

Product Summary

Device	V _{(BR)DSS}	R _{DS(ON)}	I _D T _A = 25°C
Q1	20V	35mΩ @ V _{GS} = 4.5V	4.5A
		56mΩ @ V _{GS} = 1.8V	3.5A
Q2	-20V	74mΩ @ V _{GS} = -4.5V	3.1A
		168mΩ @ V _{GS} = -1.8V	2.0A

Description

This 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.

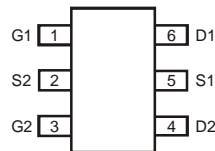
Applications

- Motor control
- Power Management Functions
- DC-DC Converters
- Backlighting

TSOT26



Top View

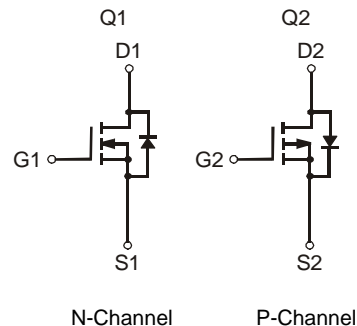

 Top View
Pin Configuration

Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 standards for High Reliability**

Mechanical Data

- Case: TSOT26
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections Indicator: See diagram
- Weight: 0.013 grams (approximate)



N-Channel

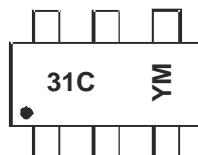
P-Channel

Ordering Information (Note 4)

Part Number	Qualification	Case	Packaging
DMC2038LVT-7	Commercial	TSOT26	3000/Tape & Reel
DMC2038LVTQ-7	Automotive	TSOT26	3000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See <http://www.diodes.com> 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>.

Marking Information



31C = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: X = 2010)
 M = Month (ex: 9 = September)

Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016
Code	X	Y	Z	A	B	C	D

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 N-CHANNEL – Q1 (@ $T_A = +25^\circ\text{C}$, 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	3.7 3.0	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	4.1 3.2	A
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	4.5 3.6	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	5.2 4.2	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	1.5	A
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)			I_{DM}	25	A

Maximum Ratings P-CHANNEL – Q2 (@ $T_A = +25^\circ\text{C}$, 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	2.6 2.1	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	2.9 2.4	A
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	3.1 2.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	3.8 3.0	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	-1.5	A
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)			I_{DM}	-17	A

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

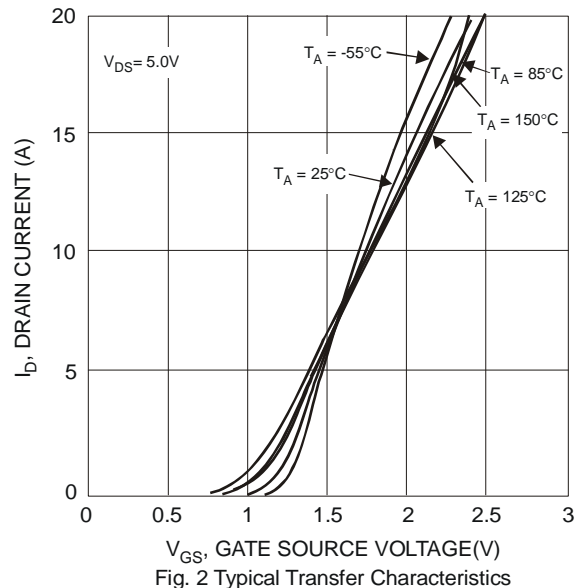
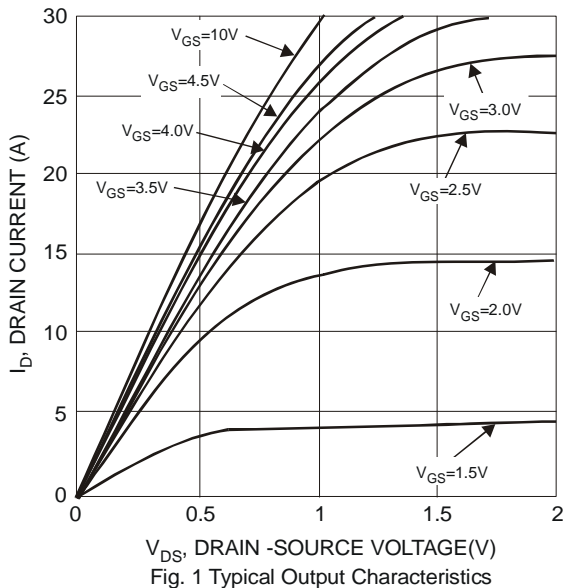
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	0.8	W
	$T_A = +70^\circ\text{C}$		0.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	168	$^\circ\text{C/W}$
	$t < 10\text{s}$		120	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	1.1	W
	$T_A = +70^\circ\text{C}$		0.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	114	$^\circ\text{C/W}$
	$t < 10\text{s}$		72	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	39	
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 1 inch square copper plate.

