

## Product Summary

Device	V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>A</sub> = 25°C
Q1	20V	35mΩ @ V <sub>GS</sub> = 4.5V	4.5A
		56mΩ @ V <sub>GS</sub> = 1.8V	3.5A
Q2	-20V	74mΩ @ V <sub>GS</sub> = -4.5V	3.1A
		168mΩ @ V <sub>GS</sub> = -1.8V	2.0A

## Description

This MOSFET has been designed to minimize the on-state resistance (R<sub>DS(on)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

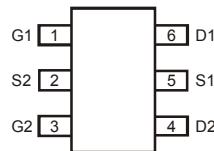
## Applications

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

TSOT26



Top View



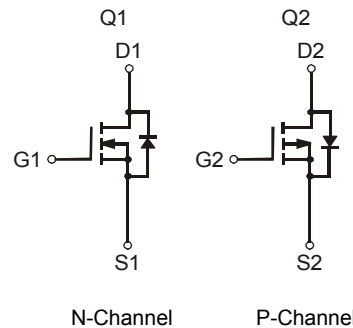
Top View  
Pin Configuration

## 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 (e3)
- Terminal Connections Indicator: See diagram
- Weight: 0.013 grams (approximate)

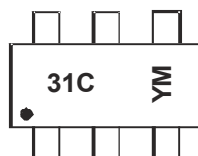


## Ordering Information (Note 4)

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/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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/products/packages.html>

## 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			$V_{GSS}$	$\pm 12$	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 $\mu\text{s}$ 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			$V_{GSS}$	$\pm 12$	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 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	-17	A

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

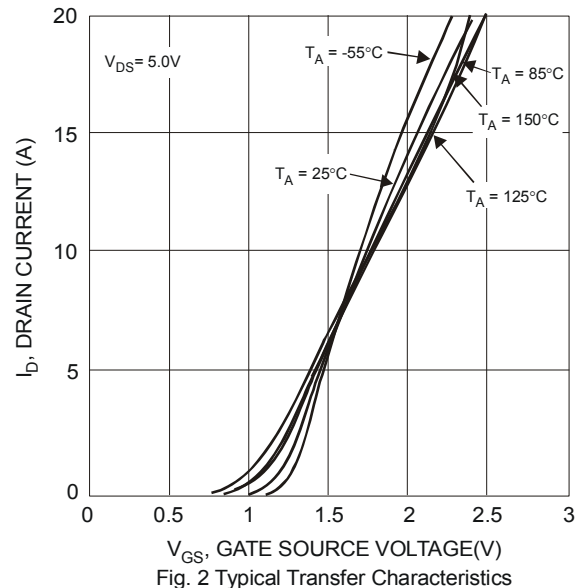
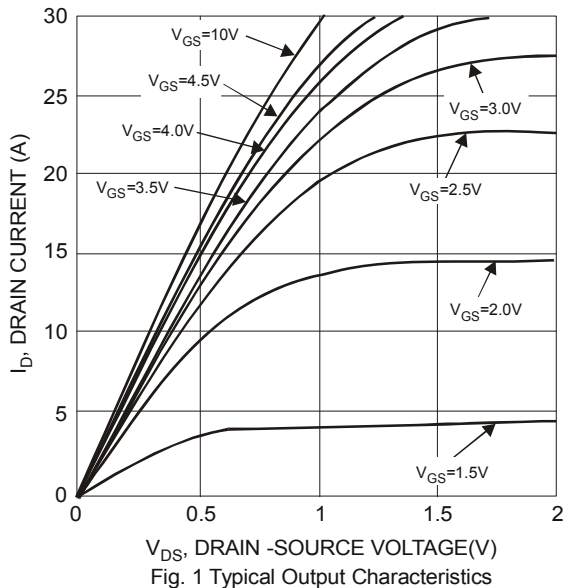
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	$P_D$	0.8	W
	$T_A = +70^\circ\text{C}$		0.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	168	$^\circ\text{C/W}$
	$t < 10\text{s}$		120	
Total Power Dissipation (Note 6)	$T_A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

**Electrical Characteristics N-CHANNEL – Q1** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	-	-	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current @ $T_c = +25^\circ\text{C}$	$I_{DSS}$	-	-	1.0	$\mu A$	$V_{DS} = 16V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS} = \pm 12V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.4	-	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	27	35	m $\Omega$	$V_{GS} = 4.5V, I_D = 4.0A$
		-	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	$V_{GS} = 0V, I_S = 1A$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
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	-	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
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	$V_{DS} = 10V, V_{GS} = 4.5V, R_G = 6\Omega, I_{DS} = 1A,$
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.



