

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV _{DSS}	R _{DS(ON)}	I _D @T _A = +25°C
Q1	20V	0.45Ω @ V _{GS} = 4.5V	1066mA
Q2	-20V	0.75Ω @ V _{GS} = -4.5V	-845mA

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

- Battery operated systems and solid-state relays
- Drivers: relays, solenoids, lamps, hammers, displays, memories, transistors, etc.
- Power supply converter circuits

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- The DMG1016UDWQ 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

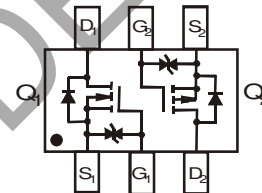
- Package: SOT363
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)



ESD PROTECTED



Top View



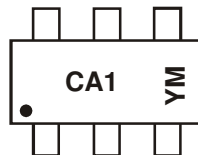
Top View
Internal Schematic

Ordering Information (Note 4)

Part Number	Compliance	Package	Packing	
			Qty.	Carrier
DMG1016UDWQ-7	Automotive	SOT363	3000	Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 - 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.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



CA1 = Product Type Marking Code
 YM or YM= Date Code Marking
 Y or 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

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P _D	330	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	379	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

Maximum Ratings N-CHANNEL – Q1 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	V _{DSS}	20	V	
Gate-Source Voltage	V _{GSS}	±6	V	
Continuous Drain Current (Note 5)	I _D	TA = +25°C	1066	mA
		TA = +85°C	690	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	3.2	A	

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

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	V _{DSS}	-20	V	
Gate-Source Voltage	V _{GSS}	±6	V	
Continuous Drain Current (Note 5)	I _D	TA = +25°C	-845	mA
		TA = +85°C	-548	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	-2.2	A	

Electrical Characteristics N-CHANNEL – Q1 (@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 = 250µA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	100	nA	V _{DS} = -20V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±1.0	µA	V _{GS} = ±4.5V, 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)}	—	0.3	0.45	Ω	V _{GS} = 4.5V, I _D = 600mA
			0.4	0.6		V _{GS} = 2.5V, I _D = 500mA
			0.5	0.75		V _{GS} = 1.8V, I _D = 350mA
Forward Transfer Admittance	Y _{fs}	—	1.4	—	S	V _{DS} = 10V, I _D = 400mA
Diode Forward Voltage (Note 6)	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 150mA
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	60.67	—	pF	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	9.68	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	5.37	—	pF	
Total Gate Charge	Q _g	—	736.6	—	nC	V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA
Gate-Source Charge	Q _{gs}	—	93.6	—	nC	
Gate-Drain Charge	Q _{gd}	—	116.6	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	5.1	—	ns	V _{DD} = 10V, V _{GS} = 4.5V, R _L = 47Ω, R _G = 10Ω
Turn-On Rise Time	t _R	—	7.4	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	26.7	—	ns	
Turn-Off Fall Time	t _F	—	12.3	—	ns	

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.

