

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	I_D $T_A = +25^\circ\text{C}$
35V	35mΩ @ $V_{GS} = 10\text{V}$	13A
-35V	45mΩ @ $V_{GS} = -10\text{V}$	-12A

Description

This new generation 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

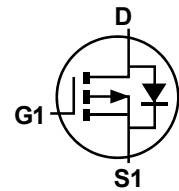
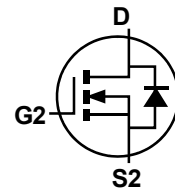
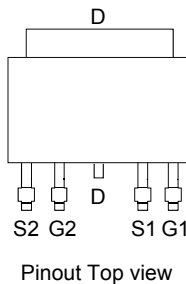
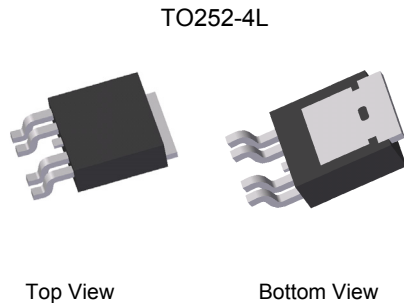
- Backlighting
- DC-DC Converters
- Power management functions

Features and Benefits

- 0.6mm profile – ideal for low profile applications
- PCB footprint of 4mm²
- 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: TO252-4L
- 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 – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.328 grams (approximate)



N-Channel MOSFET P-Channel MOSFET

Ordering Information (Note 3)

Part Number	Case	Packaging
DMG4511SK4-7	TO252-4L	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



- ⌋⌋⌋ = Manufacturer's Marking
- G4511S = Product Type Marking Code
- YYWW = Date Code Marking
- YY = Year (ex: 09 = 2009)
- WW = Week (01 – 53)

Maximum Ratings – N-CHANNEL, Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	35	V
Gate-Source Voltage			V_{GSS}	± 20	V
Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	5.3	A
		$T_A = +70^\circ\text{C}$		4.2	
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	8.6	A
		$T_A = +70^\circ\text{C}$		6.8	
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	$t \leq 10\text{s}$	$T_A = +25^\circ\text{C}$	I_D	13	A
		$T_A = +70^\circ\text{C}$		11	
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	6.3	A
		$T_A = +70^\circ\text{C}$		5.0	
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	$t \leq 10\text{s}$	$T_A = +25^\circ\text{C}$	I_D	9.3	A
		$T_A = +70^\circ\text{C}$		7.4	
Pulsed Drain Current (Note 7)			I_{DM}	50	A

Maximum Ratings – P-CHANNEL, Q2 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-35	V
Gate-Source Voltage			V_{GSS}	± 20	V
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	-5.0	A
		$T_A = +70^\circ\text{C}$		-3.8	
Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	-7.8	A
		$T_A = +70^\circ\text{C}$		-6.2	
Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$	$t \leq 10\text{s}$	$T_A = +25^\circ\text{C}$	I_D	-12	A
		$T_A = +70^\circ\text{C}$		-10	
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	-6.5	A
		$T_A = +70^\circ\text{C}$		-5.2	
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	$t \leq 10\text{s}$	$T_A = +25^\circ\text{C}$	I_D	-9.6	A
		$T_A = +70^\circ\text{C}$		-7.7	
Pulsed Drain Current (Note 7)			I_{DM}	-50	A

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	1.54	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 5)	$R_{\theta JA}$	81.3	$^\circ\text{C/W}$
Power Dissipation (Note 6)	P_D	4.1	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 6)	$R_{\theta JA}$	30.8	$^\circ\text{C/W}$
Power Dissipation (Note 6) $t \leq 10\text{s}$	P_D	8.9	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 5) $t \leq 10\text{s}$	$R_{\theta JA}$	14	$^\circ\text{C/W}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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

