COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	BV_{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 is 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

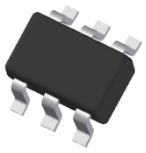
Features

- 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**
- **PPAP Capable (Note 4)**

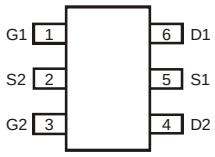
Mechanical Data

- 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)

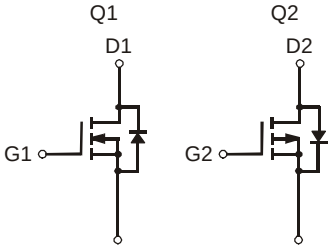
TSOT26



Top View



Top View
Pin Configuration



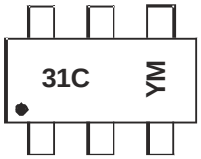
N-Channel P-Channel

Ordering Information (Note 5)

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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to https://www.diodes.com/quality/product-compliance-definitions/.
5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



31C = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: E = 2017)
M = Month (ex: 9 = September)

Date Code Key

Year	2017	2018	2019	2020	2021	2022	2023
Code	E	F	G	H	I	J	K

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	Unit
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) 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 7) 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 7)			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	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) 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 7) 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 7)			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 6)	T_A = +25°C	P_D	0.8	W
	T_A = +70°C		0.5	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	168	°C/W
	t<10s		120	
Total Power Dissipation (Note 7)	T_A = +25°C	P_D	1.1	W
	T_A = +70°C		0.7	
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	114	°C/W
	t<10s		72	
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	39	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
7. 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 8)						
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 8)						
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 9)						
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: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