Electrical Characteristics N-CHANNEL – Q1 (@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 = 250μA
Zero Gate Voltage Drain Current @T _c = +25°C	I _{DSS}	-	-	1.0	μA	V _{DS} = 16V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	-	-	±100	nA	V _{GS} = ±12V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	0.4	-	1.0	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	-	27	35	mΩ	V _{GS} = 4.5V, I _D = 4.0A
		-	33	43		V _{GS} = 2.5V, I _D = 2.5A
		-	43	56		V _{GS} = 1.8V, I _D = 1.5A
		-	-	-		-
Forward Transfer Admittance	Y _{fs}	-	9	-	S	V _{DS} = 5V, I _D = 3.4A
Diode Forward Voltage	V _{SD}	0.4	-	1.1	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	-	400	530	pF	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	-	70	90	pF	
Reverse Transfer Capacitance	C _{rss}	-	65	100	pF	
Gate Resistance	R _g	-	1.9	-	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	-	5.7	-	nC	V _{DS} = 15V, I _D = 5.8A
Total Gate Charge (V _{GS} = 10V)	Q _g	-	12	17	nC	
Gate-Source Charge	Q _{gs}	-	0.7	-	nC	
Gate-Drain Charge	Q _{gd}	-	1.4	-	nC	
Turn-On Delay Time	t _{D(on)}	-	5	10	ns	V _{DS} = 10V, V _{GS} = 4.5V, R _G = 6Ω, I _{DS} = 1A,
Turn-On Rise Time	t _r	-	8	16	ns	
Turn-Off Delay Time	t _{D(off)}	-	25	40	ns	
Turn-Off Fall Time	t _f	-	8	16	ns	

