

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET
Product Summary

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

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**

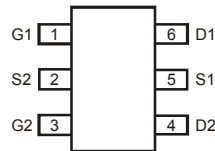
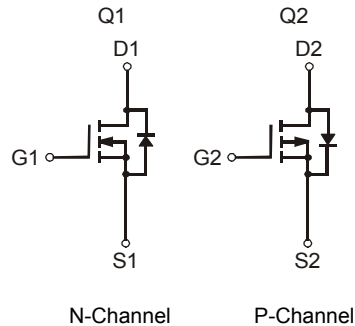
Mechanical Data

- 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)

TSOT26



Top View


 Top View
Pin Configuration


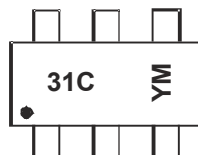
N-Channel

P-Channel

Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
DMC2038LVT-7	Standard	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 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°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} = 4.5V	Steady State	T _A = +25°C T _A = +70°C	I _D	3.7 3.0	A
	t < 10s	T _A = +25°C T _A = +70°C	I _D	4.1 3.2	A
Continuous Drain Current (Note 6) V _{GS} = 4.5V	Steady State	T _A = +25°C T _A = +70°C	I _D	4.5 3.6	A
	t < 10s	T _A = +25°C T _A = +70°C	I _D	5.2 4.2	A
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	1.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I _{DM}	25	A

Maximum Ratings P-CHANNEL – Q2 (@T_A = +25°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} = -4.5V	Steady State	T _A = +25°C T _A = +70°C	I _D	-2.6 -2.1	A
	t < 10s	T _A = +25°C T _A = +70°C	I _D	-2.9 -2.4	A
Continuous Drain Current (Note 6) V _{GS} = -4.5V	Steady State	T _A = +25°C T _A = +70°C	I _D	-3.1 -2.5	A
	t < 10s	T _A = +25°C T _A = +70°C	I _D	-3.8 -3.0	A
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	-1.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I _{DM}	-17	A

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

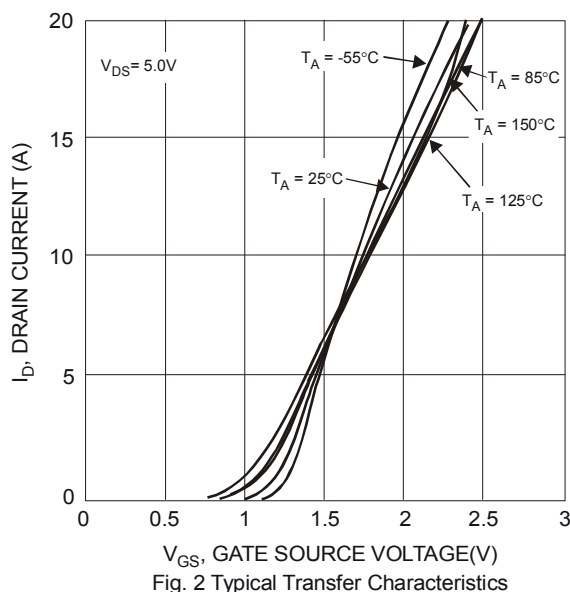
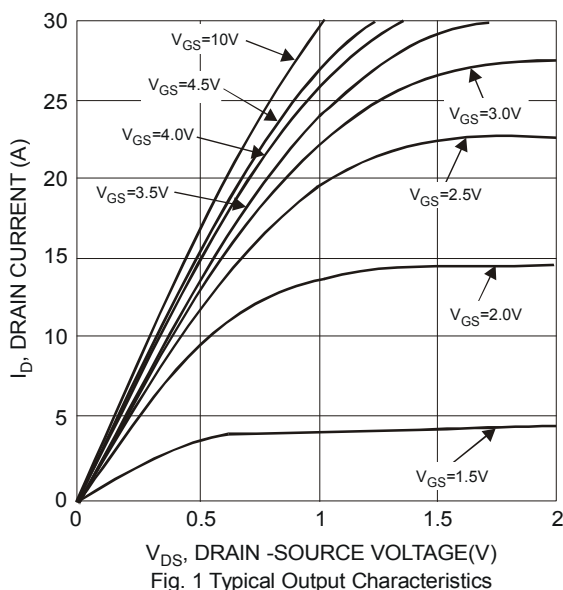
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T _A = +25°C	P _D	0.8	W
	T _A = +70°C		0.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	168	°C/W
	t < 10s		120	
Total Power Dissipation (Note 6)	T _A = +25°C	P _D	1.1	W
	T _A = +70°C		0.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	114	°C/W
	t < 10s		72	
Thermal Resistance, Junction to Case (Note 6)		R _{θJC}	39	
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°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.