Electrical Characteristics – N-CHANNEL, Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	35	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1.0	μA	$V_{DS} = 35V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	25 50	35 65	m Ω	$V_{GS} = 10V, I_D = 8A$ $V_{GS} = 4.5V, I_D = 6A$
Forward Transfer Admittance	$ Y_{fs} $	—	4.5	—	S	$V_{DS} = 10V, I_D = 8A$
Diode Forward Voltage	V_{SD}	—	—	1.2	V	$V_{GS} = 0V, I_S = 8A$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	850	—	pF	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	64.7	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	51.9	—	pF	
Gate Resistance	R_g	—	1.6	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 10V$)	Q_g	—	18.7	—	nC	$V_{GS} = 10V, V_{DS} = 28V, I_D = 8A$ $V_{GS} = 4.5V, V_{DS} = 28V,$ $I_D = 8A$
Total Gate Charge ($V_{GS} = 4.5V$)	Q_g	—	8.8	—		
Gate-Source Charge	Q_{gs}	—	2.6	—		
Gate-Drain Charge	Q_{gd}	—	2.1	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.4	—	ns	$V_{DS} = 18V, V_{GS} = 10V,$ $R_L = 18\Omega, R_G = 3.3\Omega,$ $I_D = 1A$
Turn-On Rise Time	t_r	—	2.8	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	33.2	—	ns	
Turn-Off Fall Time	t_f	—	35.6	—	ns	

Electrical Characteristics – P-CHANNEL, Q2 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	-35	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$	I_{DSS}	—	—	-1.0	μA	$V_{DS} = -35V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	-1.0	—	-3.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	30 40	45 65	m Ω	$V_{GS} = -10V, I_D = -6A$ $V_{GS} = -4.5V, I_D = -4A$
Forward Transfer Admittance	$ Y_{fs} $	—	8	—	S	$V_{DS} = -10V, I_D = -6A$
Diode Forward Voltage	V_{SD}	—	—	-1.2	V	$V_{GS} = 0V, I_S = -6A$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	985.2	—	pF	$V_{DS} = -25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	90.6	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	75.3	—	pF	
Gate Resistance	R_g	—	7.0	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = -10V$)	Q_g	—	19.2	—	nC	$V_{GS} = -10V, V_{DS} = -28V, I_D = -6A$ $V_{GS} = -4.5V, V_{DS} = -28V,$ $I_D = -6A$
Total Gate Charge ($V_{GS} = -4.5V$)	Q_g	—	9.5	—		
Gate-Source Charge	Q_{gs}	—	2.0	—		
Gate-Drain Charge	Q_{gd}	—	3.5	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.2	—	ns	$V_{DS} = -18V, V_{GS} = -10V,$ $R_L = 18\Omega, R_G = 3.3\Omega,$ $I_D = -1A$
Turn-On Rise Time	t_r	—	4.8	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	45.8	—	ns	
Turn-Off Fall Time	t_f	—	29.5	—	ns	

