COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = 25°C
Q1	30V	21mΩ @ V_{GS} = 10V	9.4A
		32mΩ @ V_{GS} = 4.5V	7.3A
Q2	-30V	39mΩ @ V_{GS} = -10V	-6.8A
		53mΩ @ V_{GS} = -4.5V	-5.8A

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **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

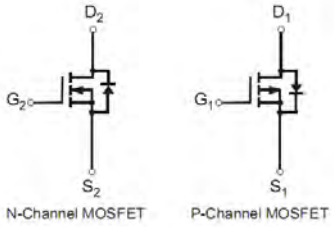
Mechanical Data

- Case: TO252-4L
- 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
- Terminals: Finish — NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.027 grams (approximate)

TO252-4L

Top View

Bottom View



Ordering Information (Note 3)

Part Number	Case	Packaging
DMC3021LK4-13	TO252-4L	2500/Tape & Reel

Notes: 1. No purposefully added lead.
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

Marking Information

= Manufacturer's Marking
C3021L = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 09 = 2009)
WW = Week (01 – 53)

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 4)	P_D	2.75	W
Thermal Resistance, Junction to Ambient (Note 4)	$R_{\theta JA}$	46.3	°C/W
Total Power Dissipation (Note 5)	P_D	1.52	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	81.3	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Maximum Ratings N-CHANNEL – Q1 @T_A = 25°C unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	30	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 4) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 70°C	I_D	9.4 7.5	A
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 70°C	I_D	6.7 5.4	A
Continuous Drain Current (Note 4) V_{GS} = 4.5V	Steady State	T_A = 25°C T_A = 70°C	I_D	7.3 5.8	A
Pulsed Drain Current (Note 6)			I_{DM}	40	A

Maximum Ratings P-CHANNEL – Q2 @T_A = 25°C unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-30	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 4) V_{GS} = -10V	Steady State	T_A = 25°C T_A = 70°C	I_D	-6.8 -5.3	A
Continuous Drain Current (Note 5) V_{GS} = -10V	Steady State	T_A = 25°C T_A = 70°C	I_D	-5.1 -4.1	A
Continuous Drain Current (Note 4) V_{GS} = -4.5V	Steady State	T_A = 25°C T_A = 70°C	I_D	-5.8 -4.6	A
Pulsed Drain Current (Note 6)			I_{DM}	-40	A

Notes: 4. Device mounted on FR-4 substrate PC board, 2oz copper, on 1inch square copper plate.
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout
6. Device mounted on minimum recommended pad layout test board, 10µs pulse duty cycle = 1%.

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}	30	-	-	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current @T_c = 25°C	I_{DSS}	-	-	1.0	μA	V_{DS} =30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	1	1.5	2.1	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	14	21	mΩ	V_{GS} = 10V, I_D = 7A
		-	18	32		V_{GS} = 4.5V, I_D = 5.6A
Forward Transfer Admittance	$\|Y_{fs}\|$	-	8.5	-	S	V_{DS} = 5V, I_D = 7A
Diode Forward Voltage (Note 6)	V_{SD}	-	0.7	1.0	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	751	-	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	121	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	110	-	pF	
Gate Resistance	R_g	-	1.5	-	Ω	V_{DS} = 10V, V_{GS} = 0V,f = 1.0MHz
Total Gate Charge (4.5V)	Q_g	-	9	-	nC	V_{GS} = 10V, V_{DS} = 15V, I_D = 6A
Total Gate Charge (10V)	Q_g	-	17.4	-	nC	
Gate-Source Charge	Q_{gs}	-	2.2	-	nC	
Gate-Drain Charge	Q_{gd}	-	3	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	2.5	-	ns	V_{DD} = 15V, V_{GS} = 10V, R_G = 6Ω, R_L = 1.8Ω, I_D = 6.7A
Turn-On Rise Time	t_r	-	6.6	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	19.0	-	ns	
Turn-Off Fall Time	t_f	-	6.3	-	ns	

