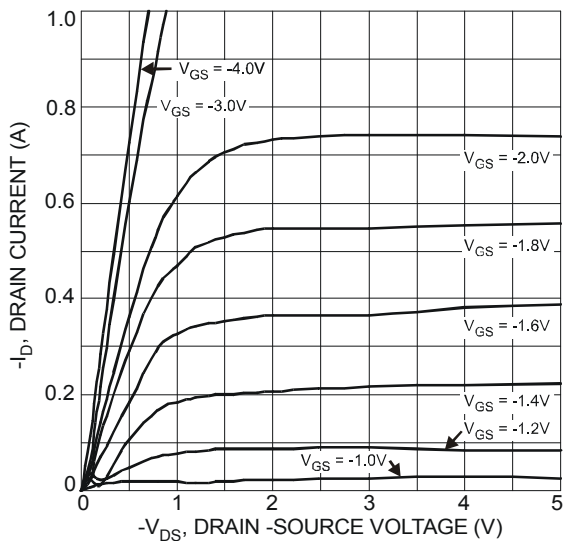


Fig. 13 Typical Output Characteristics

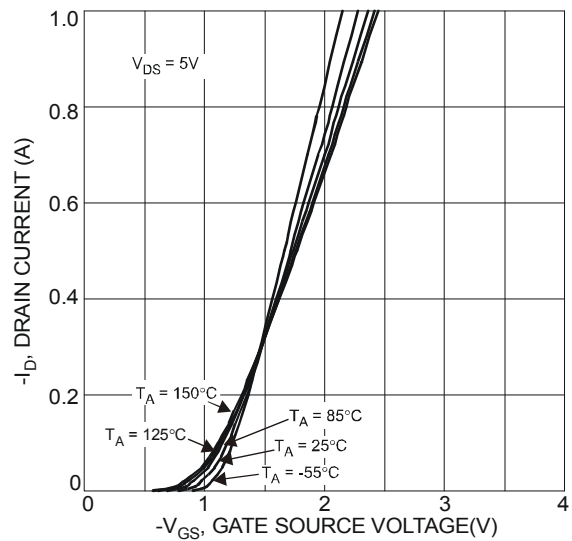


Fig. 14 Typical Transfer Characteristics

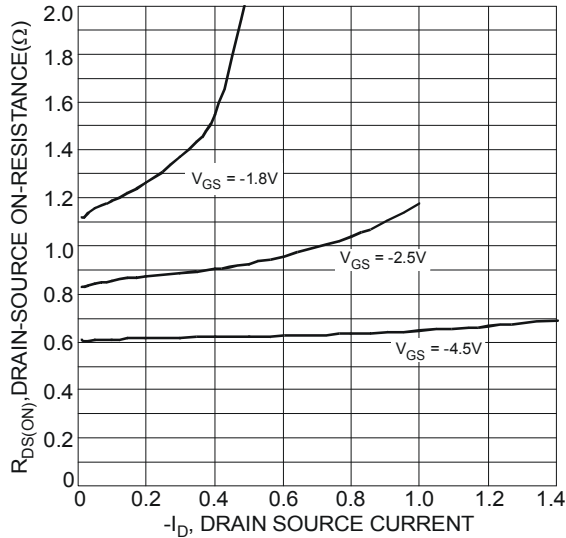


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

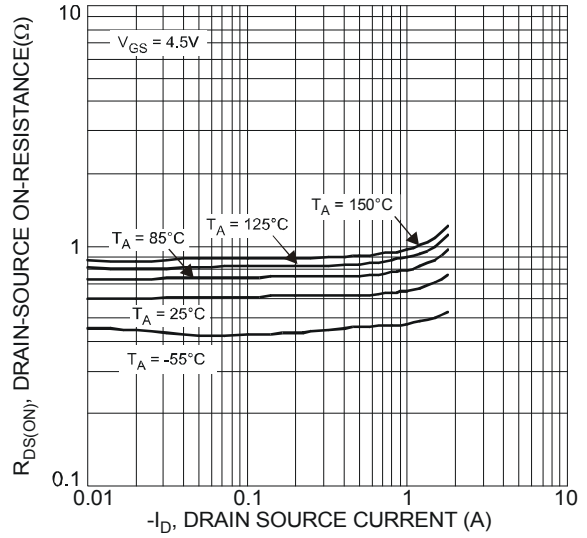


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

