

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 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.

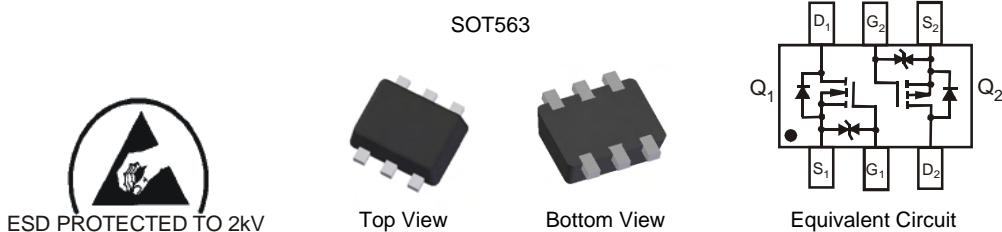
- Power management functions
- Battery Operated Systems and Solid-State Relays
- Load switch

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage $V_{GS(\text{th})} < 1\text{V}$
- 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/RoHS Compliant (Note 1)
- "Green" Device, Halogen and Antimony Free (Note 2)
- 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
- Weight: 0.003 grams (approximate)



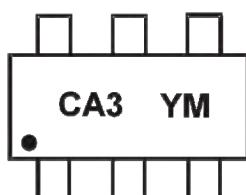
Ordering Information (Note 3)

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

Notes:

- EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free
- Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
- 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 @ $T_A = 25^\circ\text{C}$ 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) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	1030 800	mA
	$t < 10\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	1150 900	mA
Continuous Drain Current (Note 5) $V_{GS} = 1.8\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	740 570	mA
	$t < 10\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	870 700	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	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	± 8	V
Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	-700 -550	mA
	$t < 10\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	-820 -640	mA
Continuous Drain Current (Note 5) $V_{GS} = -1.8\text{V}$	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	-460 -350	mA
	$t < 10\text{s}$	$T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$	I_D	-550 -420	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

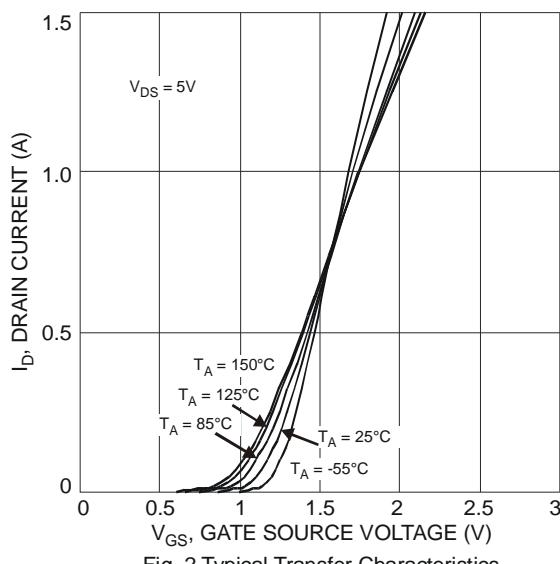
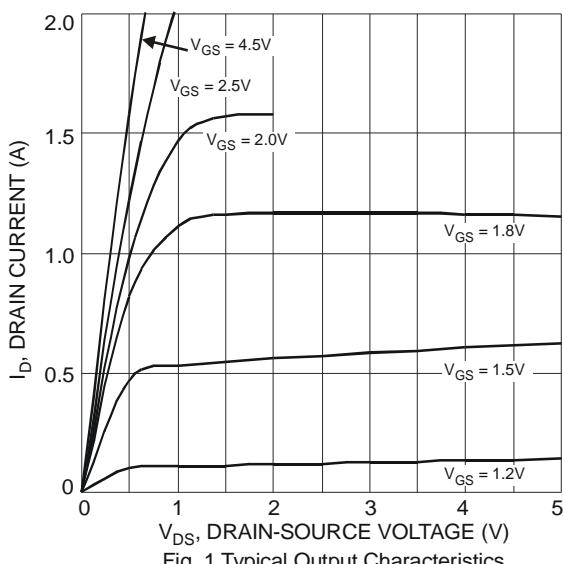
Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 4)			P_D	0.45	W
Thermal Resistance, Junction to Ambient (Note 4)	Steady state		$R_{\theta JA}$	281	$^\circ\text{C/W}$
	$t < 10\text{s}$			210	$^\circ\text{C/W}$
Total Power Dissipation (Note 5)			P_D	1	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state		$R_{\theta JA}$	129	$^\circ\text{C/W}$
	$t < 10\text{s}$			97	$^\circ\text{C/W}$
