

Product Summary

Device	BV _{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)}) 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 switches

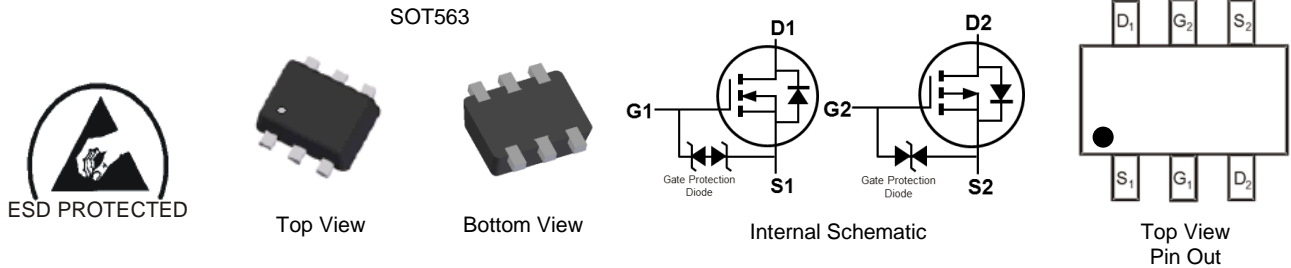
Features and Benefits

- 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**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DIODES™ DMC2400UVQ 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/>

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 (e3)
- Weight: 0.003 grams (Approximate)

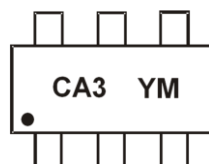


Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMC2400UVQ-7	SOT563	3000	Tape & Reel
DMC2400UVQ-13	SOT563	10000	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



CA3 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: J = 2022)
 M = Month (ex: 9 = September)

Date Code Key

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	J	K	L	M	N	O	P	R	S	T	U	V

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}	± 12	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	1030 800	mA
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	3	A
Maximum Body Diode Continuous Current			I_S	800	mA

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	± 8	V
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-700 -550	mA
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	-2	A
Maximum Body Diode Continuous Current			I_S	-800	mA

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P_D	0.45	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	281	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)		P_D	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	129	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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

