

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$                   | $I_D$<br>$T_A = 25^\circ C$ |
|---------------|--------------------------------|-----------------------------|
| 35V           | 35m $\Omega$ @ $V_{GS} = 10V$  | 13A                         |
| -35V          | 45m $\Omega$ @ $V_{GS} = -10V$ | -12A                        |

## Description and Applications

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.

- Backlighting
- DC-DC Converters
- Power management functions

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Lead Free/RoHS Compliant (Note 1)
- "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

## Mechanical Data

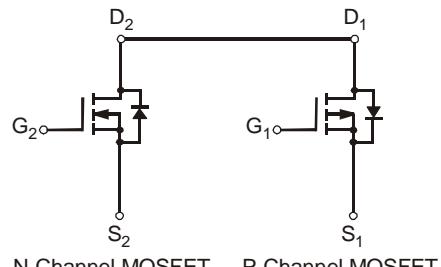
- Case: TO252-4L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.328 grams (approximate)



Top View



Bottom View



## Ordering Information (Note 3)

| Part Number  | Case     | Packaging          |
|--------------|----------|--------------------|
| DMG4511SK4-7 | TO252-4L | 3000 / 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



DII = 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                                      |                     |  | $V_{GSS}$ | $\pm 20$   | V    |
| Continuous Drain Current (Note 4) $V_{GS} = 10\text{V}$  | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | 5.3<br>4.2 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$  | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | 8.6<br>6.8 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$  | $t \leq 10\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | 13<br>11   | A    |
| Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$ | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | 6.3<br>5.0 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$ | $t \leq 10\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | 9.3<br>7.4 | A    |
| Pulsed Drain Current (Note 6)                            |                     |  | $I_{DM}$  | 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                                       |                     |  | $V_{GSS}$ | $\pm 20$     | V    |
| Continuous Drain Current (Note 4) $V_{GS} = -10\text{V}$  | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -5.0<br>-3.8 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$  | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -7.8<br>-6.2 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$  | $t \leq 10\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -12<br>-10   | A    |
| Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$ | Steady State        | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -6.5<br>-5.2 | A    |
| Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$ | $t \leq 10\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -9.6<br>-7.7 | A    |
| Pulsed Drain Current (Note 6)                             |                     |  | $I_{DM}$  | 50           | A    |

**Thermal Characteristics**

| Characteristic  |  | Symbol          | Value       | Unit |
|---|--|-----------------|-------------|------|
| Power Dissipation (Note 4)  |  | $P_D$           | 1.54        | W    |
| Thermal Resistance, Junction to Ambient @ $T_A = 25^\circ\text{C}$ (Note 4)                     |  | $R_{\theta JA}$ | 81.3        | °C/W |
| Power Dissipation (Note 5)  |  | $P_D$           | 4.1         | W    |
| Thermal Resistance, Junction to Ambient @ $T_A = 25^\circ\text{C}$ (Note 5)                     |  | $R_{\theta JA}$ | 30.8        | °C/W |
| Power Dissipation (Note 5) $t \leq 10\text{s}$  |  | $P_D$           | 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          | °C/W |
| Operating and Storage Temperature Range   |  | $T_J, T_{STG}$  | -55 to +150 | °C   |

Notes:

- 4. Device mounted on FR-4 PCB with minimum recommended pad layout, single sided.
- 5. Device mounted on 2" x 2" FR-4 PCB with high coverage 2 oz. Copper, single sided.
- 6. Repetitive rating, pulse width limited by junction temperature.