N-CHANNEL – Q1

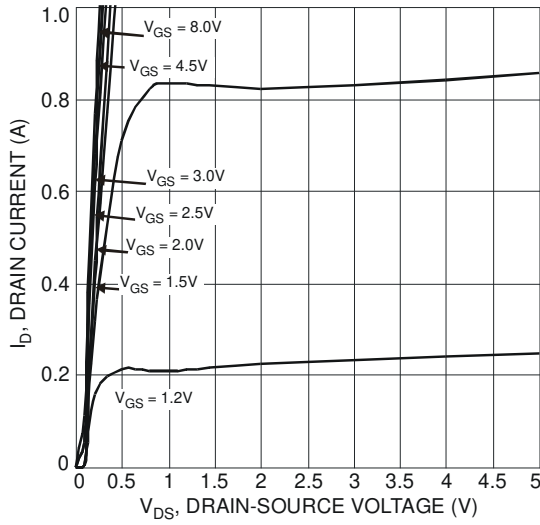


Fig. 1 Typical Output Characteristic

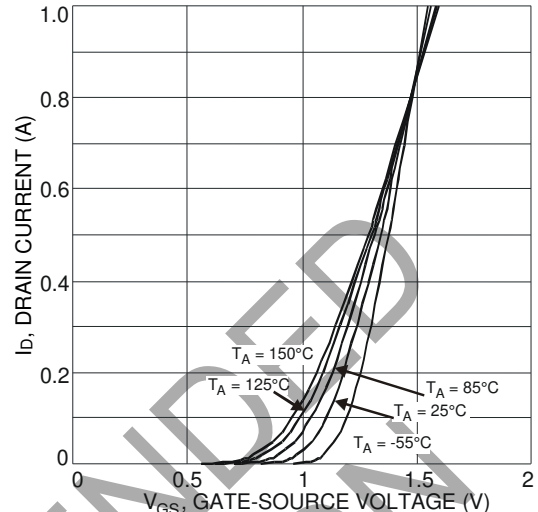


Fig. 2 Typical Transfer Characteristic

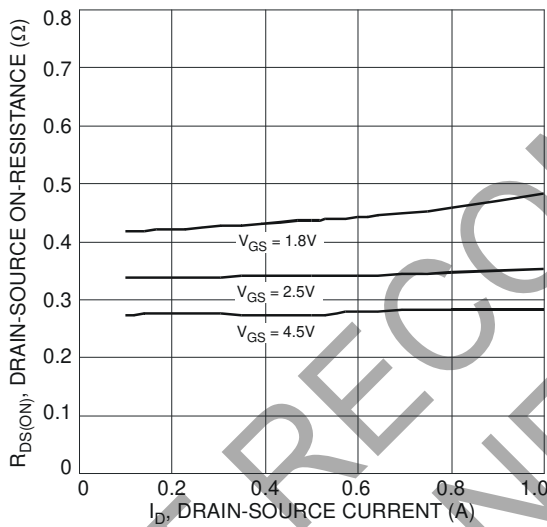


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

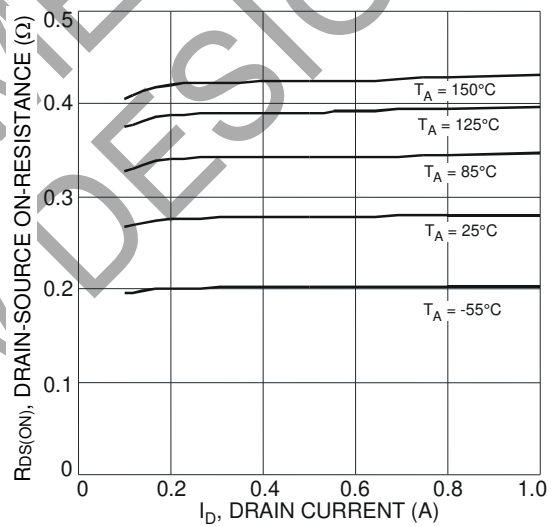


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

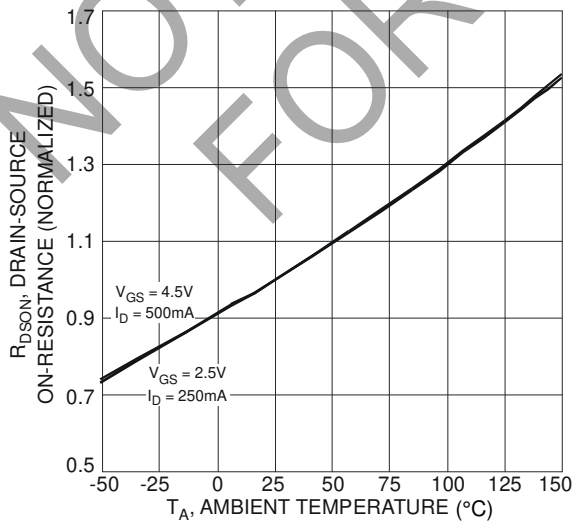


Fig. 5 On-Resistance Variation with Temperature

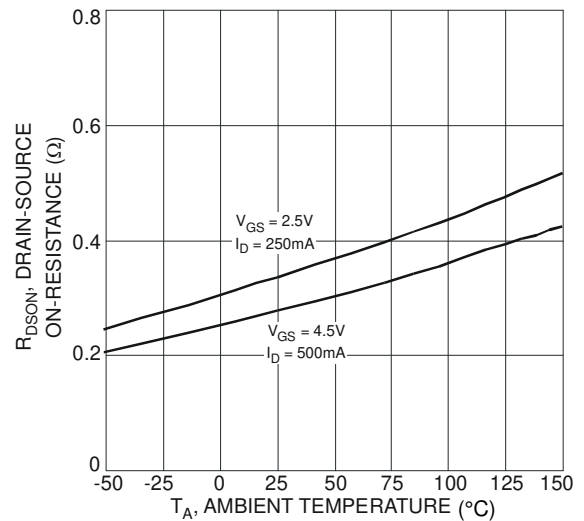


Fig. 6 On-Resistance Variation with Temperature

N-CHANNEL – Q1 (continued)