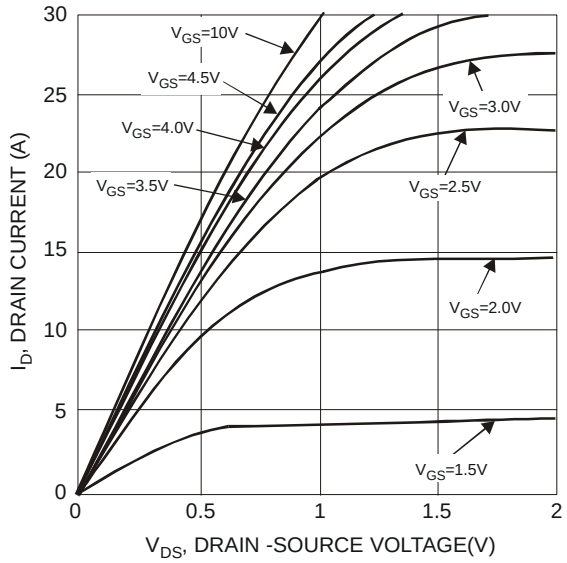


Fig. 1 Typical Output Characteristics

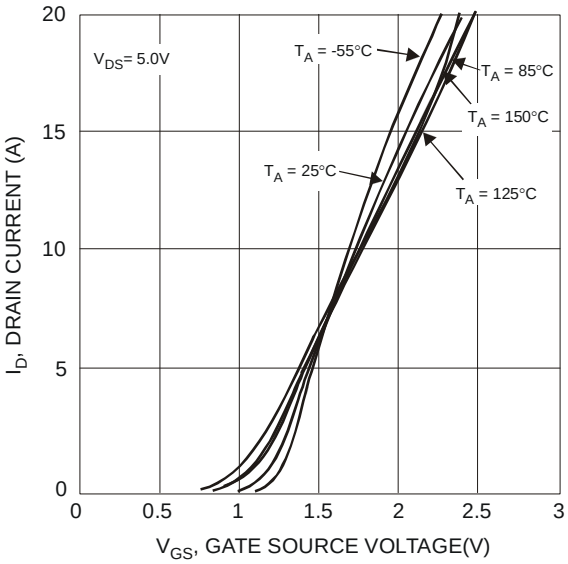


Fig. 2 Typical Transfer Characteristics

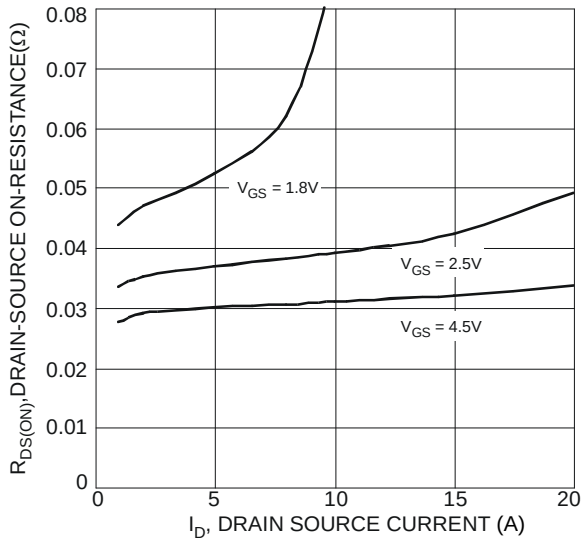


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

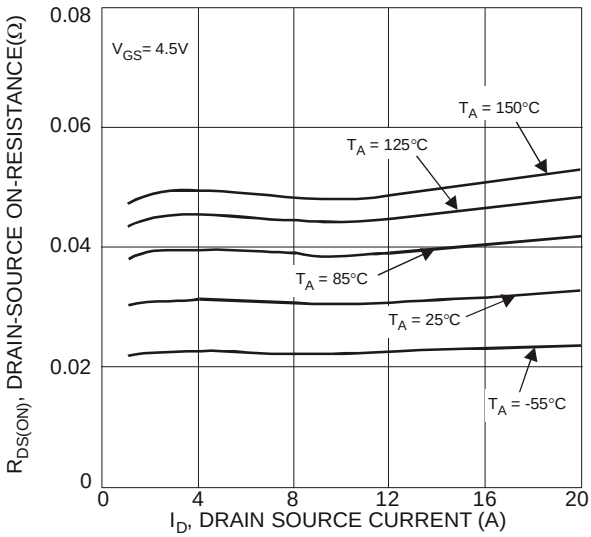


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

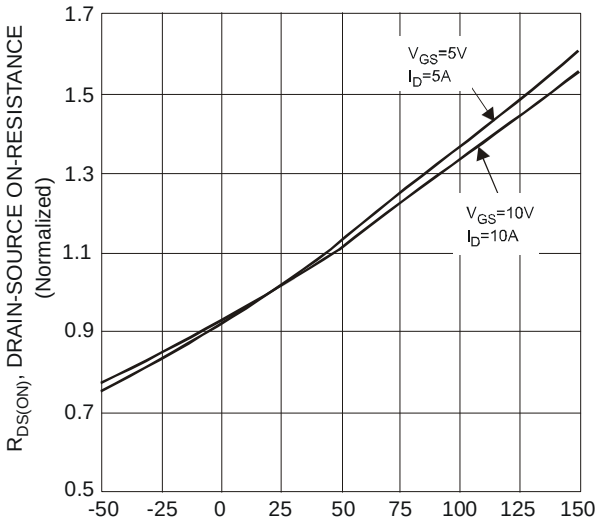


