

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D $T_A = 25^\circ\text{C}$
Q1	20V	35m Ω @ $V_{GS} = 4.5\text{V}$	4.5A
		56m Ω @ $V_{GS} = 1.8\text{V}$	3.5A
Q2	-20V	74m Ω @ $V_{GS} = -4.5\text{V}$	3.1A
		168m Ω @ $V_{GS} = -1.8\text{V}$	2.0A

Description and Applications

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.

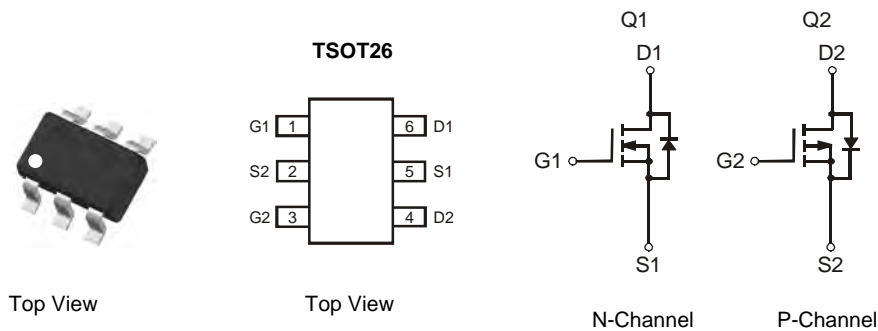
- Motor control
- Power Management Functions
- DC-DC Converters
- Backlighting

Features and Benefits

- 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
- Terminal Connections Indicator: See diagram
- — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.013 grams (approximate)

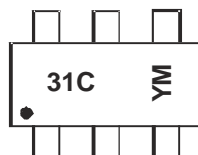


Ordering Information (Note 4)

Part Number	Case	Packaging
DMC2038LVT-7	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

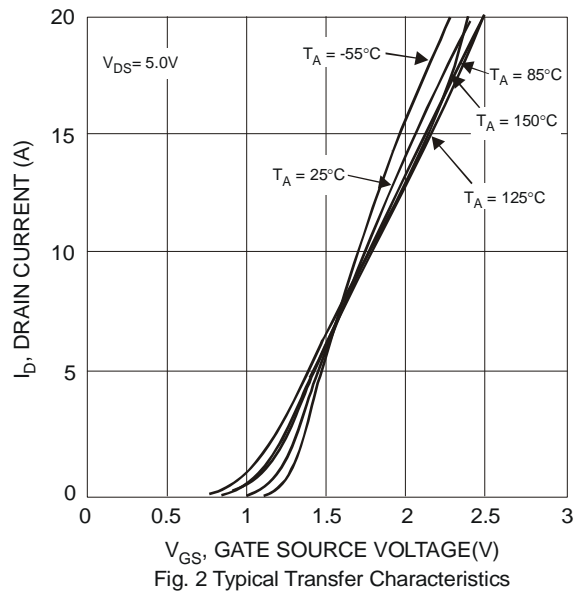
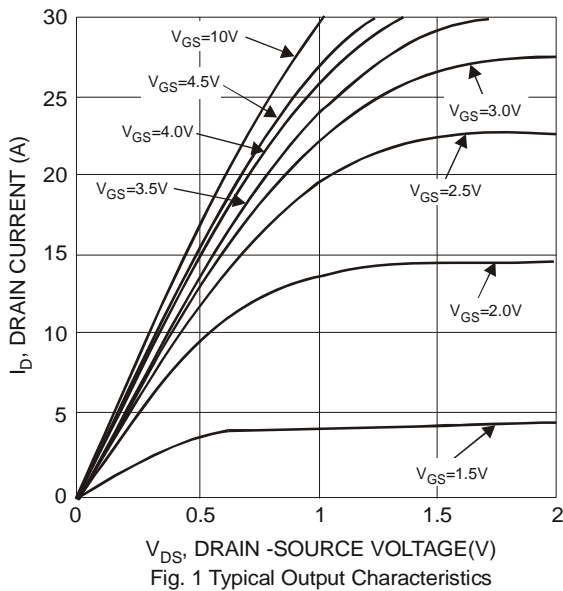
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = 25^\circ\text{C}$	P_D	0.8	W
	$T_A = 70^\circ\text{C}$		0.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	168	$^\circ\text{C/W}$
	$t < 10\text{s}$		120	
Total Power Dissipation (Note 6)	$T_A = 25^\circ\text{C}$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