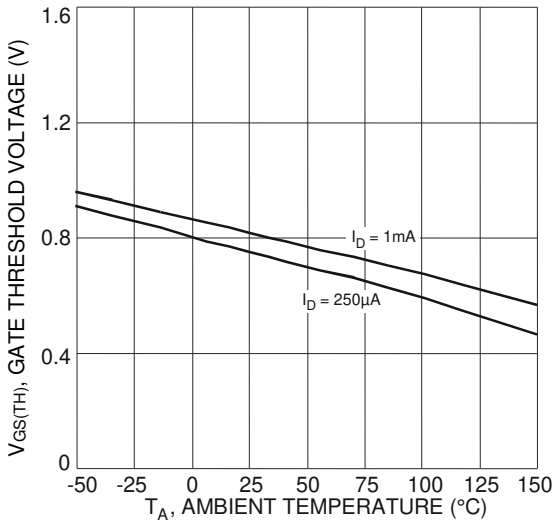


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

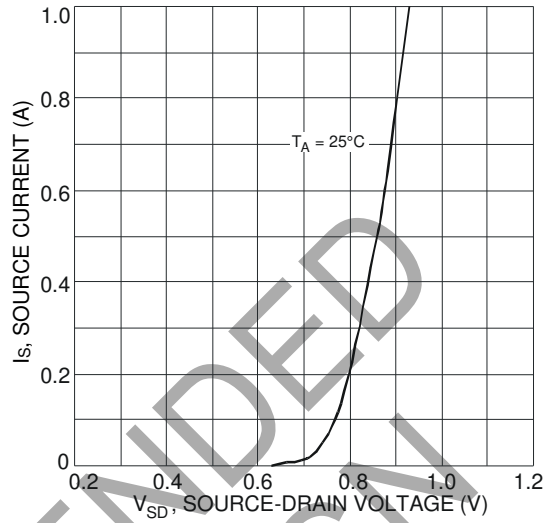


Fig. 8 Diode Forward Voltage vs. Current

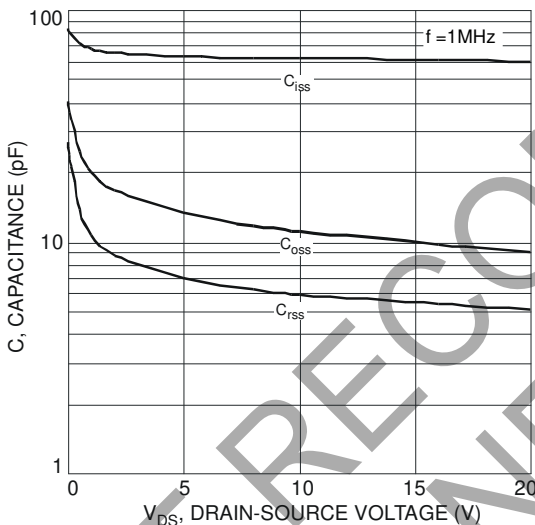


Fig. 9 Typical Total Capacitance

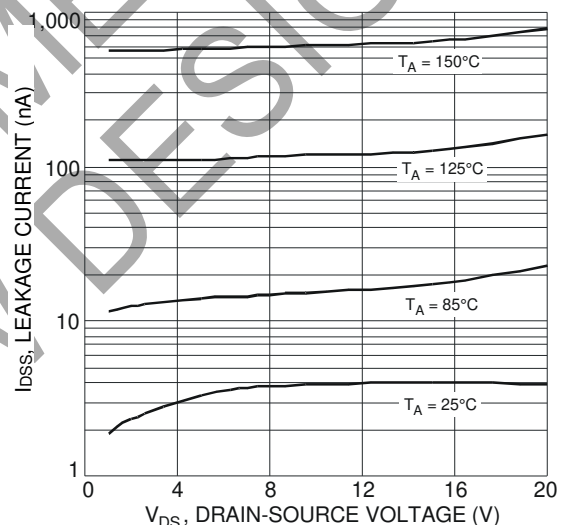


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

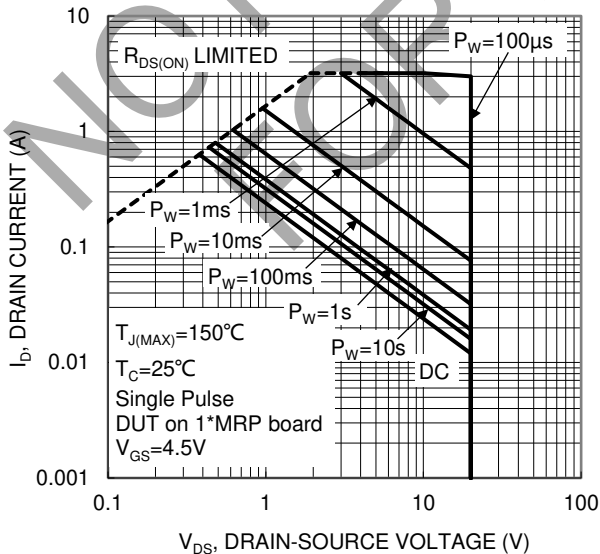


Figure 11. SOA, Safe Operation Area

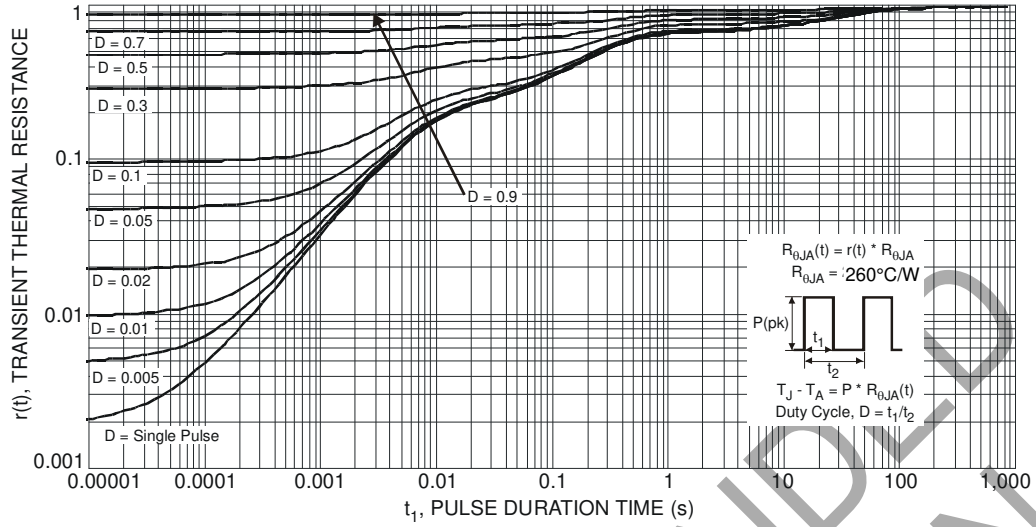


Fig. 12 Transient Thermal Response

NOT RECOMMENDED FOR NEW DESIGN

Electrical Characteristics P-CHANNEL – Q2 (@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 = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-100	nA	V _{DS} = -20V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±2.0	μA	V _{GS} = ±4.5V, 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)}	—	0.5	0.75	Ω	V _{GS} = -4.5V, I _D = -430mA
			0.7	1.05		V _{GS} = -2.5V, I _D = -300mA
			1.0	1.5		V _{GS} = -1.8V, I _D = -150mA
Forward Transfer Admittance	Y _{fs}	—	0.9	—	S	V _{DS} = -10V, I _D = -250mA
Diode Forward Voltage (Note 6)	V _{SD}	—	-0.8	-1.2	V	V _{GS} = 0V, I _S = -150mA
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C _{iss}	—	59.76	—	pF	V _{DS} = -16V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	12.07	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	6.36	—	pF	
Total Gate Charge	Q _g	—	622.4	—	pC	V _{GS} = -4.5V, V _{DS} = -10V, I _D = -250mA
Gate-Source Charge	Q _{gs}	—	100.3	—	pC	
Gate-Drain Charge	Q _{gd}	—	132.2	—	pC	
Turn-On Delay Time	t _{D(ON)}	—	5.1	—	ns	V _{DS} = -10V, V _{GS} = -4.5V, R _G = 10Ω, R _L = 47Ω
Turn-On Rise Time	t _R	—	8.1	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	28.4	—	ns	
Turn-Off Fall Time	t _F	—	20.72	—	ns	

Notes: 6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to production testing