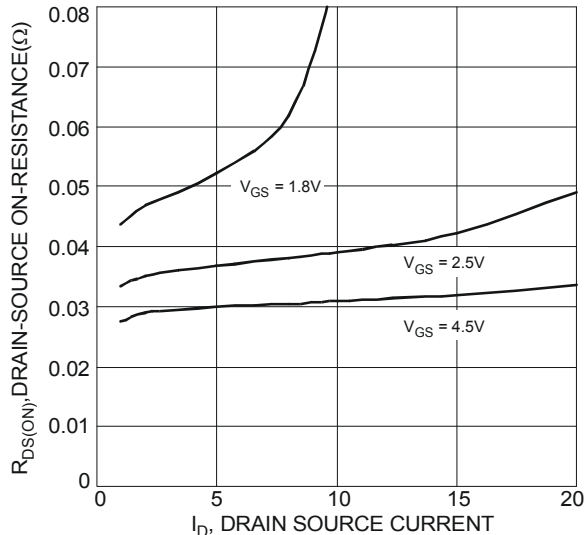


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

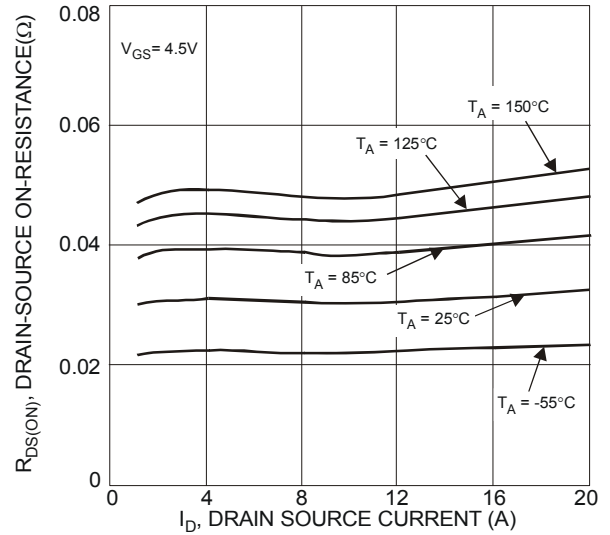


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

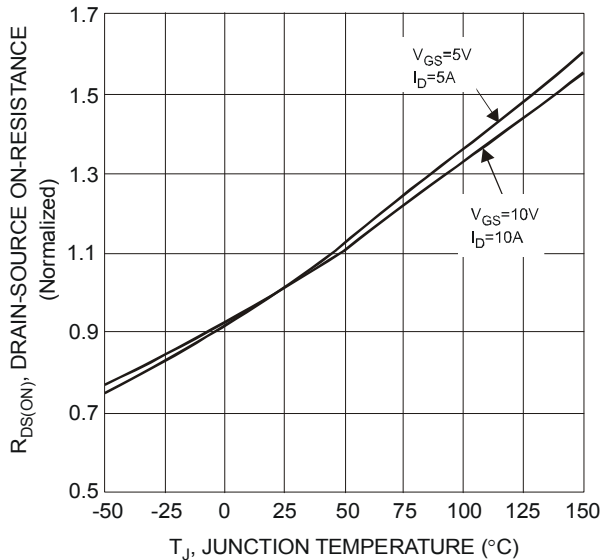


Fig. 5 On-Resistance Variation with Temperature

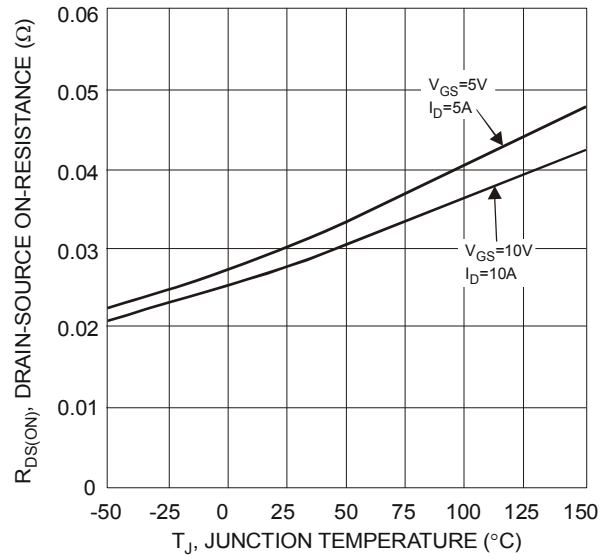