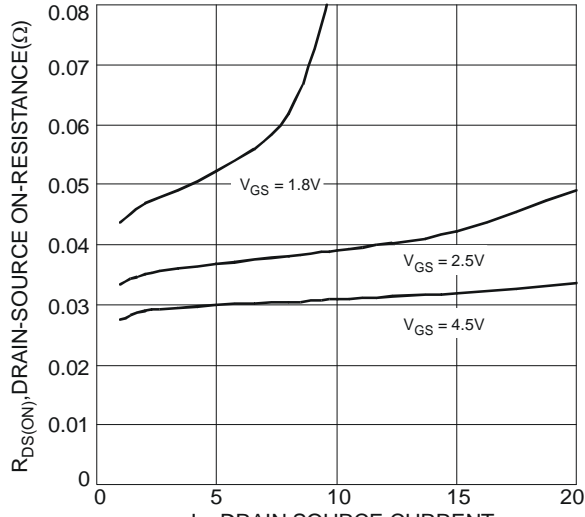


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

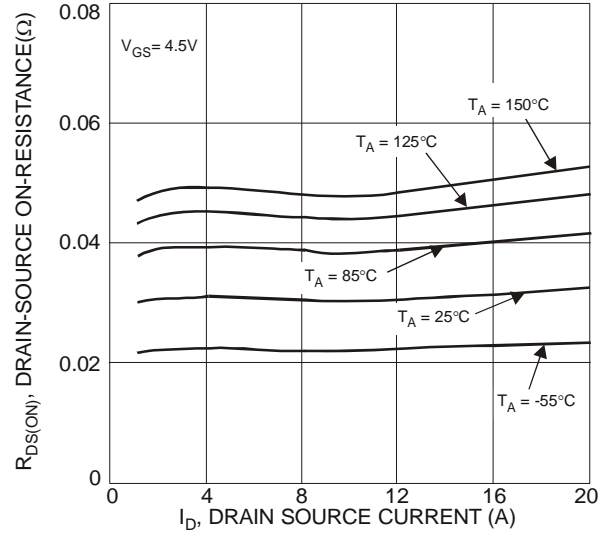


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

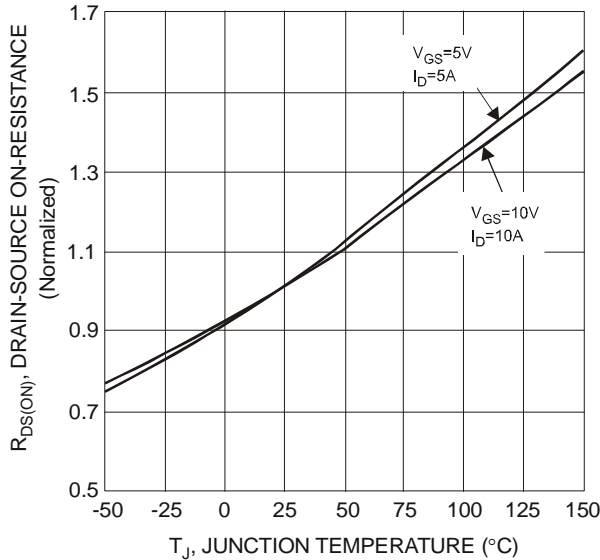