Fig. 5 On-Resistance Variation with Temperature

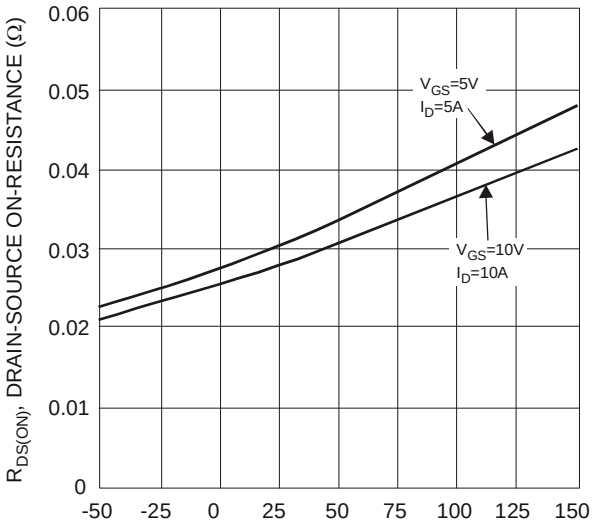


Fig. 6 On-Resistance Variation with Temperature

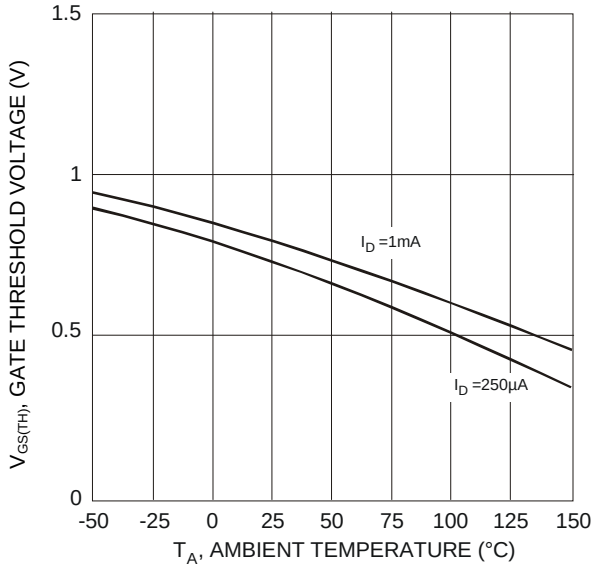


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

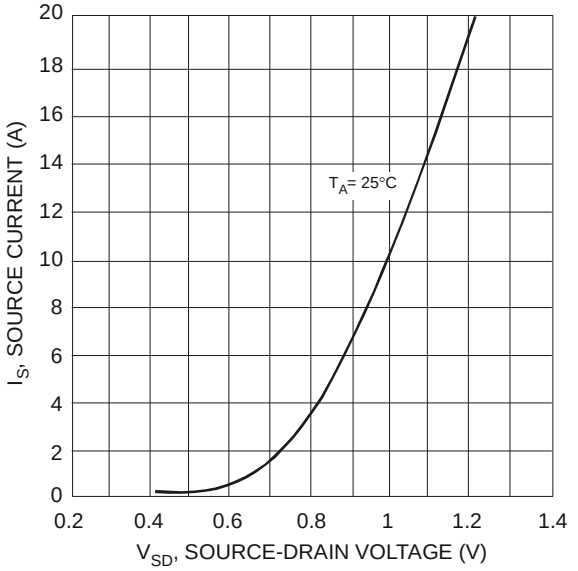


Fig. 8 Diode Forward Voltage vs. Current

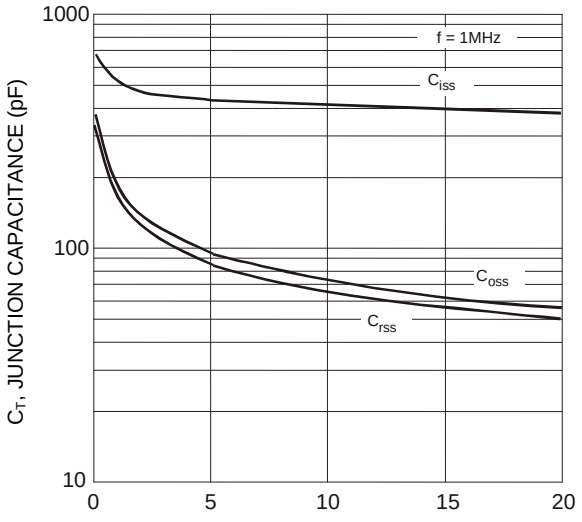


Fig. 9 Typical Junction Capacitance

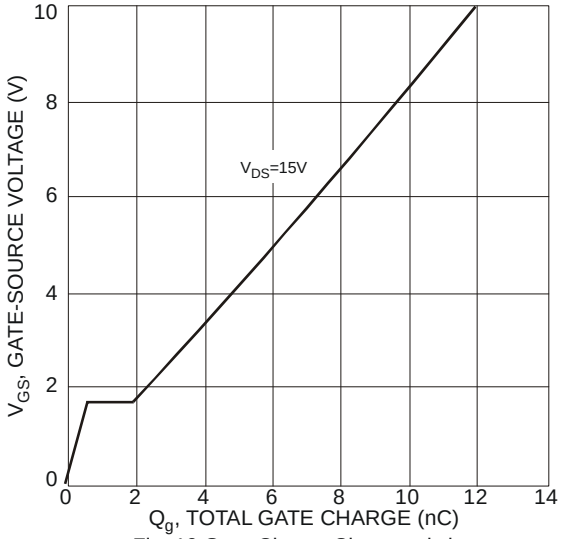