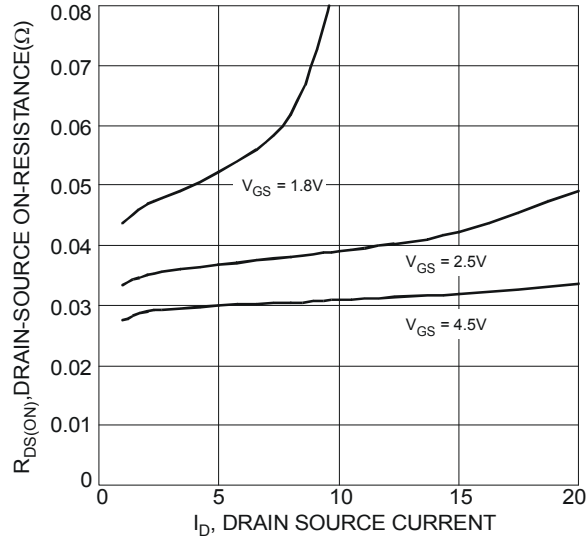


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

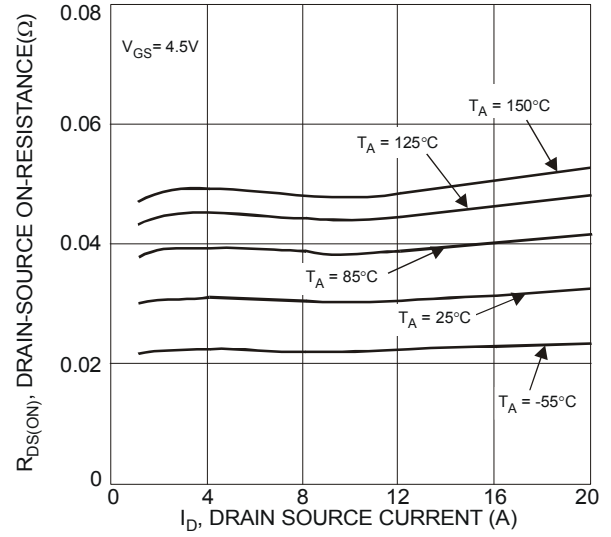


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

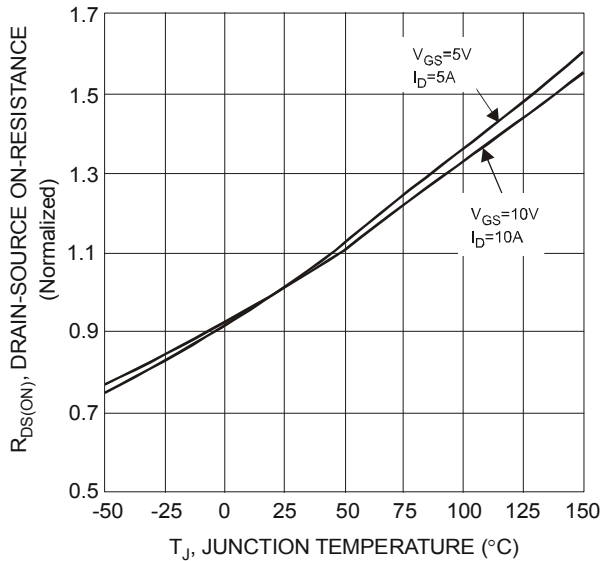