Fig. 5 On-Resistance Variation with Temperature

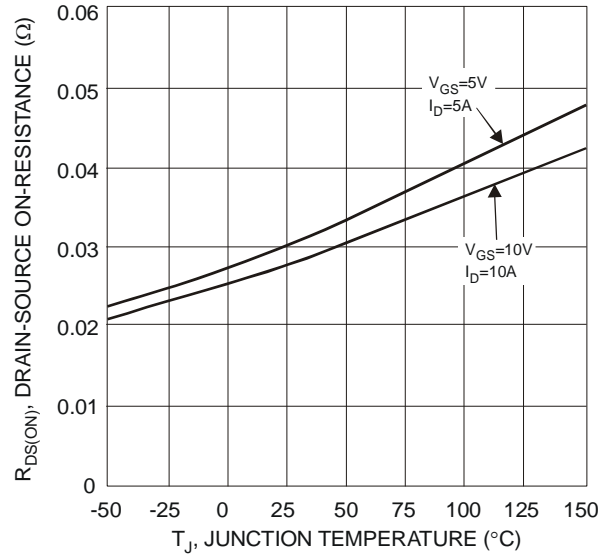


Fig. 6 On-Resistance Variation with Temperature

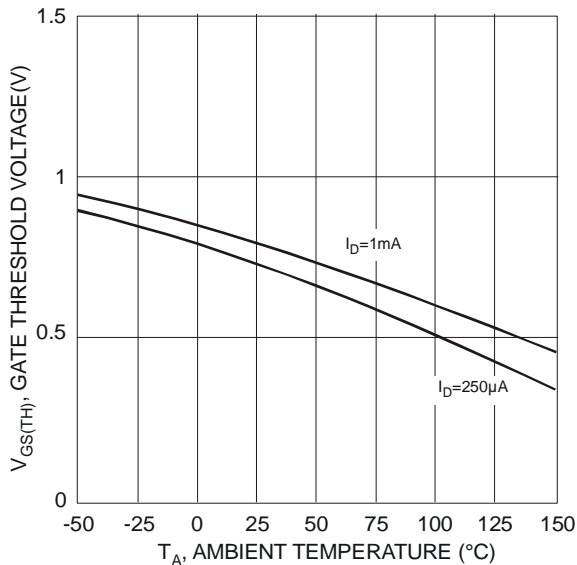


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