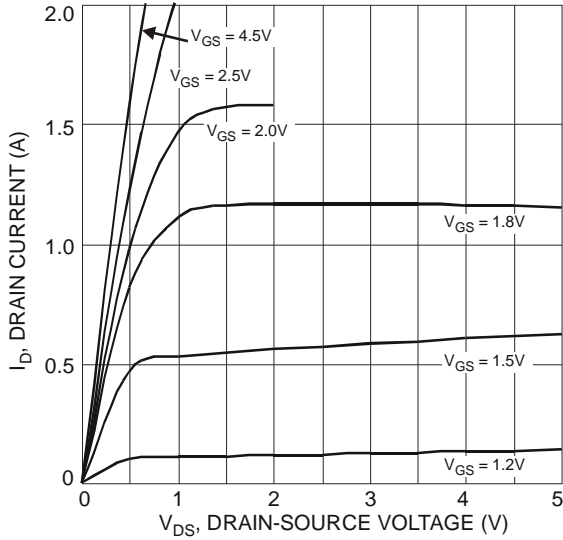


Fig. 1 Typical Output Characteristics

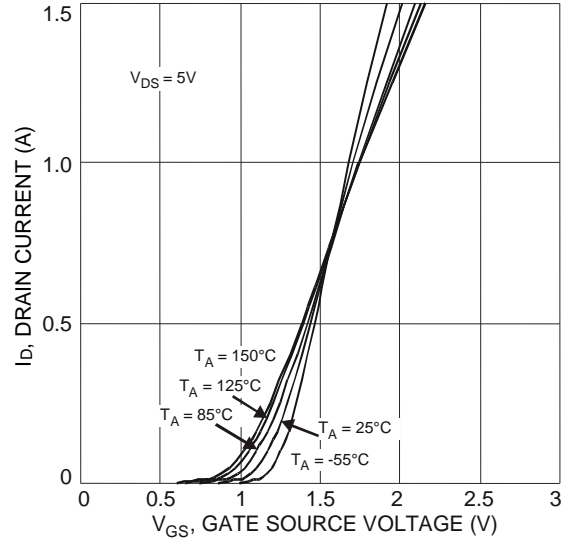


Fig. 2 Typical Transfer Characteristics

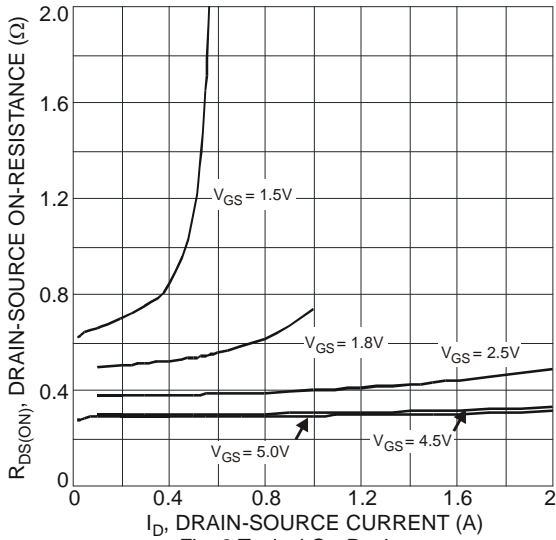


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

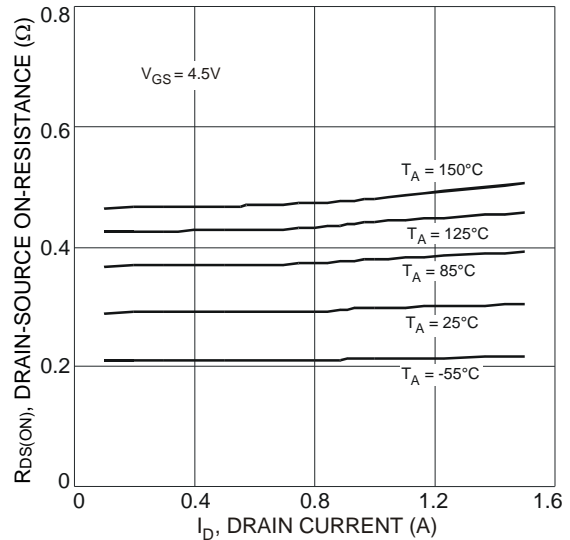


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

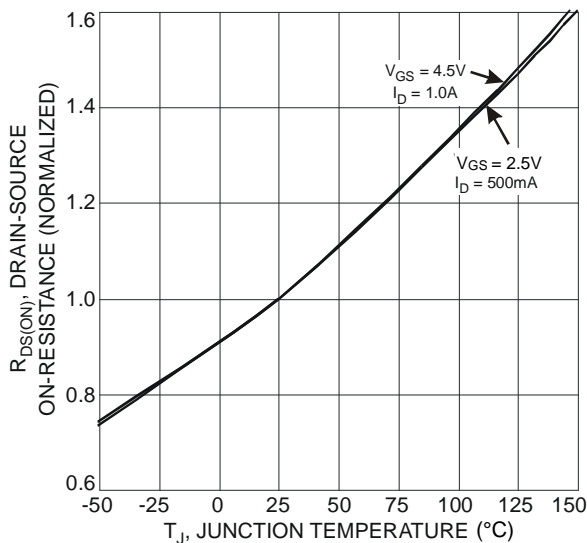


Fig. 5 On-Resistance Variation with Temperature

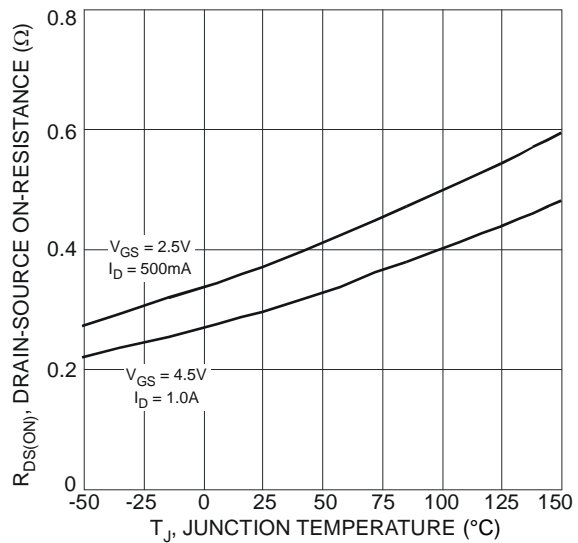


Fig. 6 On-Resistance Variation with Temperature

