COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

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

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**

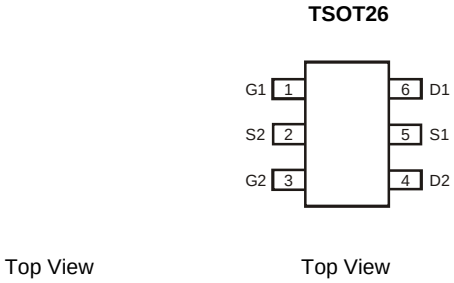
Description and Applications

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

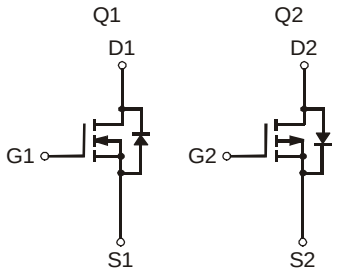
Mechanical Data

- 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)



Top View

Top View



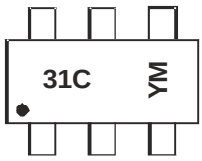
N-Channel P-Channel

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℃ 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℃ 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℃ unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = 25℃	P_D	0.8	W
	T_A = 70℃		0.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	168	℃/W
	t<10s		120	
Total Power Dissipation (Note 6)	T_A = 25℃	P_D	1.1	W
	T_A = 70℃		0.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	114	℃/W
	t<10s		72	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	39	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

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℃ 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℃	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.