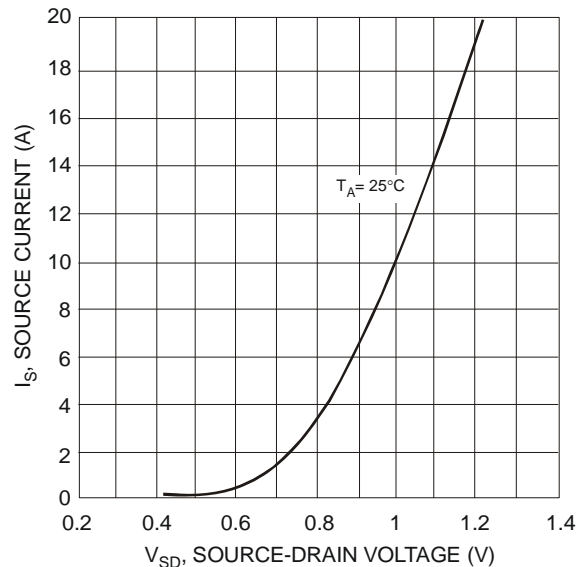
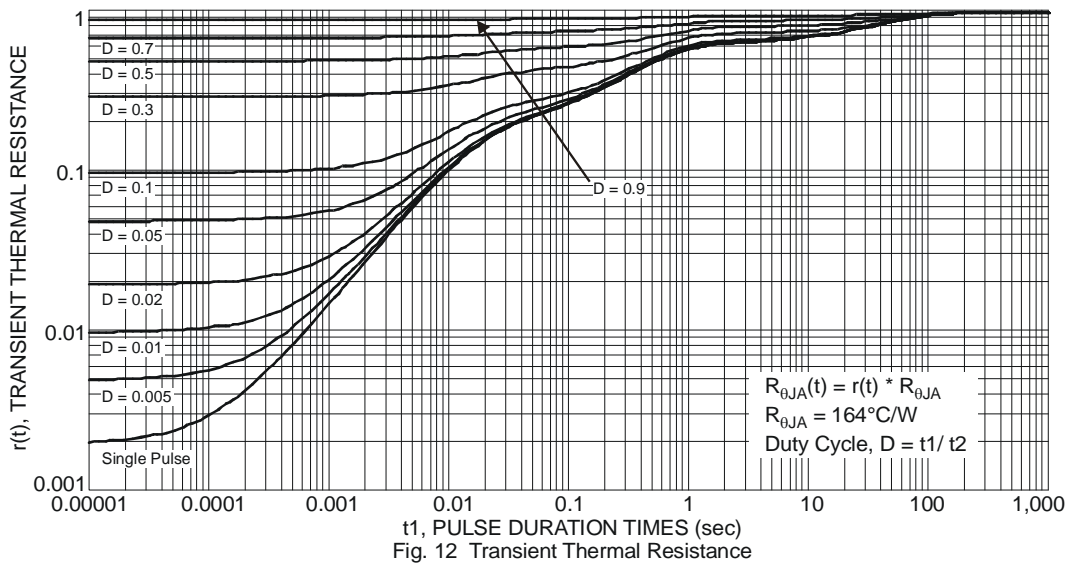
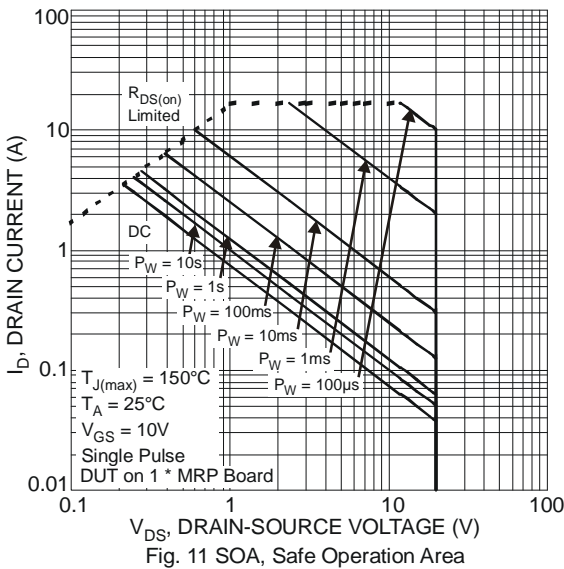
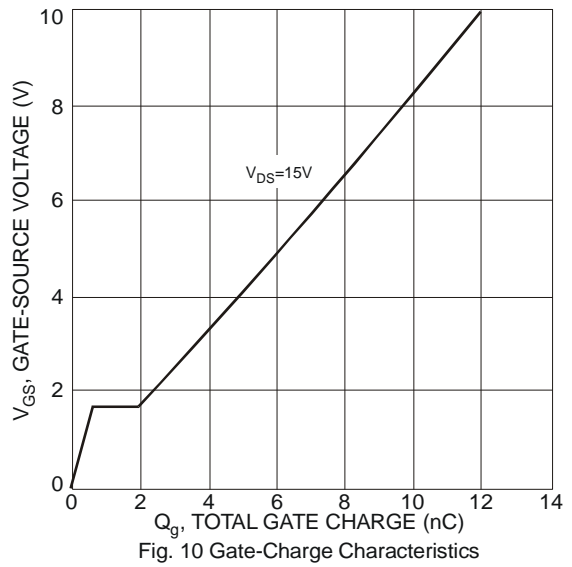
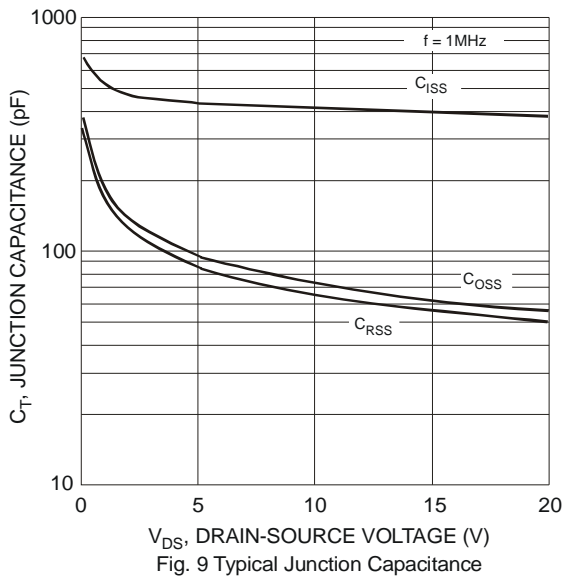