Fig. 6 On-Resistance Variation with Temperature

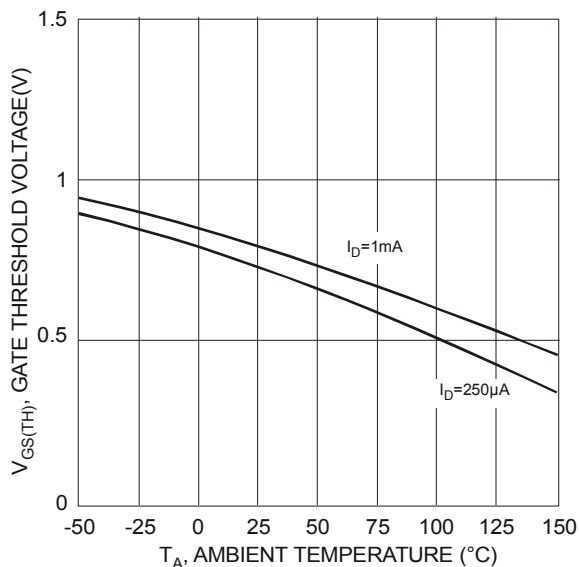


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

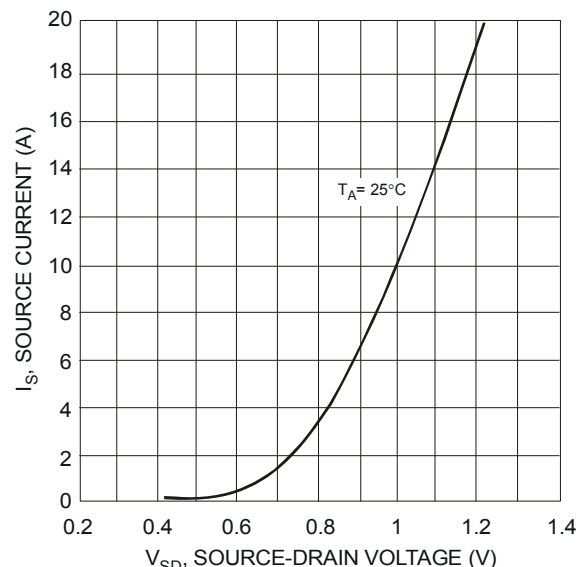
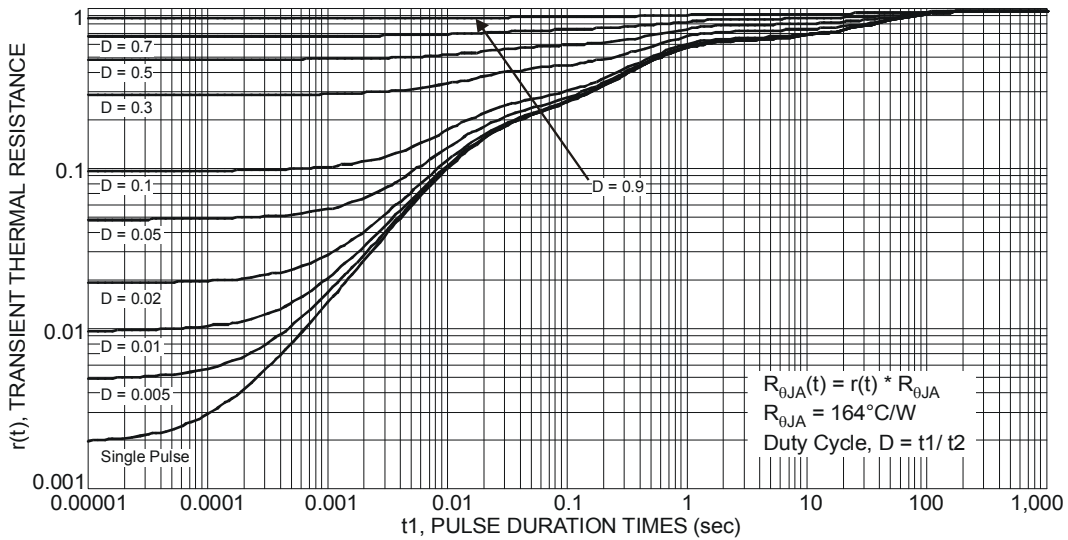
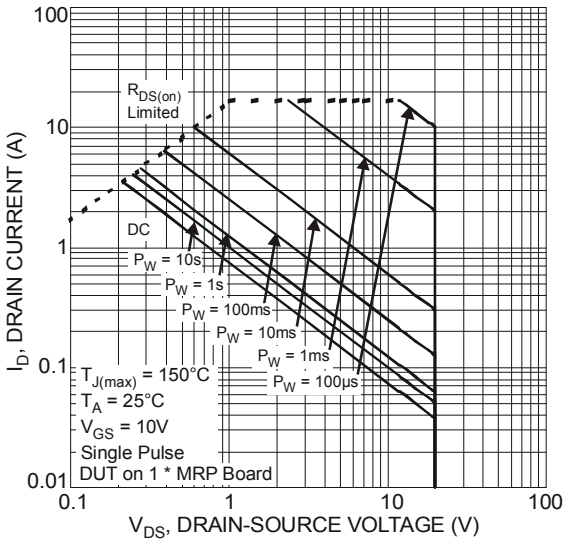
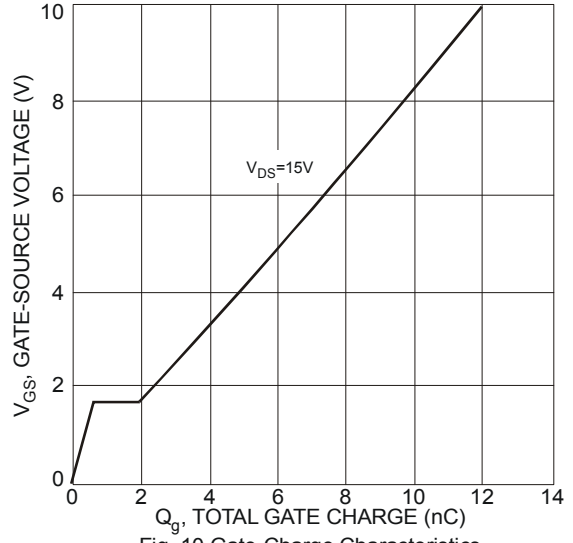
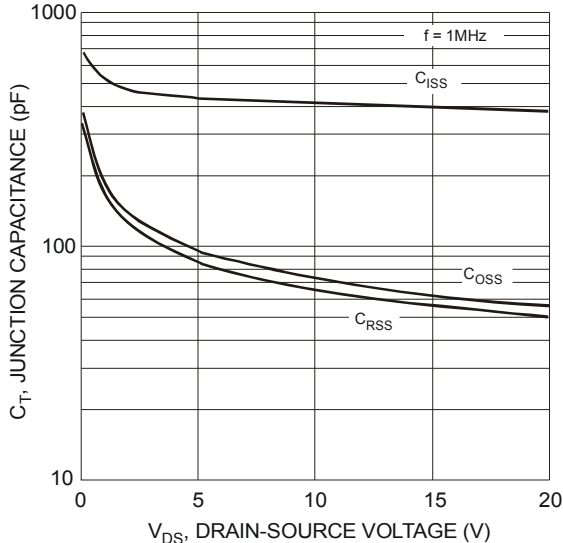