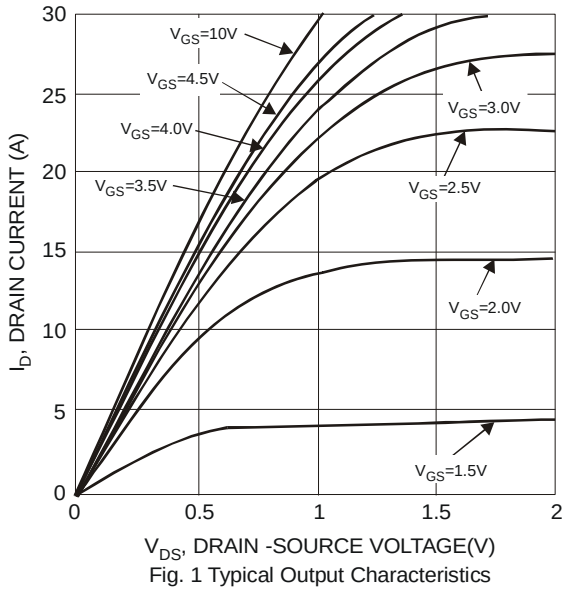


Fig. 1 Typical Output Characteristics

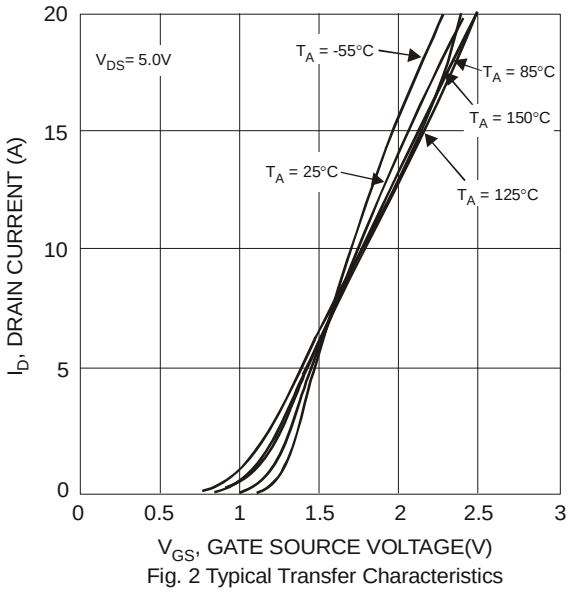


Fig. 2 Typical Transfer Characteristics

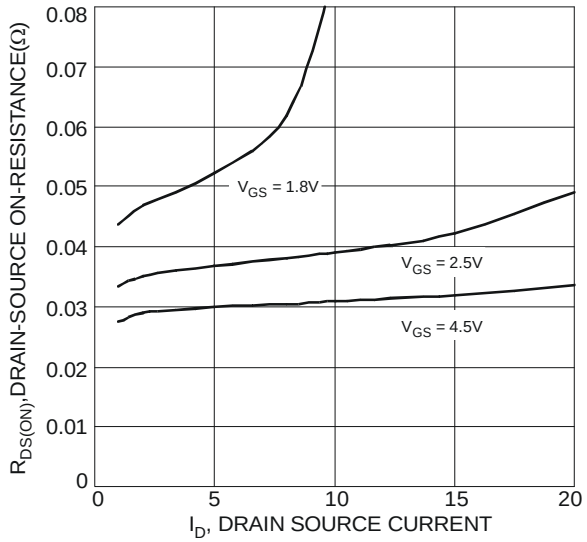


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

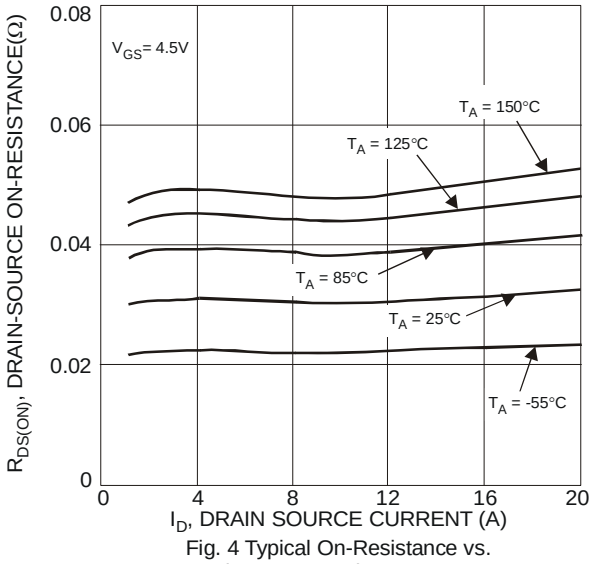


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

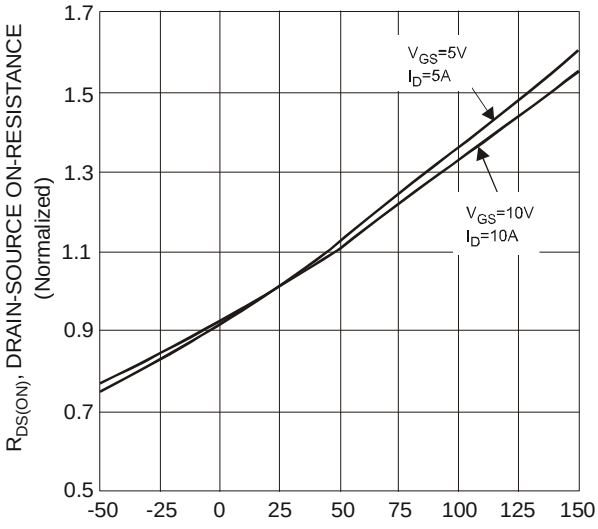