Operating and Storage Temperature Range			T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics - Q1 N-CHANNEL @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	-	-	V	$\text{V}_{\text{GS}} = 0\text{V}, \text{I}_D = 1\text{mA}$
Zero Gate Voltage Drain Current $T_A = 25^\circ\text{C}$	I_{DSS}	-	-	100	nA	$\text{V}_{\text{DS}} = 20\text{V}, \text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	-	-	± 1	μA	$\text{V}_{\text{GS}} = \pm 5\text{V}, \text{V}_{\text{DS}} = 0\text{V}$
		-	-	± 4.0		$\text{V}_{\text{GS}} = \pm 8\text{V}, \text{V}_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	0.5	-	0.9	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}, \text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	-	0.3	0.48	Ω	$\text{V}_{\text{GS}} = 5.0\text{V}, \text{I}_D = 200\text{mA}$
		-	0.35	0.5		$\text{V}_{\text{GS}} = 4.5\text{V}, \text{I}_D = 200\text{mA}$
		-	0.45	0.7		$\text{V}_{\text{GS}} = 2.5\text{V}, \text{I}_D = 200\text{mA}$
		-	0.55	0.9		$\text{V}_{\text{GS}} = 1.8\text{V}, \text{I}_D = 100\text{mA}$
		-	0.65	1.5		$\text{V}_{\text{GS}} = 1.5\text{V}, \text{I}_D = 50\text{mA}$
		-	2	-		$\text{V}_{\text{GS}} = 1.2\text{V}, \text{I}_D = 1\text{mA}$
Forward Transfer Admittance	$ \text{Y}_{\text{fs}} $	-	1.4	-	S	$\text{V}_{\text{DS}} = 3\text{V}, \text{I}_D = 200\text{mA}$
Diode Forward Voltage	V_{SD}	-	0.7	1.2	V	$\text{V}_{\text{GS}} = 0\text{V}, \text{I}_S = 500\text{mA}$
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	-	37.1	-	pF	$\text{V}_{\text{DS}} = 10\text{V}, \text{V}_{\text{GS}} = 0\text{V}, \text{f} = 1.0\text{MHz}$
Output Capacitance	C_{oss}	-	6.5	-		
Reverse Transfer Capacitance	C_{rss}	-	4.8	-		
Gate Resistance	R_g	-	68	-	Ω	$\text{V}_{\text{DS}} = 0\text{V}, \text{V}_{\text{GS}} = 0\text{V}$
Total Gate Charge	Q_g	-	0.5	-	nC	$\text{V}_{\text{GS}} = 4.5\text{V}, \text{V}_{\text{DS}} = 10\text{V}, \text{I}_D = 250\text{mA}$
Gate-Source Charge	Q_{gs}	-	0.07	-		
Gate-Drain Charge	Q_{gd}	-	0.1	-		
Turn-On Delay Time	$\text{t}_{\text{D(on)}}$	-	4.06	-	ns	$\text{V}_{\text{DD}} = 10\text{V}, \text{V}_{\text{GS}} = 4.5\text{V}, \text{R}_L = 47\Omega, \text{R}_G = 10\Omega, \text{I}_D = 200\text{mA}$
Turn-On Rise Time	t_r	-	7.28	-		
Turn-Off Delay Time	$\text{t}_{\text{D(off)}}$	-	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.