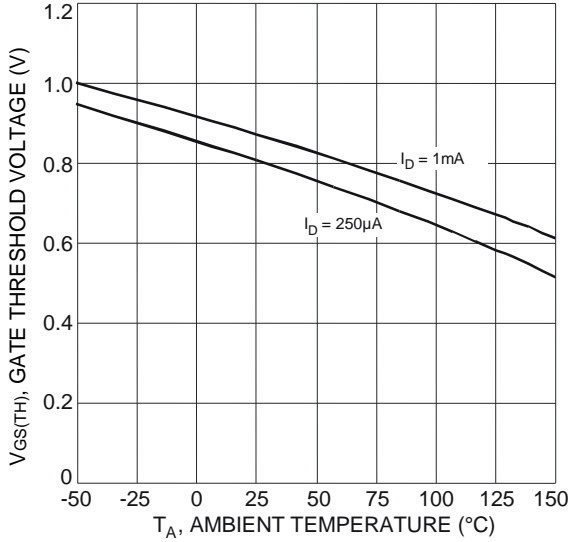


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

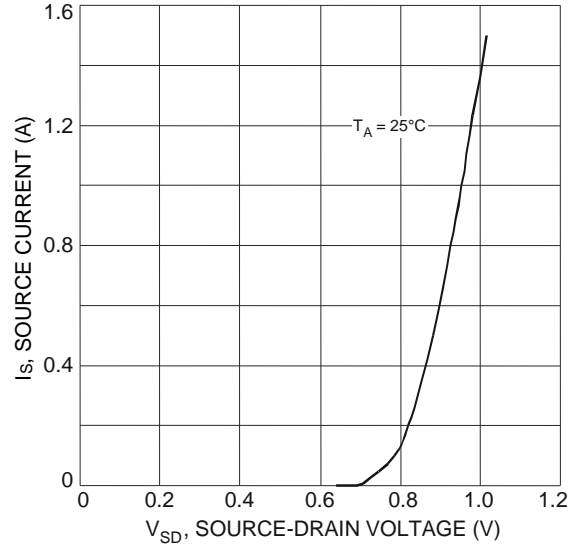


Fig. 8 Diode Forward Voltage vs. Current

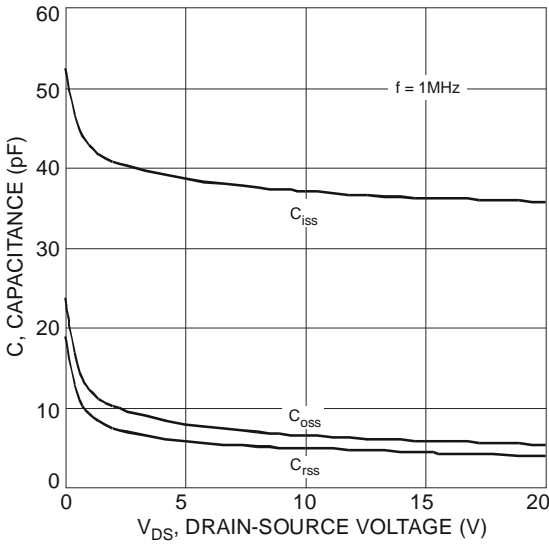


Fig. 9 Typical Capacitance

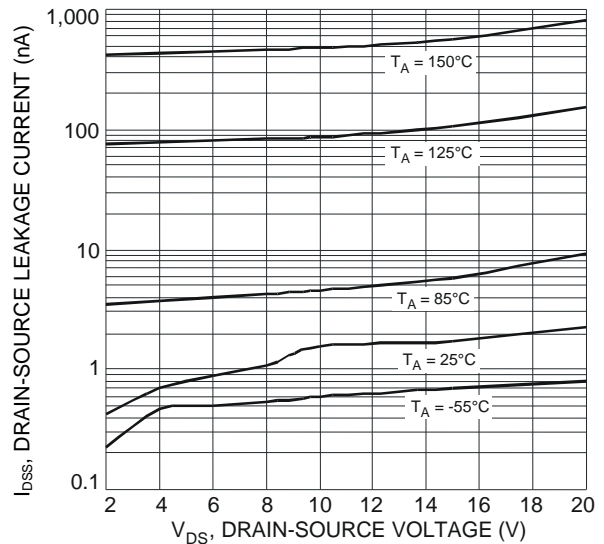


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

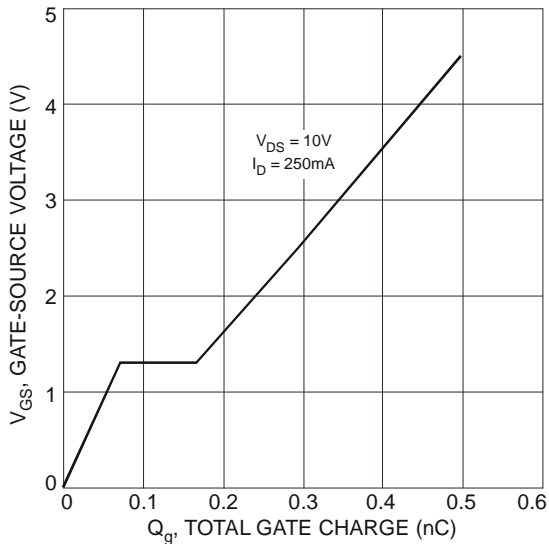


Fig. 11 Gate-Charge Characteristics

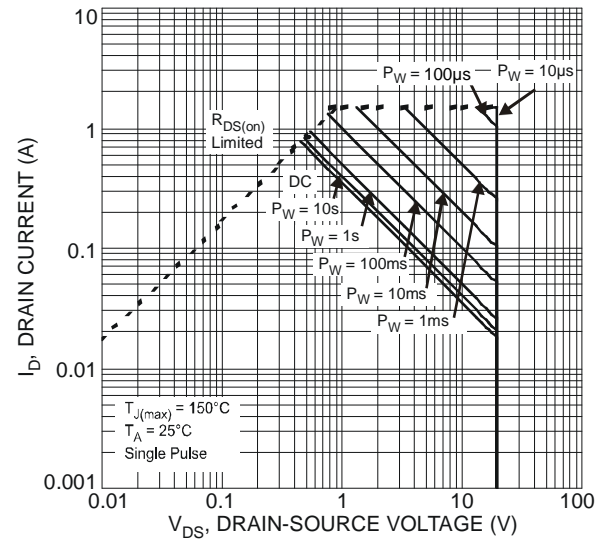


Fig. 12 SOA, Safe Operation Area

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 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}	—	—	±1.0	μA	V _{GS} = ±5V, V _{DS} = 0V
		—	—	±5.0		V _{GS} = ±8V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
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
Diode Forward Voltage	V _{SD}	—	-0.75	-1.2	V	V _{GS} = 0V, I _S = -330mA
DYNAMIC CHARACTERISTICS (Note 8)						
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 _{riss}	—	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: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