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

| Characteristic   | Symbol                            | Min | Typ      | Max       | Unit             | Test Condition  |
|--|-----------------------------------|-----|----------|-----------|------------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>                        |                                   |     |          |           |                  |   |
| Drain-Source Breakdown Voltage                             | $\text{BV}_{\text{DSS}}$          | 35  | -        | -         | V                | $\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = 250\mu\text{A}$  |
| Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$   | $\text{I}_{\text{DSS}}$           | -   | -        | 1.0       | $\mu\text{A}$    | $\text{V}_{\text{DS}} = 35\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$  |
| Gate-Source Leakage  | $\text{I}_{\text{GSS}}$           | -   | -        | $\pm 100$ | nA               | $\text{V}_{\text{GS}} = \pm 20\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$  |
| <b>ON CHARACTERISTICS (Note 7)</b>                         |                                   |     |          |           |                  |   |
| Gate Threshold Voltage                                     | $\text{V}_{\text{GS}(\text{th})}$ | 1.0 | -        | 3.0       | V                | $\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = 250\mu\text{A}$   |
| Static Drain-Source On-Resistance                          | $\text{R}_{\text{DS}(\text{ON})}$ | -   | 25<br>50 | 35<br>65  | $\text{m}\Omega$ | $\text{V}_{\text{GS}} = 10\text{V}$ , $\text{I}_D = 8\text{A}$<br>$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{I}_D = 6\text{A}$                               |
| Forward Transfer Admittance                                | $ \text{Y}_{\text{fs}} $          | -   | 4.5      | -         | S                | $\text{V}_{\text{DS}} = 10\text{V}$ , $\text{I}_D = 8\text{A}$  |
| Diode Forward Voltage                                      | $\text{V}_{\text{SD}}$            | -   | -        | 1.2       | V                | $\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = 8\text{A}$   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                    |                                   |     |          |           |                  |   |
| Input Capacitance  | $\text{C}_{\text{iss}}$           | -   | 850      | -         | pF               | $\text{V}_{\text{DS}} = 25\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ ,<br>$f = 1.0\text{MHz}$   |
| Output Capacitance   | $\text{C}_{\text{oss}}$           | -   | 64.7     | -         | pF               |   |
| Reverse Transfer Capacitance                               | $\text{C}_{\text{rss}}$           | -   | 51.9     | -         | pF               |   |
| Gate Resistance  | $\text{R}_g$                      | -   | 1.6      | -         | $\Omega$         |   |
| Total Gate Charge ( $\text{V}_{\text{GS}} = 10\text{V}$ )  | $\text{Q}_g$                      | -   | 18.7     | -         | nC               |   |
| Total Gate Charge ( $\text{V}_{\text{GS}} = 4.5\text{V}$ ) | $\text{Q}_g$                      | -   | 8.8      | -         | nC               |   |
| Gate-Source Charge   | $\text{Q}_{\text{gs}}$            | -   | 2.6      | -         | nC               |   |
| Gate-Drain Charge  | $\text{Q}_{\text{gd}}$            | -   | 2.1      | -         | nC               |   |
| Turn-On Delay Time   | $\text{t}_{\text{D}(\text{on})}$  | -   | 5.4      | -         | ns               |   |
| Turn-On Rise Time  | $\text{t}_r$                      | -   | 2.8      | -         | ns               | $\text{V}_{\text{DS}} = 18\text{V}$ , $\text{V}_{\text{GS}} = 10\text{V}$ ,<br>$\text{R}_L = 18\Omega$ , $\text{R}_G = 3.3\Omega$ ,<br>$\text{I}_D = 1\text{A}$ |
| Turn-Off Delay Time  | $\text{t}_{\text{D}(\text{off})}$ | -   | 33.2     | -         | ns               |   |
| Turn-Off Fall Time   | $\text{t}_f$                      | -   | 35.6     | -         | ns               |   |