Fig. 5 On-Resistance Variation with Temperature

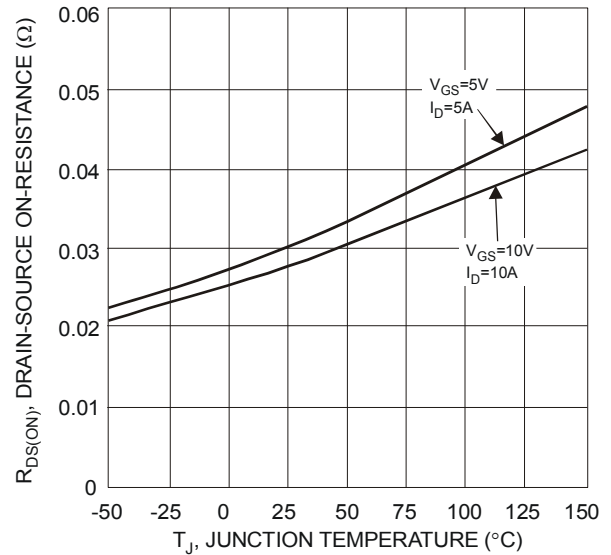


Fig. 6 On-Resistance Variation with Temperature

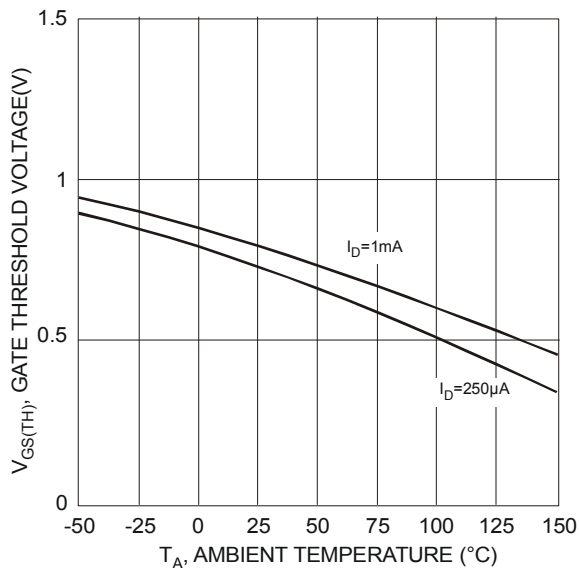


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