Fig. 5 On-Resistance Variation with Temperature

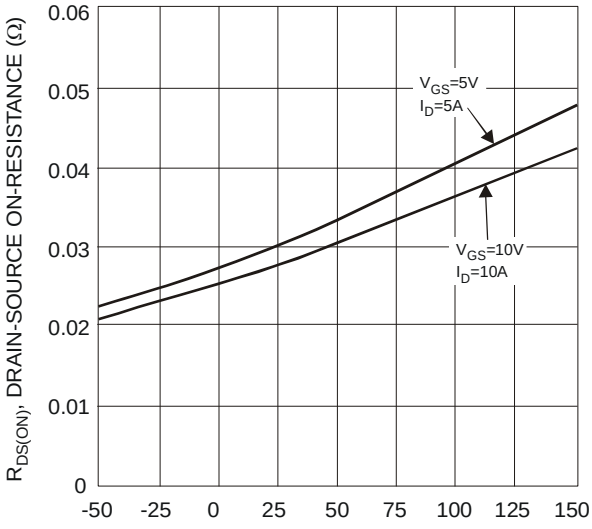


Fig. 6 On-Resistance Variation with Temperature

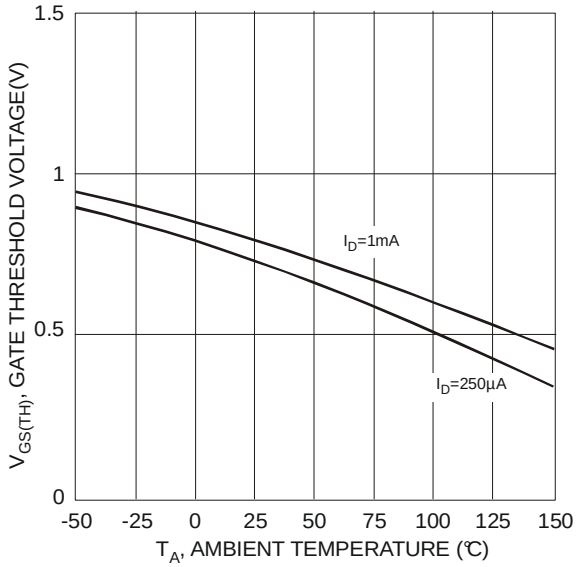


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

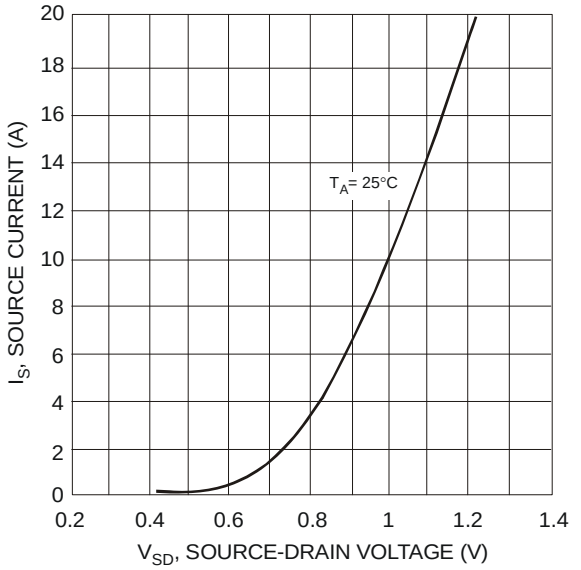


Fig. 8 Diode Forward Voltage vs. Current

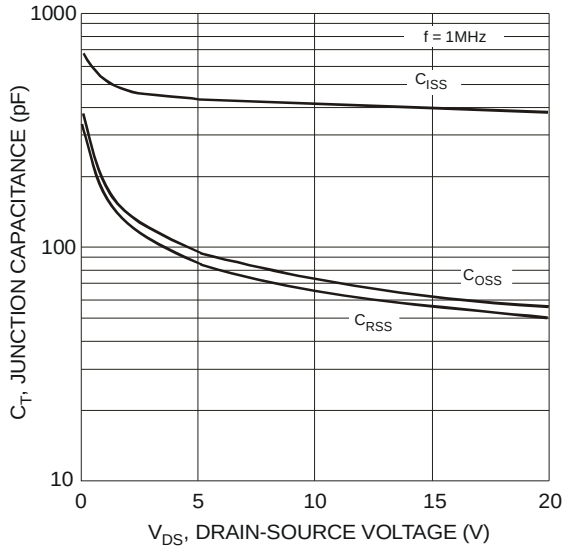


Fig. 9 Typical Junction Capacitance

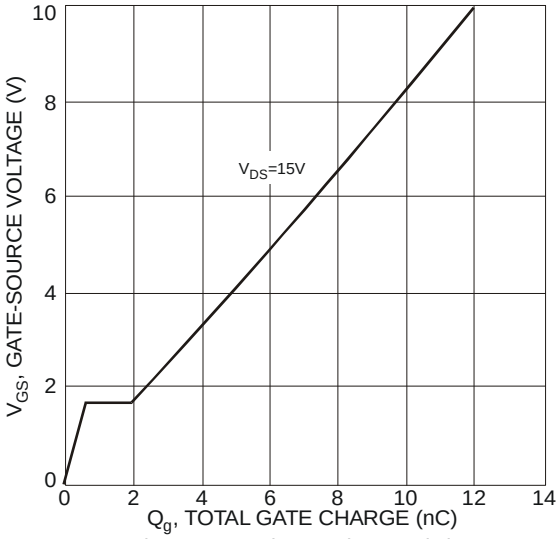