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



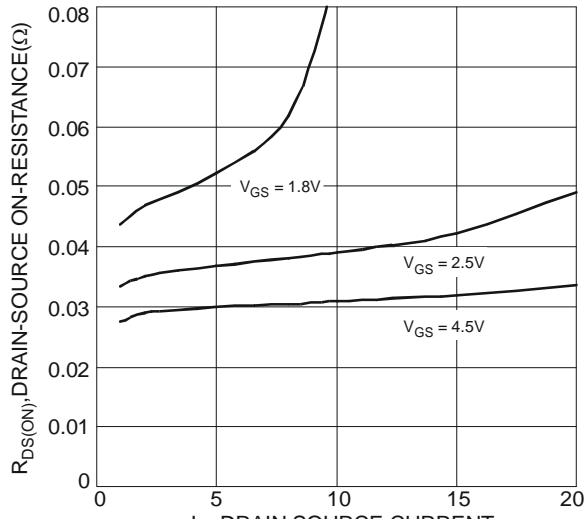


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

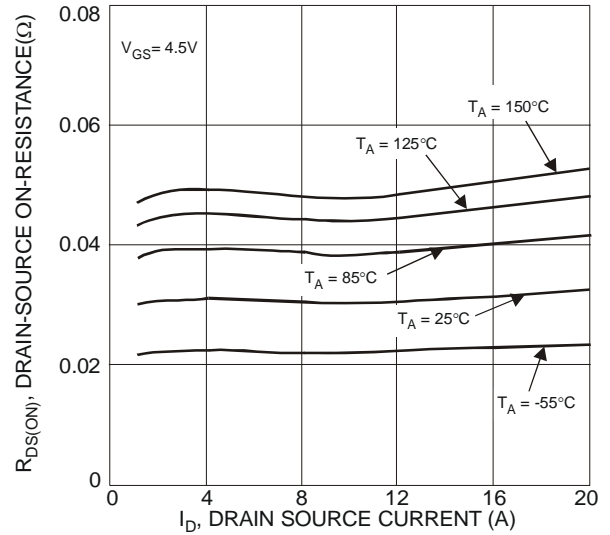


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

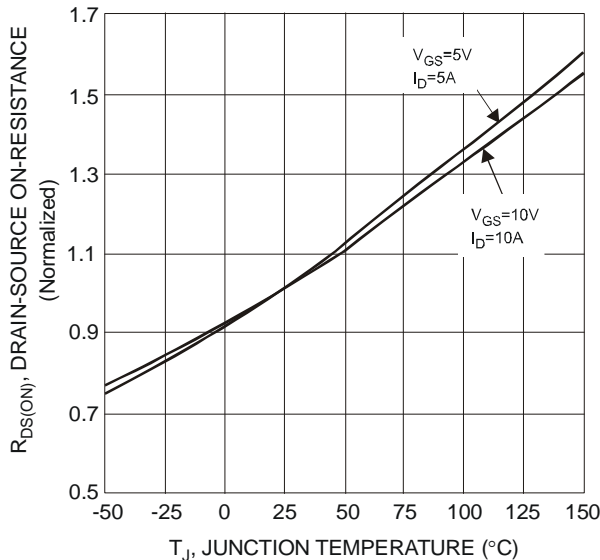


Fig. 5 On-Resistance Variation with Temperature

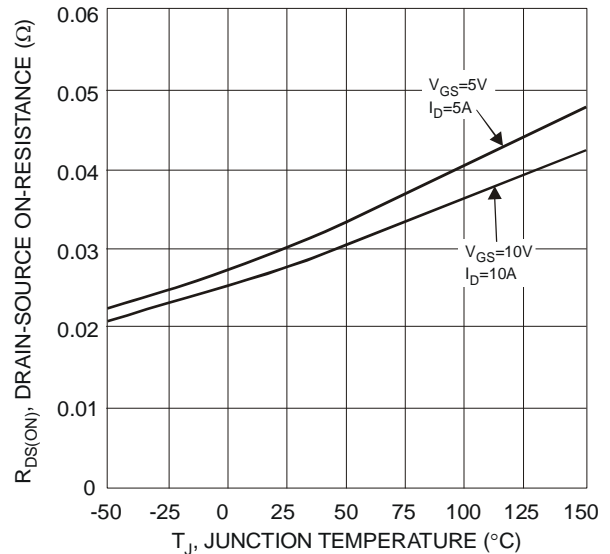