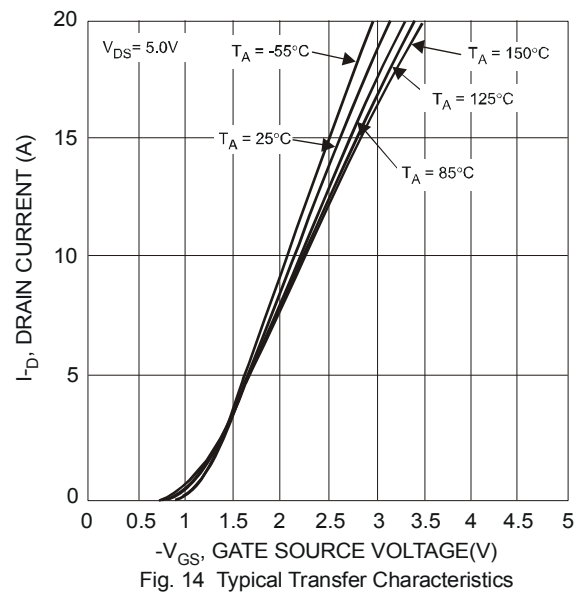
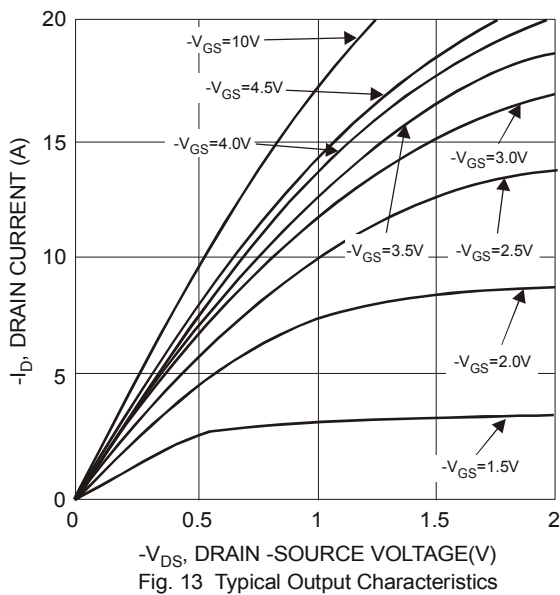
Fig. 8 Diode Forward Voltage vs. Current



**Electrical Characteristics P-CHANNEL – Q2 (@T<sub>A</sub> = +25°C, unless otherwise specified.)**

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	-	-	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current @T <sub>c</sub> = +25°C	I <sub>DSS</sub>	-	-	-1.0	μA	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	-	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	-	57	74	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.0A
		-	76	110		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -1.5A
		-	102	168		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -1.0A
Forward Transfer Admittance	Y <sub>fs</sub>	-	10	-	S	V <sub>DS</sub> = -5V, I <sub>D</sub> = -3.0A
Diode Forward Voltage	V <sub>SD</sub>	-	-0.8	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -0.6A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	530	705	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	70	95	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	60	90	pF	
Gate Resistance	R <sub>g</sub>	-	72	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	-	7	10	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -6A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	-	14	-	nC	
Gate-Source Charge	Q <sub>gs</sub>	-	0.95	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	1.2	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	11	20	nS	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 6Ω, I <sub>S</sub> = -1A,
Turn-On Rise Time	t <sub>r</sub>	-	12	22	nS	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	21	34	nS	
Turn-Off Fall Time	t <sub>f</sub>	-	13	23	nS	