NOT RECOMMENDED FOR NEW DESIGN

P-CHANNEL – Q2

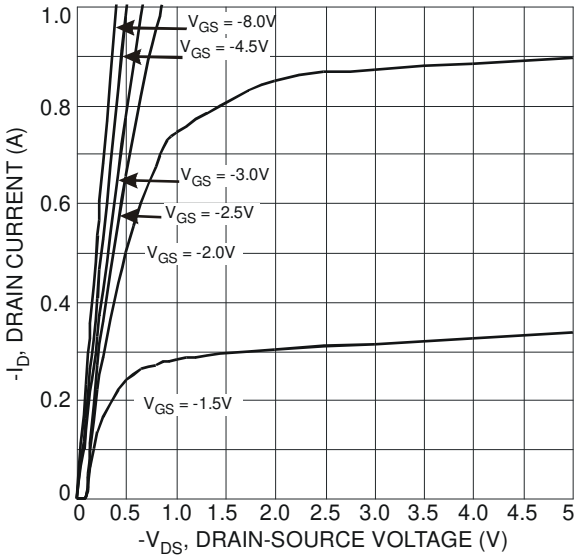


Fig. 13 Typical Output Characteristic

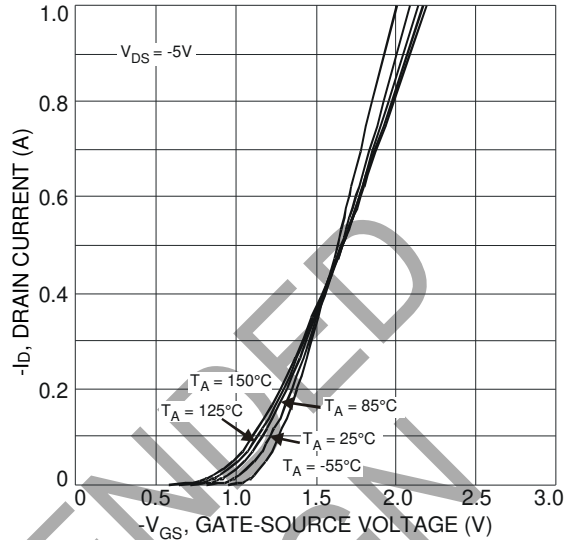


Fig. 14 Typical Transfer Characteristic

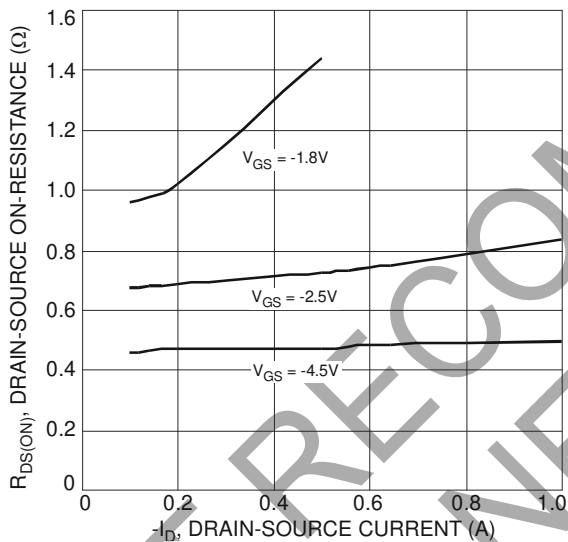


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