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

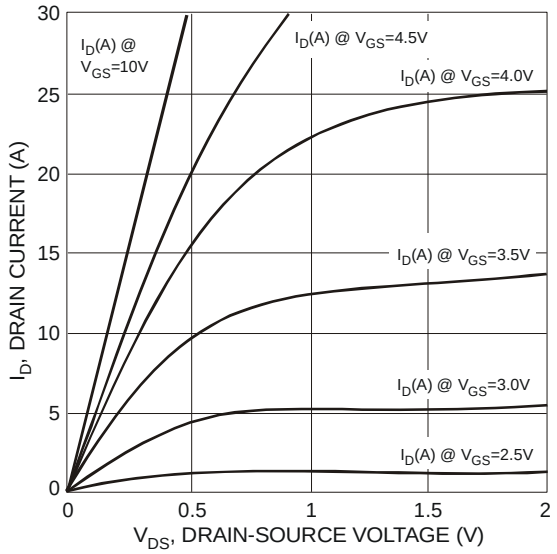


Fig.1 Typical Output Characteristics

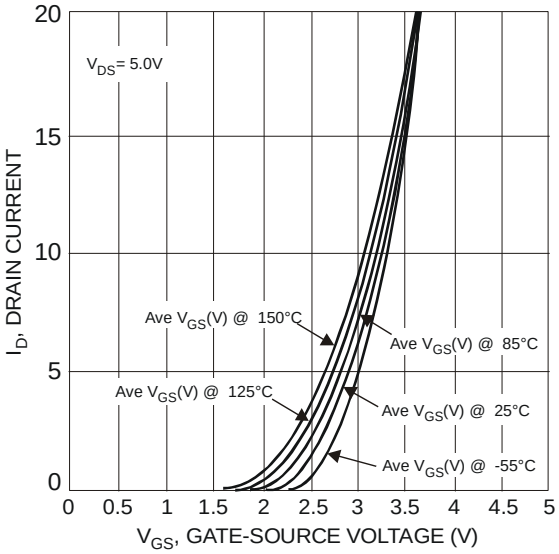


Fig. 2 Typical Transfer Characteristics

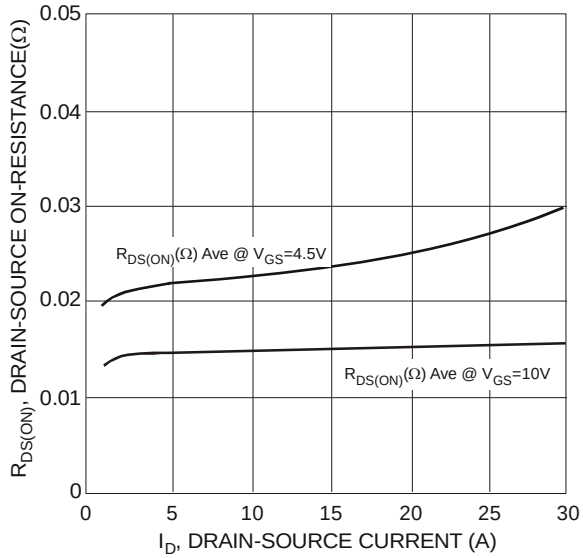


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

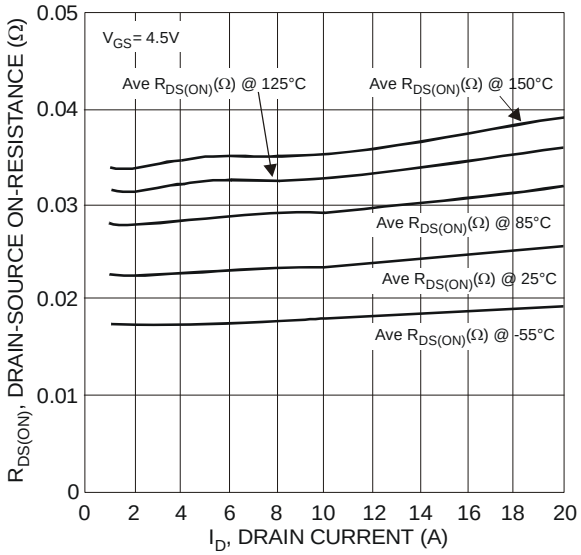


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

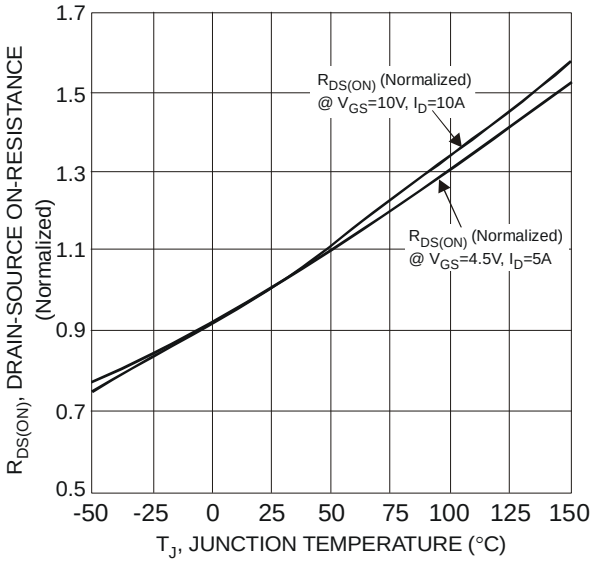


Fig. 5 On-Resistance Variation with Temperature

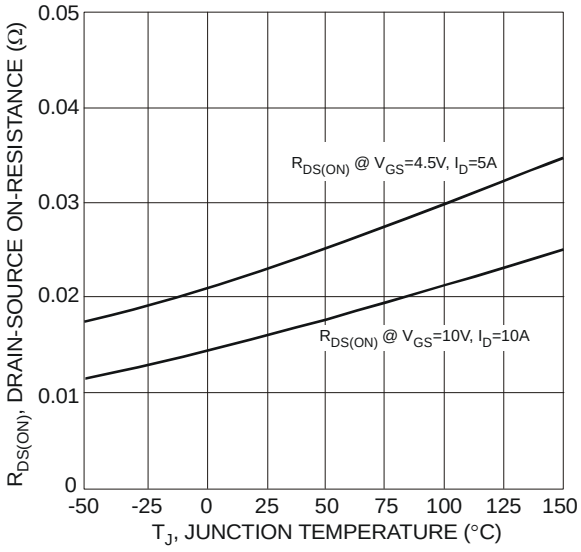


Fig. 6 On-Resistance Variation with Temperature

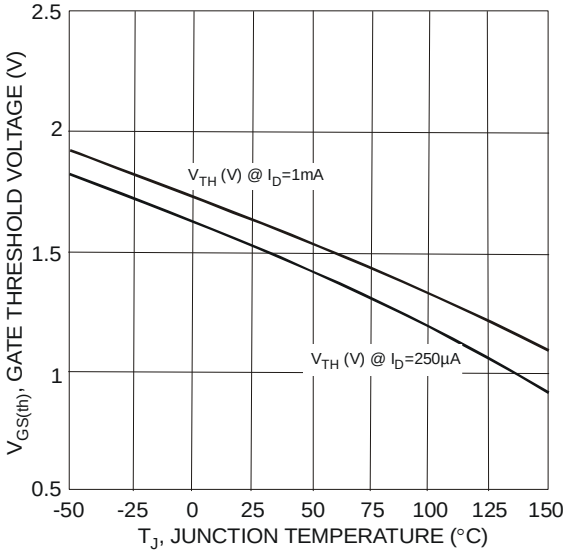


Fig. 7 On-Resistance Variation with Temperature

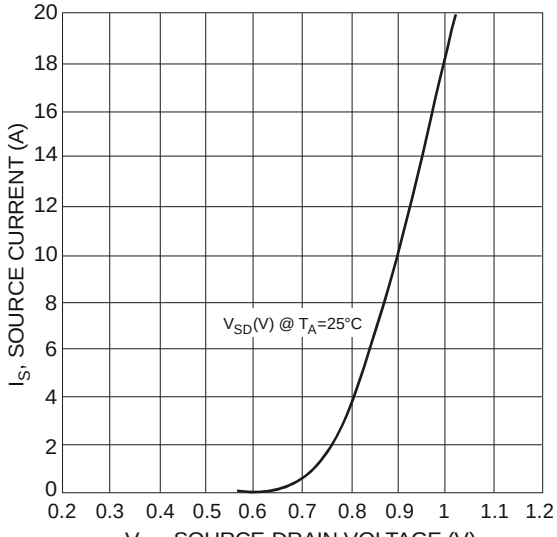


Fig. 8 Diode Forward Voltage vs. Current

