Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_C = +25°C
Q1	30V	21mΩ @ V_{GS} = 10V	14A
		32mΩ @ V_{GS} = 4.5V	14A
Q2	-30V	39mΩ @ V_{GS} = -10V	-14A
		53mΩ @ V_{GS} = -4.5V	-14A

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

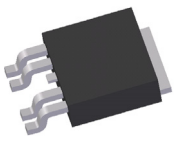
Features and Benefits

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm^2
- Low Gate Threshold Voltage
- **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**

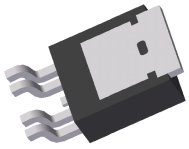
Mechanical Data

- Case: TO252-4
- 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 – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.027 grams (approximate)

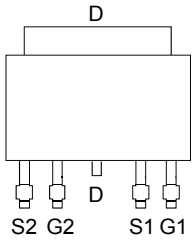
TO252-4L



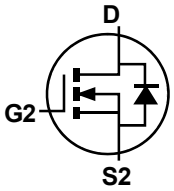
Top View



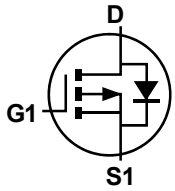
Bottom View



Pinout Top View



N-Channel MOSFET



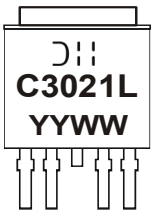
P-Channel MOSFET

Ordering Information (Note 4)

Part Number	Case	Packaging
DMC3021LK4-13	TO252-4	2500/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



= Manufacturer's Marking
C3021L = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 11 = 2011)
WW = Week (01 - 53)

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 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.4 7.5	A
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_C = +25°C T_C = +70°C	I_D	14 14	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	70	A
Avalanche Current, (Notes 7) L = 0.1mH			I_{AS}	16	A
Avalanche Energy, (Notes 7) L = 0.1mH			E_{AS}	13	mJ

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 6) V_{GS} = -10V	Steady State	T_A = +25°C T_A = +70°C	I_D	-6.8 -5.3	A
Continuous Drain Current (Note 6) V_{GS} = -10V	Steady State	T_C = +25°C T_C = +70°C	I_D	-14 -14	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-50	A
Avalanche Current, (Notes 7) L = 0.1mH			I_{AS}	-16	A
Avalanche Energy, (Notes 7) L = 0.1mH			E_{AS}	13	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.7	W
	T_A = +70°C		1.7	
Total Power Dissipation (Note 6)	T_C = +25°C		22	
	T_C = +70°C		14	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	46	°C/W
Thermal Resistance, Junction to Case (Note 6)	Steady state	$R_{\theta JC}$	5.5	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
7. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = 25°C
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

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}	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 8)						
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	V_{SD}	—	0.7	1.0	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
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: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

