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

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/RoHS Compliant (Note 1)**
- **"Green" Device, Halogan and Antimony Free (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

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.

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

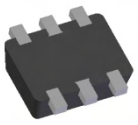
Mechanical Data

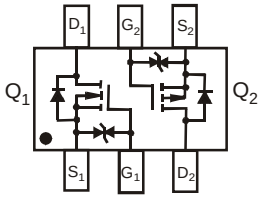
- Case: SOT563
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.003 grams (approximate)


ESD PROTECTED TO 2kV

SOT563


Top View


Bottom View



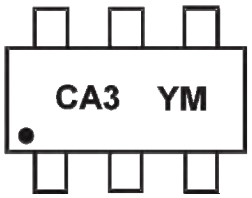
Equivalent Circuit

Ordering Information (Note 3)

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. No purposely added lead. Halogen and Antimony free
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

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 5) 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 5) 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 5) 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 5) 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 4)		P_D	0.45	W
Thermal Resistance, Junction to Ambient (Note 4)	Steady state	$R_{\theta JA}$	281	°C/W
	t<10s		210	°C/W
Total Power Dissipation (Note 5)		P_D	1	W
Thermal Resistance, Junction to Ambient (Note 5)	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 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	µA	V_{GS} = ±5V, V_{DS} = 0V
		-	-	±4.0		V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
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 7)						
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:
4. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