Fig. 10 Gate-Charge Characteristics

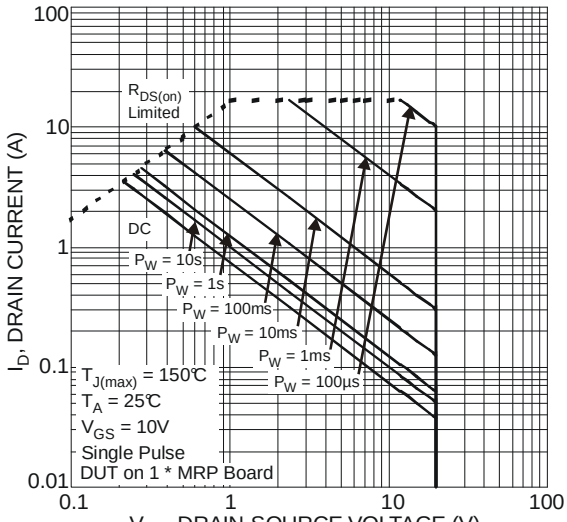


Fig. 11 SOA, Safe Operation Area

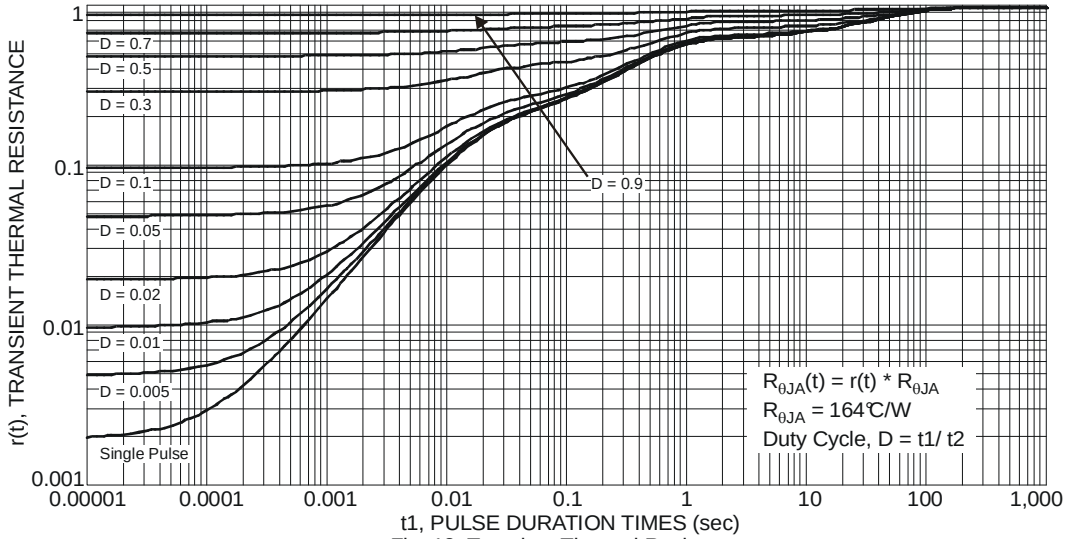


Fig. 12 Transient Thermal Resistance

Electrical Characteristics P-CHANNEL – Q2 @T_A = 25℃ 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℃	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 effec
8. Guaranteed by design. Not subject to product testing.