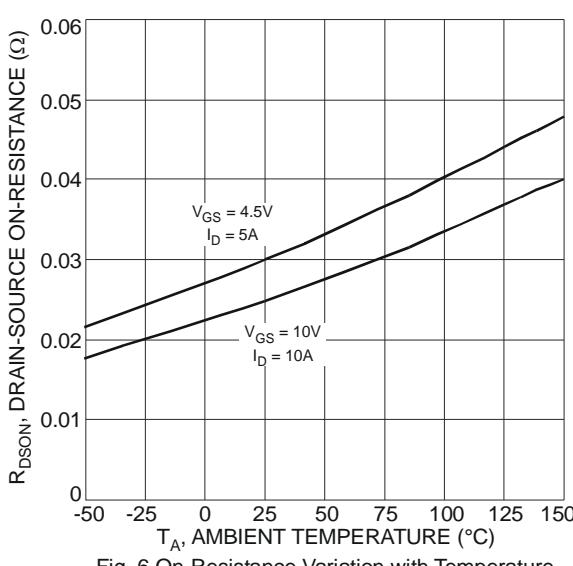
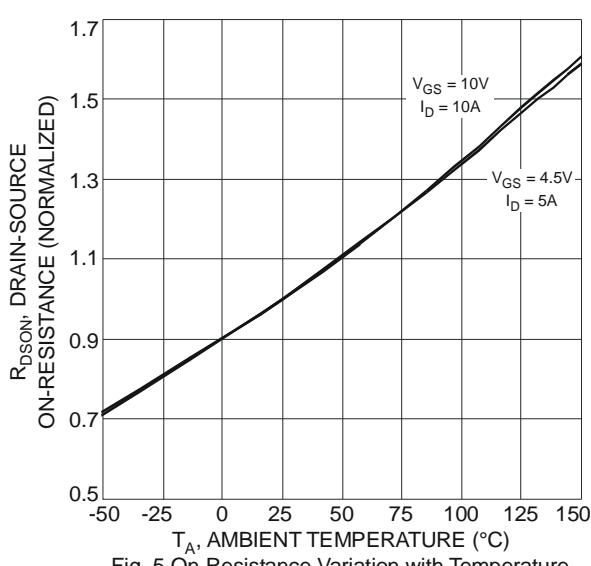
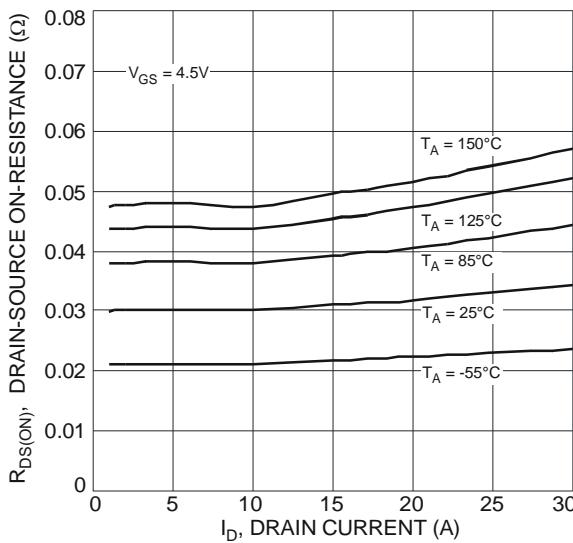
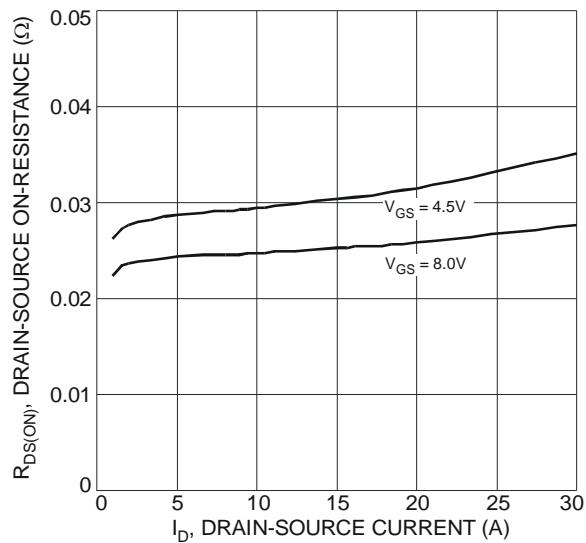
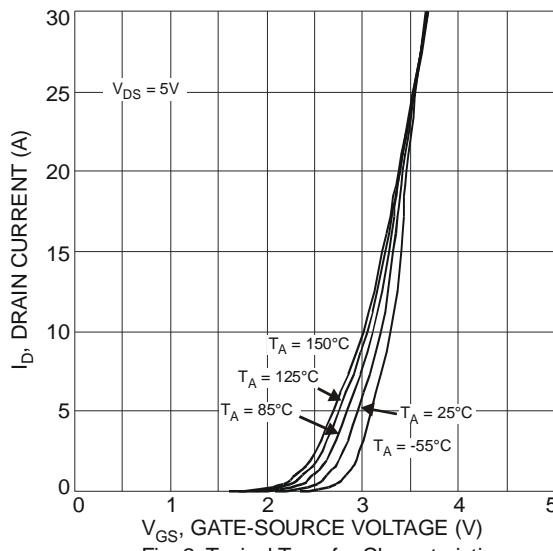
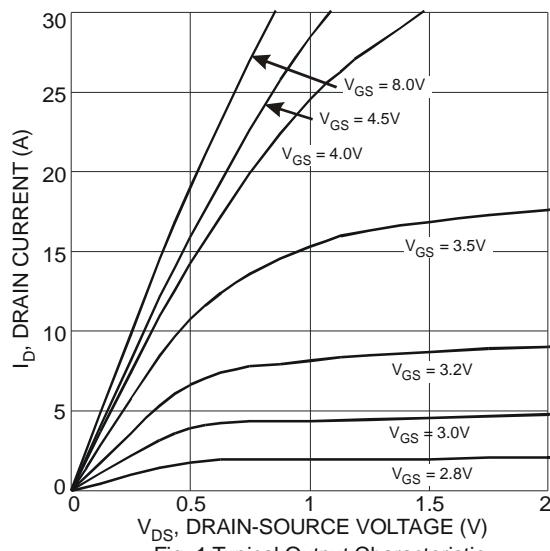
**Electrical Characteristics – P-CHANNEL, Q2** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic  | Symbol                            | Min  | Typ      | Max       | Unit             | Test Condition   |
|---|-----------------------------------|------|----------|-----------|------------------|--|
| <b>OFF CHARACTERISTICS (Note 7)</b>                         |                                   |      |          |           |                  |  |
| Drain-Source Breakdown Voltage                              | $\text{BV}_{\text{DSS}}$          | -35  | -        | -         | V                | $\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = -250\mu\text{A}$  |
| Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$    | $\text{I}_{\text{DSS}}$           | -    | -        | -1.0      | $\mu\text{A}$    | $\text{V}_{\text{DS}} = -35\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$  |
| Gate-Source Leakage   | $\text{I}_{\text{GSS}}$           | -    | -        | $\pm 100$ | nA               | $\text{V}_{\text{GS}} = \pm 20\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$   |
| <b>ON CHARACTERISTICS (Note 7)</b>                          |                                   |      |          |           |                  |  |
| Gate Threshold Voltage                                      | $\text{V}_{\text{GS}(\text{th})}$ | -1.0 | -        | -3.0      | V                | $\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = -250\mu\text{A}$   |
| Static Drain-Source On-Resistance                           | $\text{R}_{\text{DS}(\text{ON})}$ | -    | 30<br>40 | 45<br>65  | $\text{m}\Omega$ | $\text{V}_{\text{GS}} = -10\text{V}$ , $\text{I}_D = -6\text{A}$<br>$\text{V}_{\text{GS}} = -4.5\text{V}$ , $\text{I}_D = -4\text{A}$                              |
| Forward Transfer Admittance                                 | $ \text{Y}_{\text{fs}} $          | -    | 8        | -         | S                | $\text{V}_{\text{DS}} = -10\text{V}$ , $\text{I}_D = -6\text{A}$   |