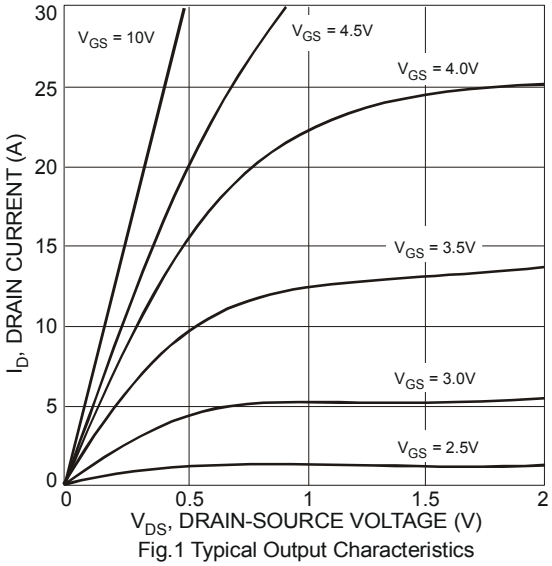


Fig.1 Typical Output Characteristics

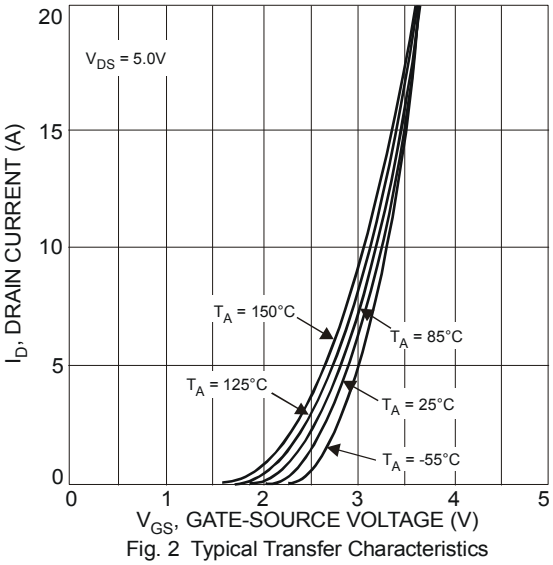


Fig. 2 Typical Transfer Characteristics

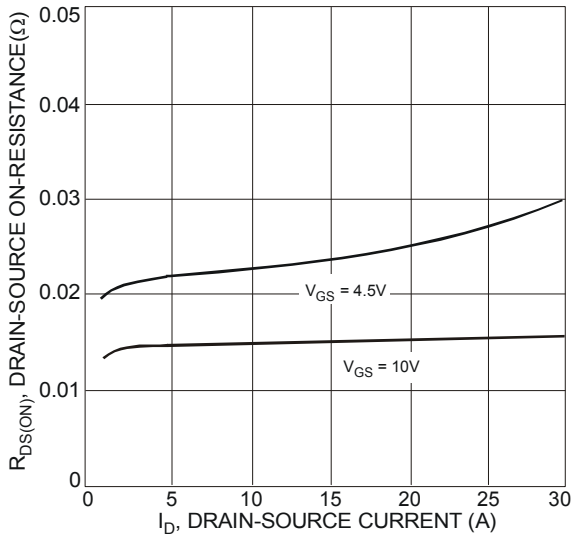


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

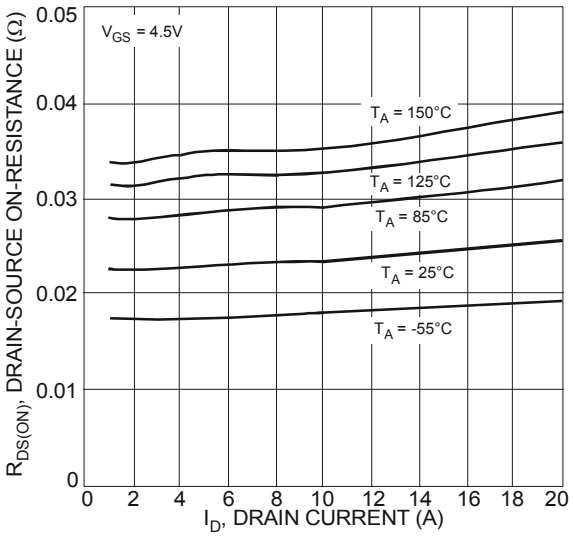


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

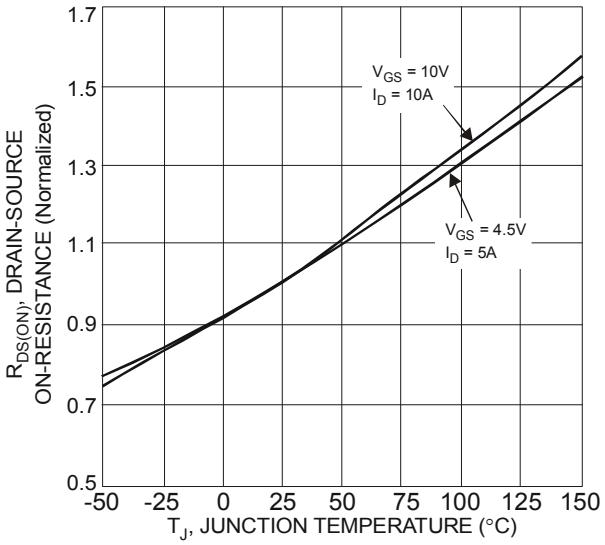


Fig. 5 On-Resistance Variation with Temperature