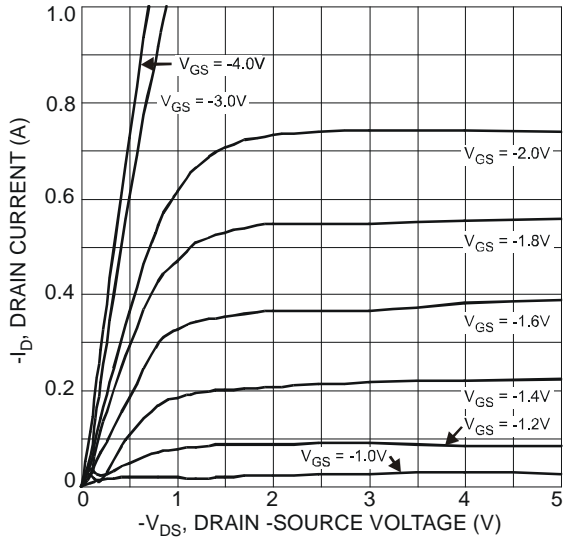


Fig. 13 Typical Output Characteristics

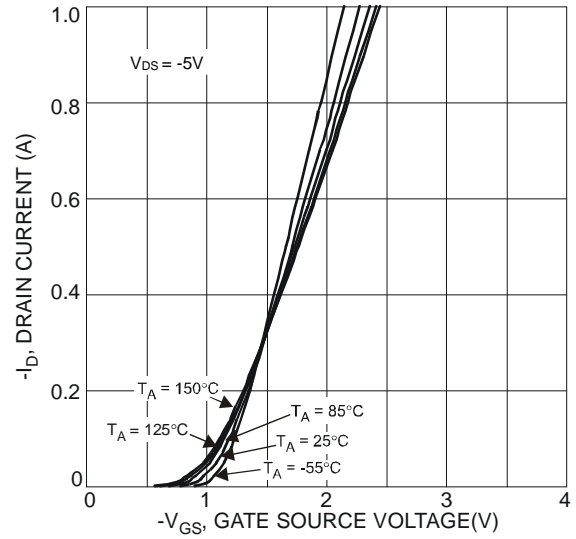


Fig. 14 Typical Transfer Characteristics

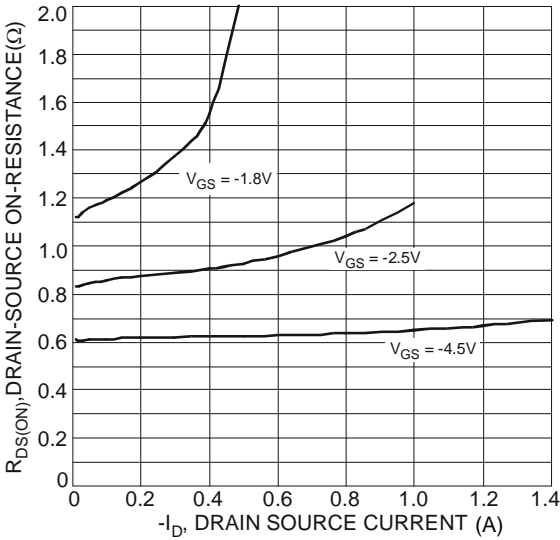


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

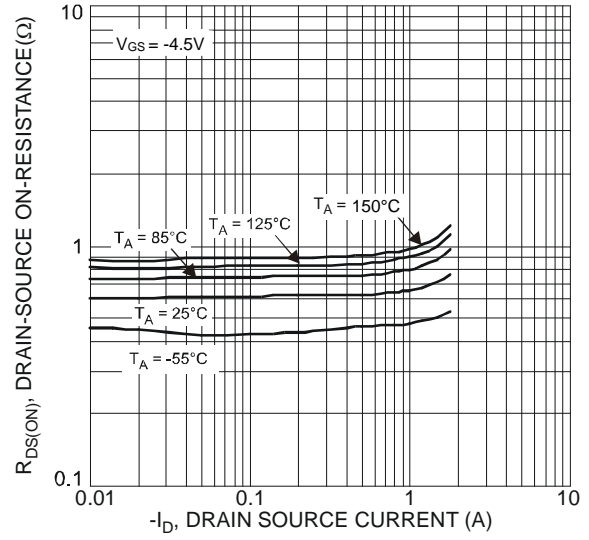


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