| Diode Forward Voltage                                       | $\text{V}_{\text{SD}}$            | -    | -        | -1.2      | V                | $\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = -6\text{A}$   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                     |                                   |      |          |           |                  |  |
| Input Capacitance   | $\text{C}_{\text{iss}}$           | -    | 985.2    | -         | pF               | $\text{V}_{\text{DS}} = -25\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ ,<br>$f = 1.0\text{MHz}$   |
| Output Capacitance  | $\text{C}_{\text{oss}}$           | -    | 90.6     | -         | pF               |  |
| Reverse Transfer Capacitance                                | $\text{C}_{\text{rss}}$           | -    | 75.3     | -         | pF               |  |
| Gate Resistance   | $\text{R}_g$                      | -    | 7.0      | -         | $\Omega$         |  |
| Total Gate Charge ( $\text{V}_{\text{GS}} = -10\text{V}$ )  | $\text{Q}_g$                      | -    | 19.2     | -         | nC               |  |
| Total Gate Charge ( $\text{V}_{\text{GS}} = -4.5\text{V}$ ) | $\text{Q}_g$                      | -    | 9.5      | -         | nC               |  |
| Gate-Source Charge  | $\text{Q}_{\text{gs}}$            | -    | 2.0      | -         | nC               |  |
| Gate-Drain Charge   | $\text{Q}_{\text{gd}}$            | -    | 3.5      | -         | nC               |  |
| Turn-On Delay Time  | $\text{t}_{\text{D}(\text{on})}$  | -    | 5.2      | -         | ns               |  |
| Turn-On Rise Time   | $\text{t}_r$                      | -    | 4.8      | -         | ns               | $\text{V}_{\text{DS}} = -18\text{V}$ , $\text{V}_{\text{GS}} = -10\text{V}$ ,<br>$\text{R}_L = 18\Omega$ , $\text{R}_G = 3.3\Omega$ ,<br>$\text{I}_D = -1\text{A}$ |
| Turn-Off Delay Time   | $\text{t}_{\text{D}(\text{off})}$ | -    | 45.8     | -         | ns               |  |
| Turn-Off Fall Time  | $\text{t}_f$                      | -    | 29.5     | -         | ns               |  |