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



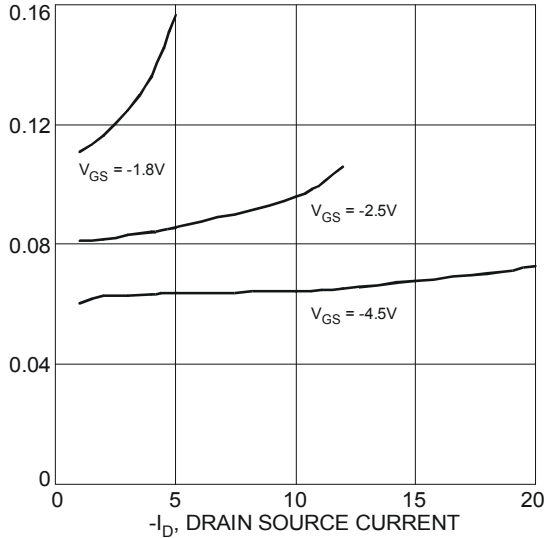


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

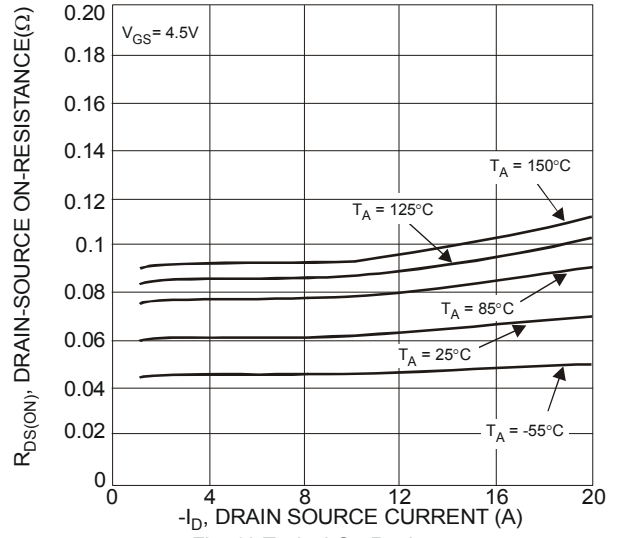


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