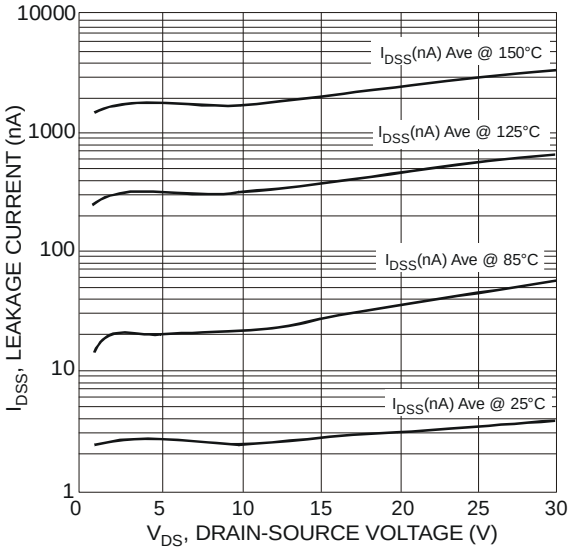


Fig. 9 Typical Drain-Source Leakage Current vs. Voltage

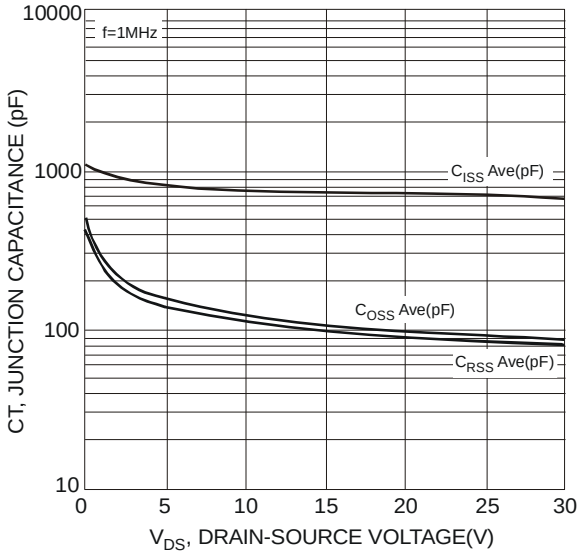


Fig. 10 Typical Junction Capacitance

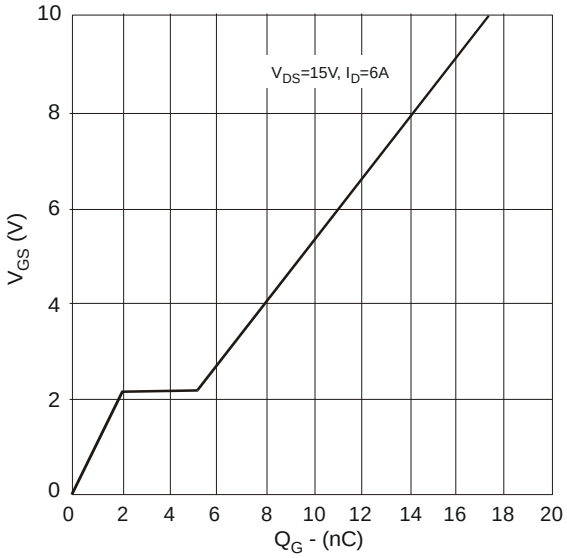


Fig. 11 Gate Charge Characteristics

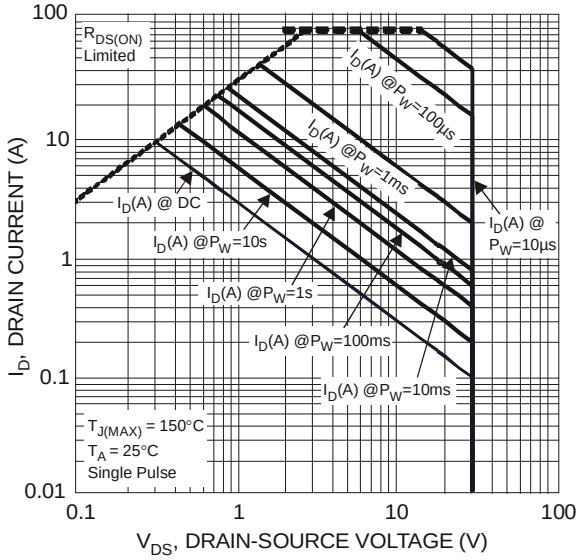


Fig. 12 SOA, Safe Operation Area

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}	-30	-	-	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current @T_c = 25°C	I_{DSS}	-	-	-1	µA	V_{DS} = -30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	-1	-1.7	-2.2	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	30	39	Ω	V_{GS} = -10V, I_D = -4.3A
		-	42	53		V_{GS} = -4.5V, I_D = -3.7A
Forward Transfer Admittance	$\|Y_{fs}\|$	-	10	-	S	V_{DS} = -5V, I_D = -4.3A
Diode Forward Voltage (Note 6)	V_{SD}	-	-0.75	-1.0	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	1039	-	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	144	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	134	-	pF	
Gate Resistance	R_g	-	13	-	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (4.5V)	Q_g	-	10.1	-	nC	V_{GS} = -10V, V_{DS} = -15V, I_D = -6A
Total Gate Charge (10V)	Q_g	-	21.1	-	nC	
Gate-Source Charge	Q_{gs}	-	2.8	-	nC	
Gate-Drain Charge	Q_{gd}	-	3.2	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	10.1	-	ns	V_{DS} = -15V, V_{GS} = -10V, R_G = 6Ω, I_D = -1A
Turn-On Rise Time	t_r	-	6.5	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	50.1	-	ns	
Turn-Off Fall Time	t_f	-	22.2	-	ns	