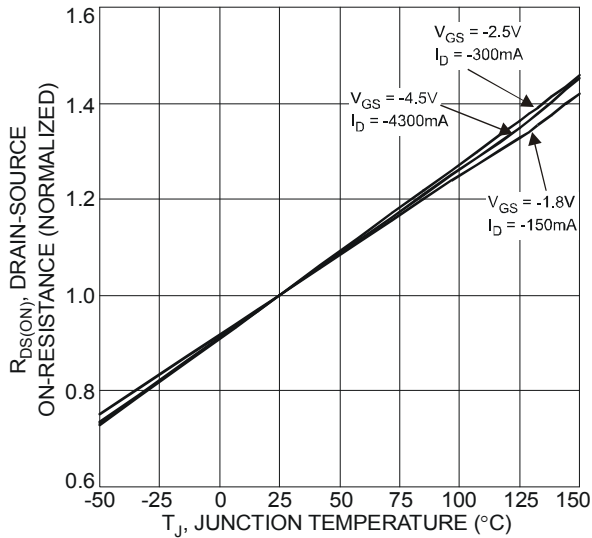


Fig. 17 On-Resistance Variation with Temperature

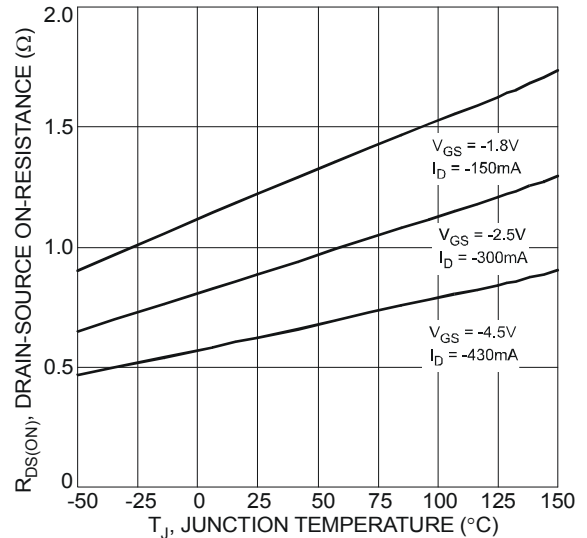


Fig. 18 On-Resistance vs. Temperature

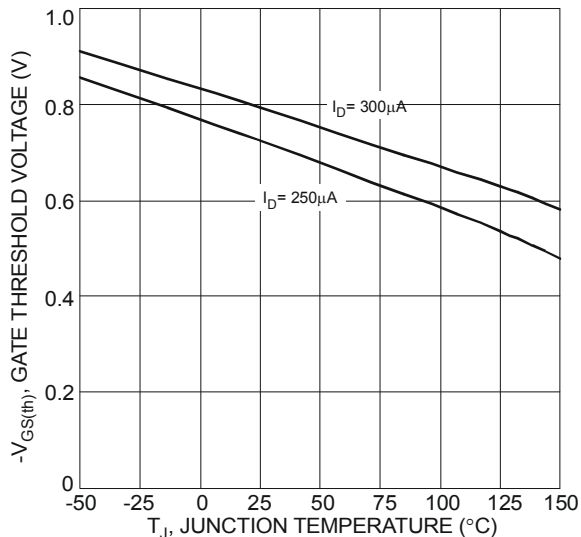


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

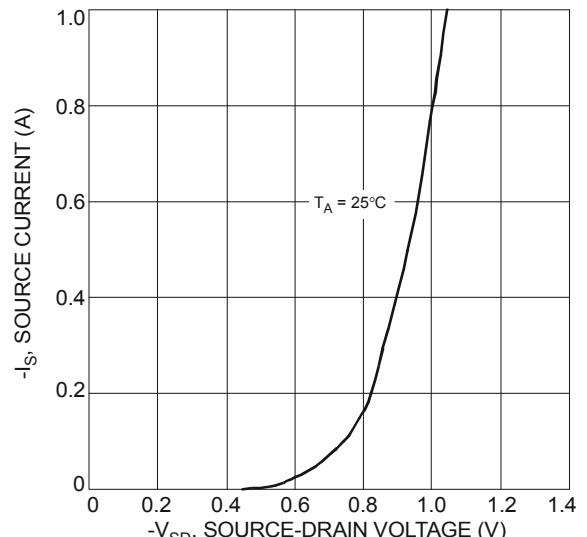