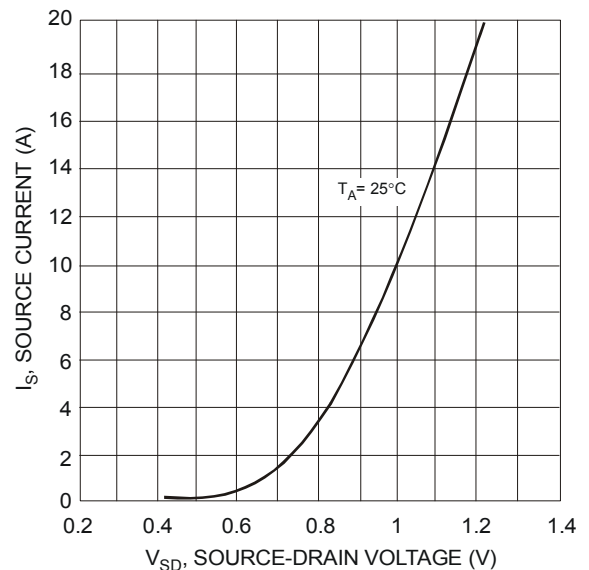
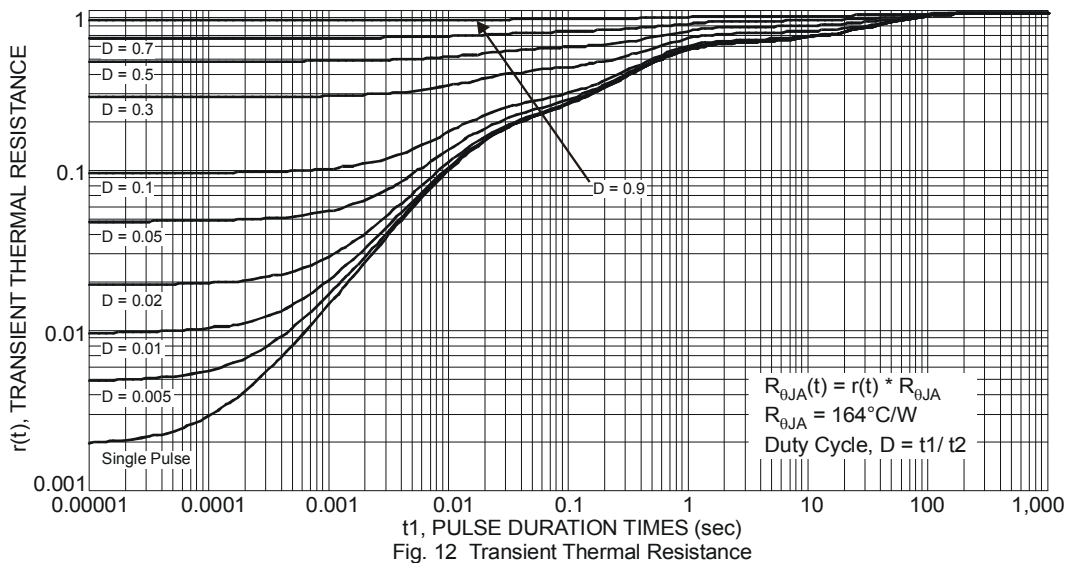
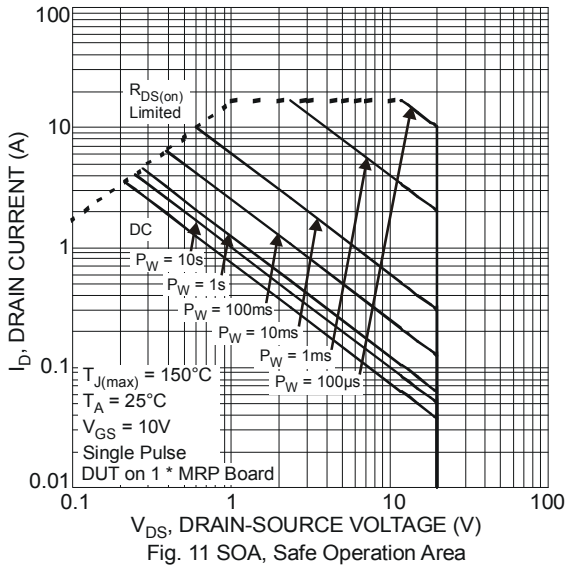
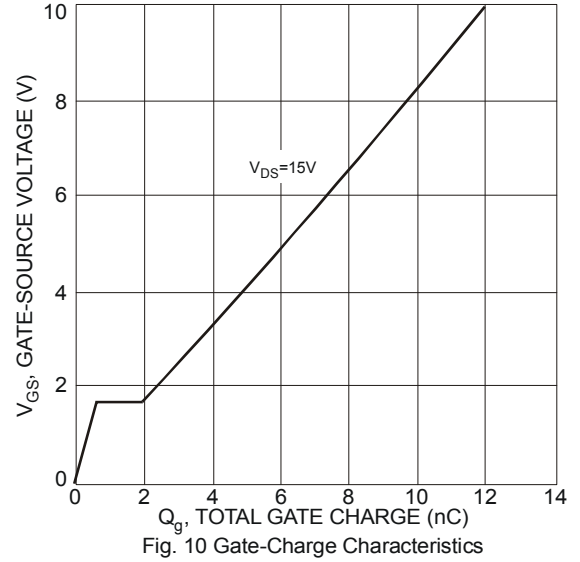
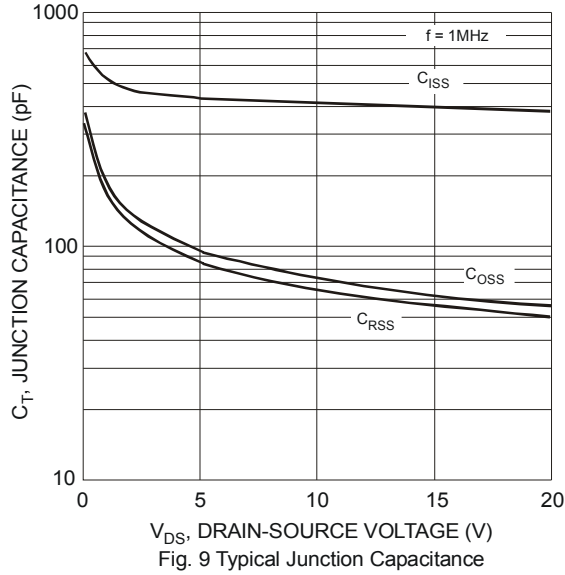