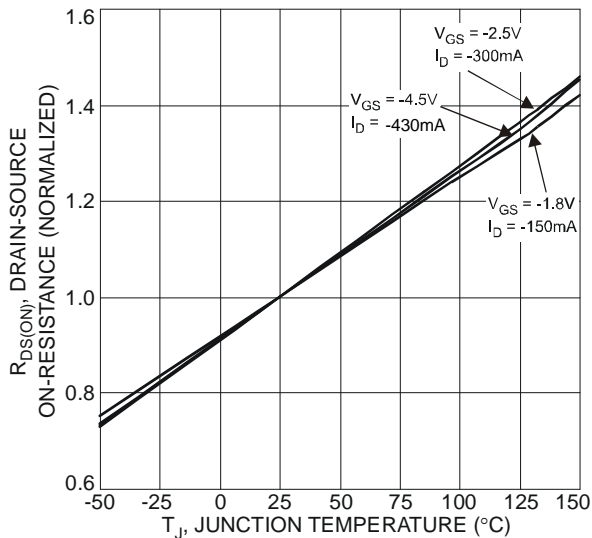


Fig. 17 On-Resistance Variation with Temperature

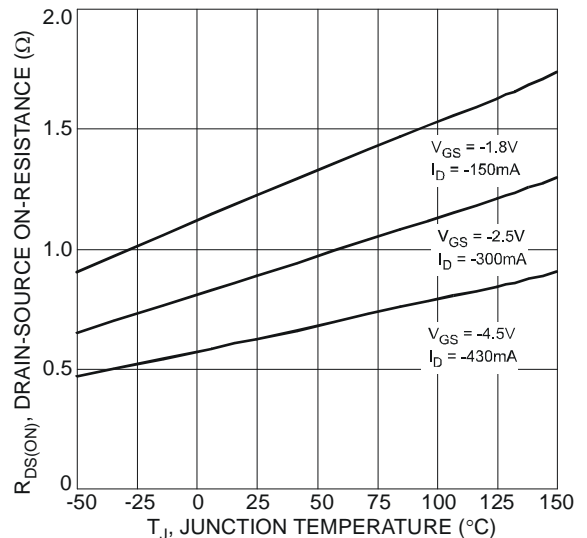


Fig. 18 On-Resistance vs. Temperature

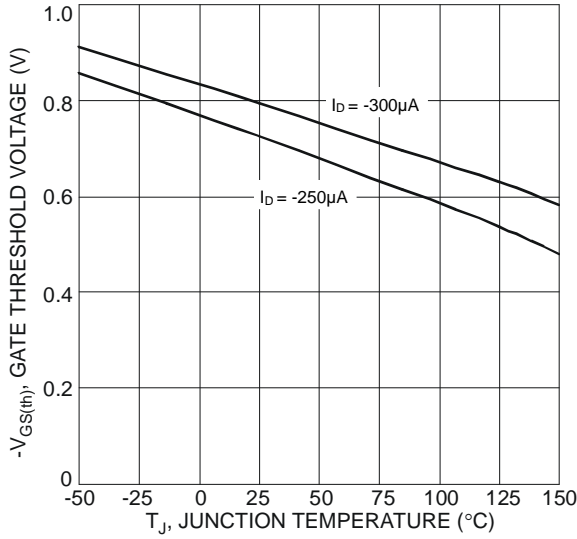


Fig. 19 Gate Threshold Voltage vs. Junction Temperature

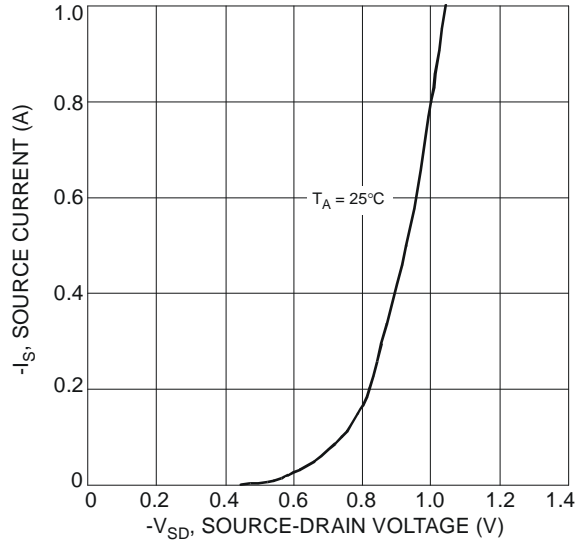


Fig. 20 Diode Forward Voltage vs. Current

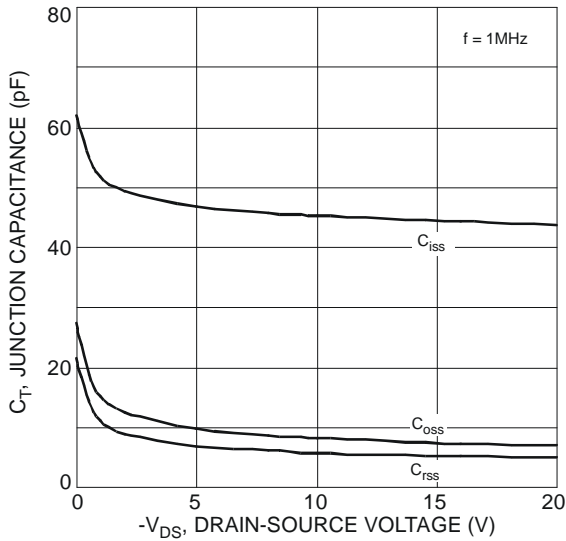