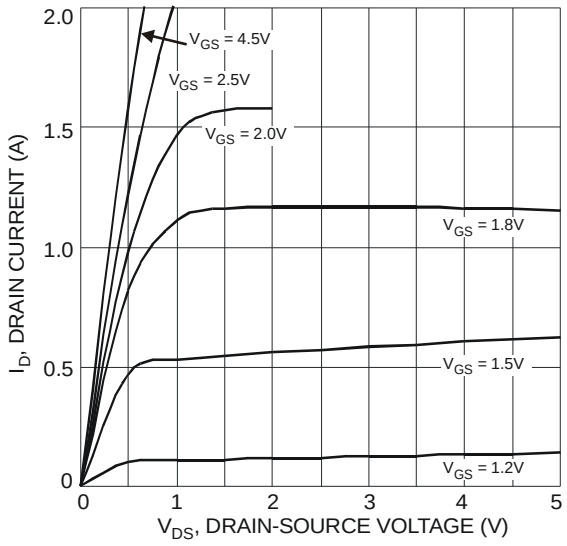


Fig. 1 Typical Output Characteristics

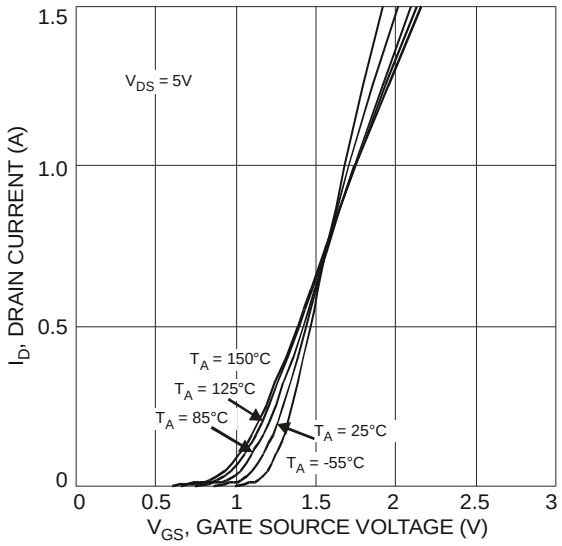


Fig. 2 Typical Transfer Characteristics

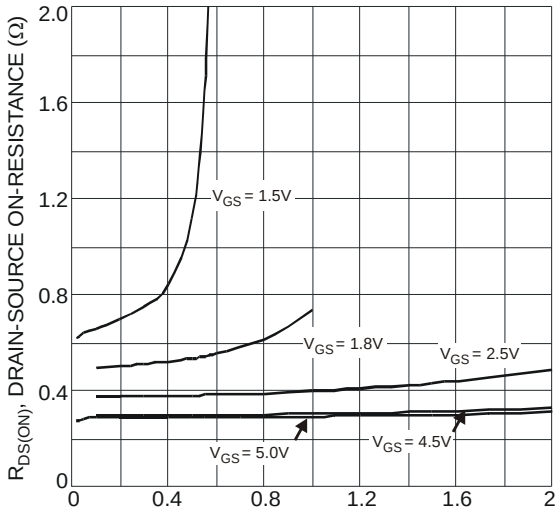


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

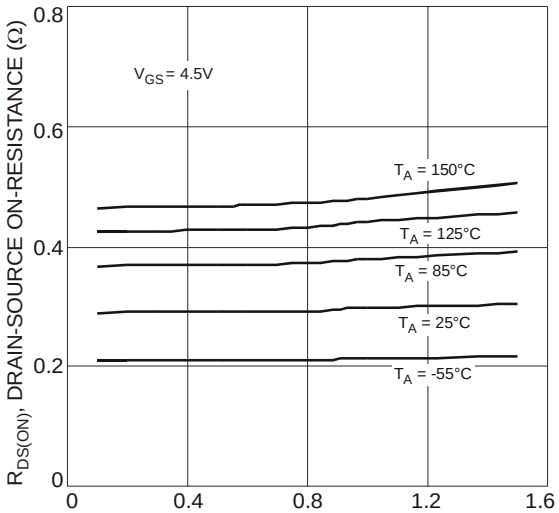


Fig. 4 Typical Drain-Source On-Resistance
vs. Drain Current and Temperature