Fig. 8 Diode Forward Voltage vs. Current



Electrical Characteristics P-CHANNEL – Q2 (@T_A = +25°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.

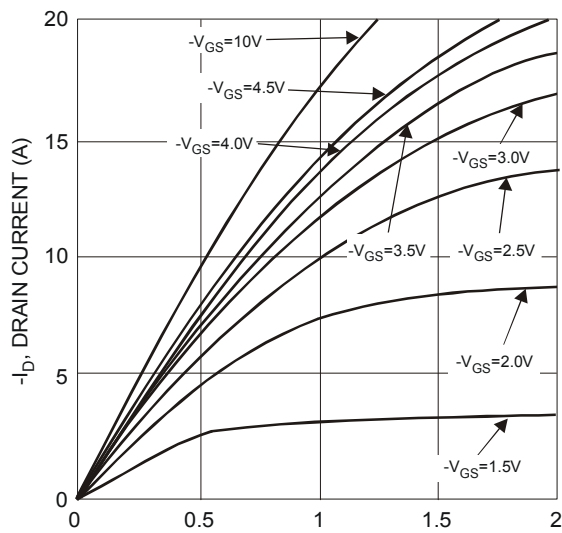


Fig. 13 Typical Output Characteristics

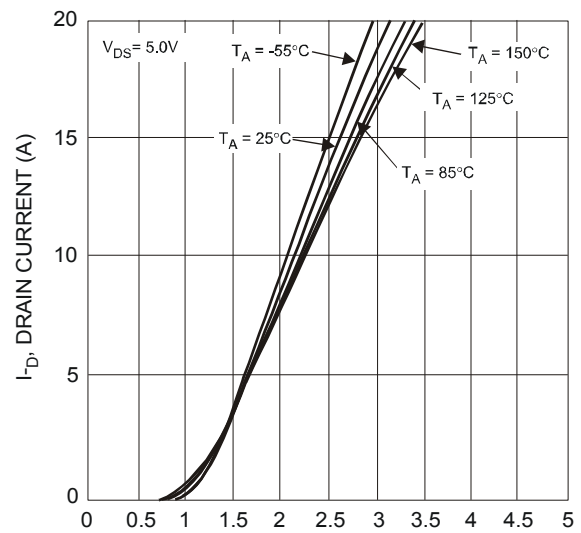


Fig. 14 Typical Transfer Characteristics

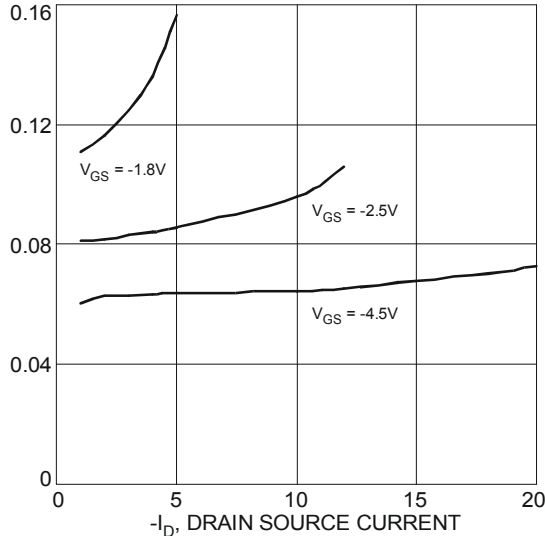