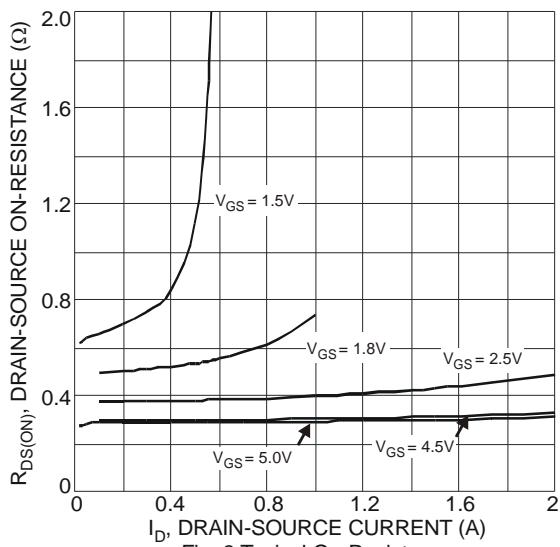


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

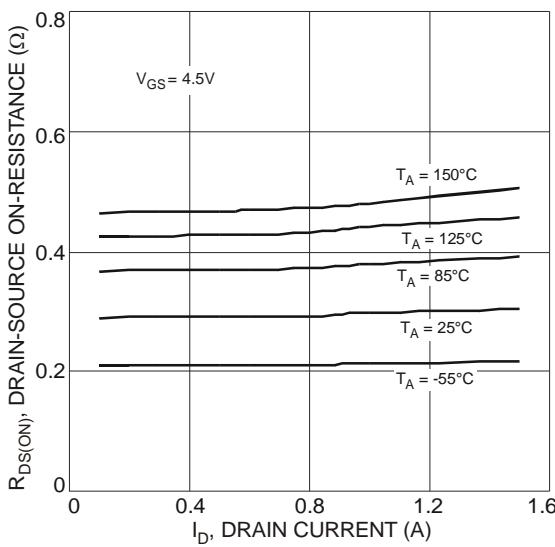


Fig. 4 Typical Drain-Source On-Resistance
vs. Drain Current and Temperature

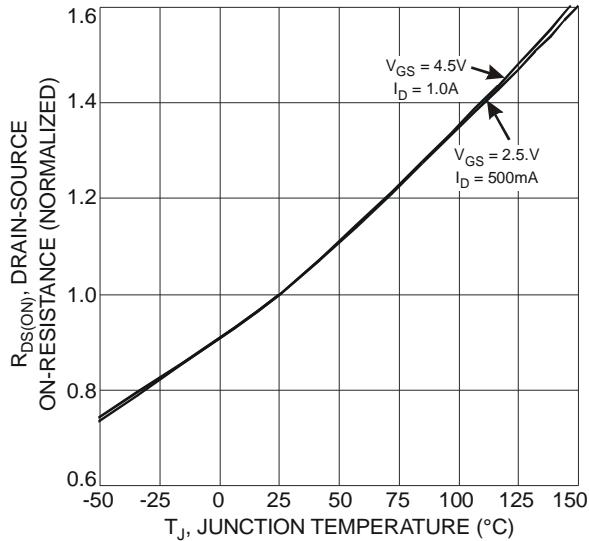


Fig. 5 On-Resistance Variation with Temperature

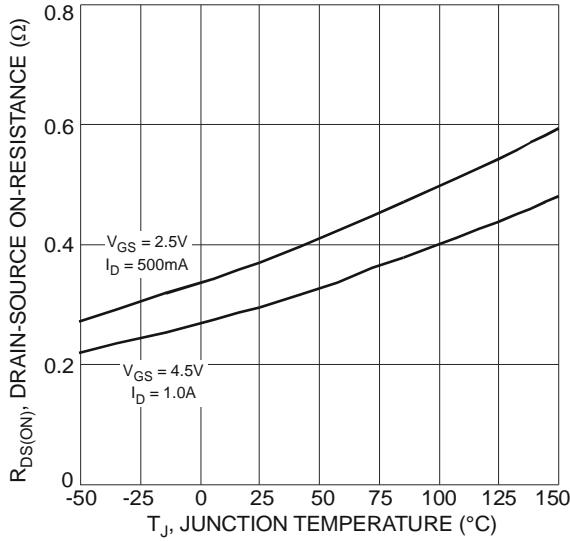


Fig. 6 On-Resistance Variation with Temperature

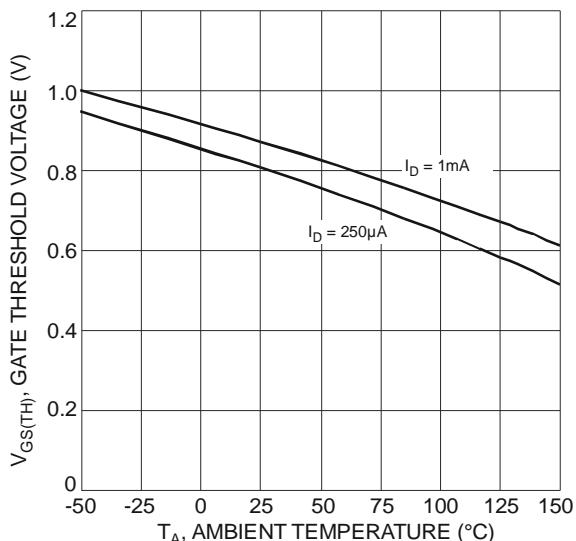


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

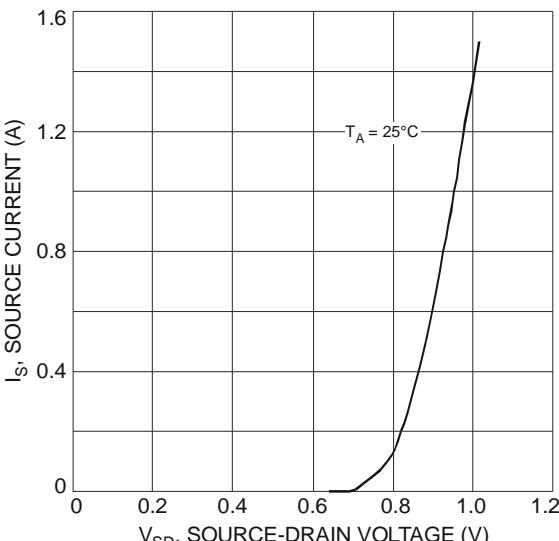


Fig. 8 Diode Forward Voltage vs. Current

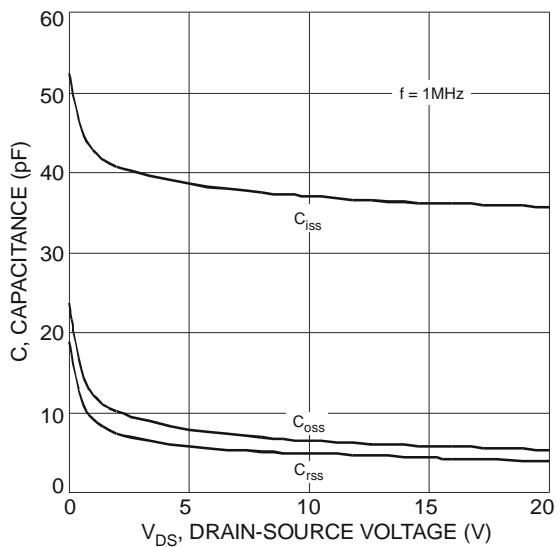


Fig. 9 Typical Capacitance

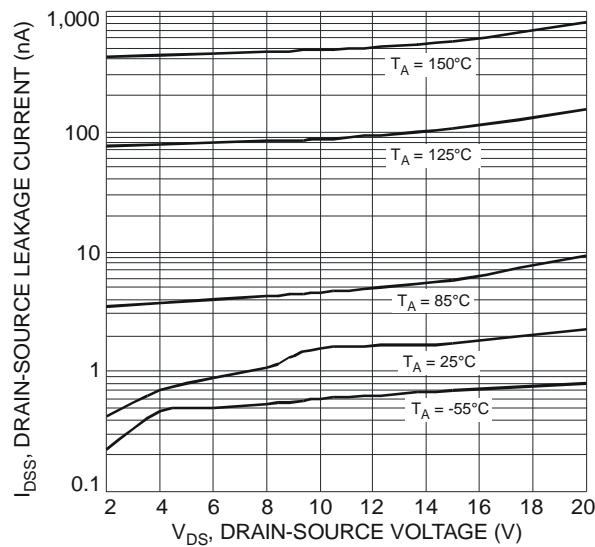


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

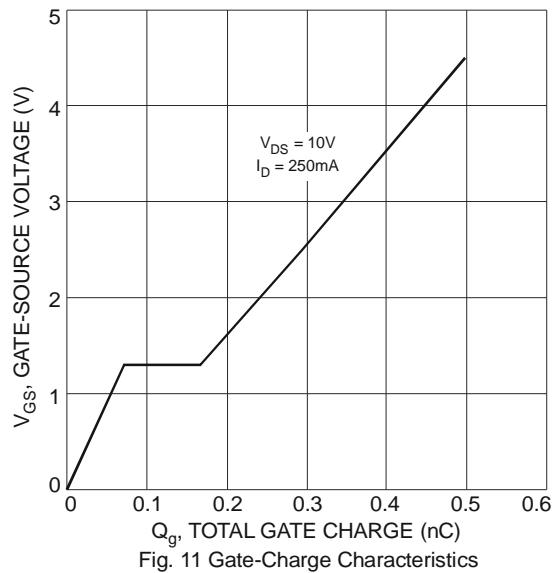


Fig. 11 Gate-Charge Characteristics

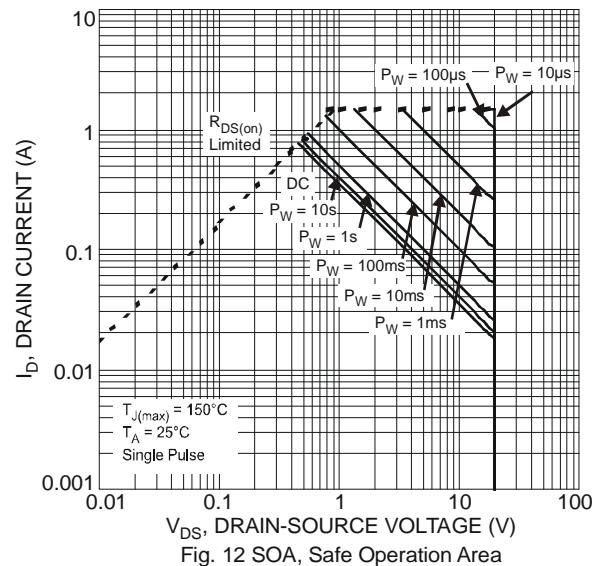


Fig. 12 SOA, Safe Operation Area