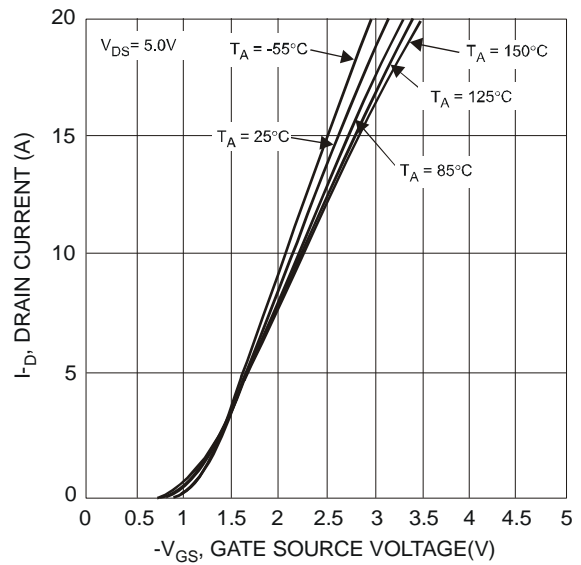
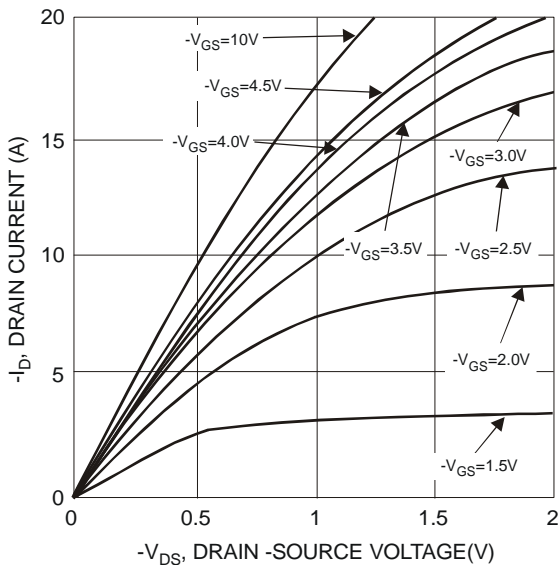
Fig. 8 Diode Forward Voltage vs. Current



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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	-	-	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current @ $T_c = 25^\circ\text{C}$	I_{DSS}	-	-	-1.0	μA	$V_{DS} = -16V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	-	-	± 100	nA	$V_{GS} = \pm 12V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.4	-	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{D(ON)}$	-	57	74	m Ω	$V_{GS} = -4.5V, I_D = -3.0A$
		-	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	$V_{DS} = -10V, V_{GS} = -4.5V, R_G = 6\Omega, I_S = -1A,$
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.