Fig. 10 Gate-Charge Characteristics

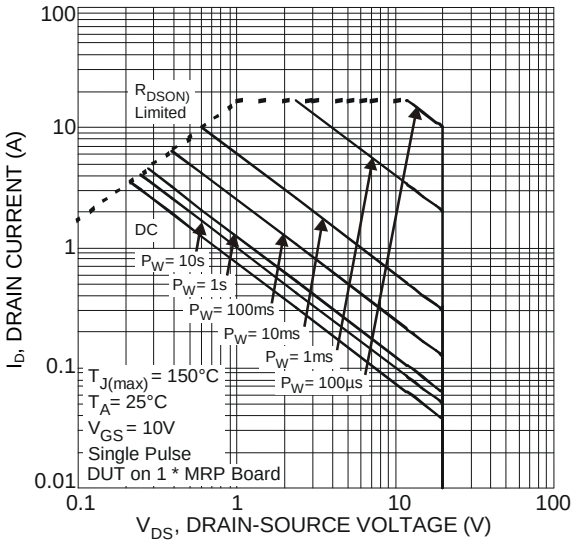


Fig. 11 SOA, Safe Operation Area

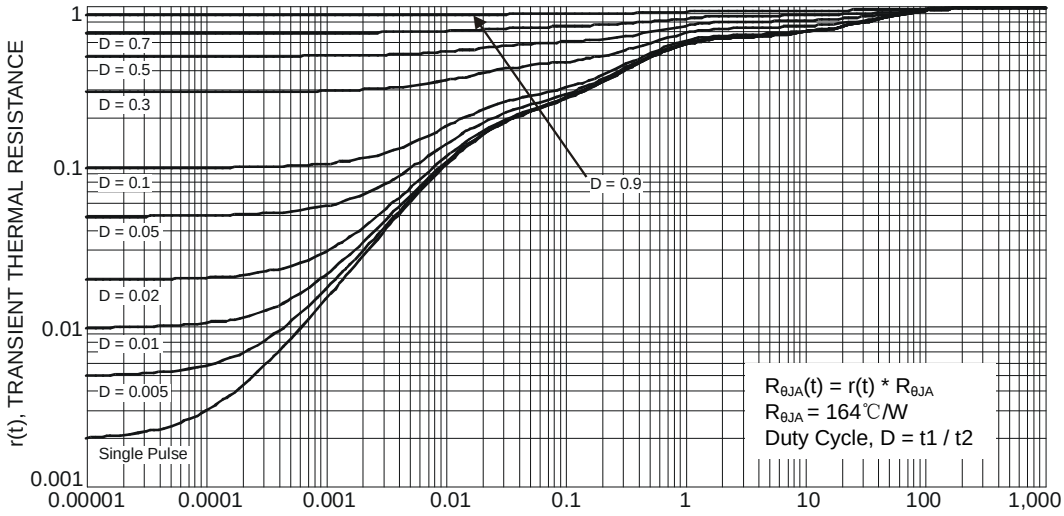


Fig. 12 Transient Thermal Resistance

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
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 9)						
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: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