Notes: 7. Short duration pulse test used to minimize self-heating effect.

8. Guaranteed by design. Not subject to production testing.

**N-CHANNEL, Q1**



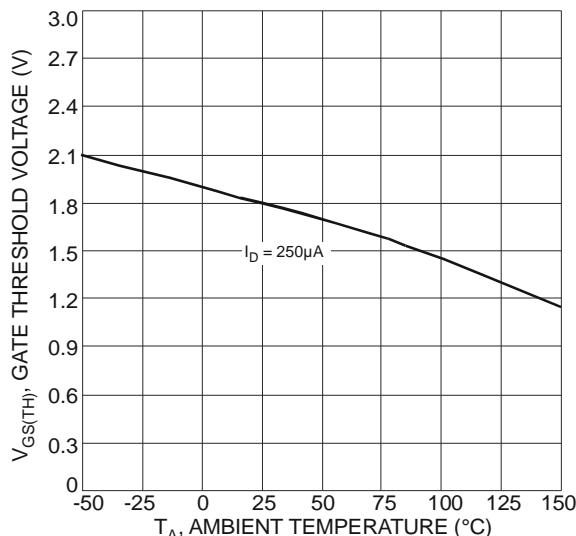


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

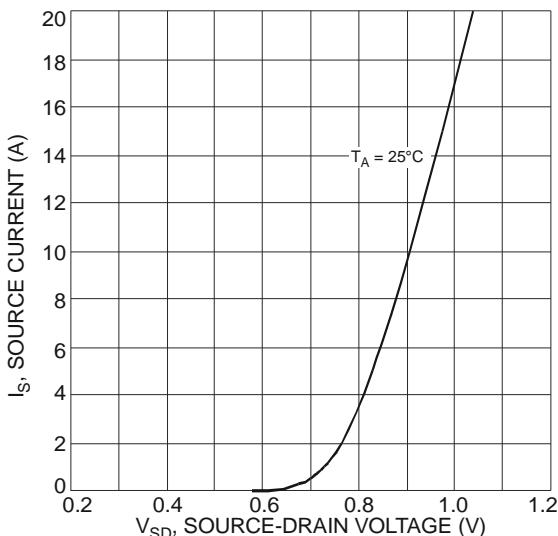


Fig. 8 Diode Forward Voltage vs. Current