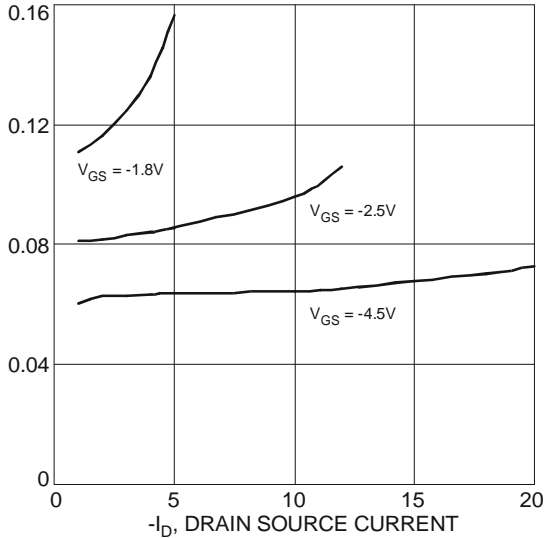


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

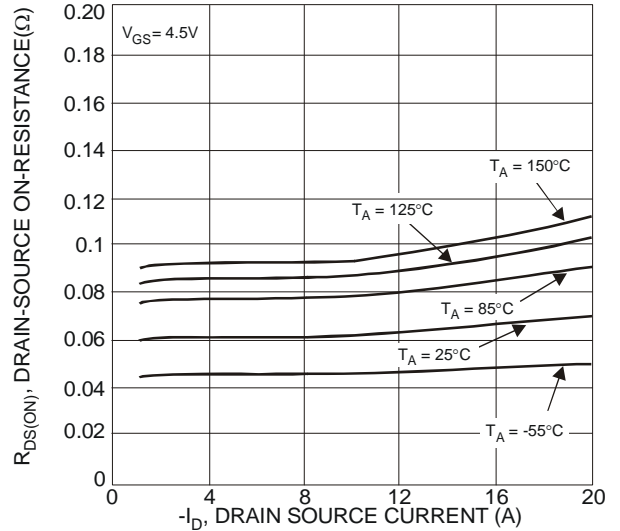


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

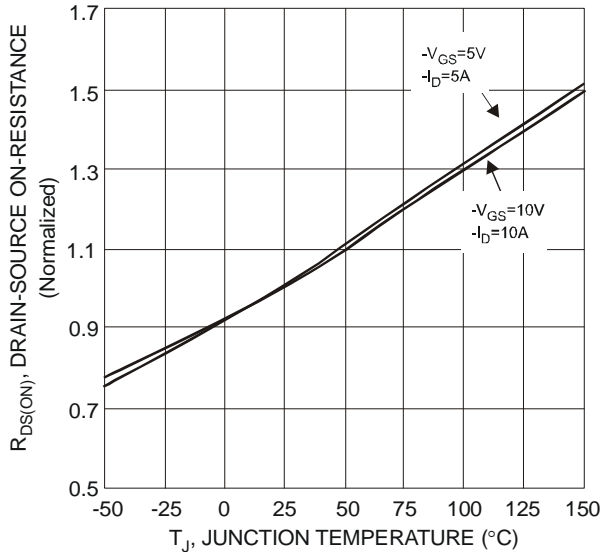


Fig. 17 On-Resistance Variation with Temperature

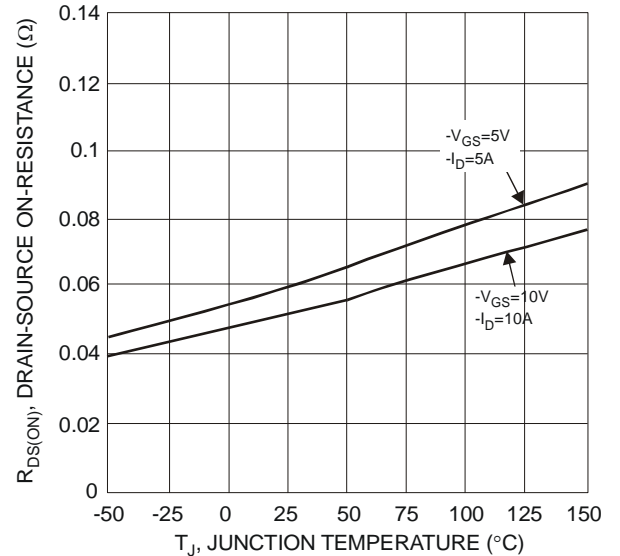