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

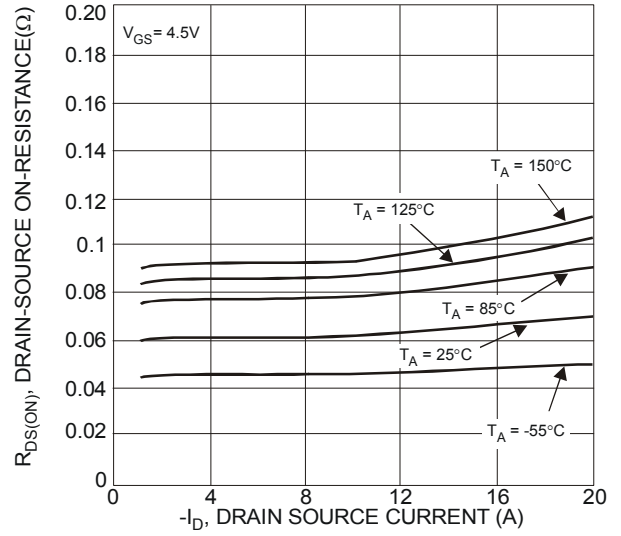


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

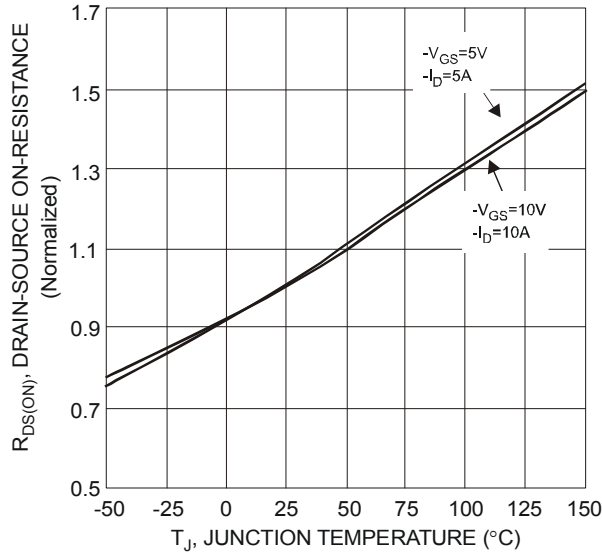


Fig. 17 On-Resistance Variation with Temperature

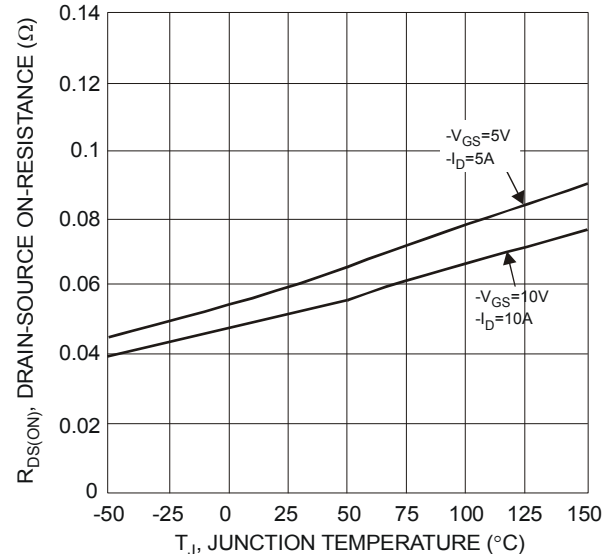


Fig. 18 On-Resistance Variation with Temperature