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

N-CHANNEL, Q1

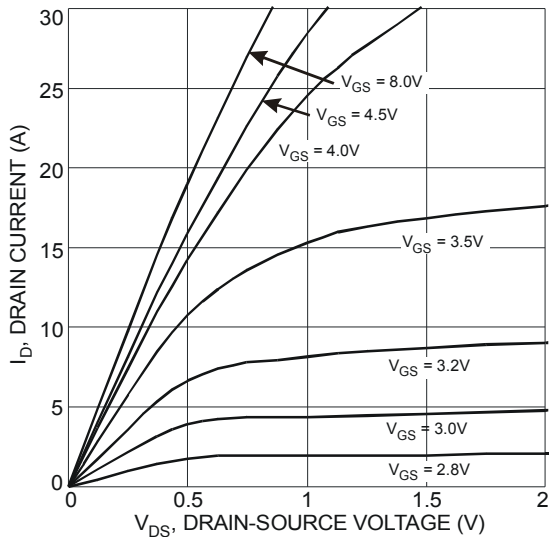


Fig. 1 Typical Output Characteristic

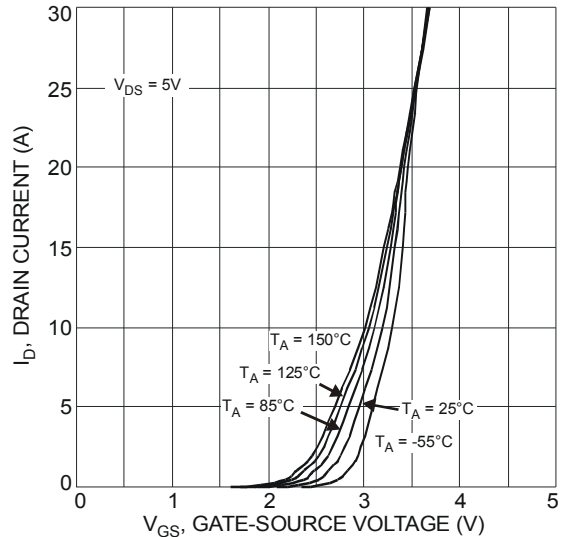


Fig. 2 Typical Transfer Characteristic

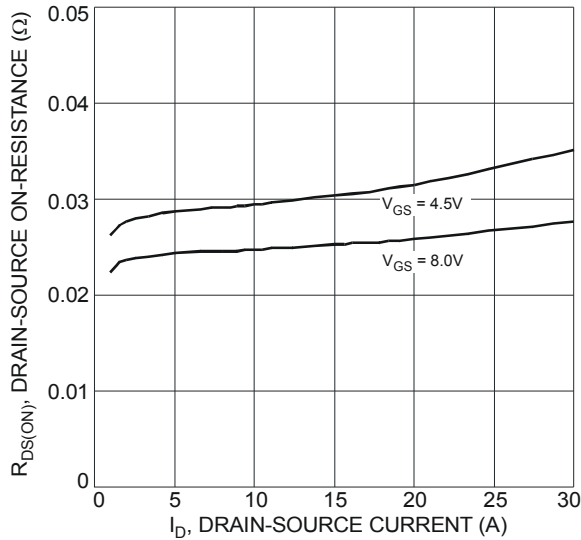


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

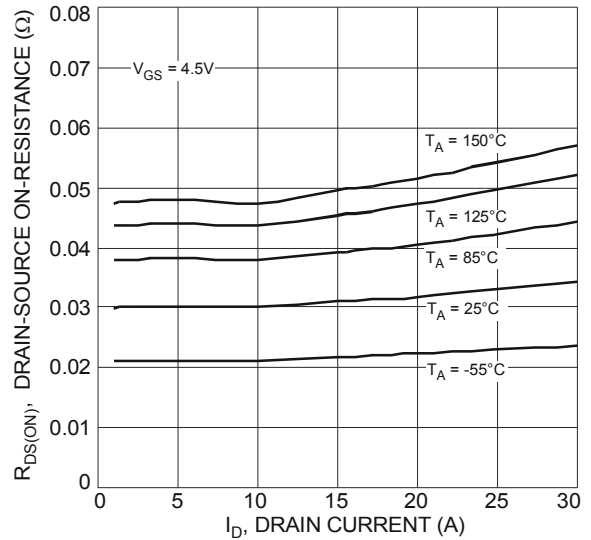