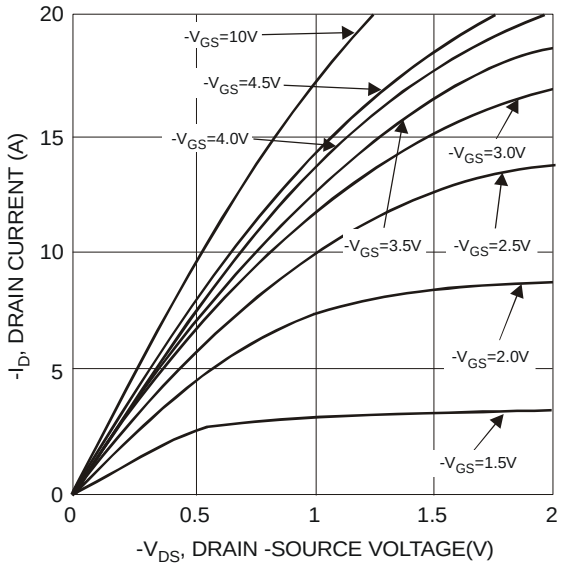


Fig. 13 Typical Output Characteristics

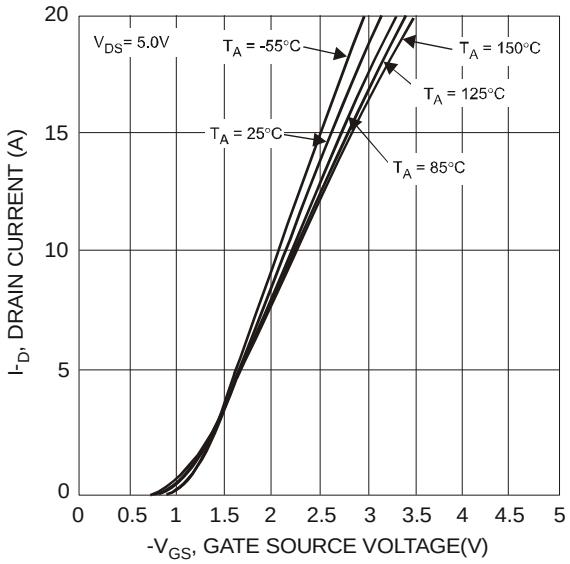


Fig. 14 Typical Transfer Characteristics

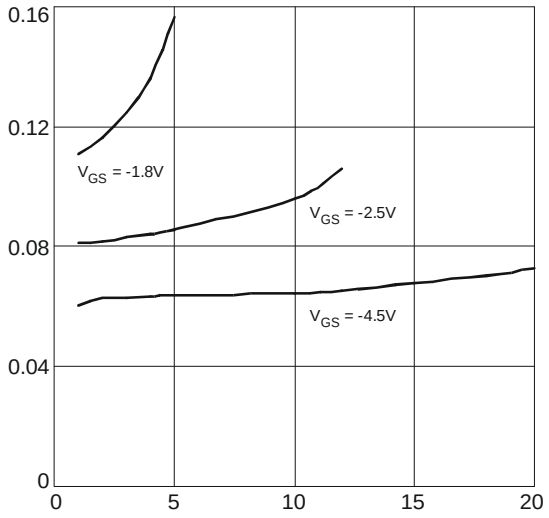


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

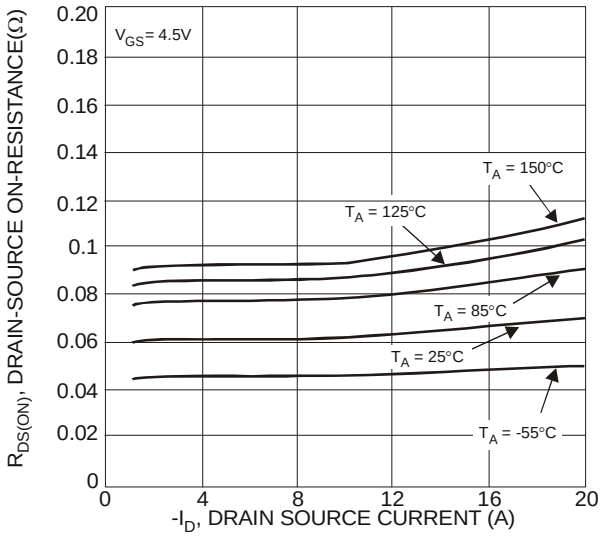


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