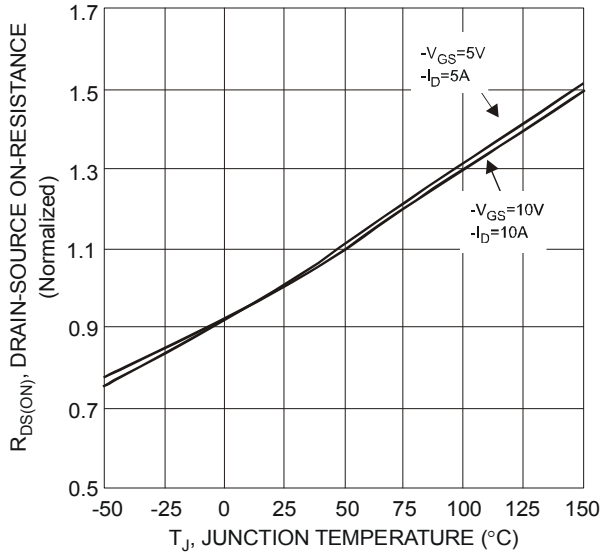


Fig. 17 On-Resistance Variation with Temperature

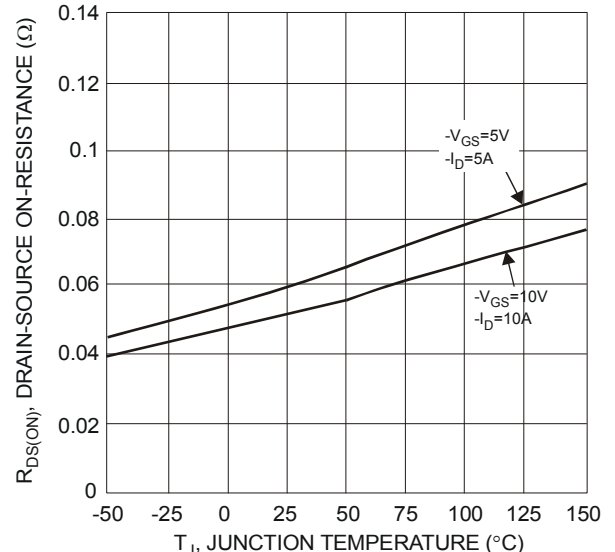


Fig. 18 On-Resistance Variation with Temperature

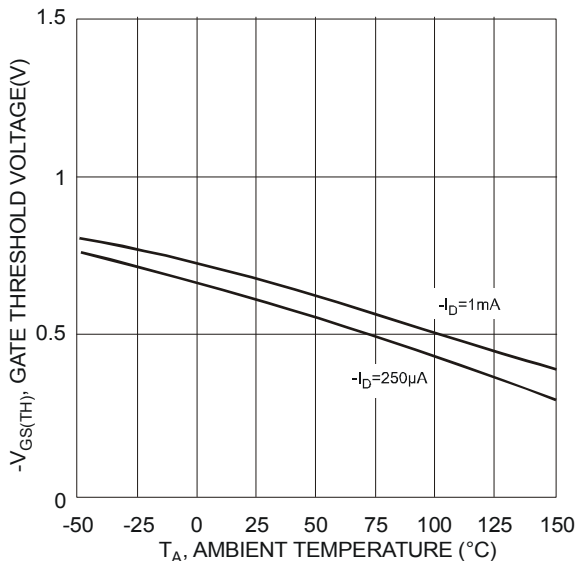