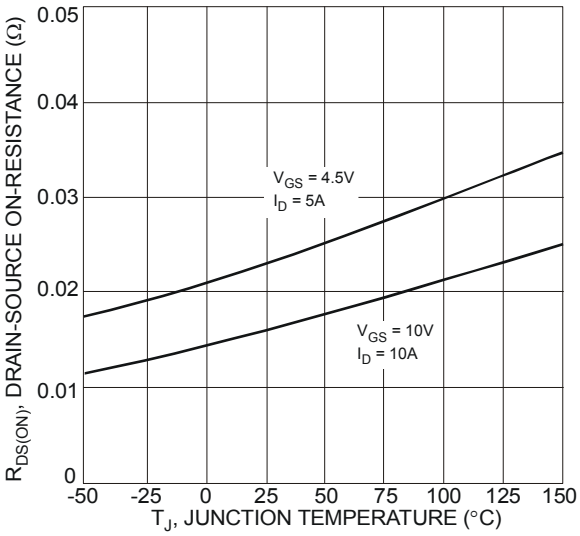


Fig. 6 On-Resistance Variation with Temperature

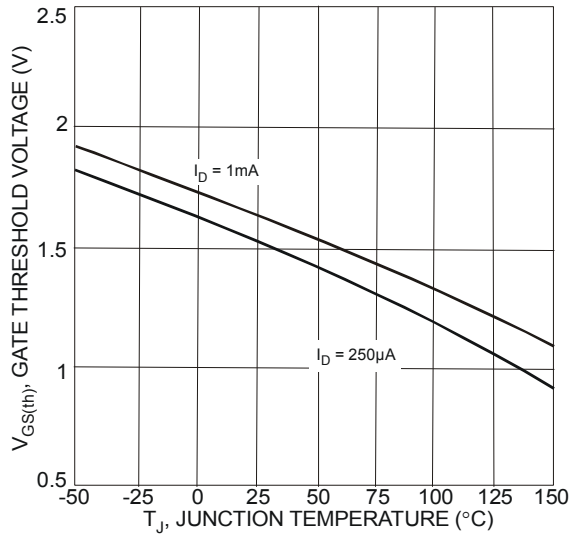


Fig. 7 On-Resistance Variation with Temperature

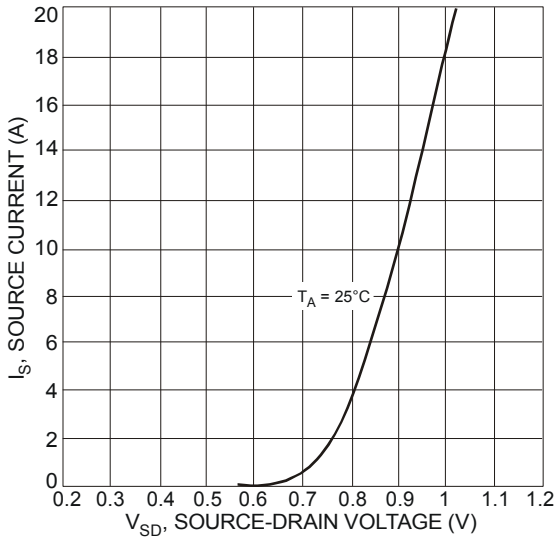


Fig. 8 Diode Forward Voltage vs. Current

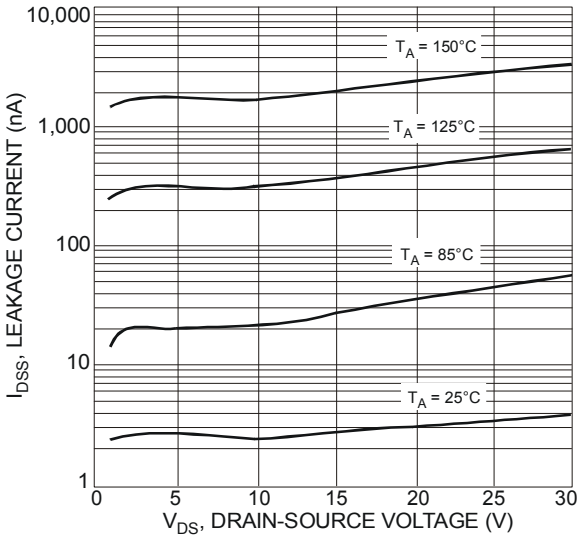


Fig. 9 Typical Drain-Source Leakage Current vs. Voltage

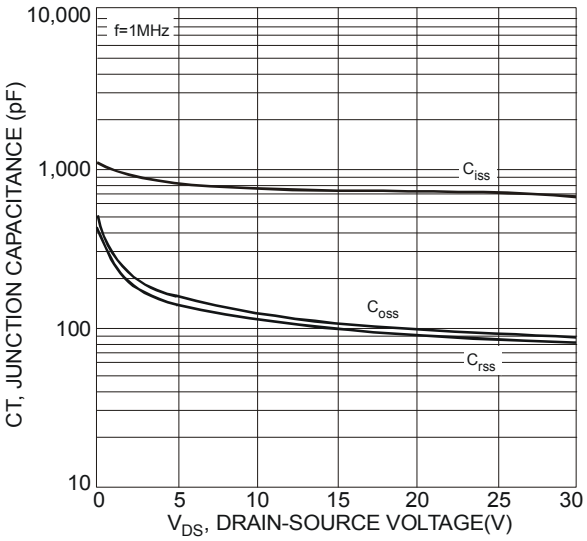


Fig. 10 Typical Junction Capacitance

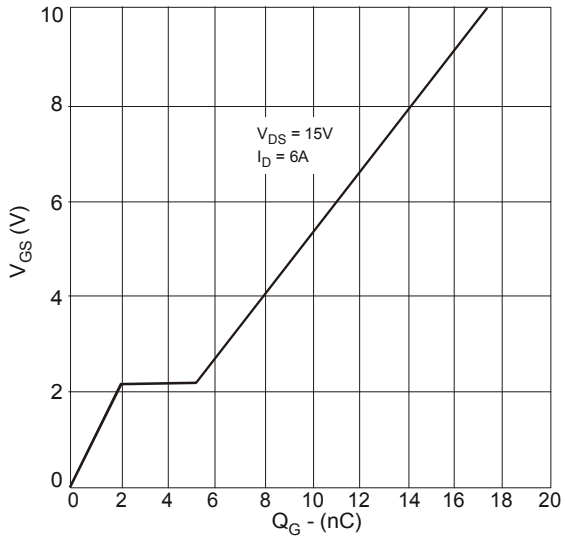


Fig. 11 Gate Charge Characteristics

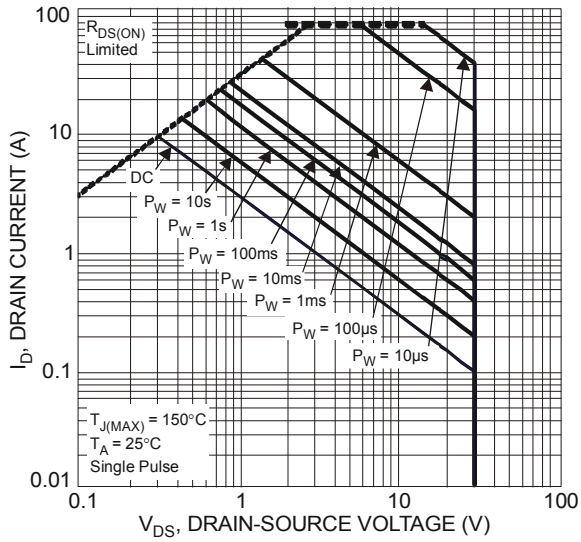


Fig. 12 SOA, Safe Operation Area

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
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	mΩ	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	V_{SD}	—	-0.75	-1.0	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 9)						
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: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