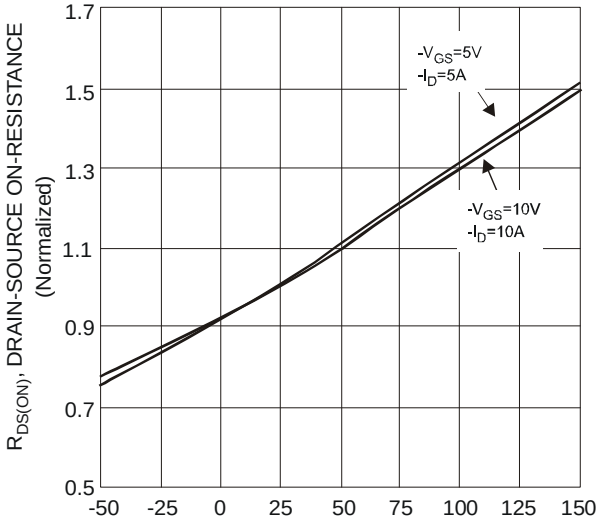


Fig. 17 On-Resistance Variation with Temperature

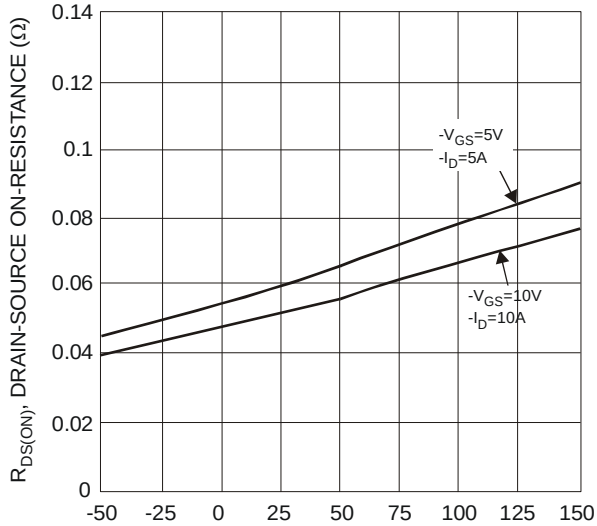


Fig. 18 On-Resistance Variation with Temperature

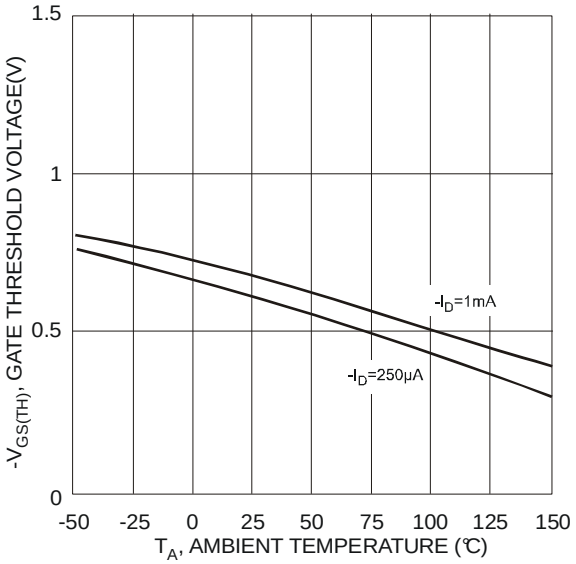


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

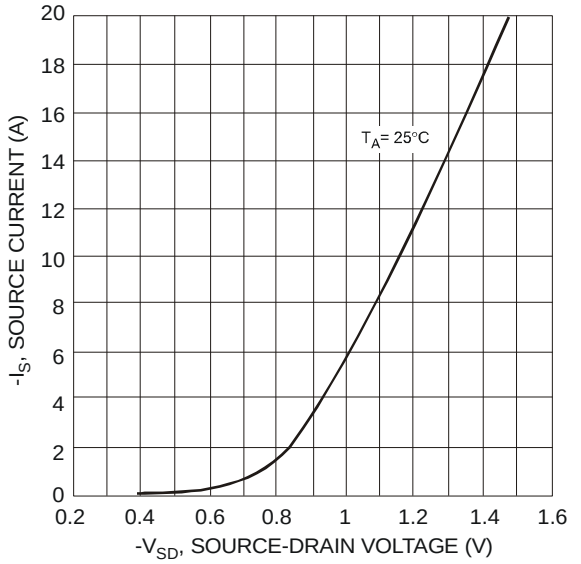


Fig. 20 Diode Forward Voltage vs. Current