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

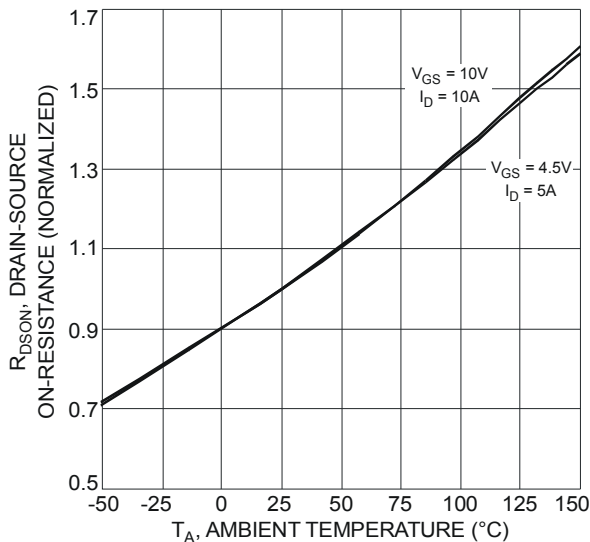


Fig. 5 On-Resistance Variation with Temperature

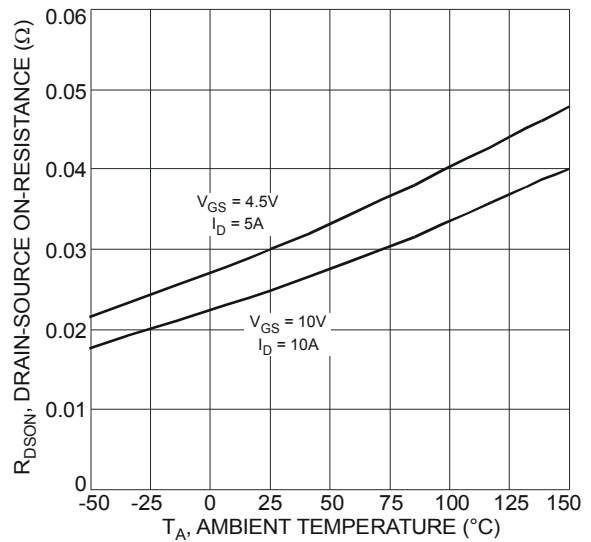


Fig. 6 On-Resistance Variation with Temperature

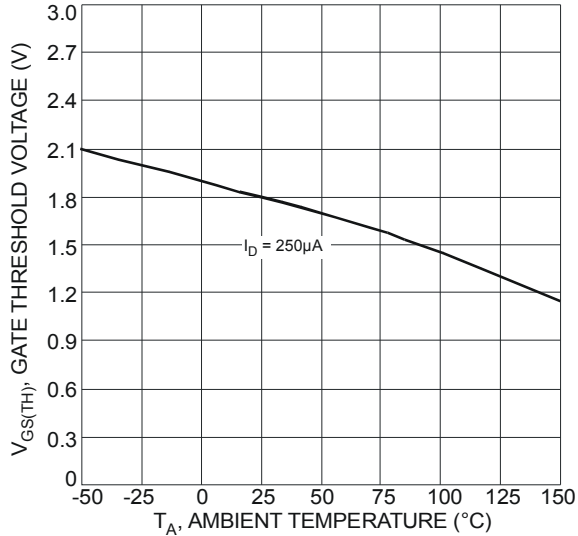


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

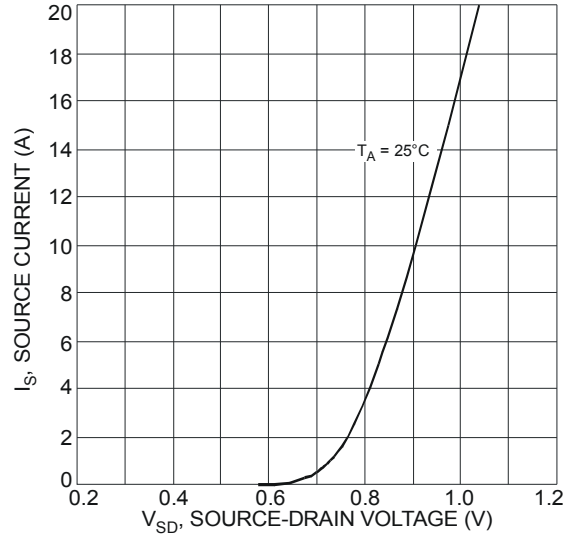


Fig. 8 Diode Forward Voltage vs. Current