Fig. 6 On-Resistance Variation with Temperature

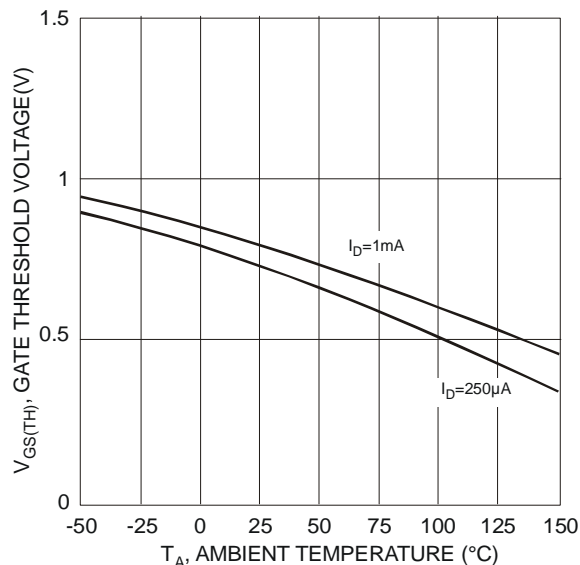


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

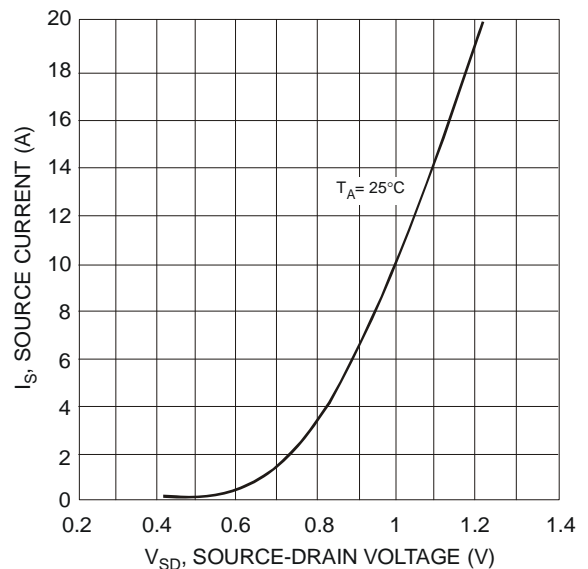
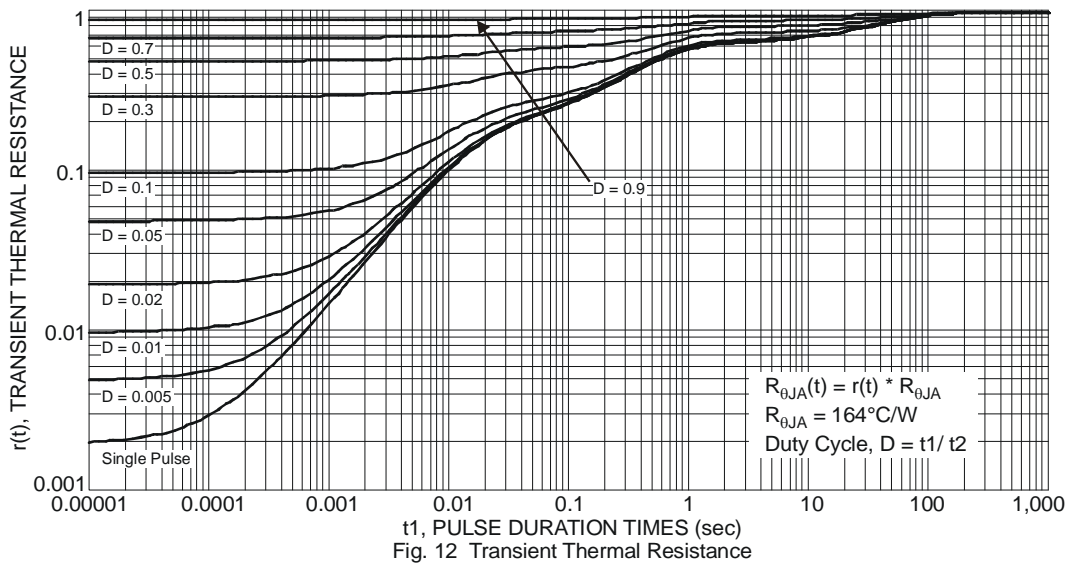
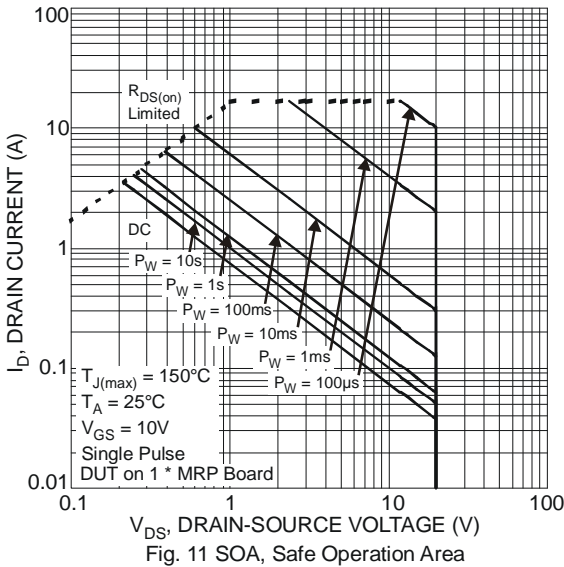
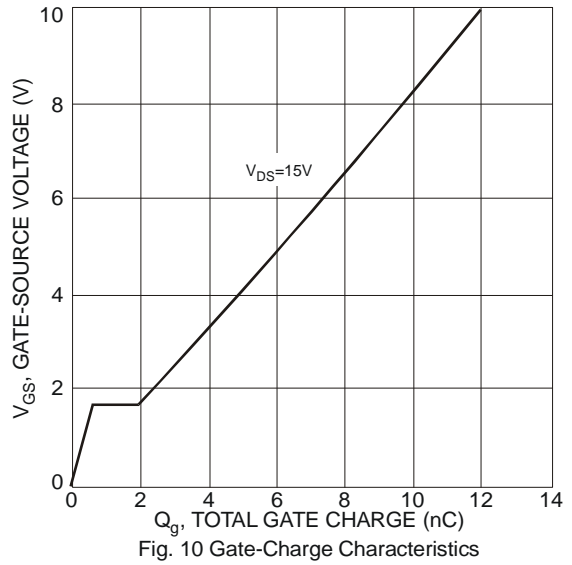
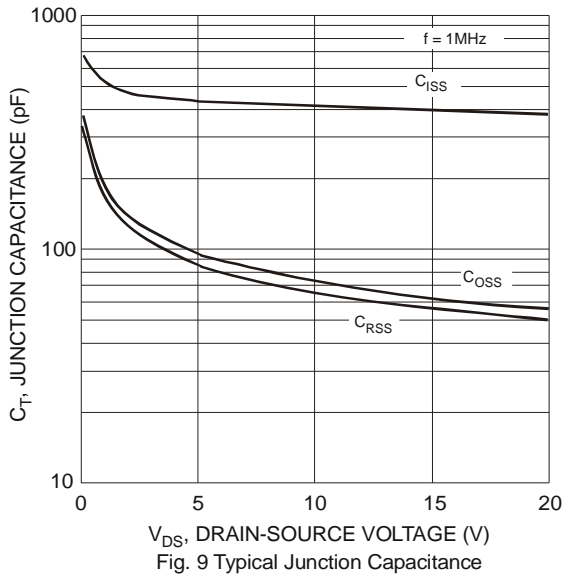