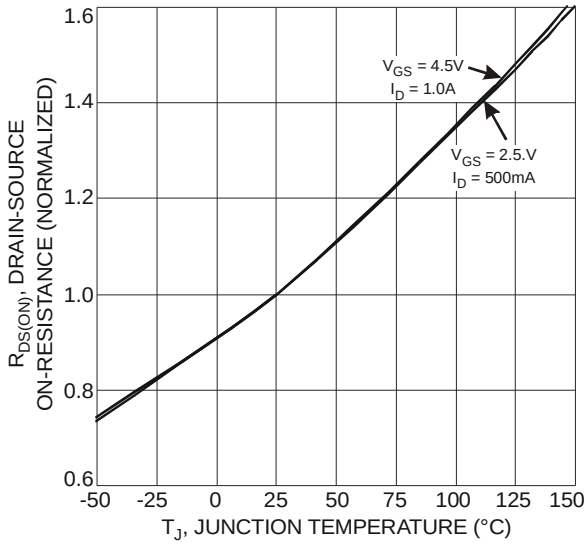


Fig. 5 On-Resistance Variation with Temperature

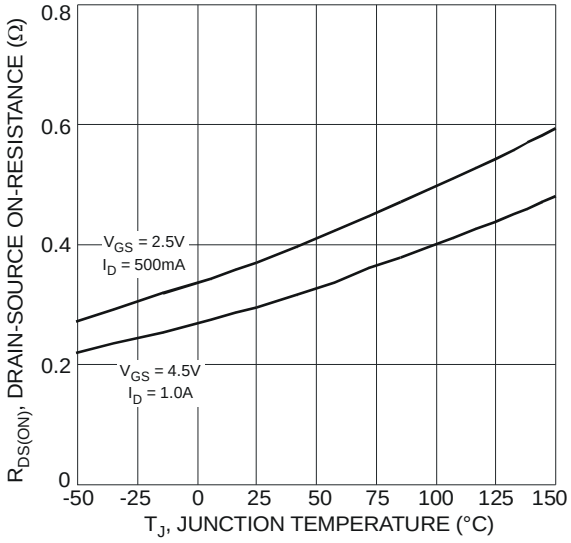


Fig. 6 On-Resistance Variation with Temperature

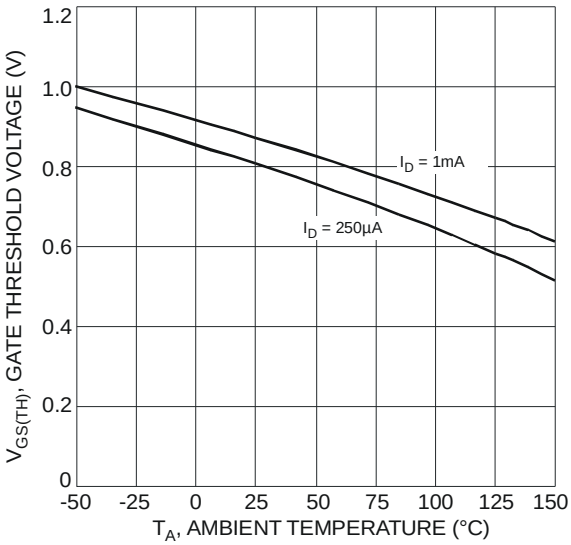


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

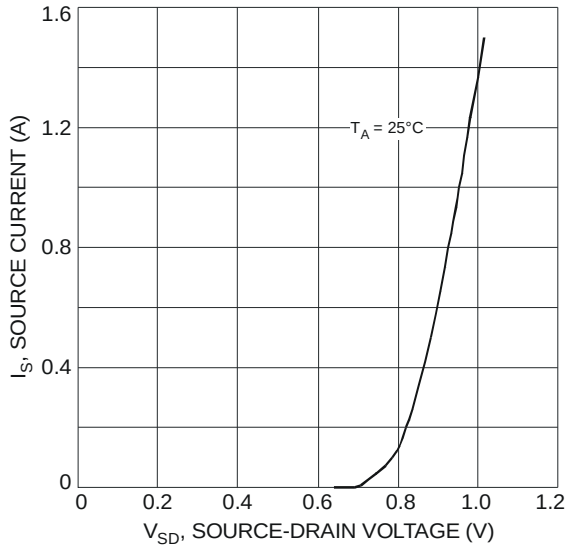


Fig. 8 Diode Forward Voltage vs. Current

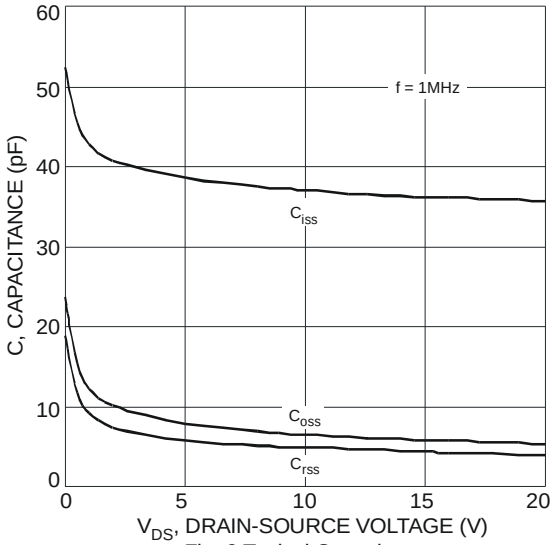