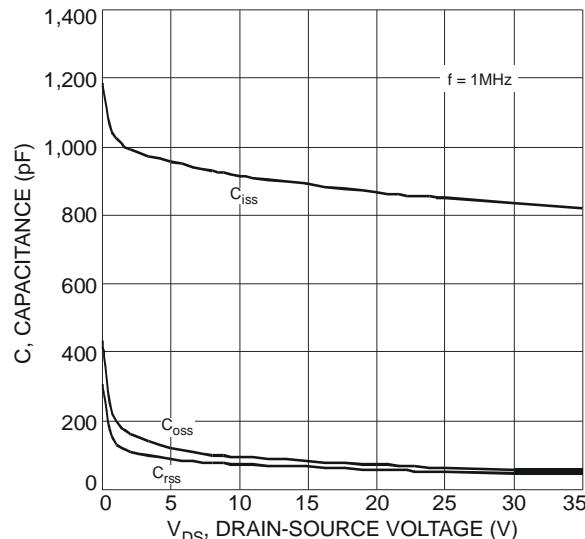


Fig. 9 Typical Total Capacitance

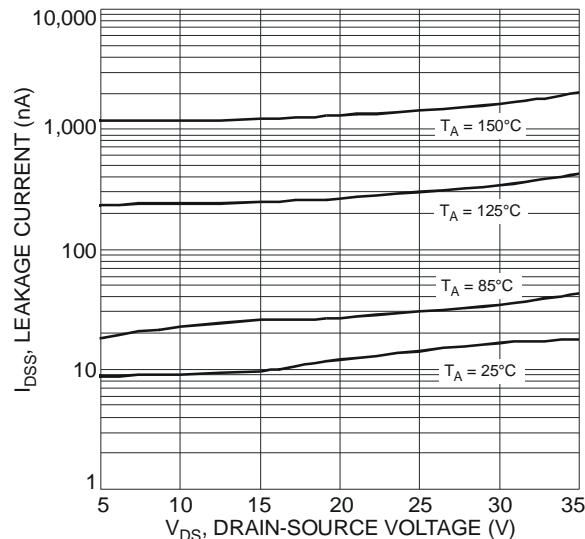


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

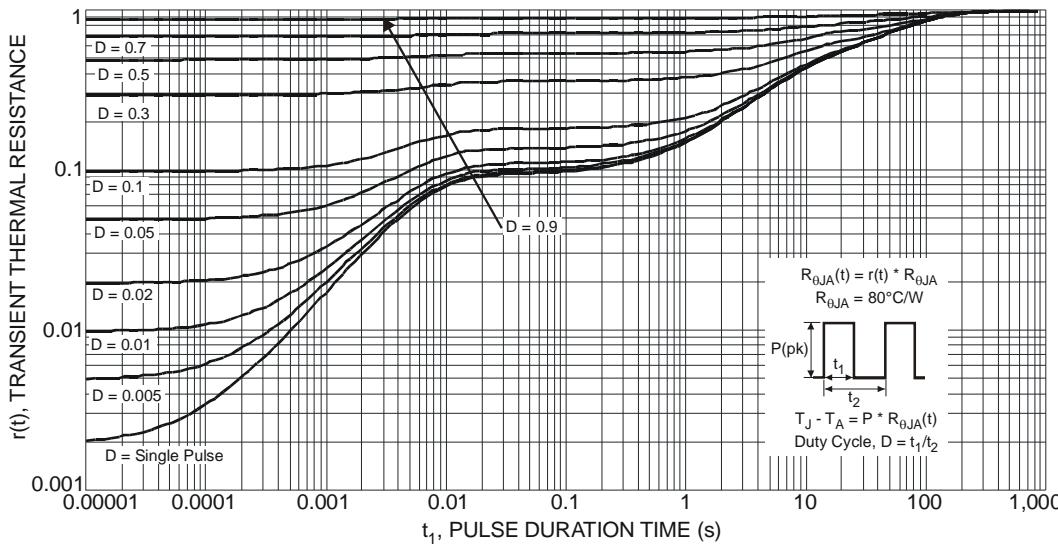


Fig. 11 Transient Thermal Response

**P-CHANNEL, Q2**

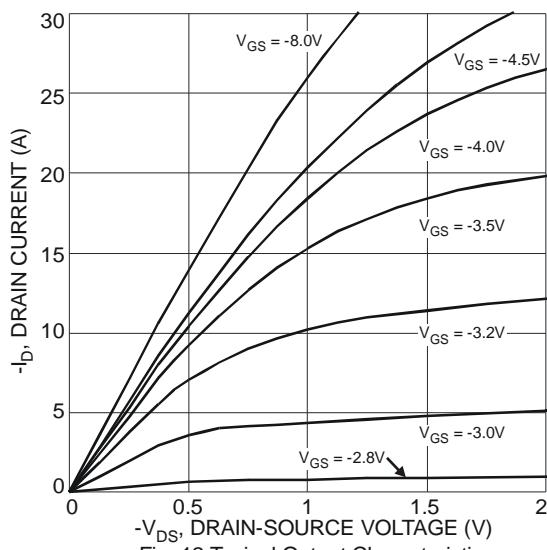


Fig. 12 Typical Output Characteristic