Fig. 20 Diode Forward Voltage vs. Current

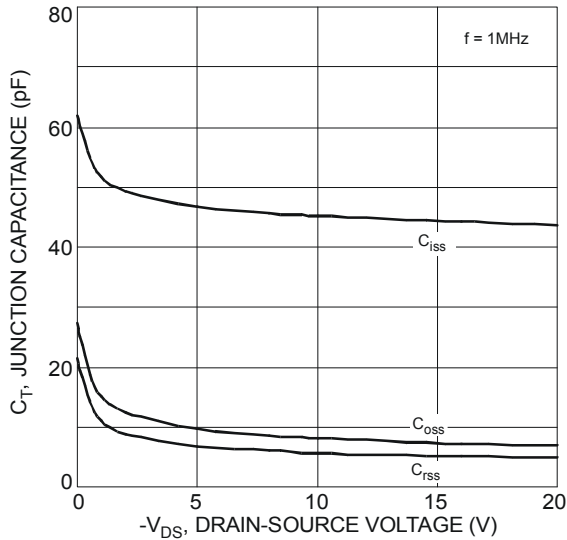


Fig. 21 Typical Junction Capacitance

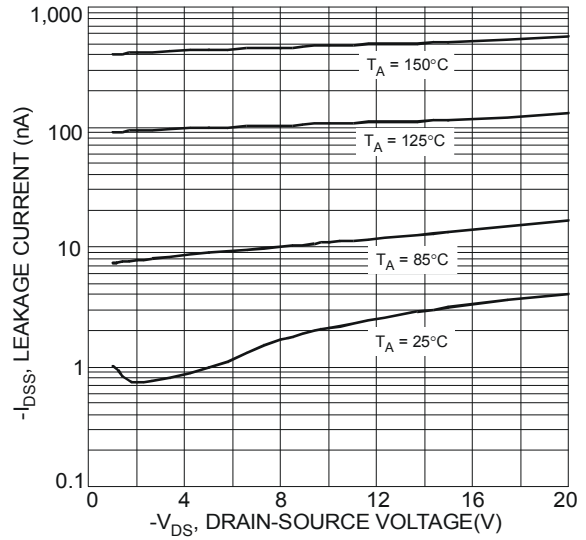


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

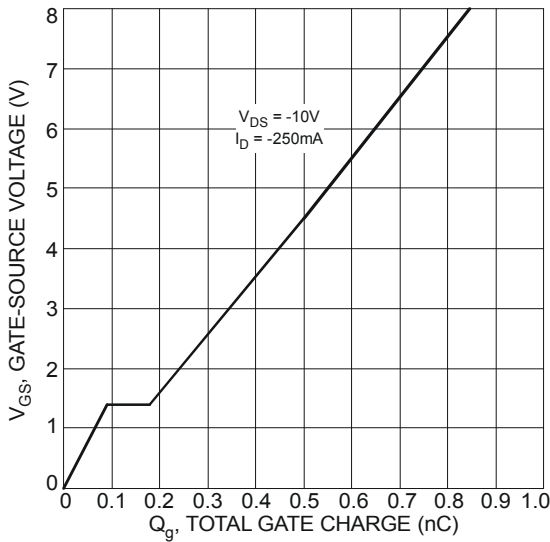


Fig. 23 Gate-Charge Characteristics

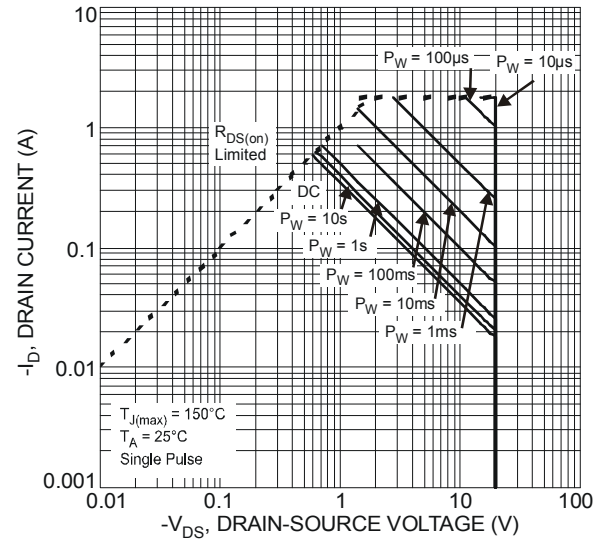