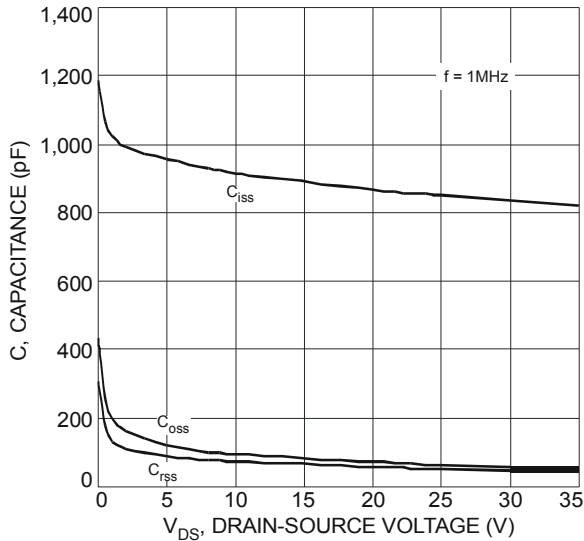


Fig. 9 Typical Total Capacitance

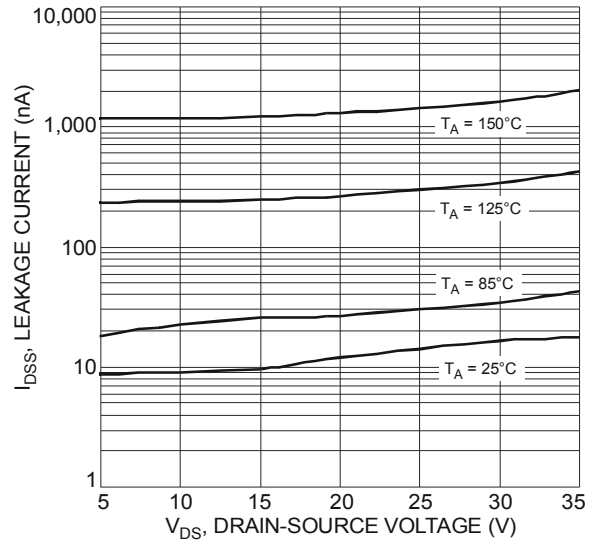


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

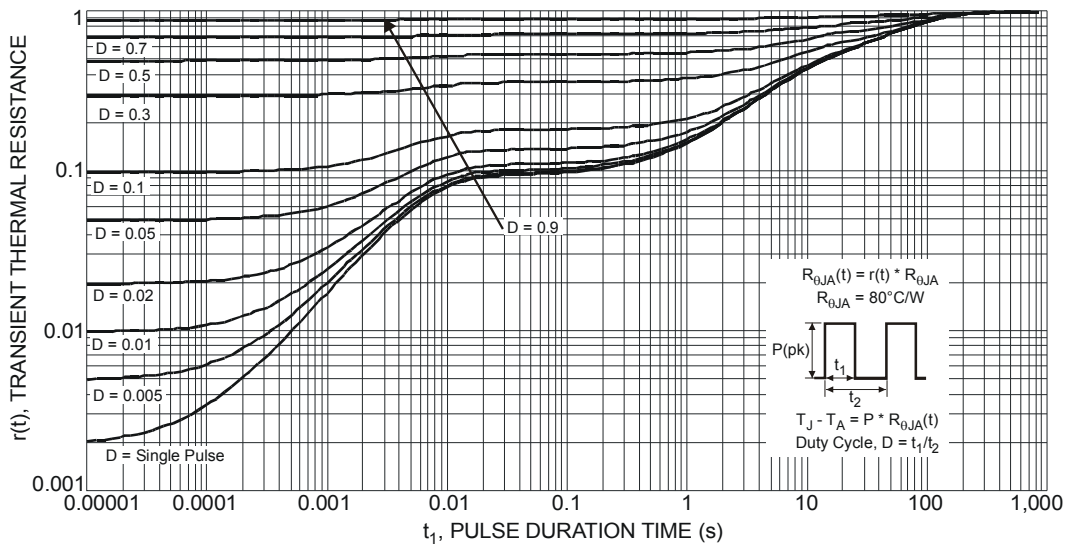


Fig. 11 Transient Thermal Response

P-CHANNEL, Q2

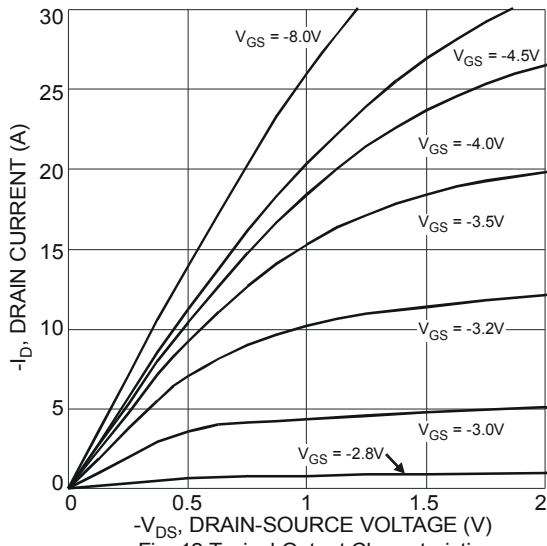


Fig. 12 Typical Output Characteristic

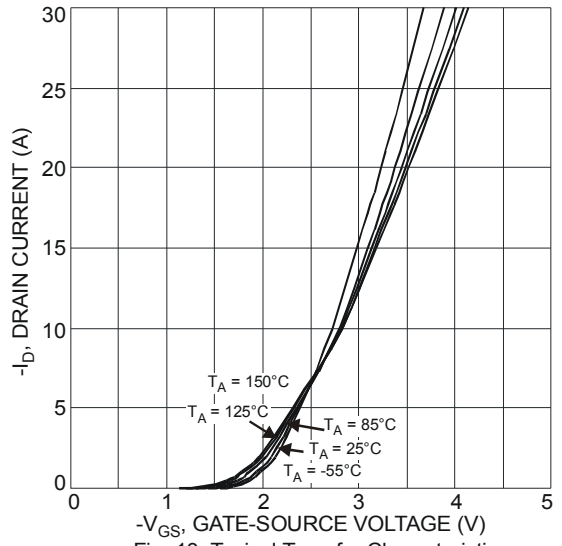