Fig. 9 Typical Capacitance

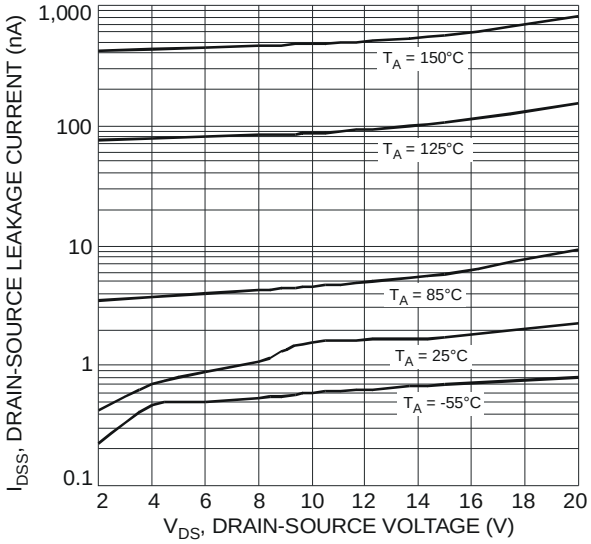


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

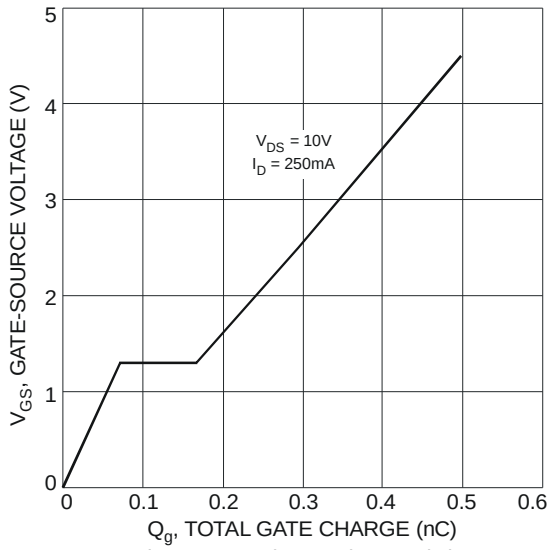


Fig. 11 Gate-Charge Characteristics

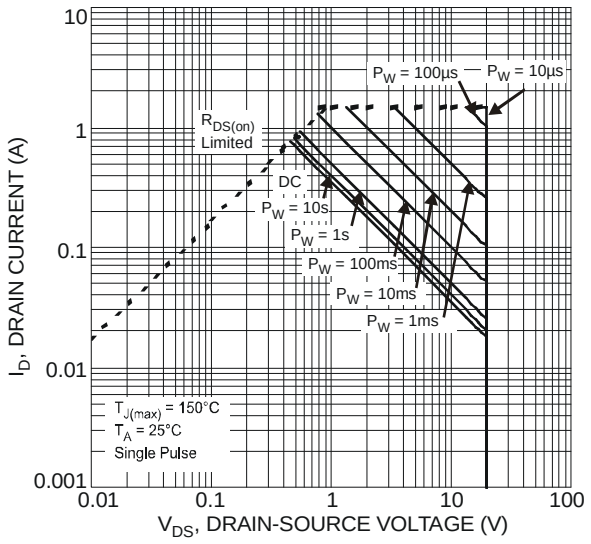


Fig. 12 SOA, Safe Operation Area

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:
4. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