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

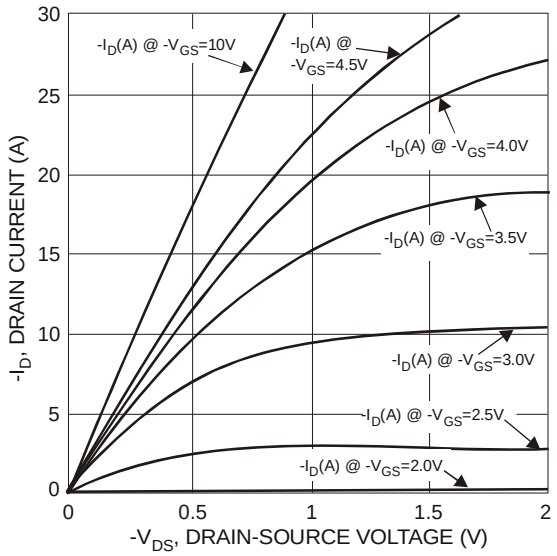


Fig.13 Typical Output Characteristics

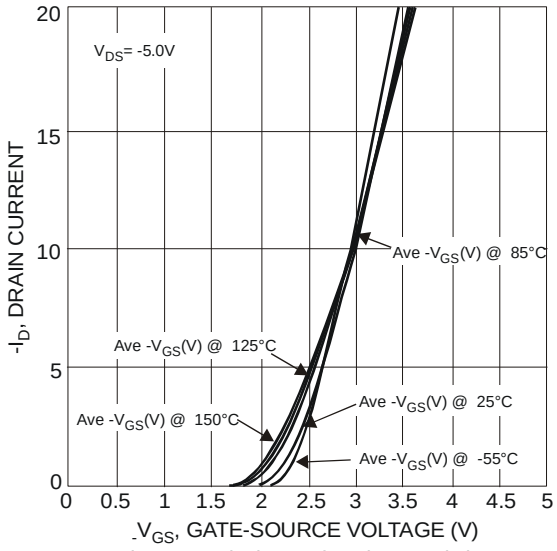


Fig. 14 Typical Transfer Characteristics

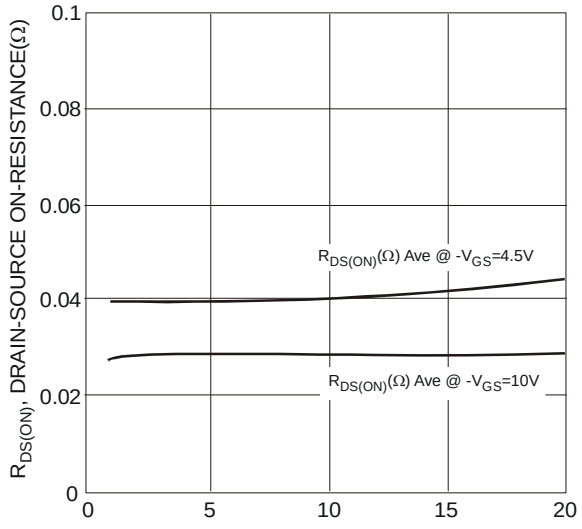


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

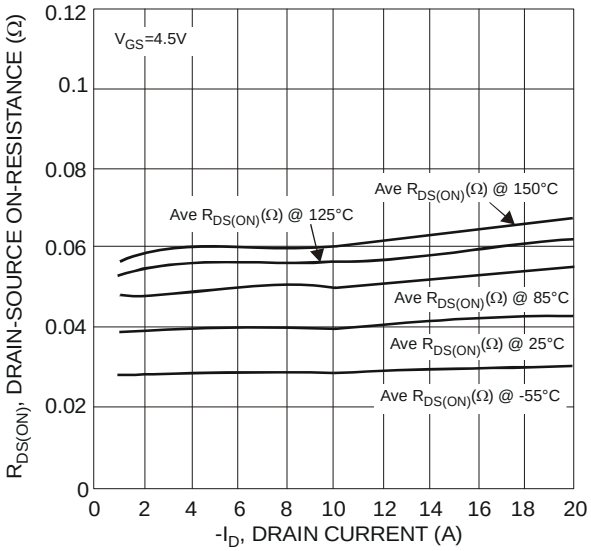


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

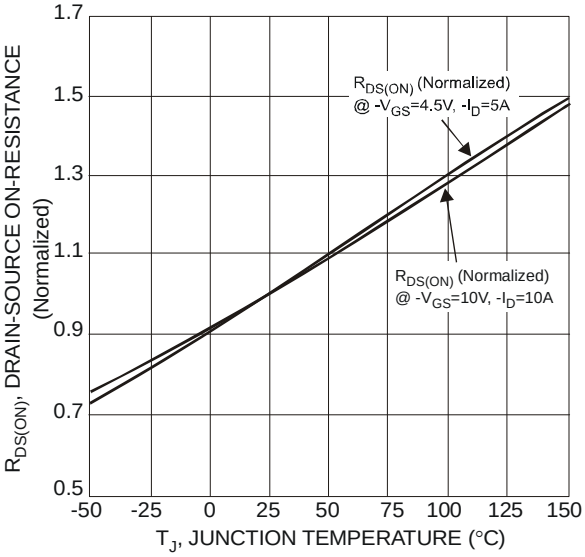