Electrical Characteristics - Q2 P-CHANNEL @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	-	-	V	$V_{\text{GS}} = 0\text{V}$, $I_D = -1\text{mA}$
Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$	I_{DSS}	-	-	-100	nA	$V_{\text{DS}} = -20\text{V}$, $V_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GS}	-	-	± 1.0	μA	$V_{\text{GS}} = \pm 5\text{V}$, $V_{\text{DS}} = 0\text{V}$
		-	-	± 5.0		$V_{\text{GS}} = \pm 8\text{V}$, $V_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{\text{GS(th)}}$	-0.5	-	-1.0	V	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{\text{DS(on)}}$	-	0.67	0.97		$V_{\text{GS}} = -5\text{V}$, $I_D = -100\text{mA}$
		-	0.7	1.0		$V_{\text{GS}} = -4.5\text{V}$, $I_D = -100\text{mA}$
		-	0.9	1.5		$V_{\text{GS}} = -2.5\text{V}$, $I_D = -80\text{mA}$
		-	1.2	2.0		$V_{\text{GS}} = -1.8\text{V}$, $I_D = -40\text{mA}$
		-	1.5	3.0		$V_{\text{GS}} = -1.5\text{V}$, $I_D = -30\text{mA}$
		-	5	-		$V_{\text{GS}} = -1.2\text{V}$, $I_D = -1\text{mA}$
Forward Transfer Admittance	$ Y_{\text{fs}} $	-	0.7	-	S	$V_{\text{DS}} = -3\text{V}$, $I_D = -100\text{mA}$