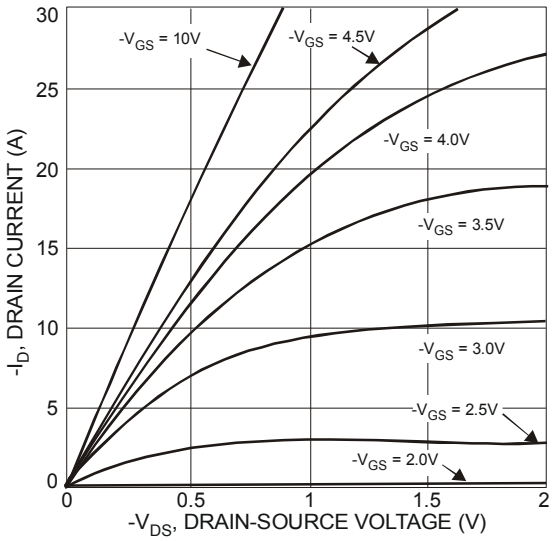


Fig.13 Typical Output Characteristics

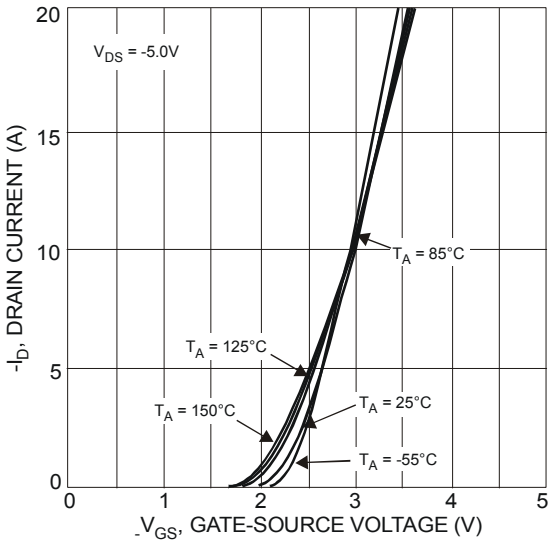


Fig. 14 Typical Transfer Characteristics

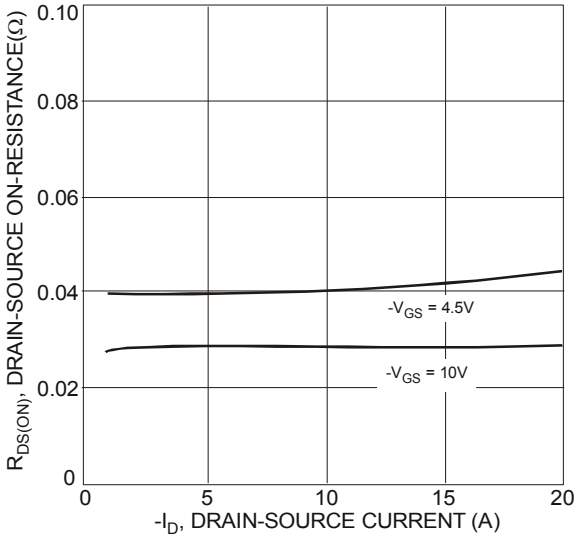


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

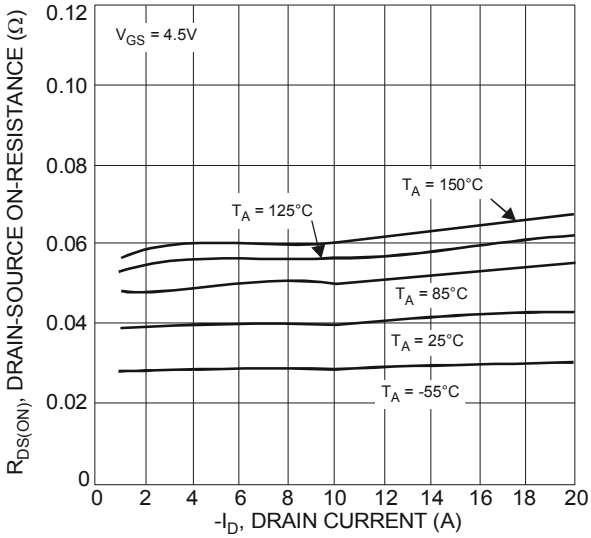


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

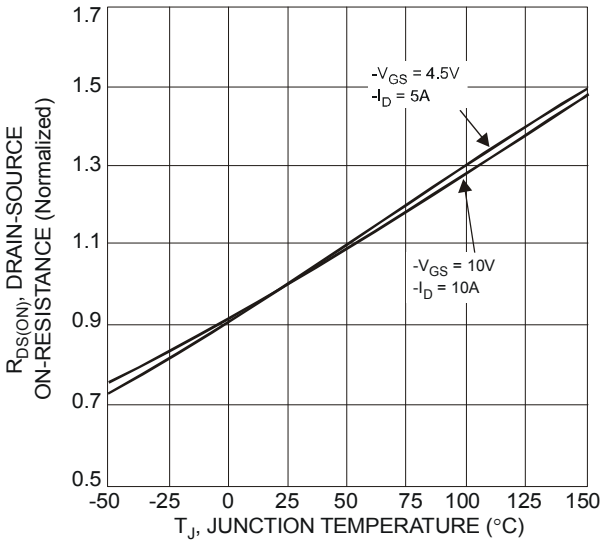