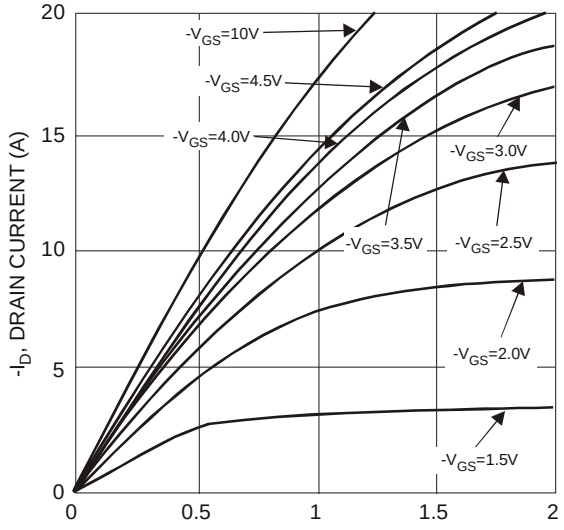


Fig. 13 Typical Output Characteristics

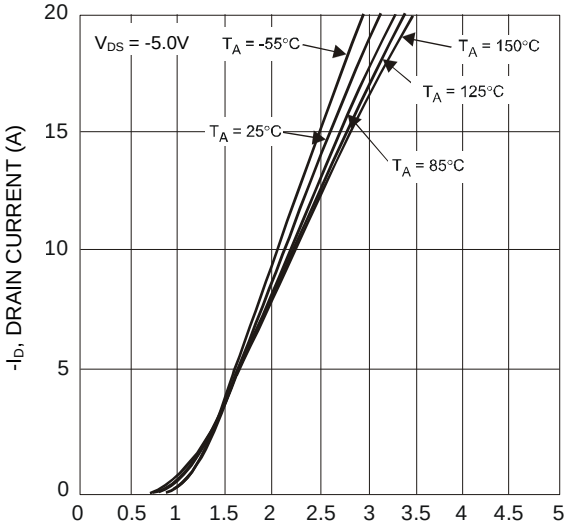


Fig. 14 Typical Transfer Characteristics

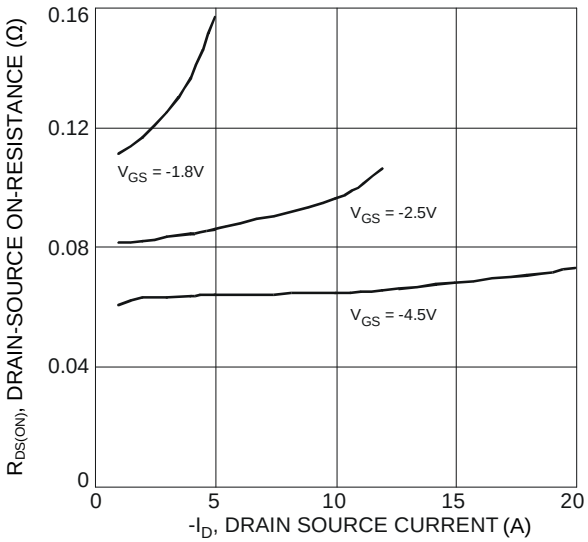


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

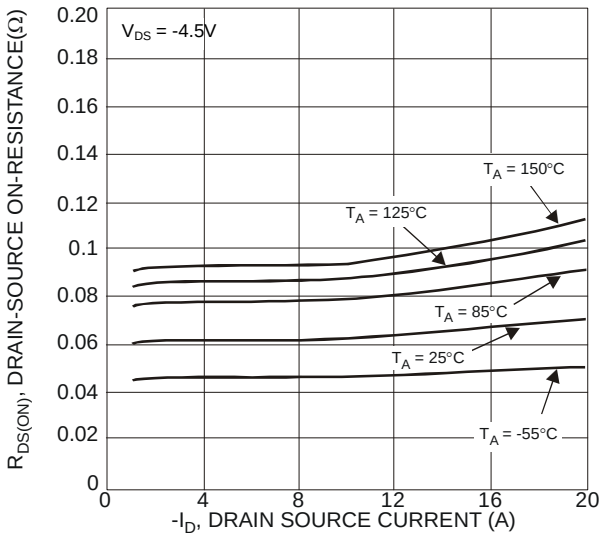


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

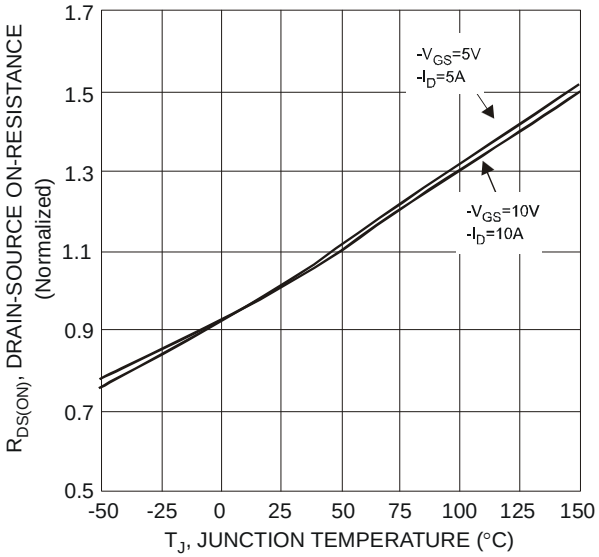