Fig. 13 Typical Transfer Characteristic

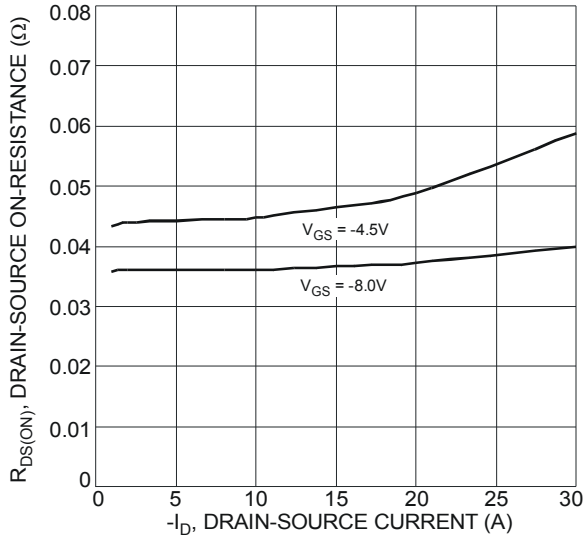


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

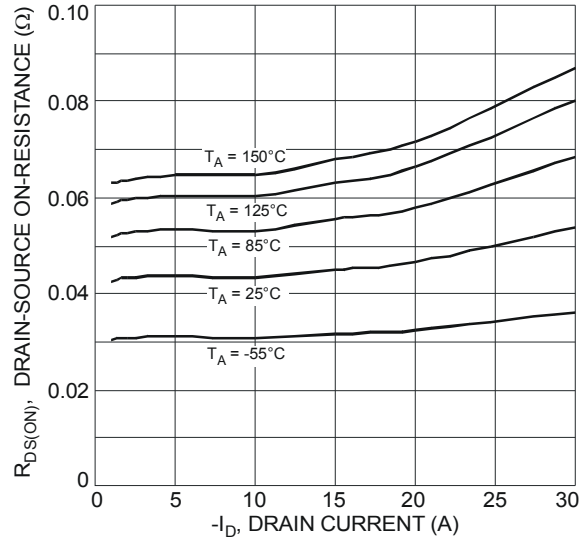


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

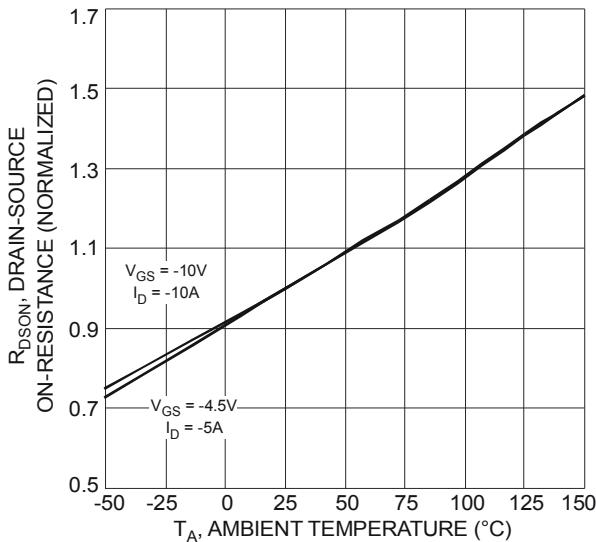


Fig. 16 On-Resistance Variation with Temperature

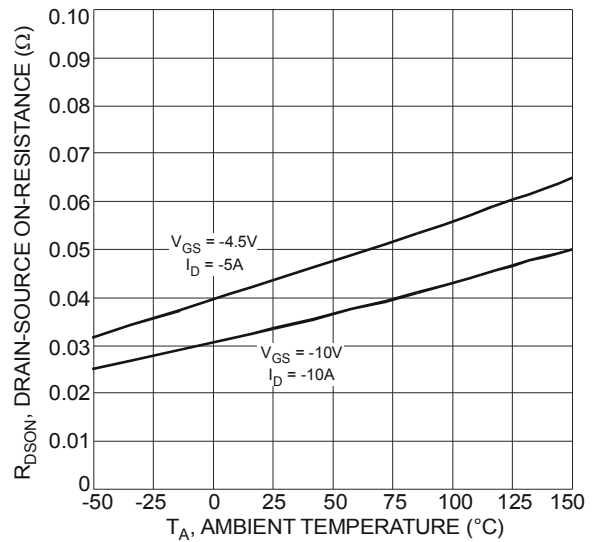