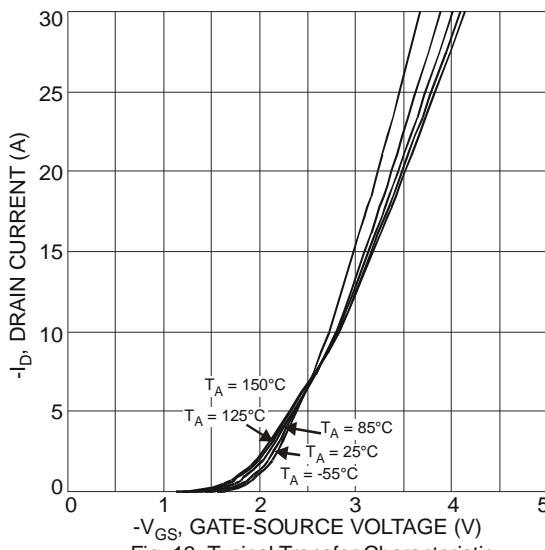


Fig. 13 Typical Transfer Characteristic

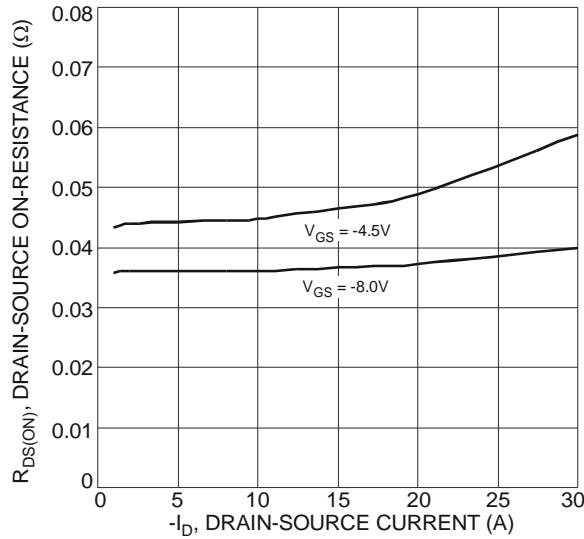


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

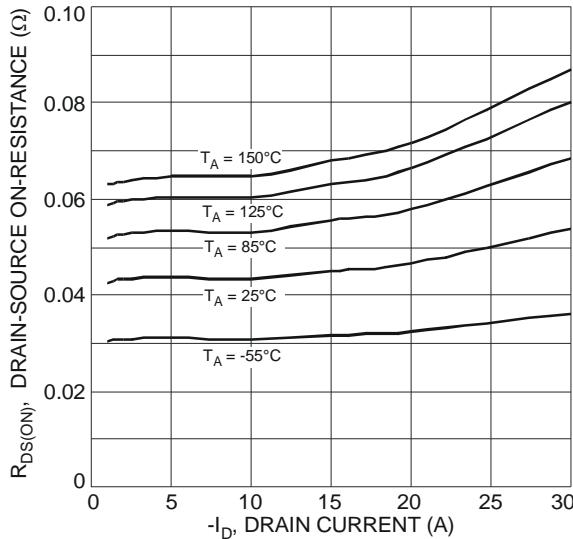


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

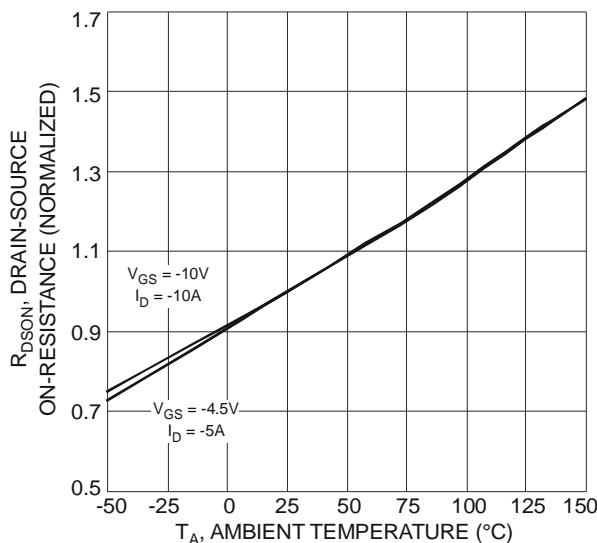


Fig. 16 On-Resistance Variation with Temperature