Diode Forward Voltage	V_{SD}	-	-0.75	-1.2	V	$V_{\text{GS}} = 0\text{V}$, $I_S = -330\text{mA}$
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	-	46.1	-	pF	$V_{\text{DS}} = 10\text{V}$, $V_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	-	7.2	-		
Reverse Transfer Capacitance	C_{rss}	-	4.9	-		
Gate Resistance	R_g	-	14.3	-	Ω	$V_{\text{DS}} = 0\text{V}$, $V_{\text{GS}} = 0\text{V}$,
Total Gate Charge $V_{\text{GS}} = -4.5\text{V}$	Q_g	-	0.5	-	nC	$V_{\text{DS}} = -10\text{V}$, $I_D = -250\text{mA}$
Total Gate Charge $V_{\text{GS}} = -10\text{V}$	Q_g	-	0.85	-		
Gate-Source Charge	Q_{gs}	-	0.09	-		
Gate-Drain Charge	Q_{gd}	-	0.09	-		
Turn-On Delay Time	$t_{\text{D(on)}}$	-	8.5	-	ns	$V_{\text{DD}} = -3\text{V}$, $V_{\text{GS}} = -2.5\text{V}$, $R_L = 300\Omega$, $R_G = 25\Omega$, $I_D = -100\text{mA}$
Turn-On Rise Time	t_r	-	4.3	-		
Turn-Off Delay Time	$t_{\text{D(off)}}$	-	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.