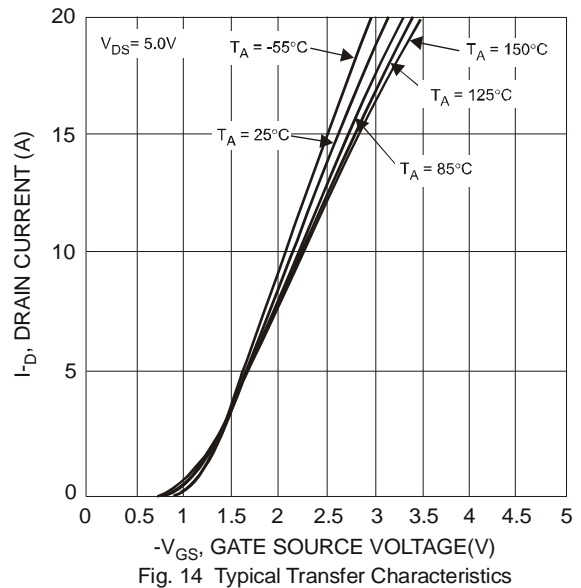
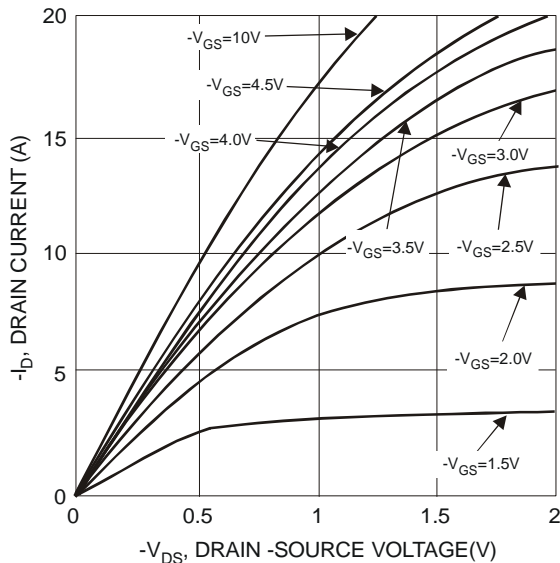
Fig. 8 Diode Forward Voltage vs. Current



Electrical Characteristics P-CHANNEL – Q2 (@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 = -250μA
Zero Gate Voltage Drain Current @T _c = +25°C	I _{DSS}	-	-	-1.0	μA	V _{DS} = -16V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	-	-	±100	nA	V _{GS} = ±12V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	-0.4	-	-1.0	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(on)}	-	57	74	mΩ	V _{GS} = -4.5V, I _D = -3.0A
		-	76	110		V _{GS} = -2.5V, I _D = -1.5A
		-	102	168		V _{GS} = -1.8V, I _D = -1.0A
Forward Transfer Admittance	Y _{fs}	-	10	-	S	V _{DS} = -5V, I _D = -3.0A
Diode Forward Voltage	V _{SD}	-	-0.8	-1.0	V	V _{GS} = 0V, I _S = -0.6A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	-	530	705	pF	V _{DS} = -10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	-	70	95	pF	
Reverse Transfer Capacitance	C _{rss}	-	60	90	pF	
Gate Resistance	R _g	-	72	-	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	-	7	10	nC	V _{DS} = -15V, I _D = -6A
Total Gate Charge (V _{GS} = -10V)	Q _g	-	14	-	nC	
Gate-Source Charge	Q _{gs}	-	0.95	-	nC	
Gate-Drain Charge	Q _{gd}	-	1.2	-	nC	
Turn-On Delay Time	t _{D(on)}	-	11	20	nS	V _{DS} = -10V, V _{GS} = -4.5V, R _G = 6Ω, I _S = -1A,
Turn-On Rise Time	t _r	-	12	22	nS	
Turn-Off Delay Time	t _{D(off)}	-	21	34	nS	
Turn-Off Fall Time	t _f	-	13	23	nS	