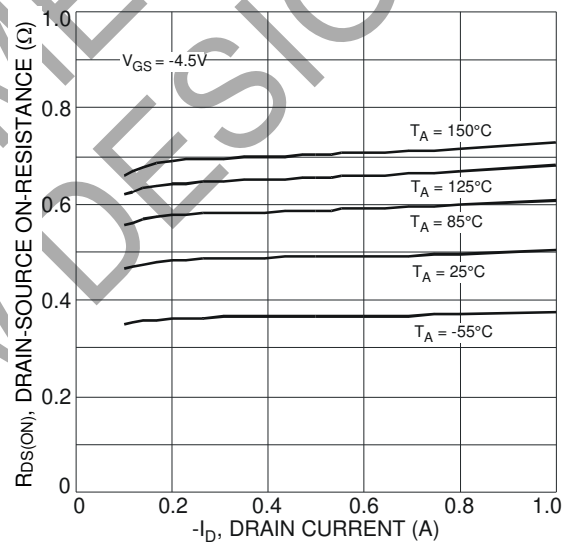


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

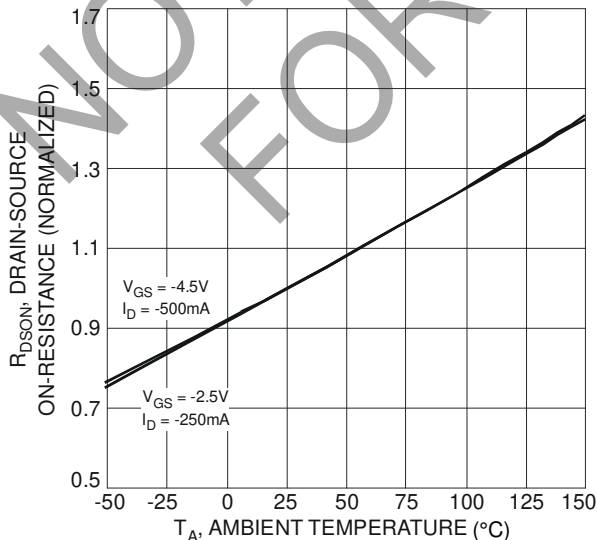


Fig. 17 On-Resistance Variation with Temperature

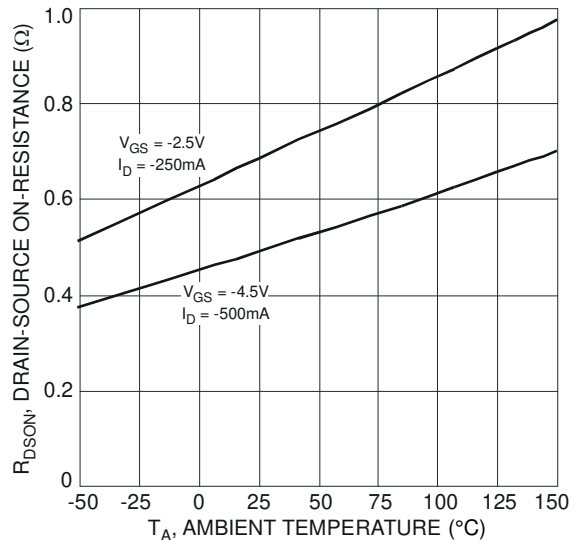


Fig. 18 On-Resistance Variation with Temperature

P-CHANNEL – Q2 (continued)