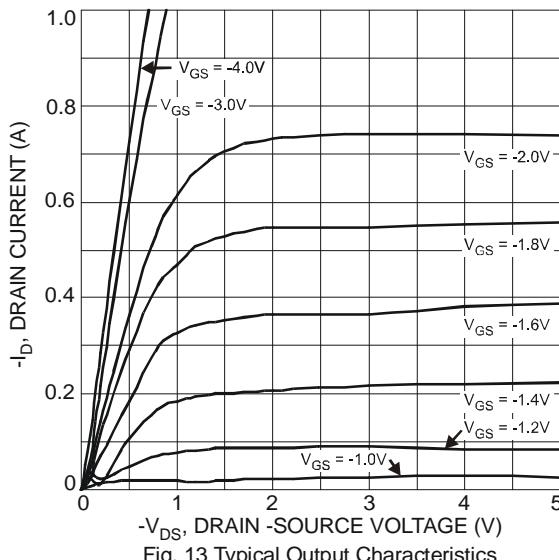


Fig. 13 Typical Output Characteristics

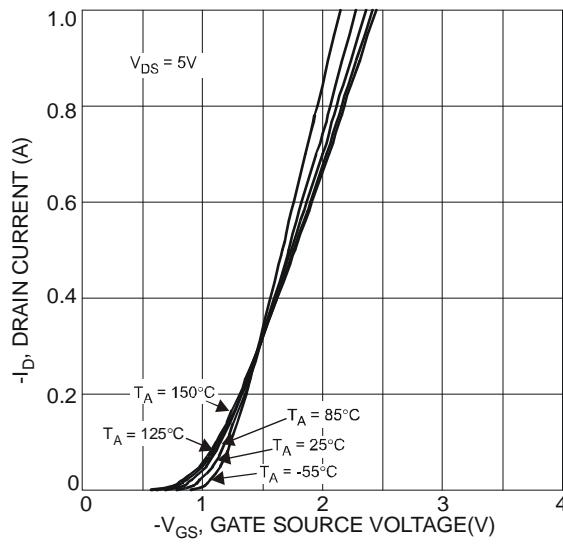


Fig. 14 Typical Transfer Characteristics

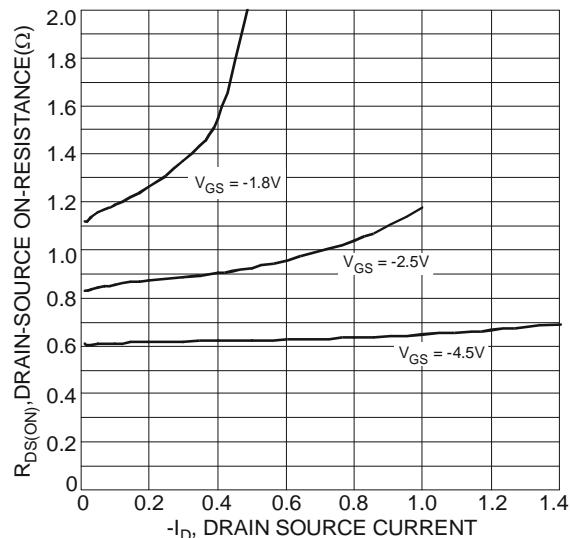


Fig. 15 Typical On-Resistance vs.
Drain Current and Gate Voltage

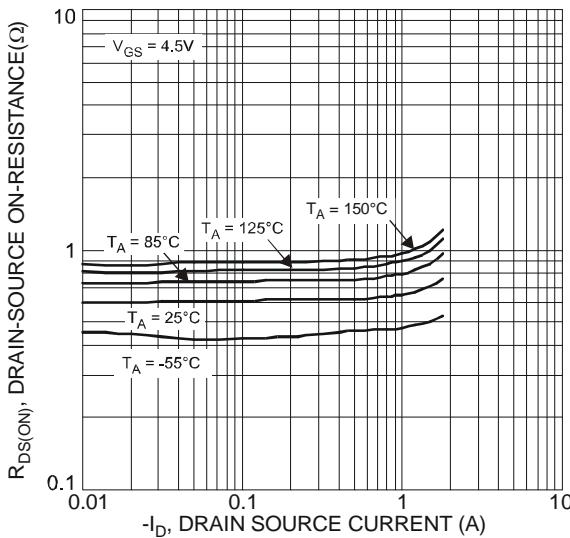


Fig. 16 Typical On-Resistance vs.
Drain Current and Temperature

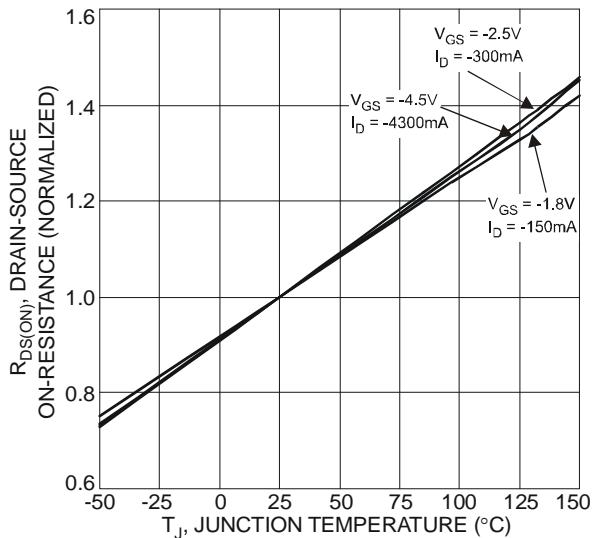