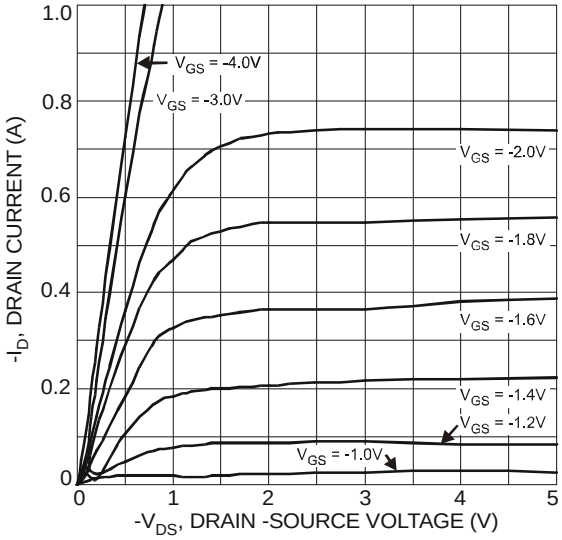


Fig. 13 Typical Output Characteristics

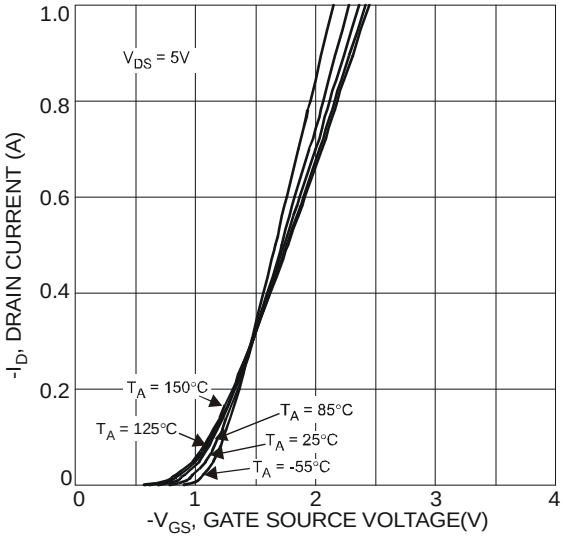


Fig. 14 Typical Transfer Characteristics

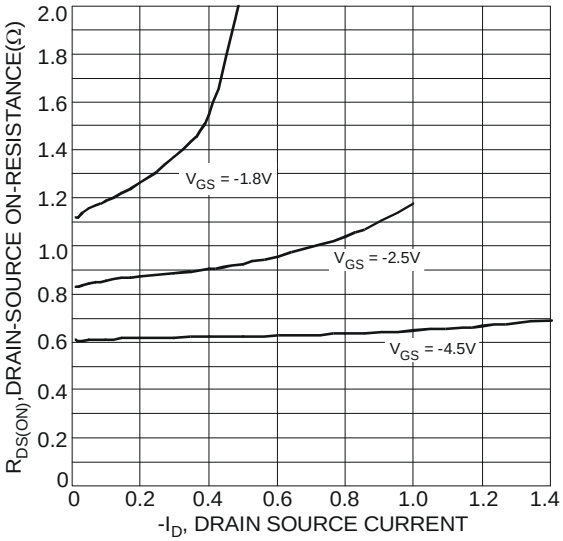


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

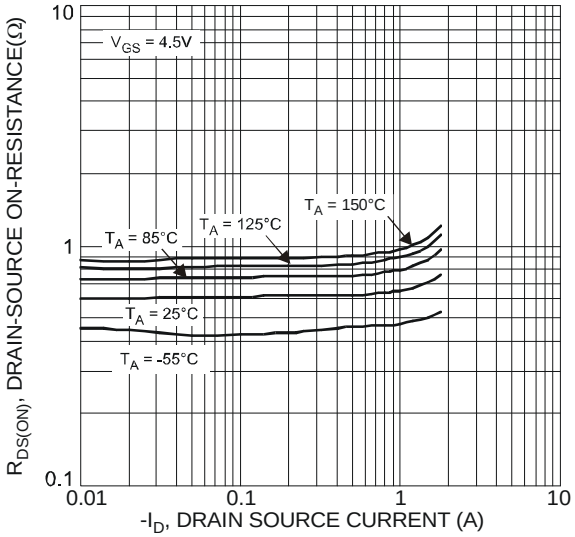


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

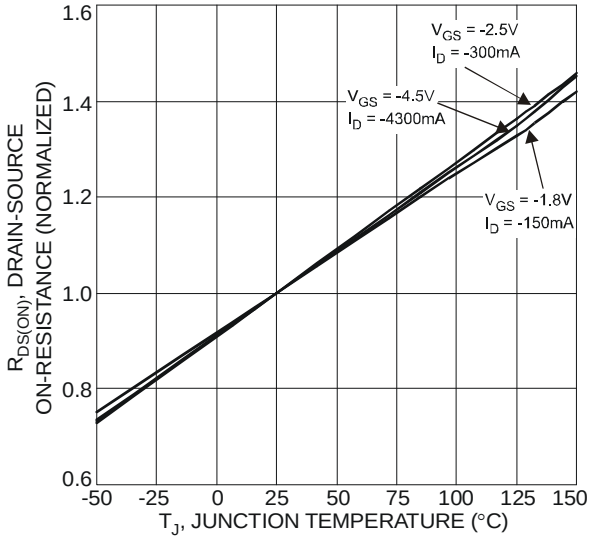


Fig. 17 On-Resistance Variation with Temperature