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

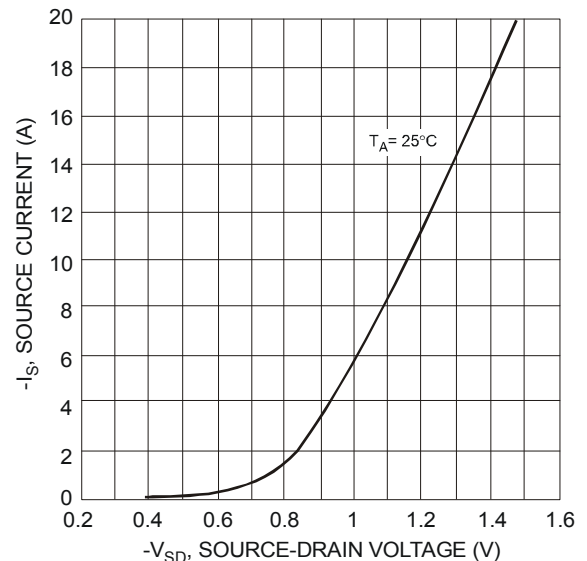
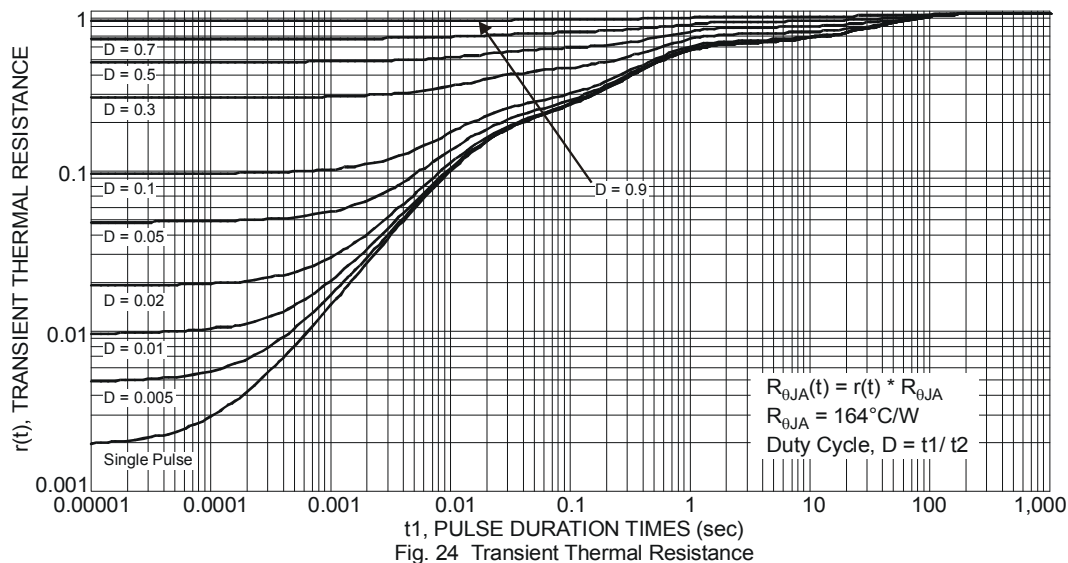
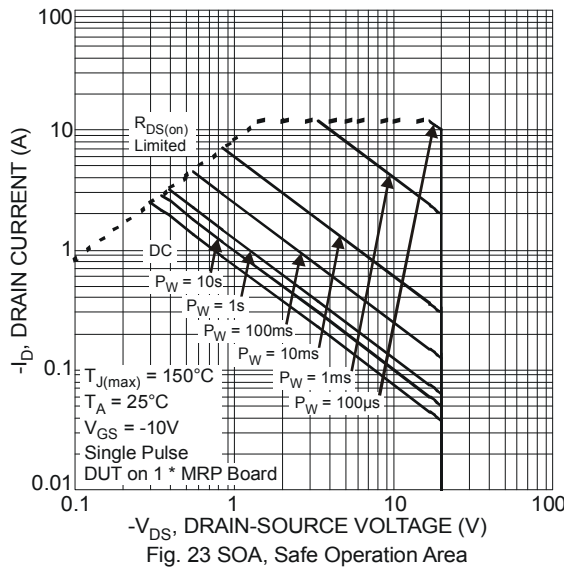
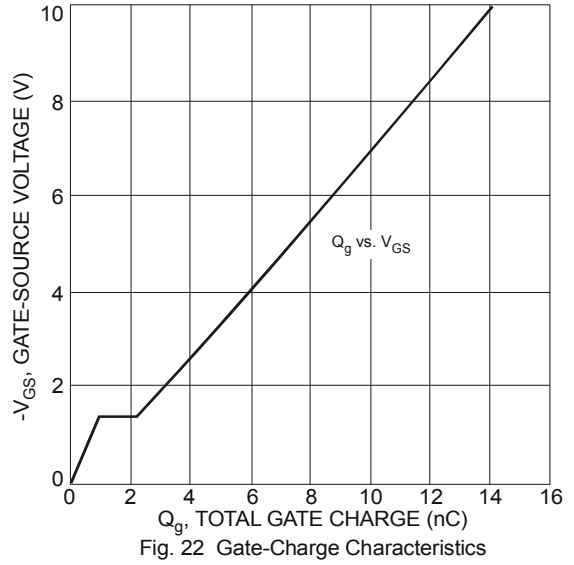
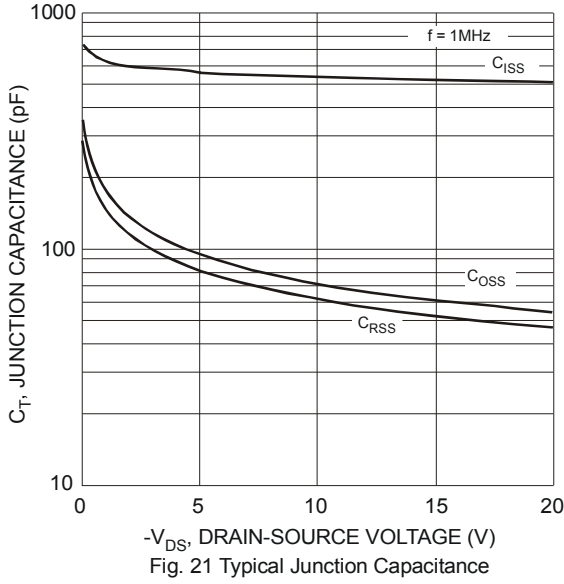