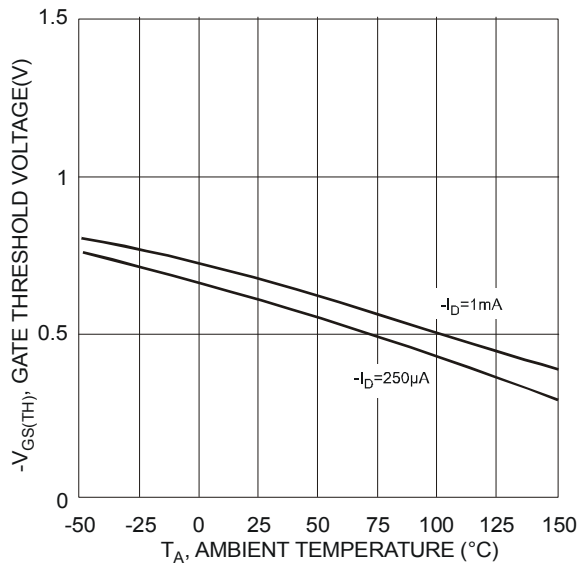


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

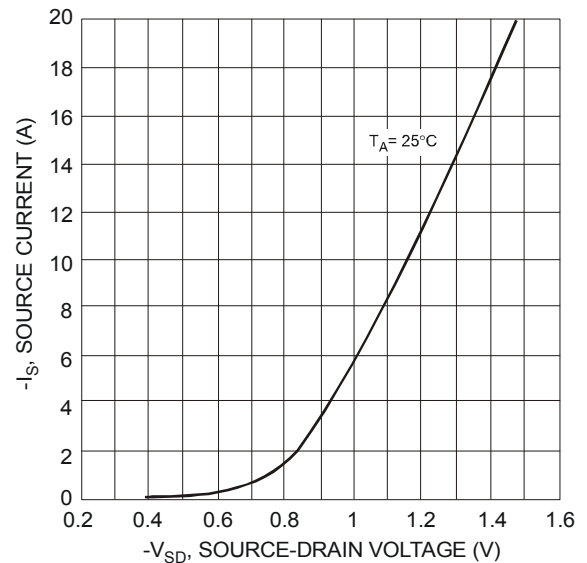
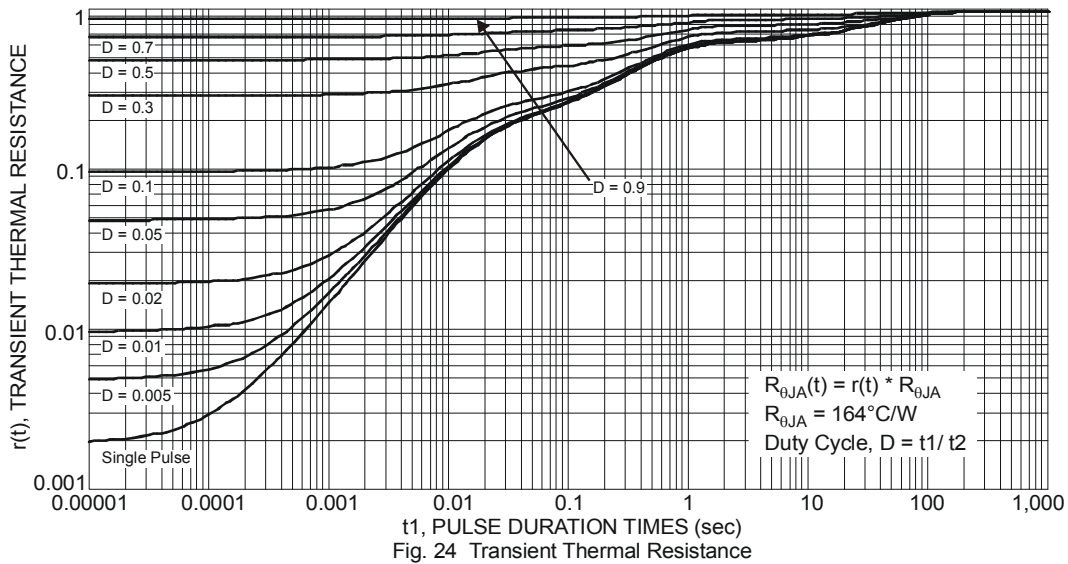
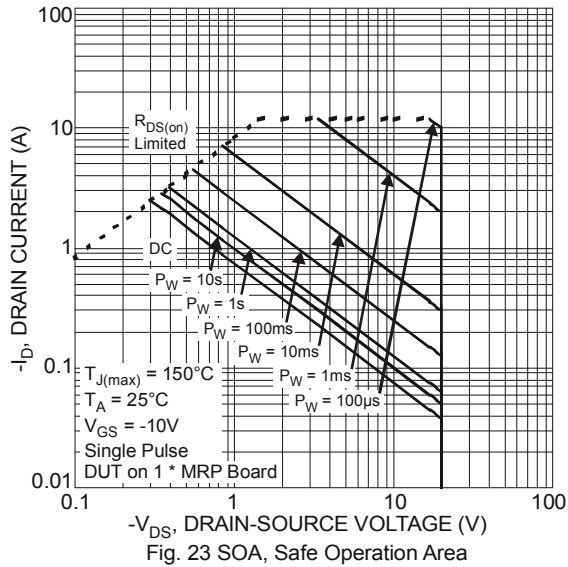
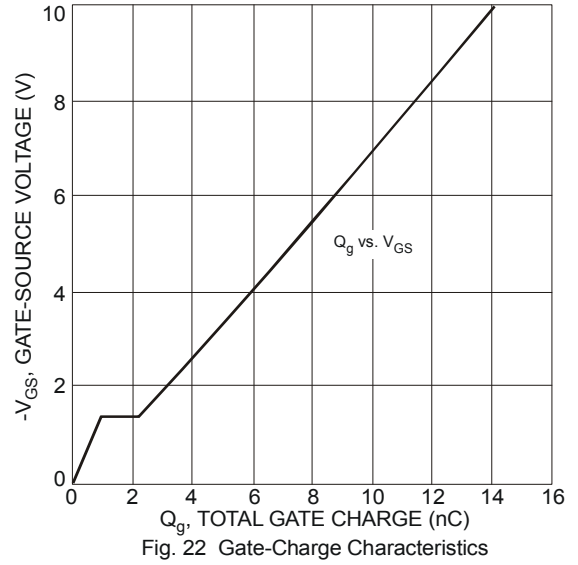
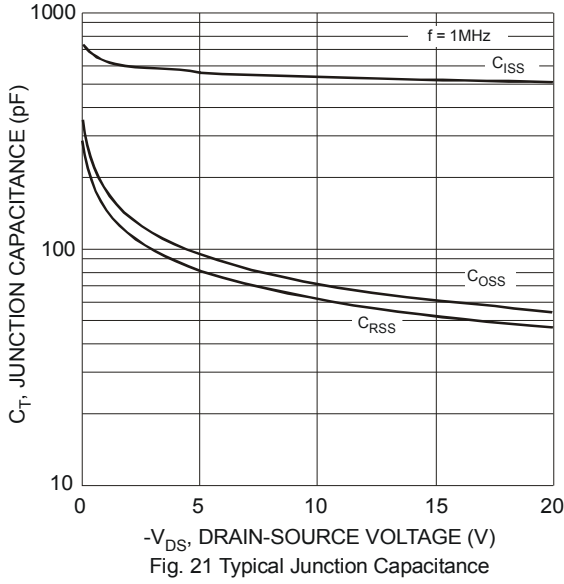
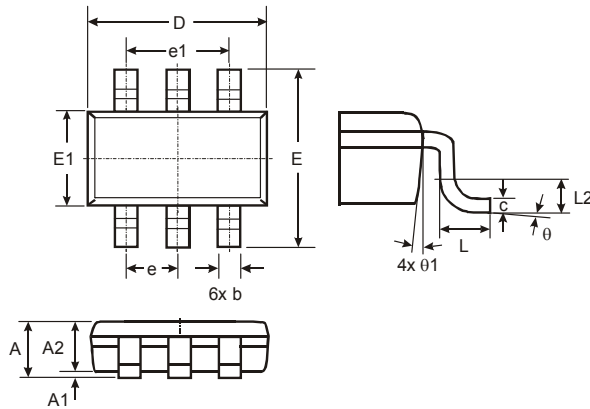


Fig. 20 Diode Forward Voltage vs. Current



Package Outline Dimensions

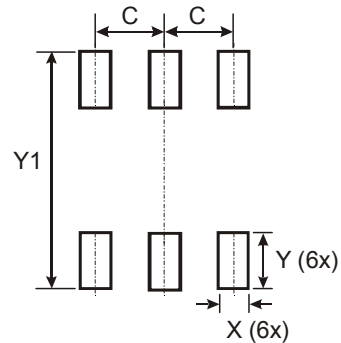
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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
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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