Fig. 17 On-Resistance Variation with Temperature

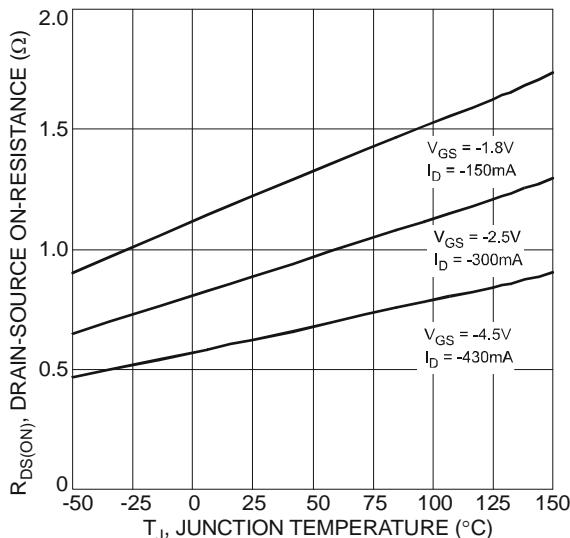


Fig. 18 On-Resistance vs. Temperature

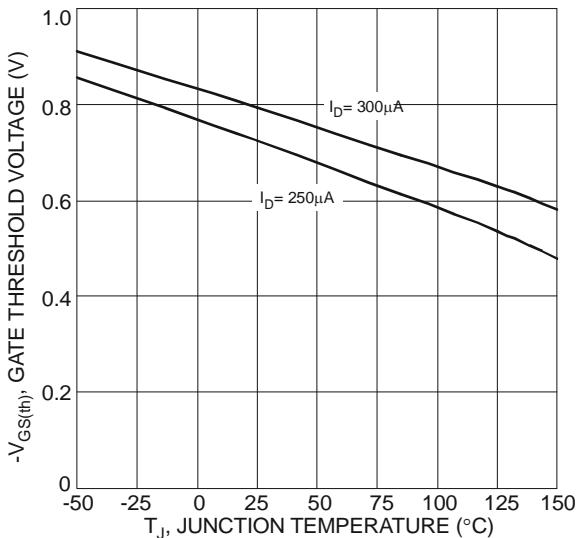


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

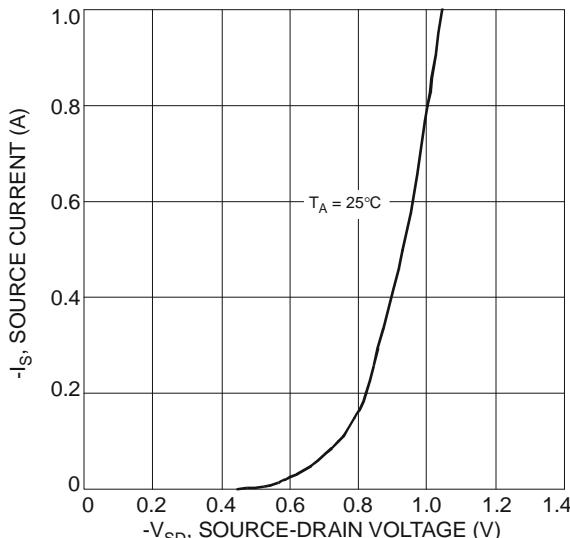


Fig. 20 Diode Forward Voltage vs. Current

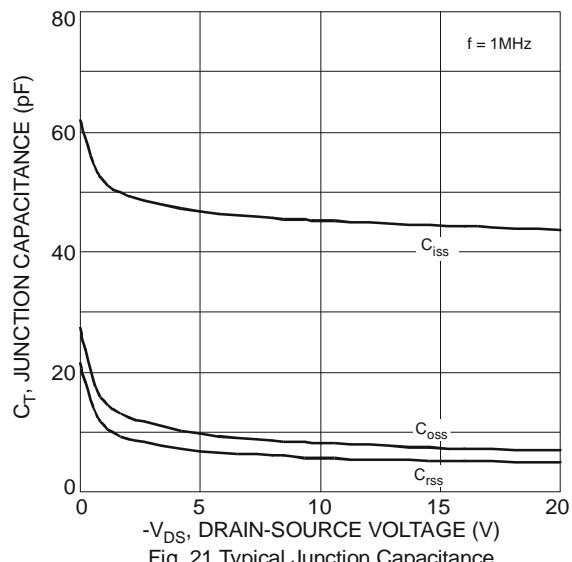


Fig. 21 Typical Junction Capacitance

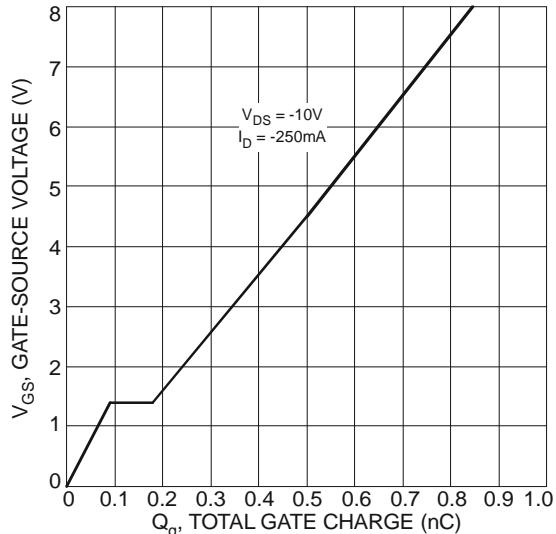


Fig. 23 Gate-Charge Characteristics