Fig. 17 On-Resistance Variation with Temperature

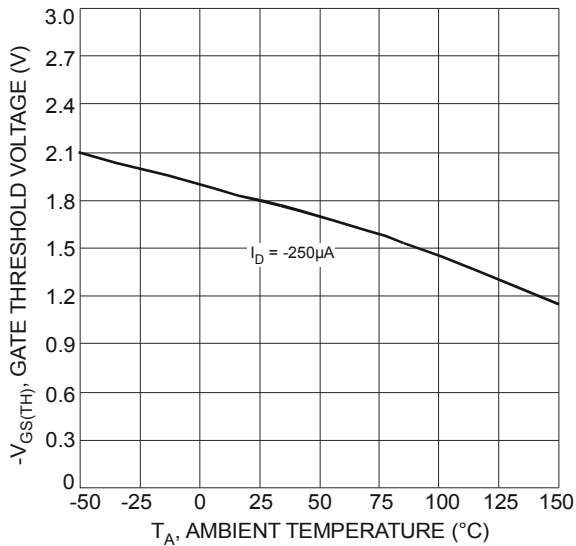


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

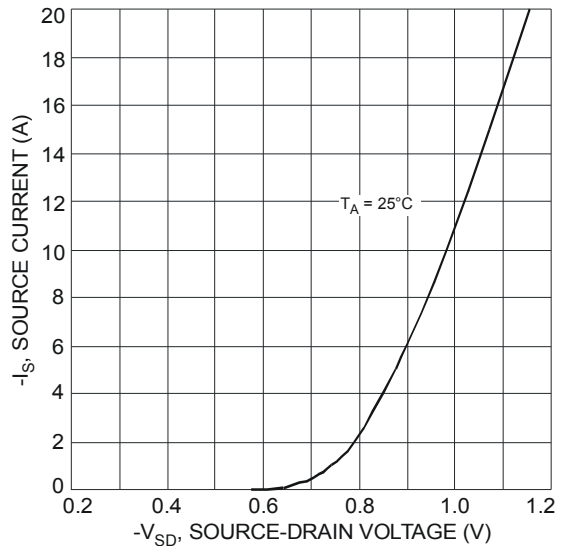


Fig. 19 Diode Forward Voltage vs. Current

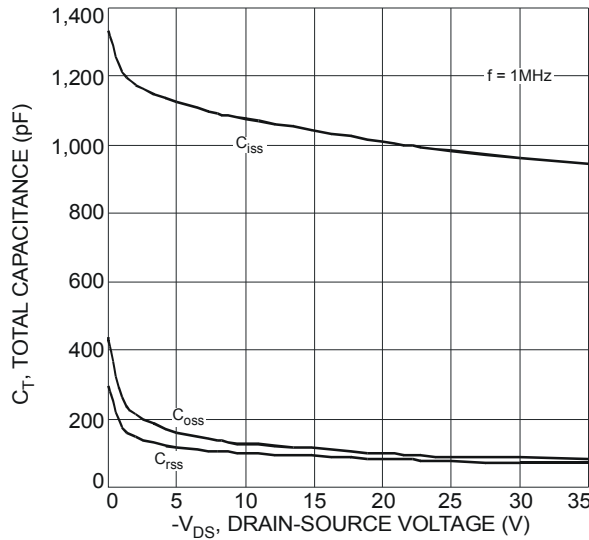


Fig. 20 Typical Total Capacitance

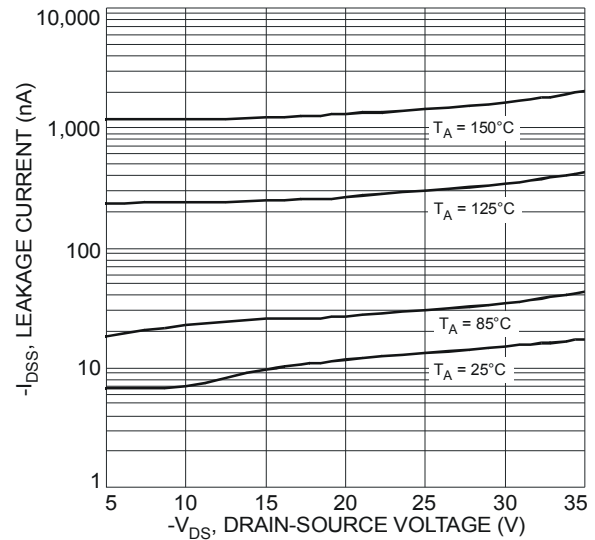


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