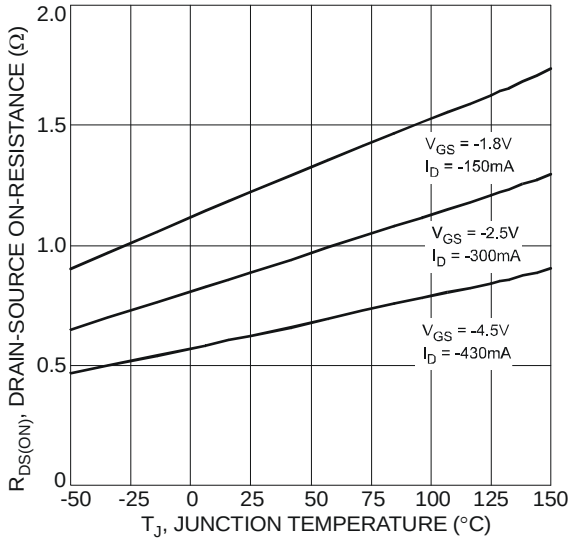


Fig. 18 On-Resistance vs.Temperature

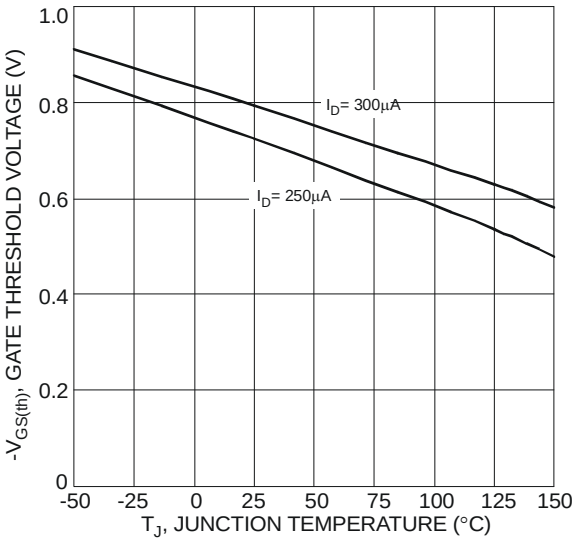


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

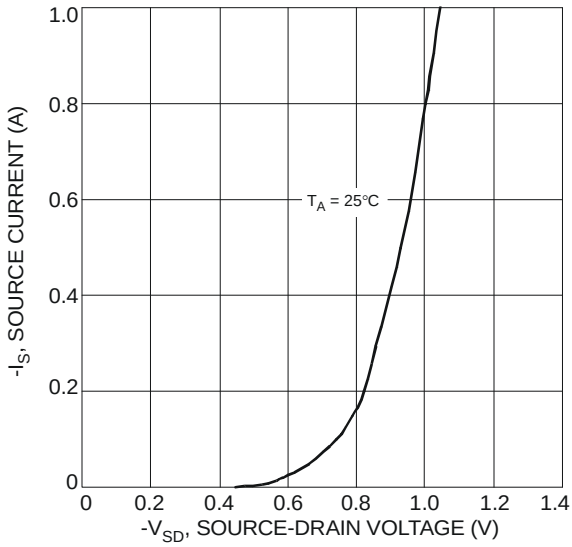


Fig. 20 Diode Forward Voltage vs. Current

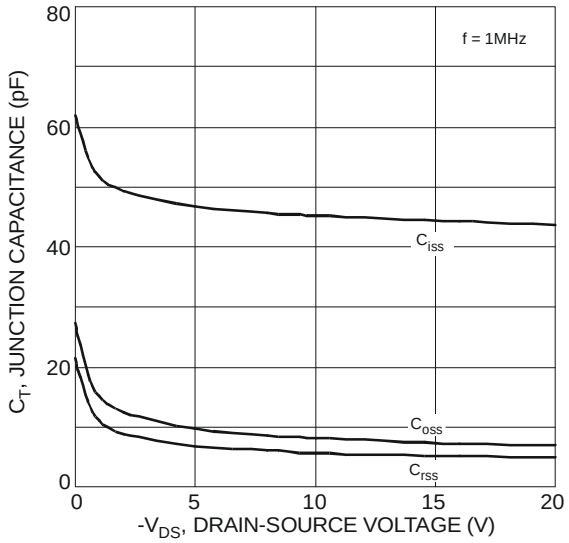


Fig. 21 Typical Junction Capacitance

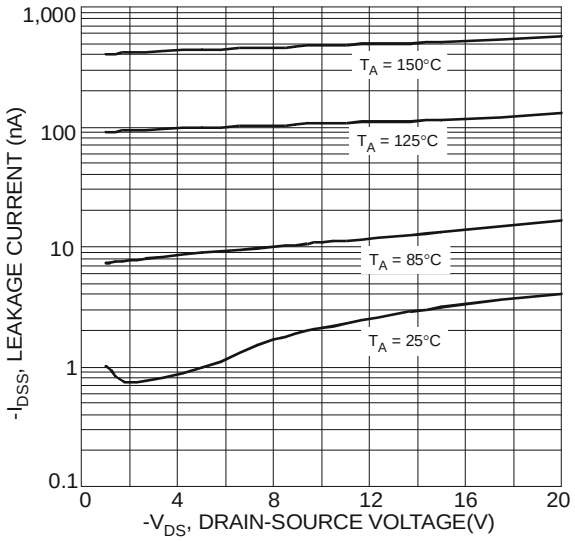


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

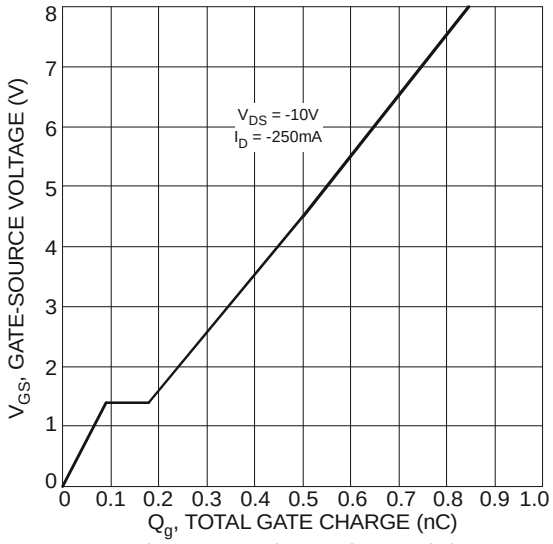