Fig. 17 On-Resistance Variation with Temperature

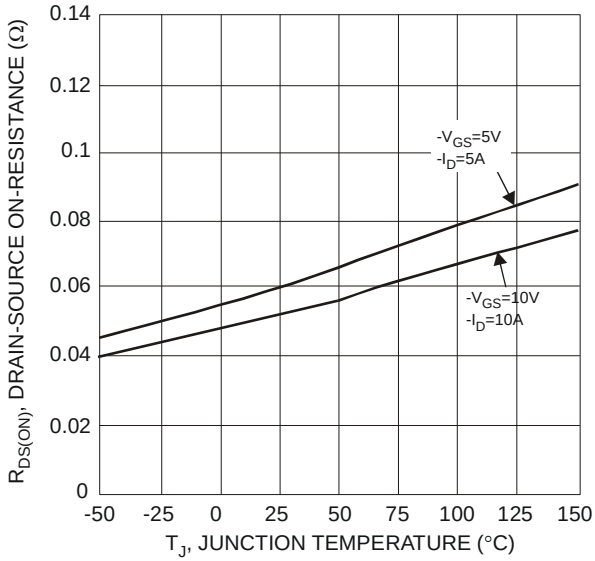


Fig. 18 On-Resistance Variation with Temperature

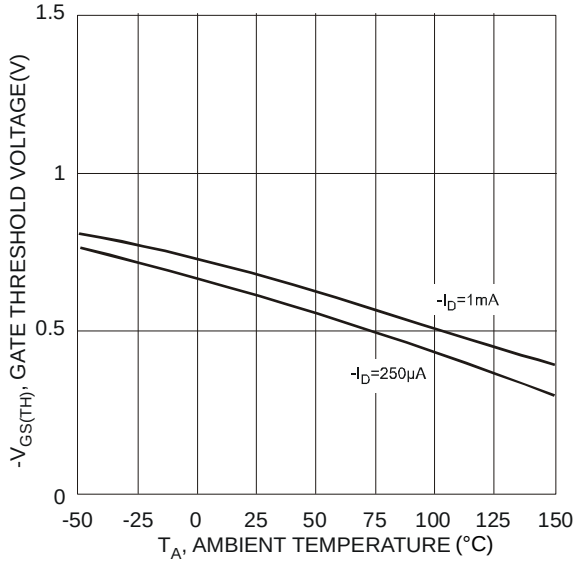


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

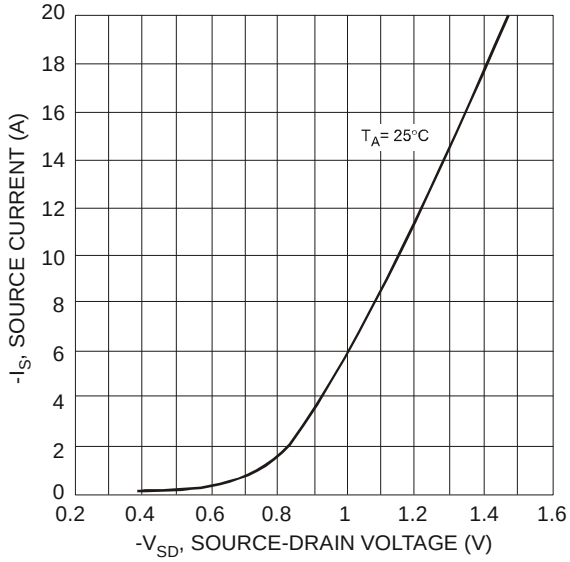


Fig. 20 Diode Forward Voltage vs. Current

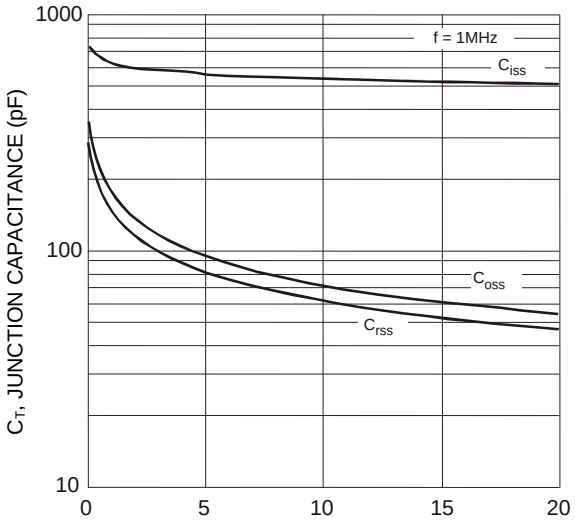


Fig. 21 Typical Junction Capacitance

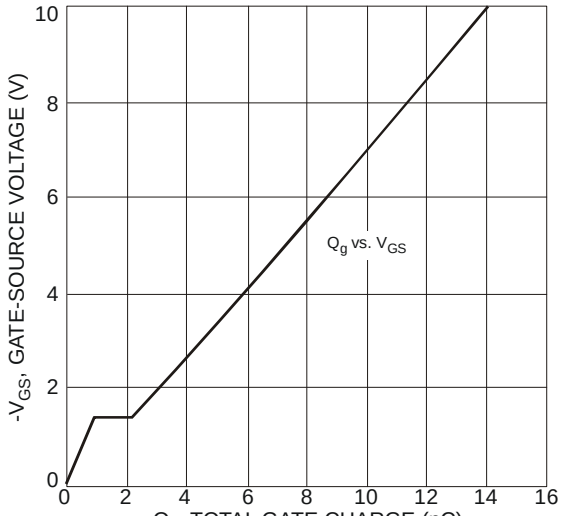