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



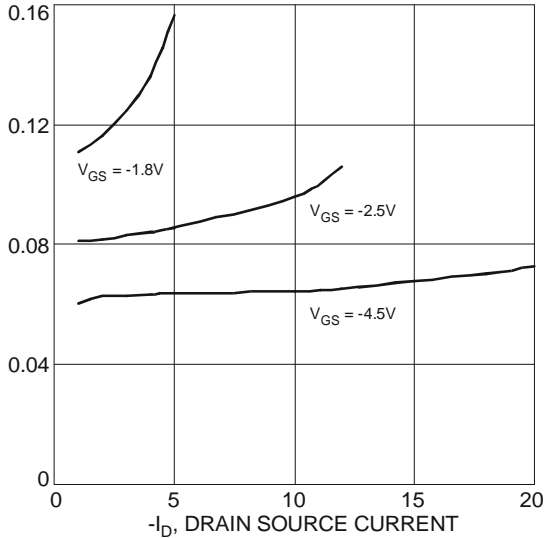


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

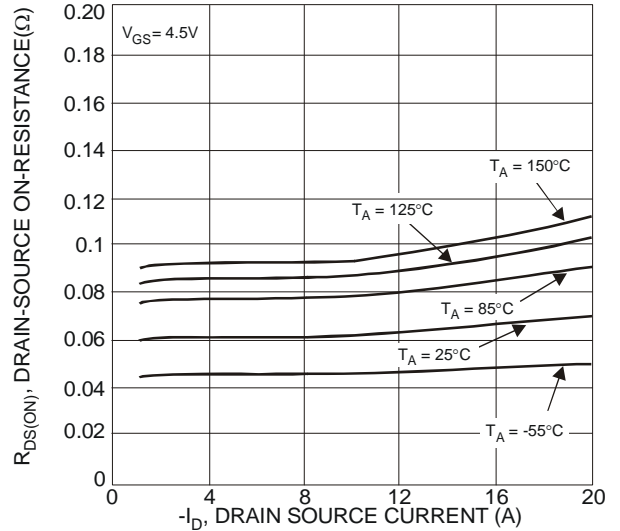


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

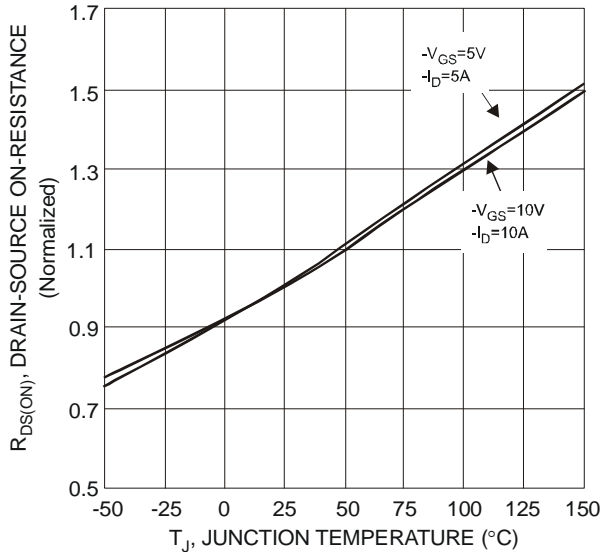


Fig. 17 On-Resistance Variation with Temperature

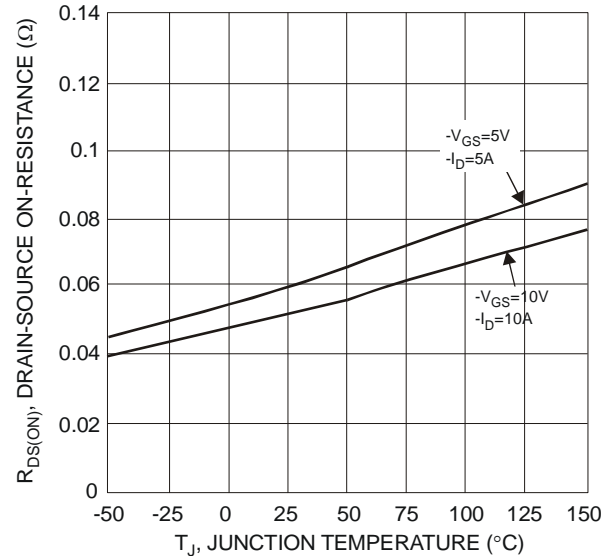


Fig. 18 On-Resistance Variation with Temperature