Fig. 17 On-Resistance Variation with Temperature

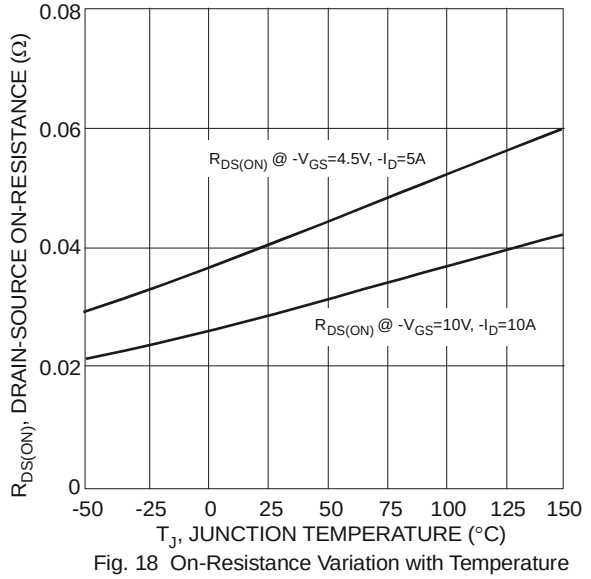


Fig. 18 On-Resistance Variation with Temperature

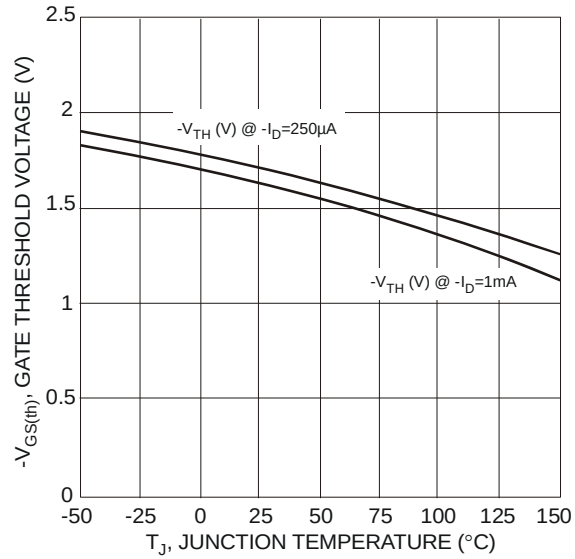


Fig. 19 On-Resistance Variation with Temperature

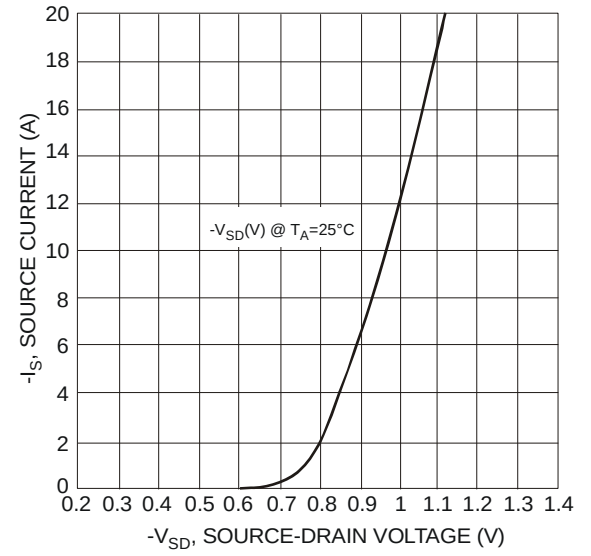


Fig. 20 Diode Forward Voltage vs. Current

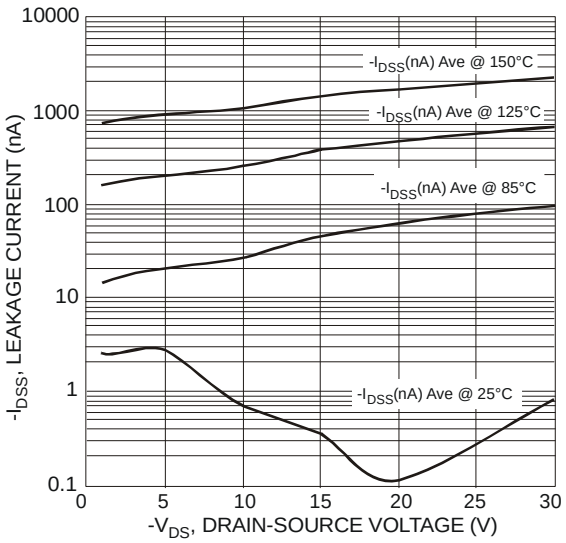


Fig. 21 Typical Drain-Source Leakage Current vs. Voltage

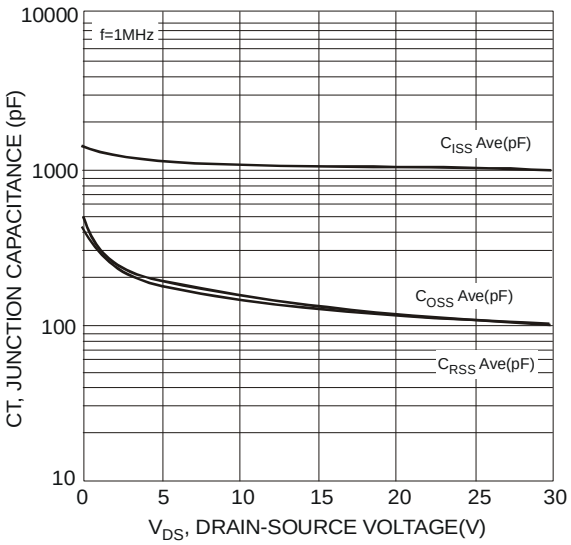