Fig. 21 Typical Junction Capacitance

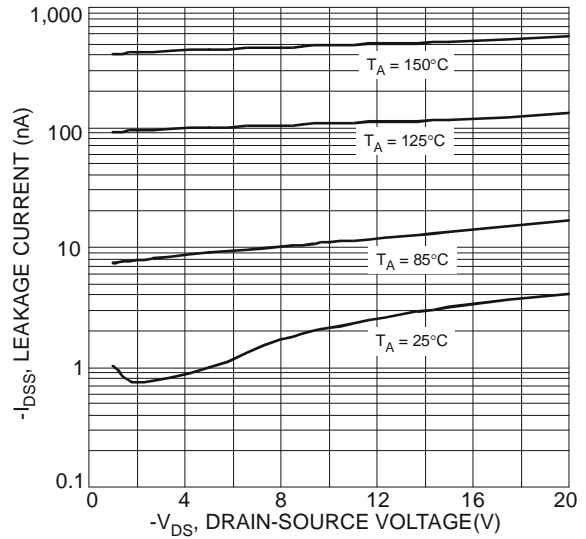


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

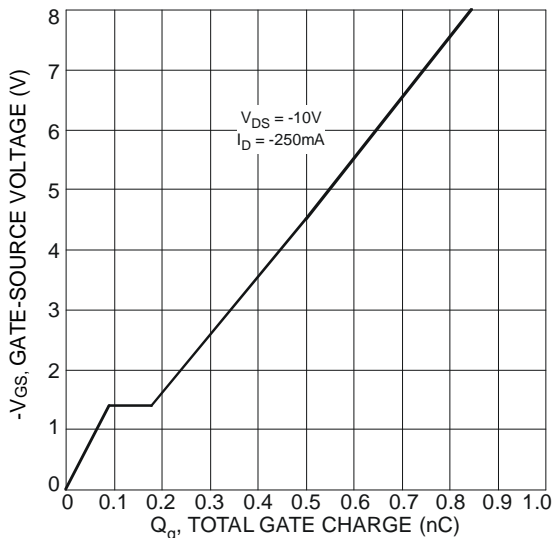


Fig. 23 Gate-Charge Characteristics

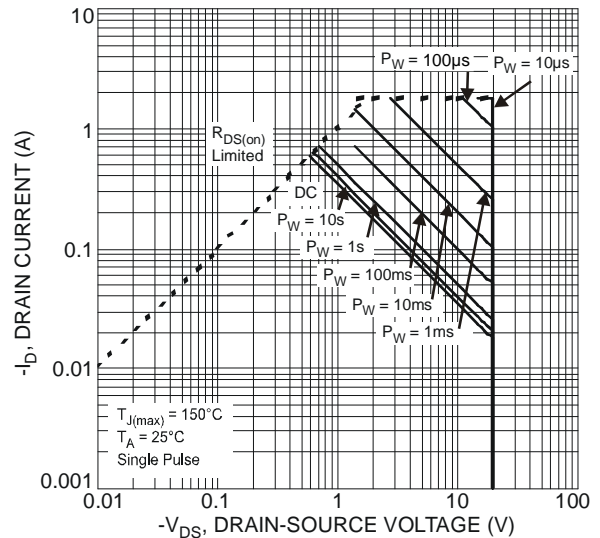


Fig. 24 SOA, Safe Operation Area

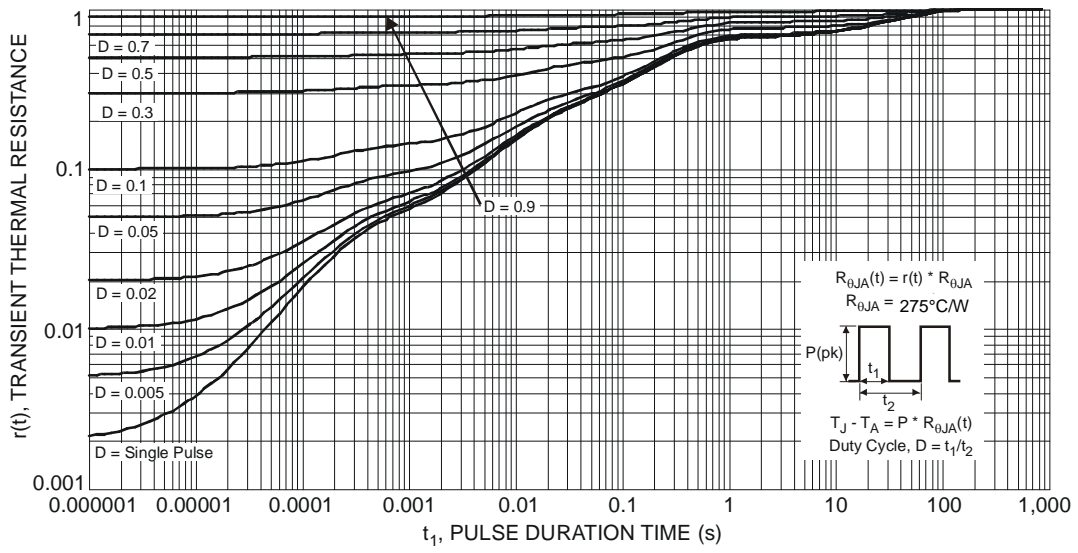
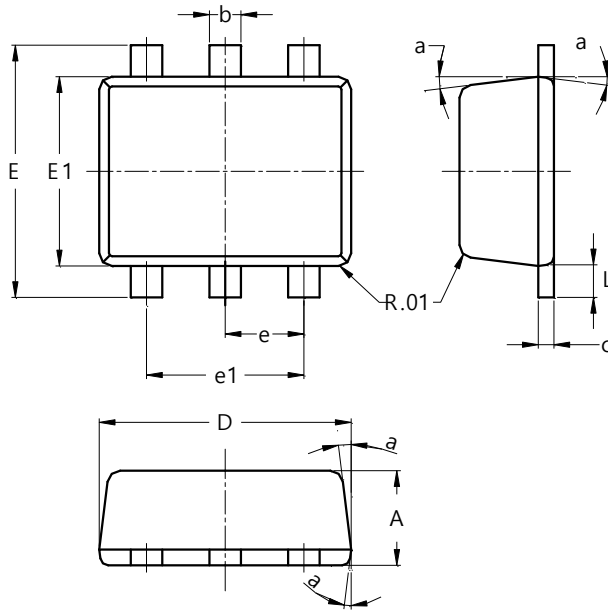


Fig. 25 Transient Thermal Response

Package Outline Dimensions

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

SOT563

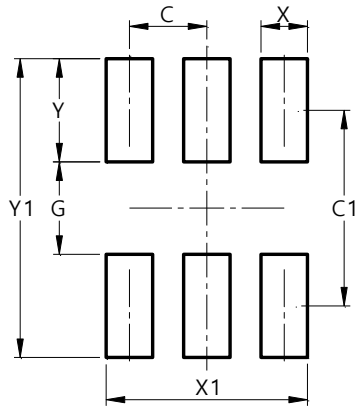


SOT563			
Dim	Min	Max	Typ
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°
All Dimensions in mm			

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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