Fig. 24 SOA, Safe Operation Area

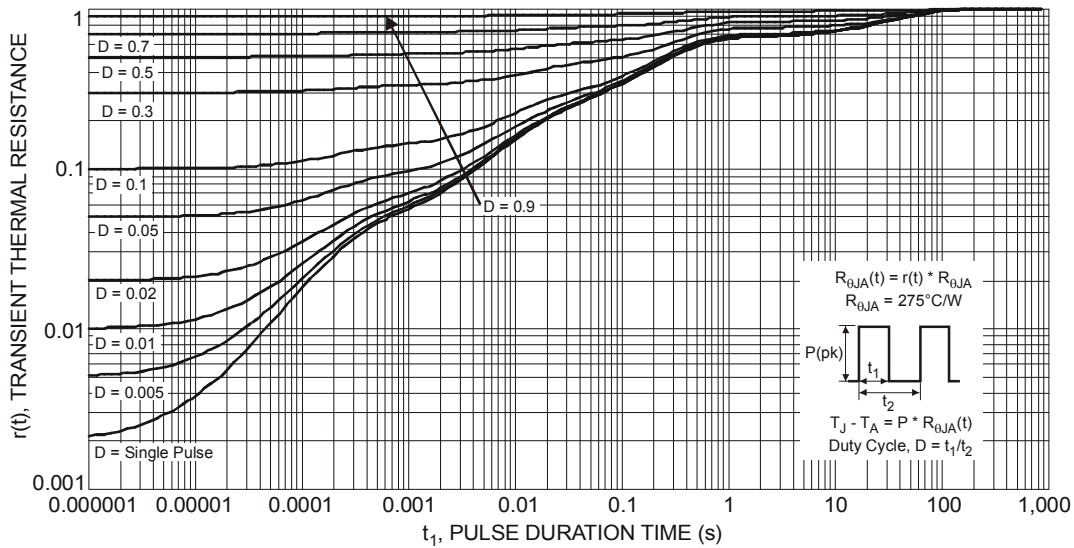
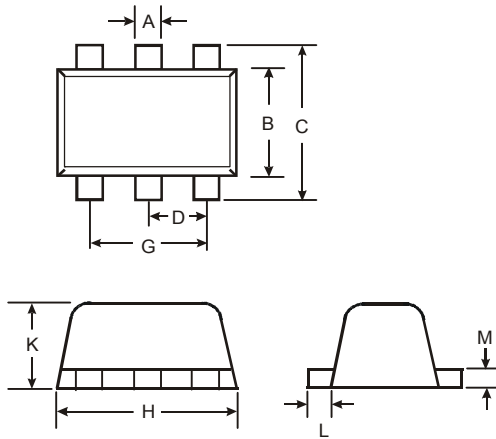


Fig. 25 Transient Thermal Response

Package Outline Dimensions

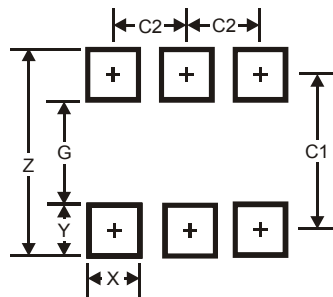
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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