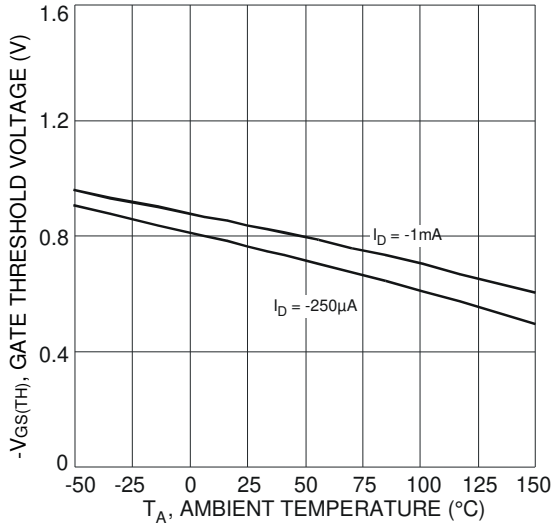


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

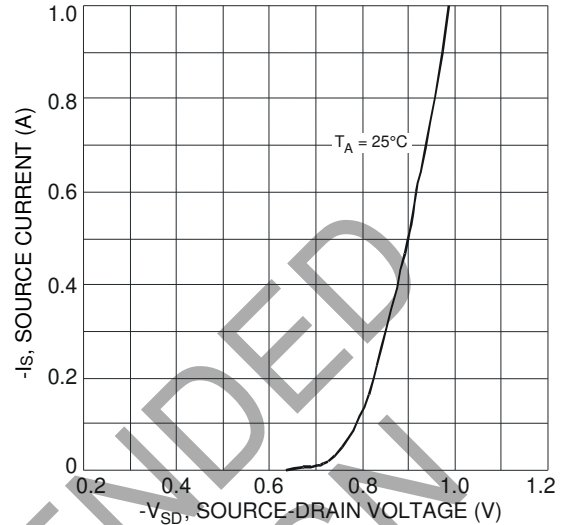


Fig. 20 Diode Forward Voltage vs. Current

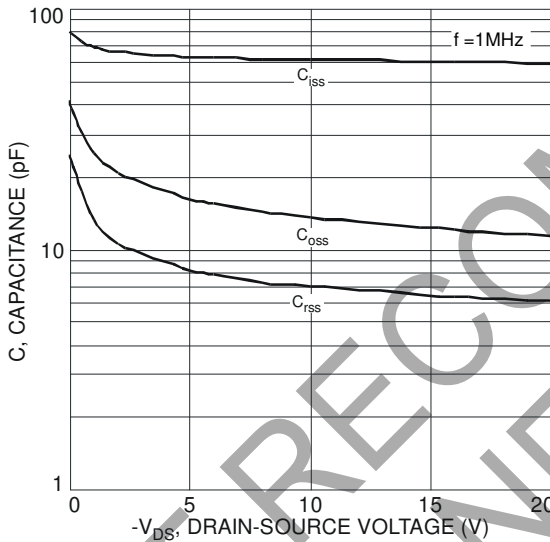


Fig. 21 Typical Total Capacitance

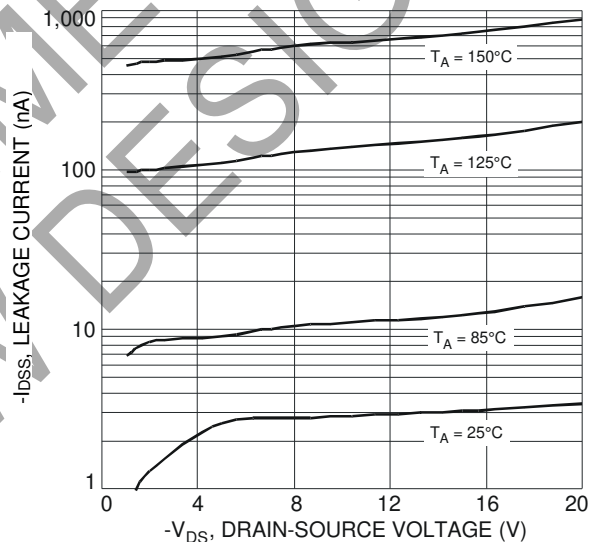


Fig. 22 Typical Leakage Current vs. Drain-Source Voltage

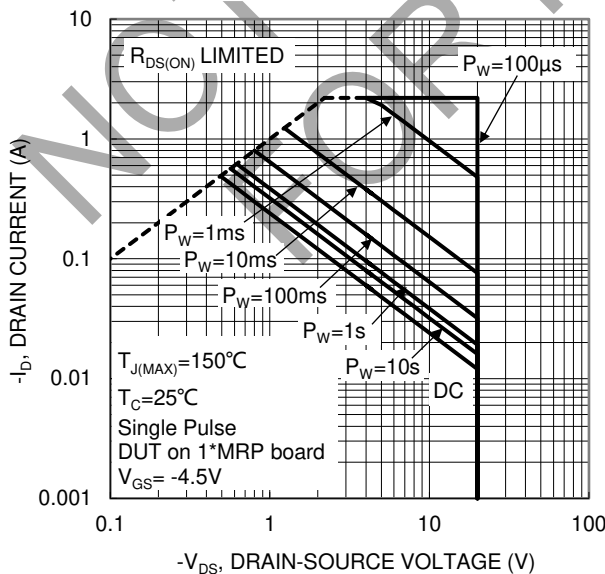