Fig. 17 On-Resistance Variation with Temperature

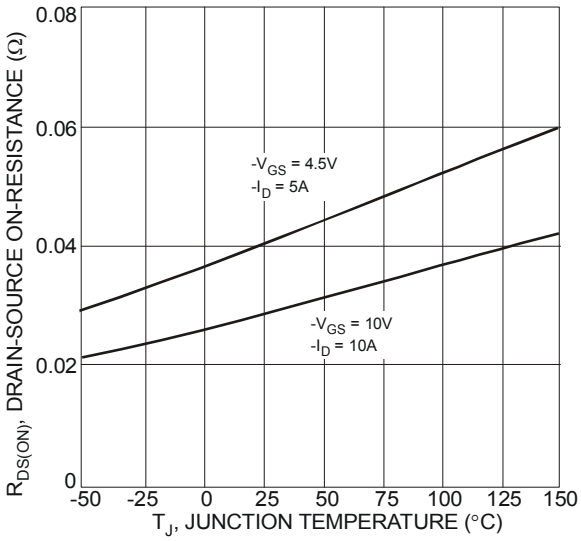


Fig. 18 On-Resistance Variation with Temperature

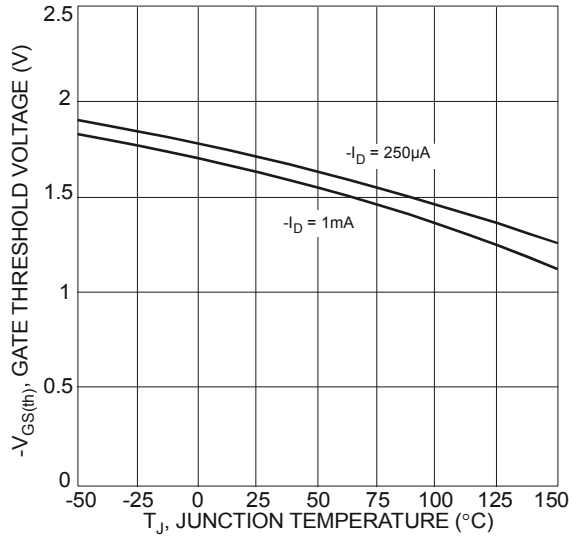


Fig. 19 On-Resistance Variation with Temperature

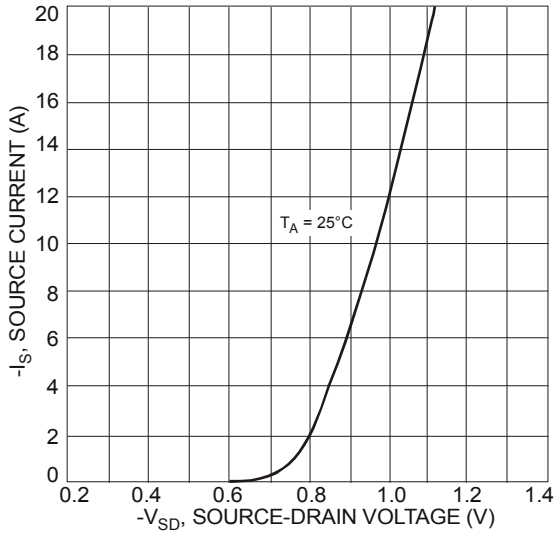


Fig. 20 Diode Forward Voltage vs. Current

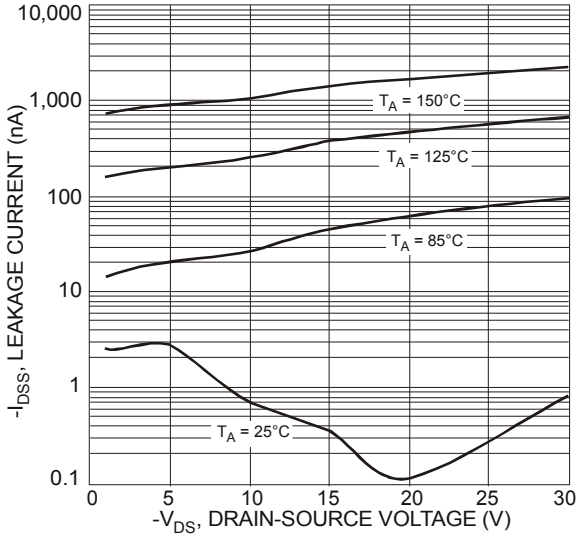