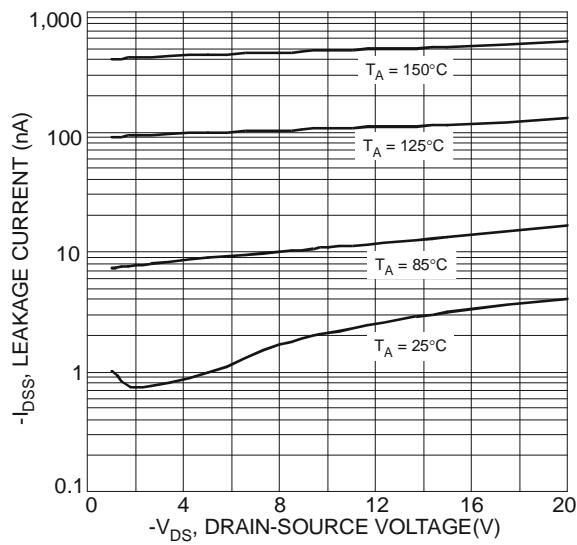


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

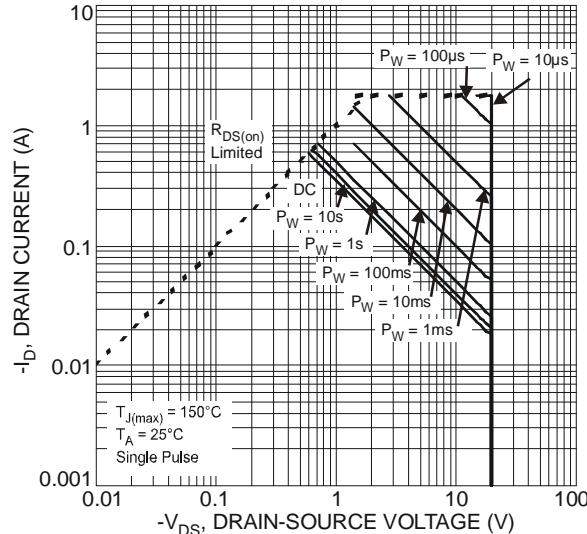


Fig. 24 SOA, Safe Operation Area

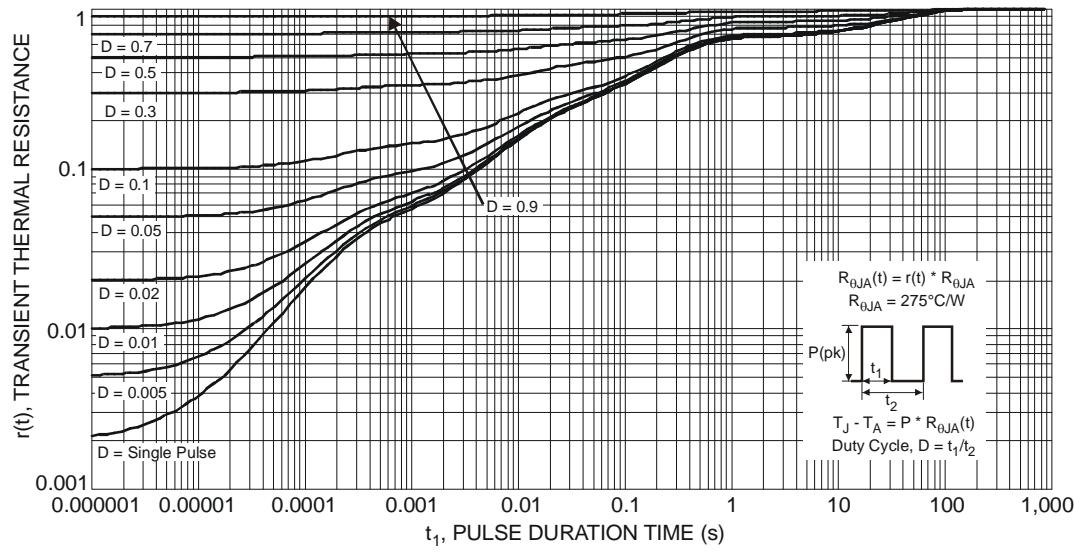
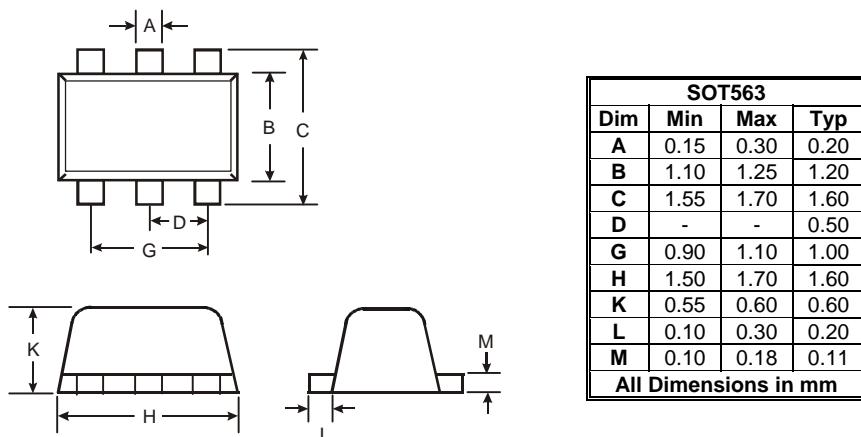
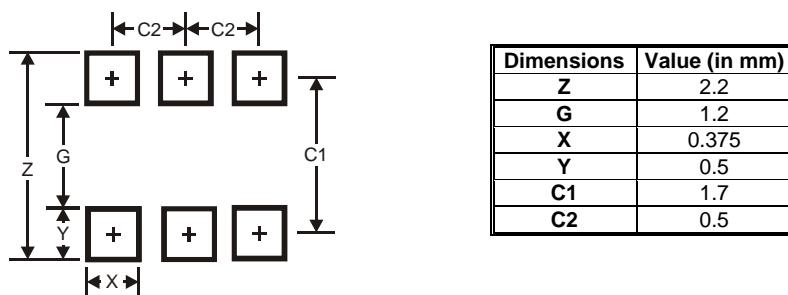


Fig. 25 Transient Thermal Response

Package Outline Dimensions



Suggested Pad Layout



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