Fig. 22 Gate-Charge Characteristics

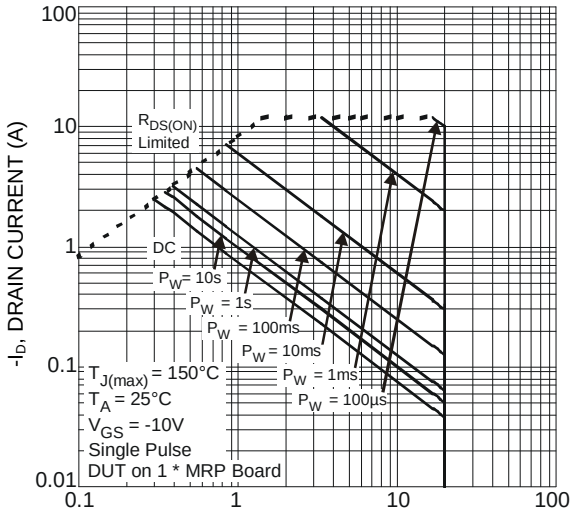


Fig. 23 SOA, Safe Operation Area

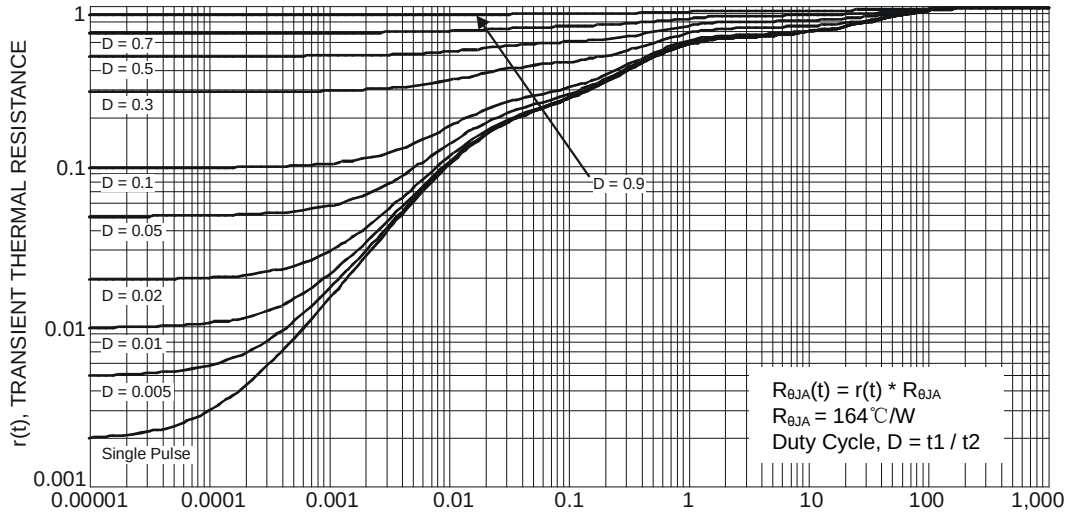
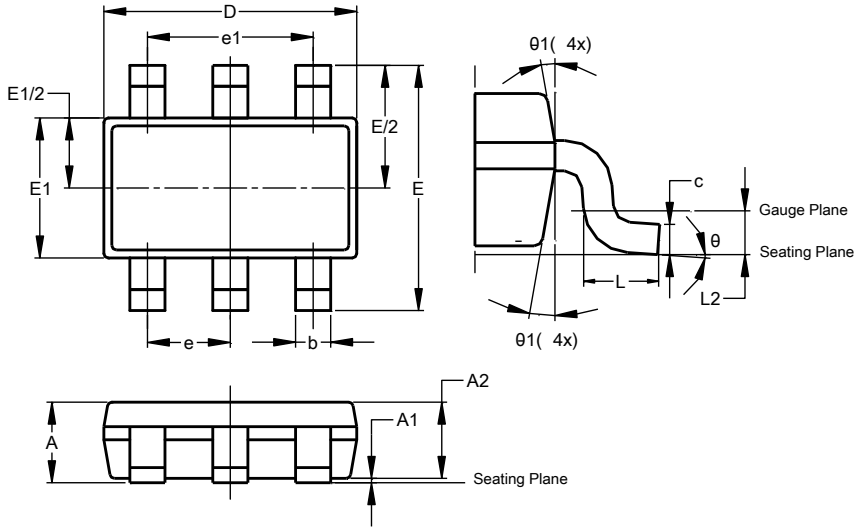


Fig. 24 Transient Thermal Resistance

Package Outline Dimensions

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

TSOT26

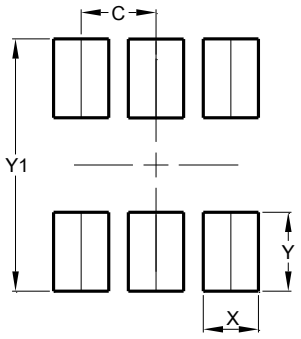


TSOT26			
Dim	**Min**	**Max**	**Typ**
A	–	1.00	–
A1	0.010	0.100	–
A2	0.840	0.900	–
D	2.800	3.000	2.900
E	2.800 BSC		
E1	1.500	1.700	1.600
b	0.300	0.450	–
c	0.120	0.200	–
e	0.950 BSC		
e1	1.900 BSC		
L	0.30	0.50	–
L2	0.250 BSC		
θ	0°	8°	4°
θ1	4°	12°	–
All Dimensions in mm			

Suggested Pad Layout

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

TSOT26



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

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