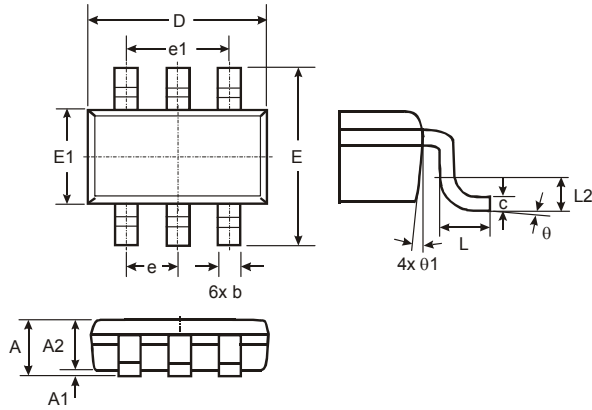
Fig. 20 Diode Forward Voltage vs. Current





**Package Outline Dimensions**

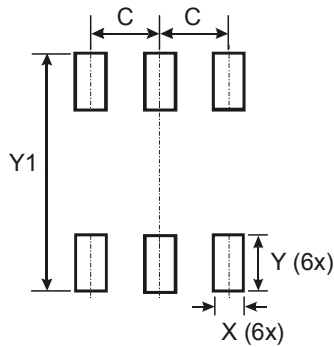
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



TSOT26			
Dim	Min	Max	Typ
A	-	1.00	-
A1	0.01	0.10	-
A2	0.84	0.90	-
D	2.85	2.95	2.90
E	2.70	2.90	2.80
E1	1.55	1.65	1.60
b	0.30	0.45	-
c	0.12	0.20	-
e	BSC	BSC	0.95
e1	BSC	BSC	1.90
L	0.30	0.50	-
L2	BSC	BSC	0.25
theta	0°	8°	4°
theta1	4°	12°	-
<b>All Dimensions in mm</b>			

**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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[IPS70R2K0CEAKMA1](#) [RJK60S3DPP-E0#T2](#) [RJK60S5DPK-M0#T0](#) [APT5010JVFR](#) [APT12031JFLL](#) [APT12040JVR](#) [DMN3404LQ-7](#)  
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