Fig. 18 On-Resistance Variation with Temperature

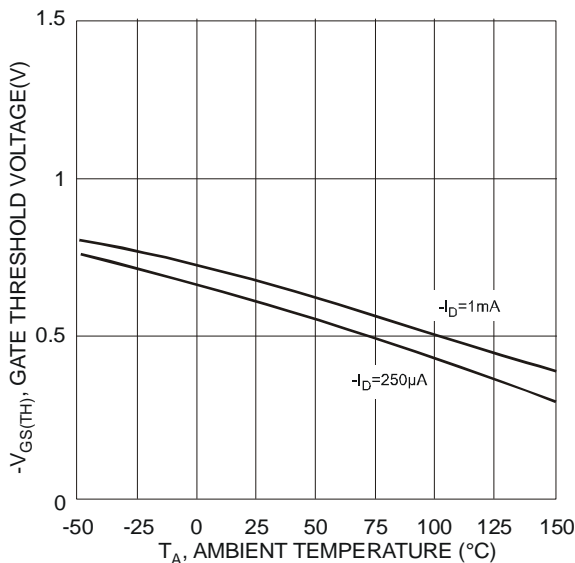


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

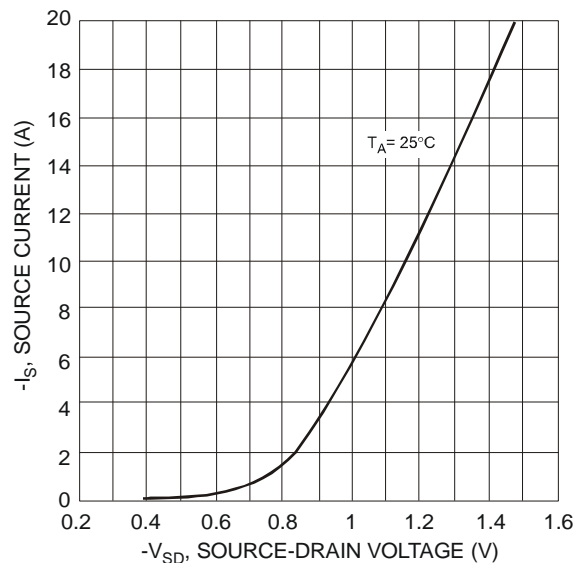
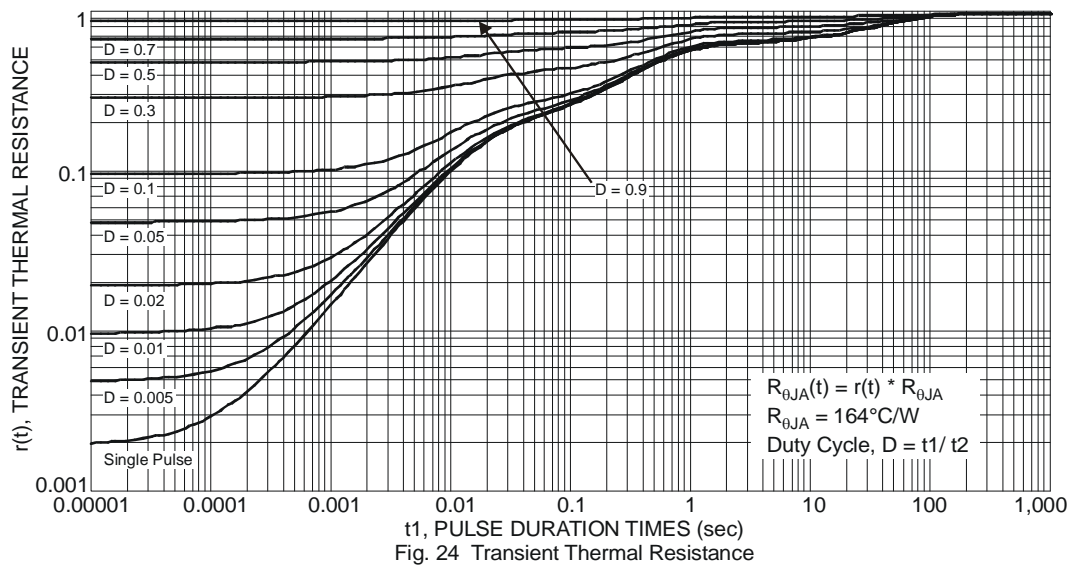
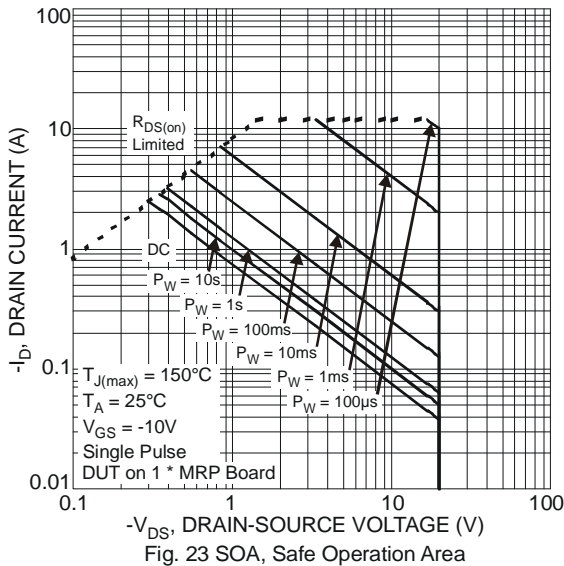
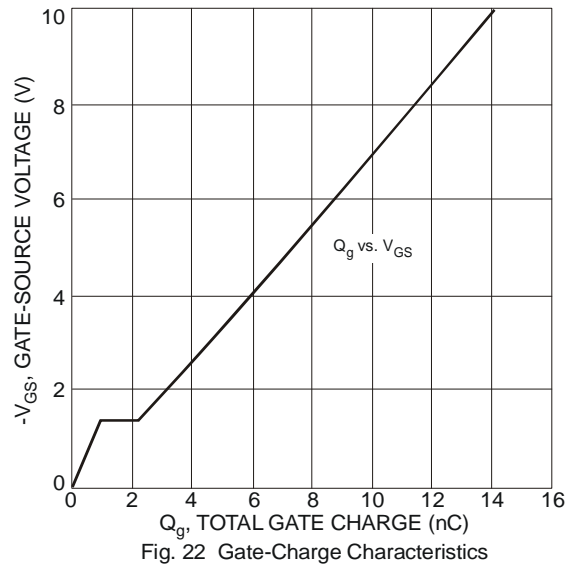
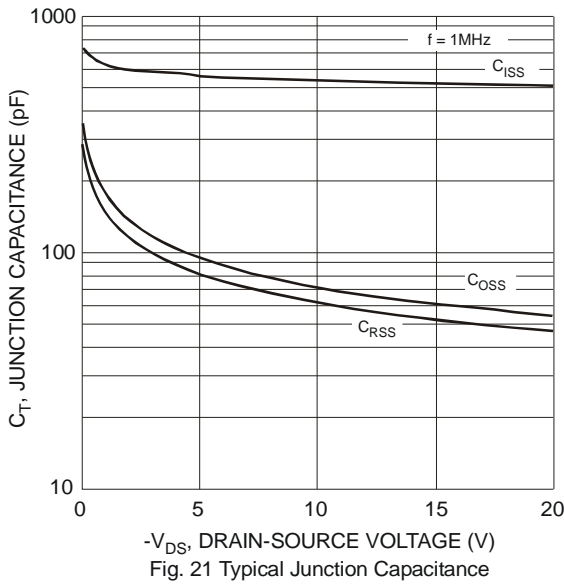
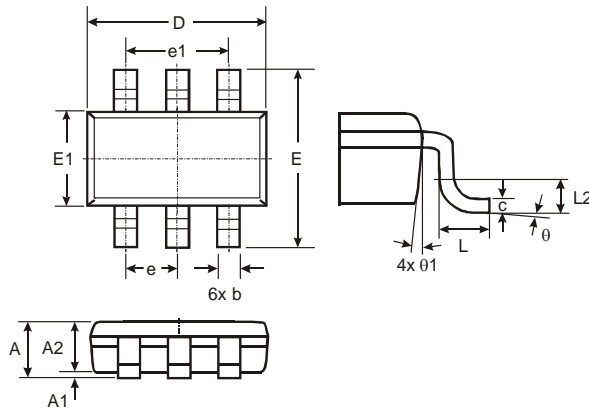


Fig. 20 Diode Forward Voltage vs. Current

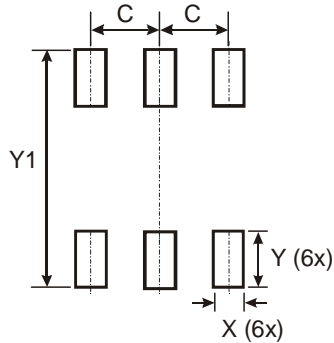


Package Outline Dimensions



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



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

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

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