Figure 23. SOA, Safe Operation Area

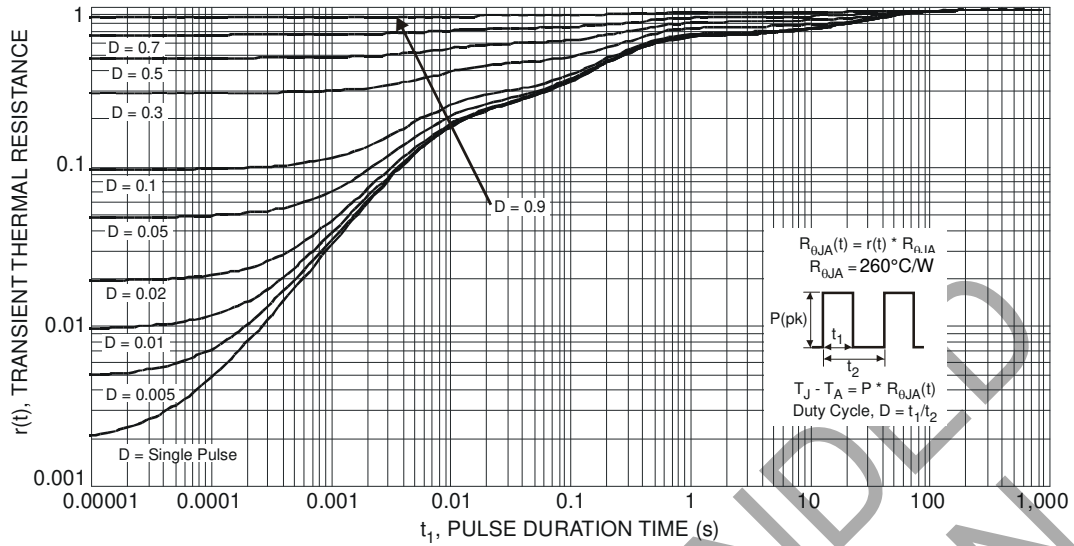


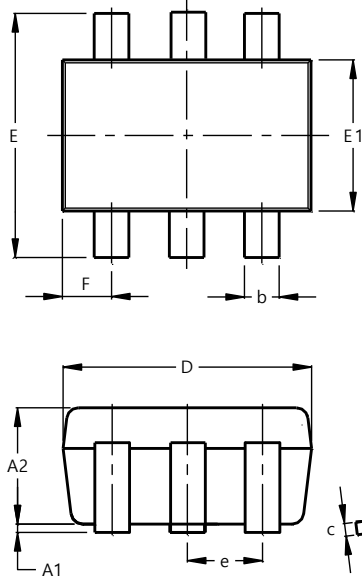
Fig. 24 Transient Thermal Response

NOT RECOMMENDED FOR NEW DESIGN

Package Outline Dimensions

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

SOT363

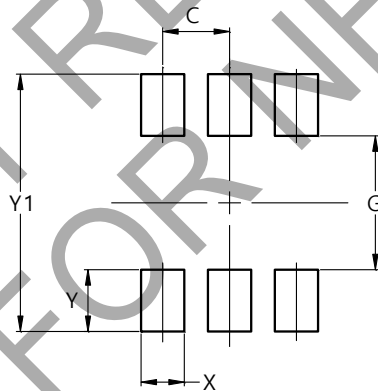


SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500

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