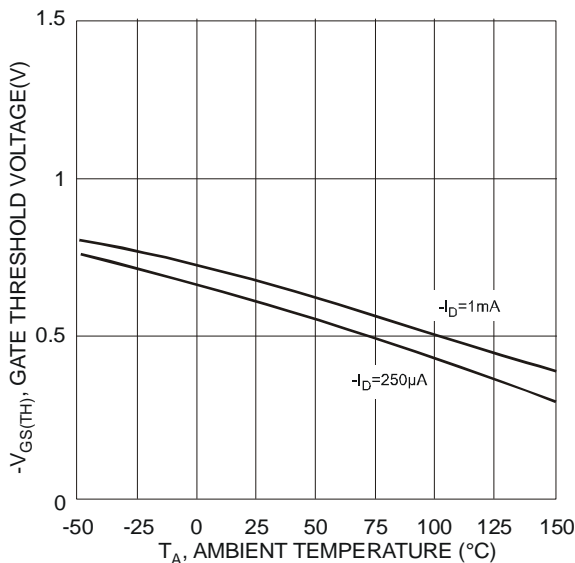


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

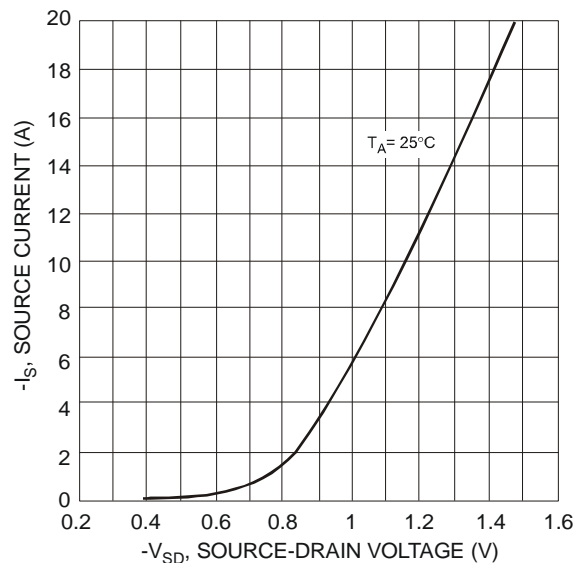
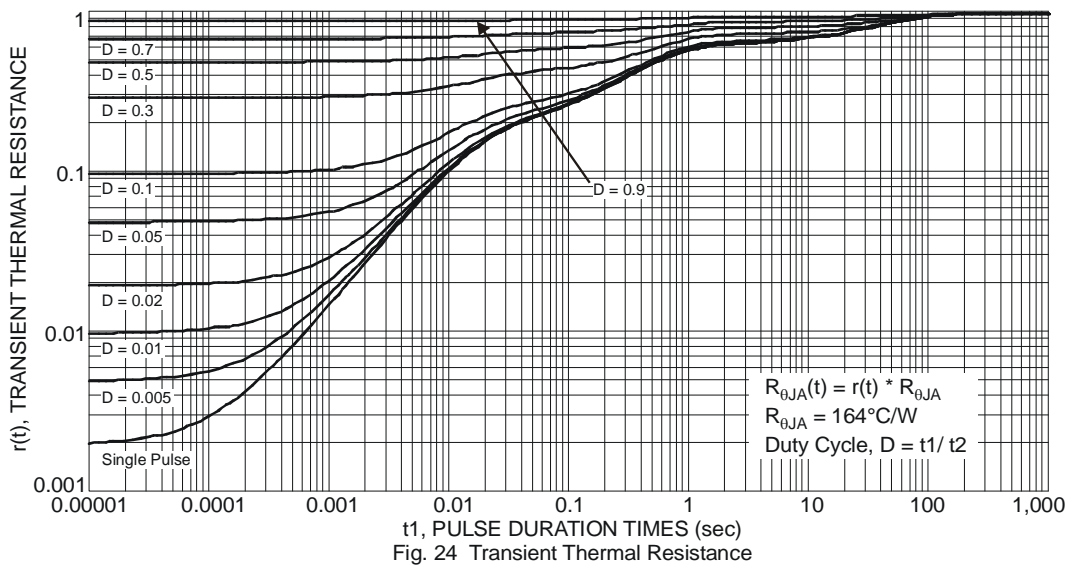
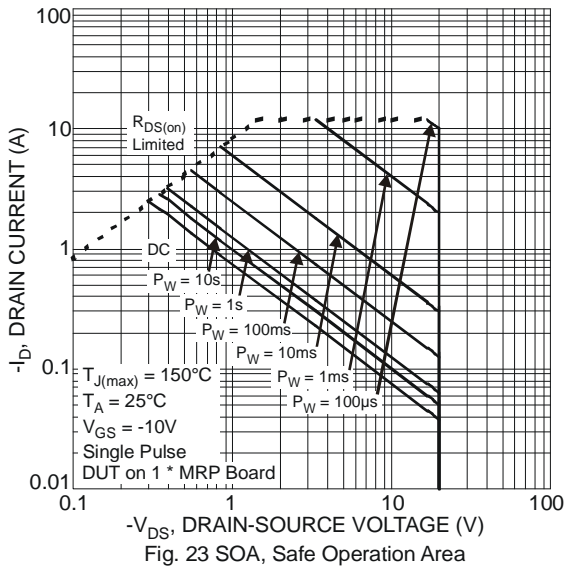
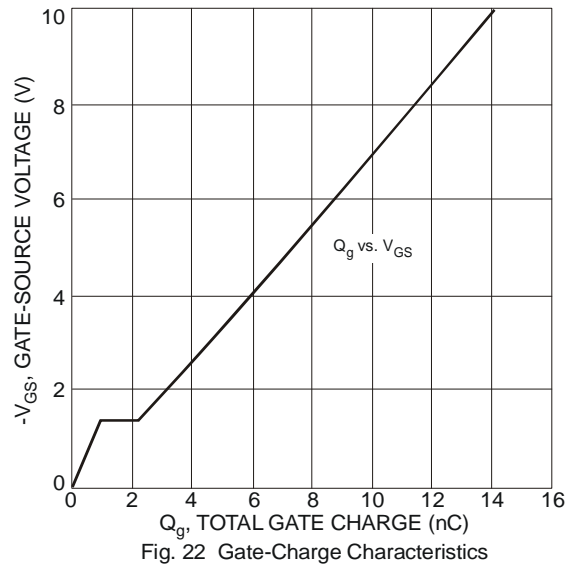
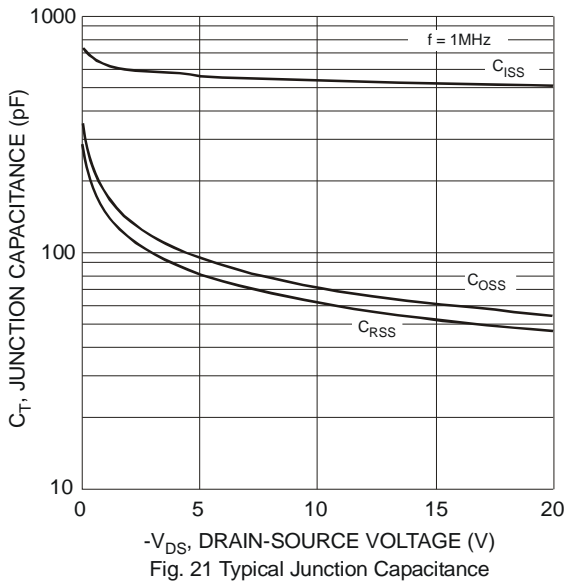
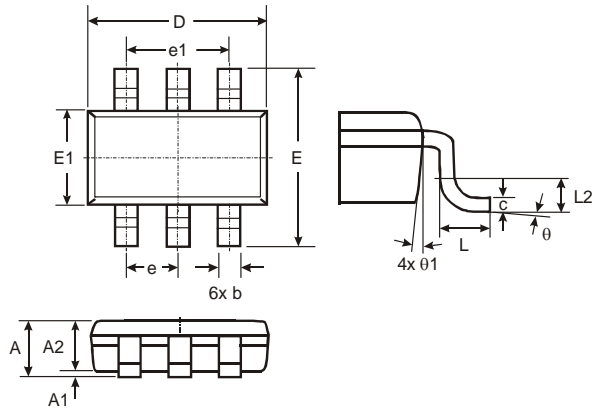


Fig. 20 Diode Forward Voltage vs. Current



Package Outline Dimensions

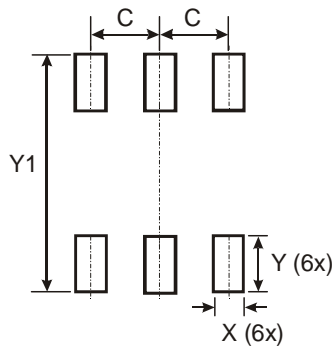
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



TSOT26			
Dim	Min	Max	Typ
A	-	1.00	-
A1	0.01	0.10	-
A2	0.84	0.90	-
D	-	-	2.90
E	-	-	2.80
E1	-	-	1.60
b	0.30	0.45	-
c	0.12	0.20	-
e	-	-	0.95
e1	-	-	1.90
L	0.30	0.50	-
L2	-	-	0.25
θ	0°	8°	4°
θ1	4°	12°	-
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.199

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