Fig. 22 Typical Junction Capacitance

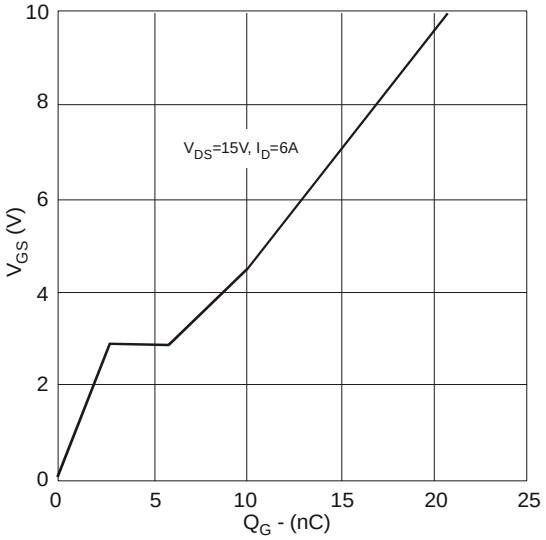


Fig. 23 Gate Charge Characteristics

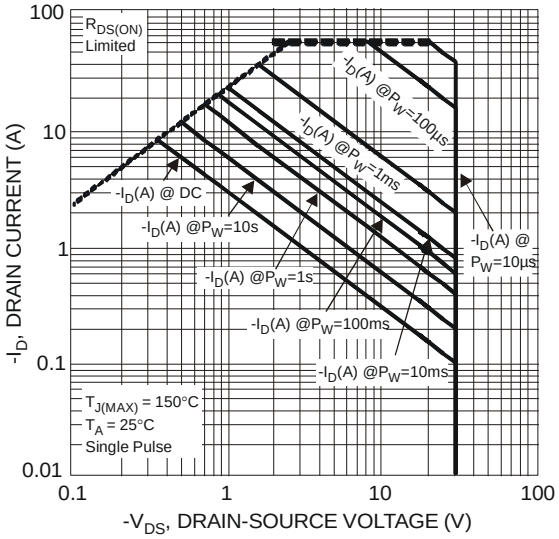


Fig. 24 SOA, Safe Operation Area

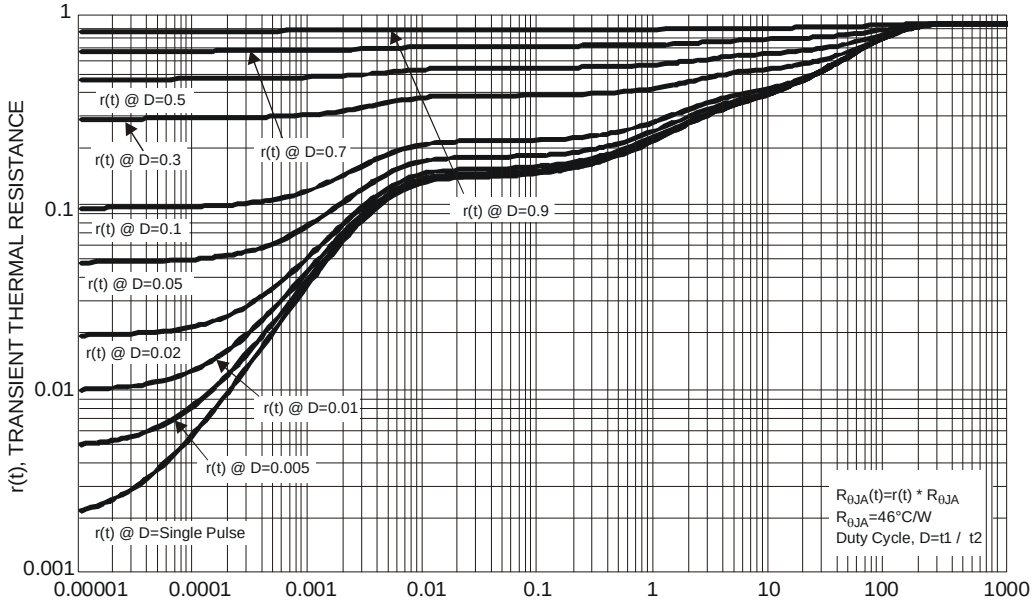
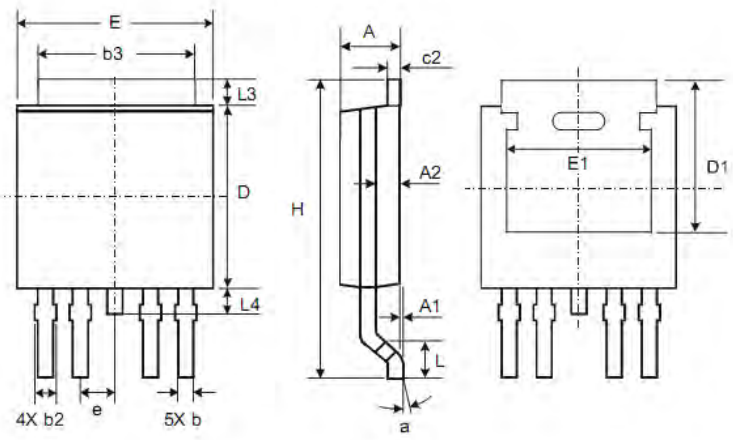


Fig. 25 Transient Thermal Resistance

Package Outline Dimensions

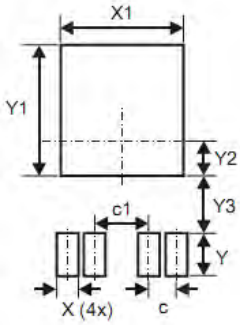
TO252-4L



TO252-4L			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.51	0.71	0.583
b2	0.61	0.79	0.70
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	–	–
e	–	–	1.27
E	6.45	6.70	6.58
E1	4.32	–	–
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	–
All Dimensions in mm			

Suggested Pad Layout

TO252-4L



Dimensions	Value (in mm)
c	1.27
c1	2.54
X	1.00
X1	5.73
Y	2.00
Y1	6.17
Y2	1.64
Y3	2.66

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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.

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