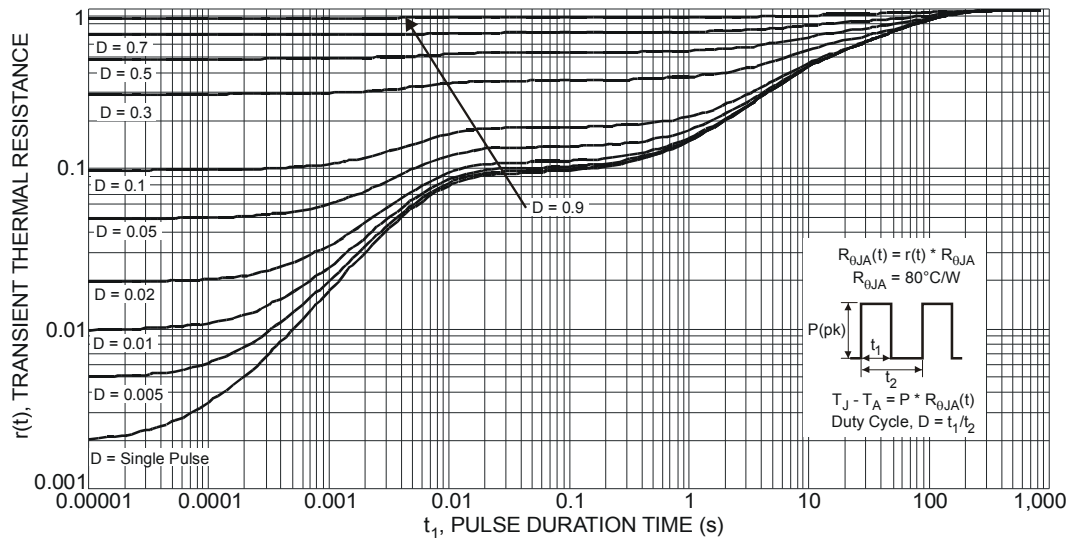
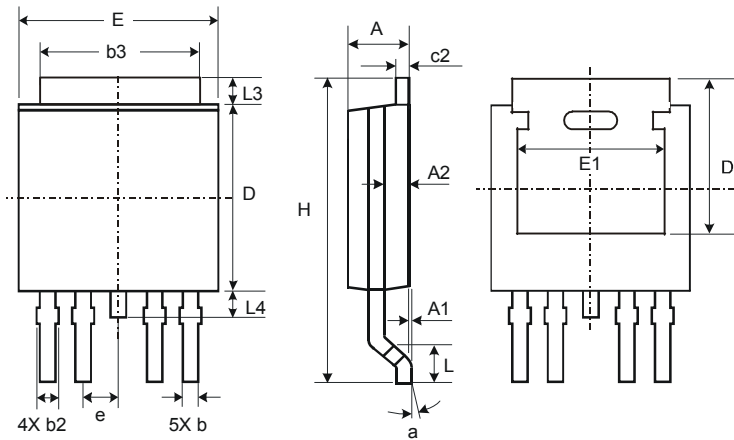


Fig. 22 Transient Thermal Response

Package Outline Dimensions

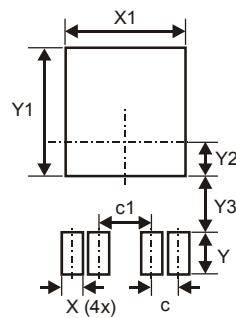
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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

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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