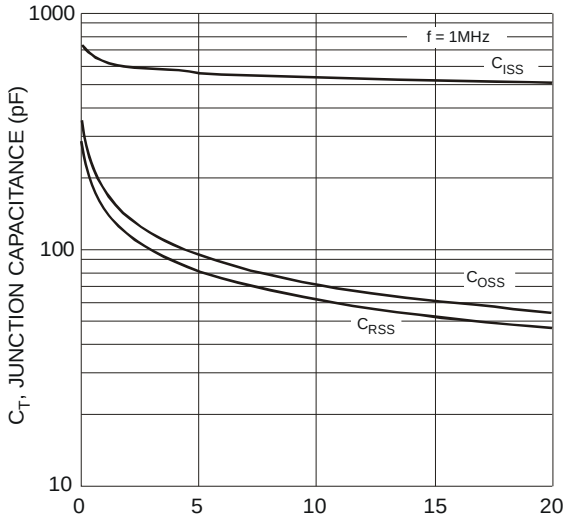


Fig. 21 Typical Junction Capacitance

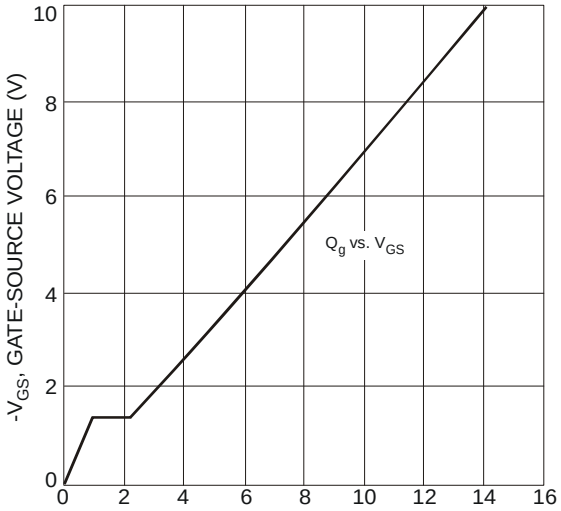


Fig. 22 Gate-Charge Characteristics

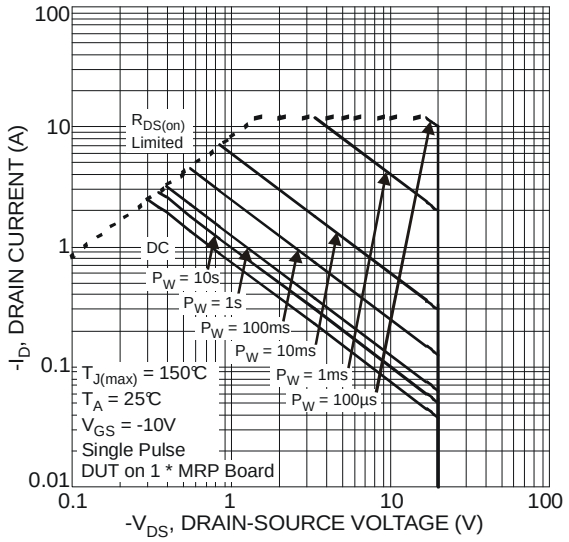


Fig. 23 SOA, Safe Operation Area

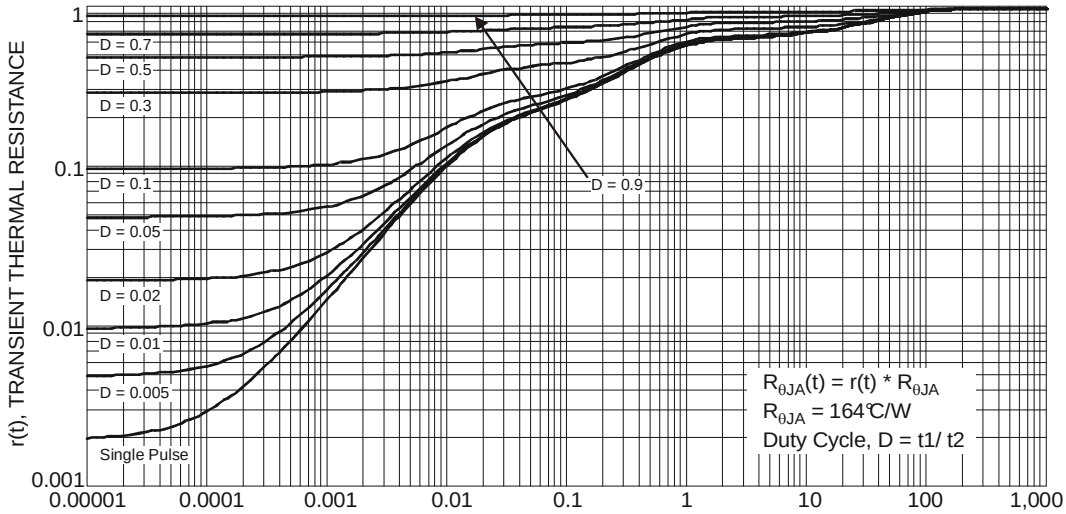
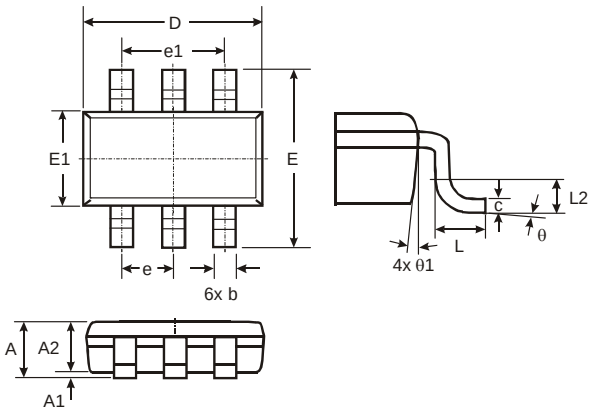


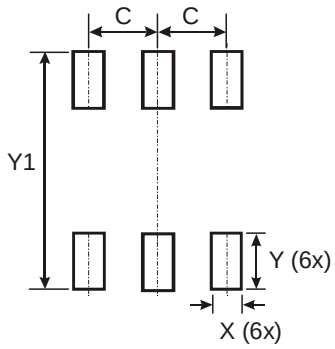
Fig. 24 Transient Thermal Resistance

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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1. are intended to implant into the body, or
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.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

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