Fig. 21 Typical Drain-Source Leakage Current vs. Voltage

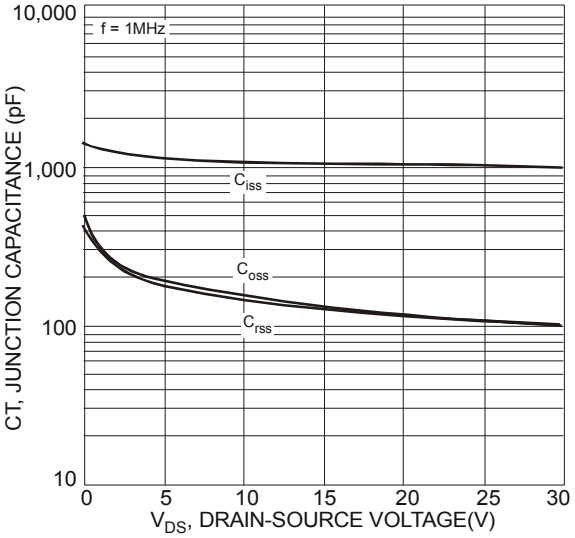


Fig. 22 Typical Junction Capacitance

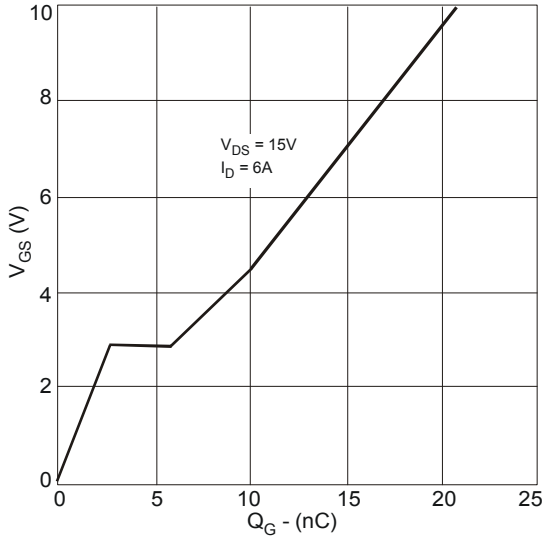


Fig. 23 Gate Charge Characteristics

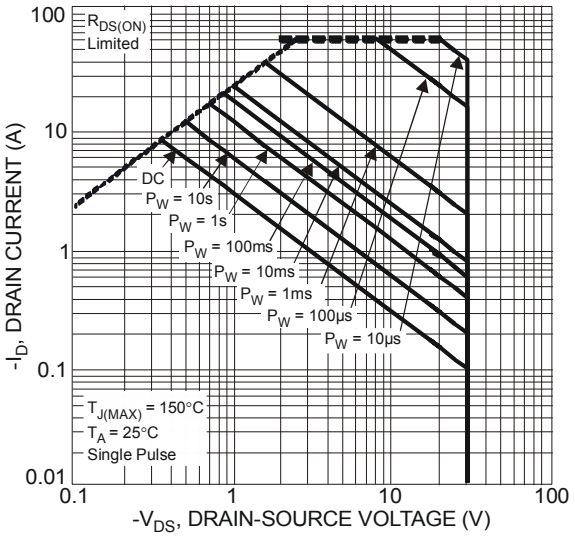


Fig. 24 SOA, Safe Operation Area

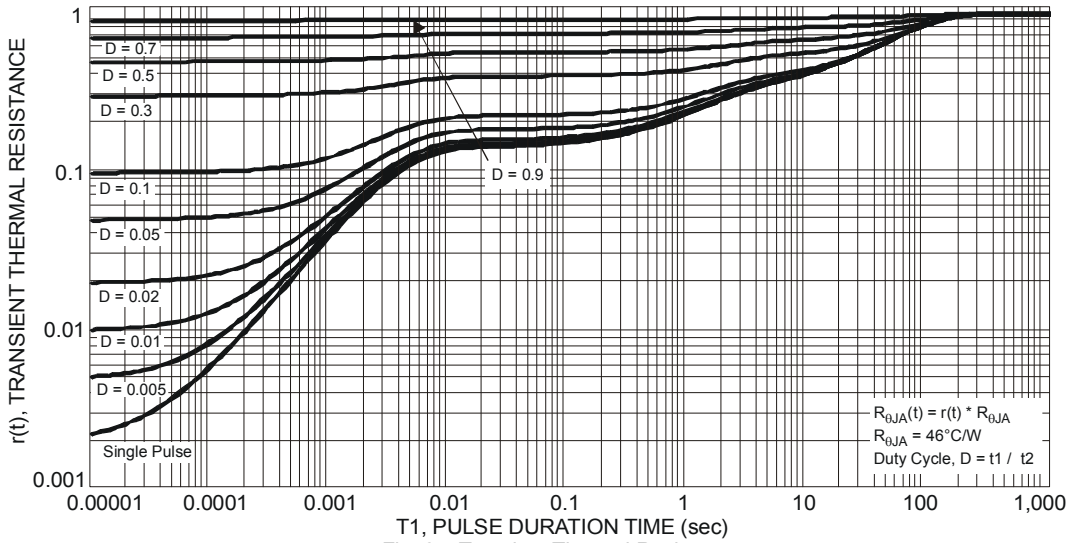
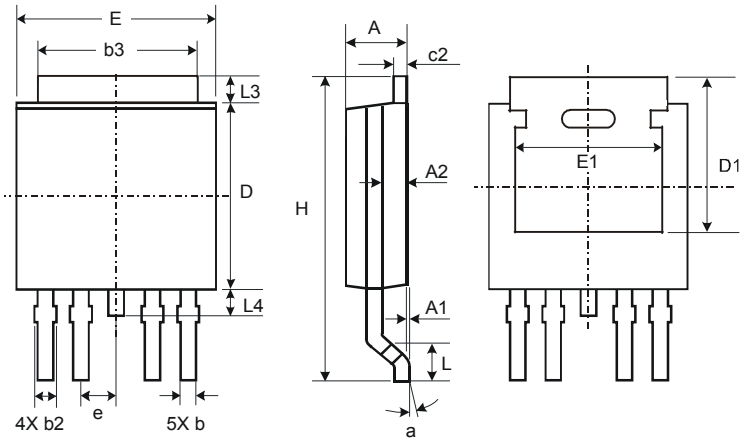


Fig. 25 Transient Thermal Resistance

Package Outline Dimensions

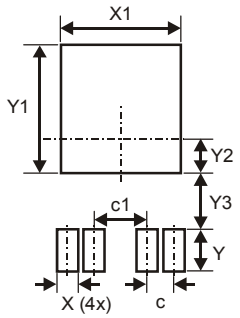
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



TO252-4			
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

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



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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