Fig. 23 Gate-Charge Characteristics

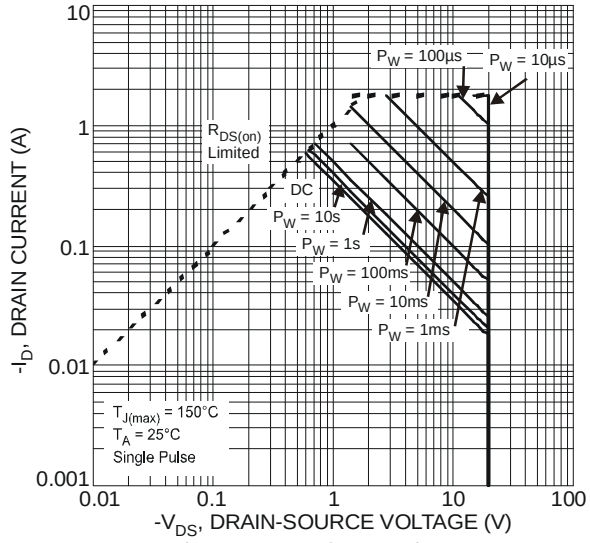


Fig. 24 SOA, Safe Operation Area

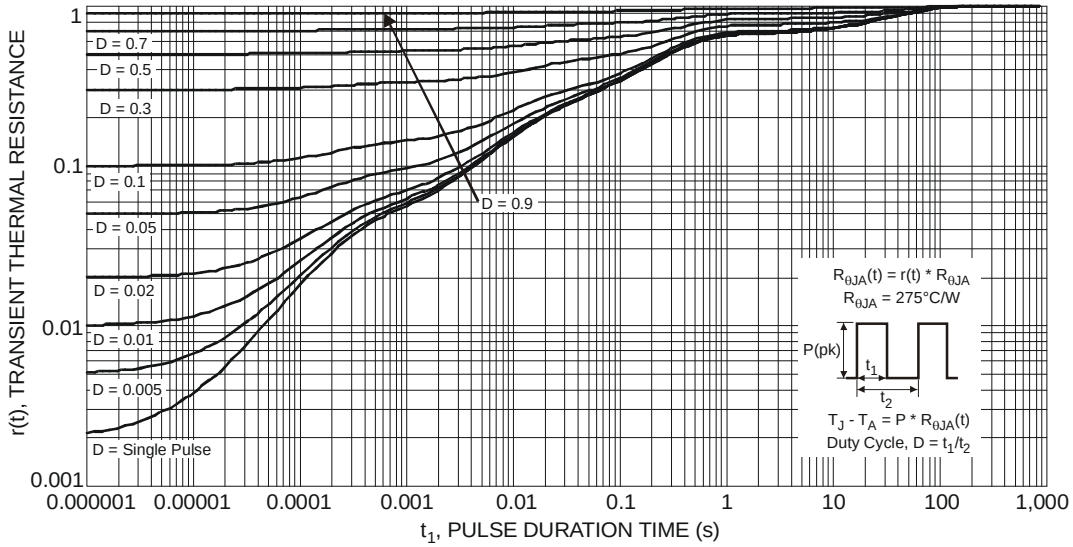
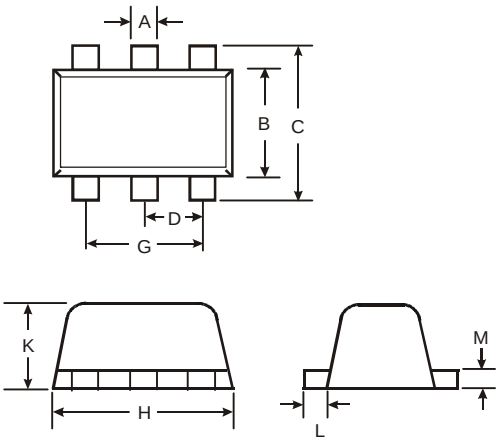


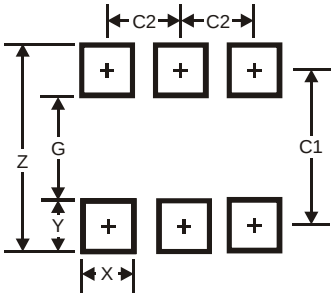
Fig. 25 Transient Thermal Response

Package Outline Dimensions



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



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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