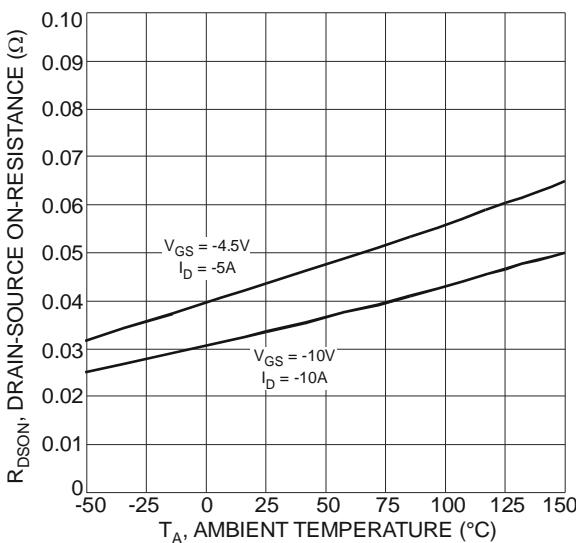


Fig. 17 On-Resistance Variation with Temperature

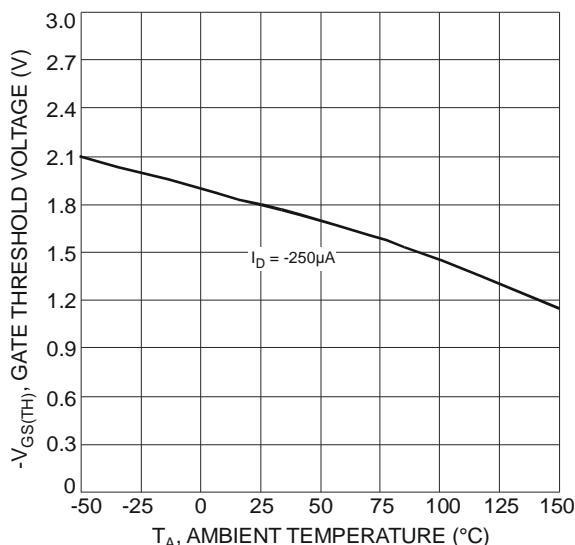


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

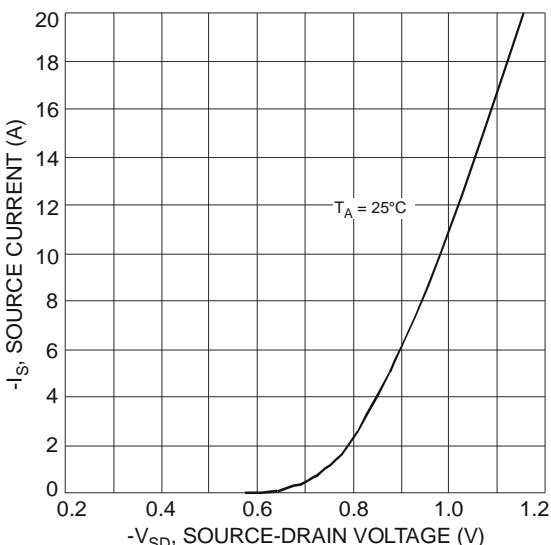


Fig. 19 Diode Forward Voltage vs. Current

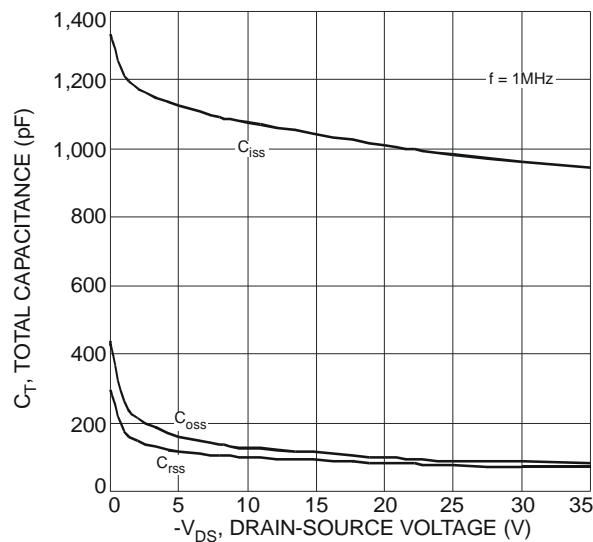


Fig. 20 Typical Total Capacitance

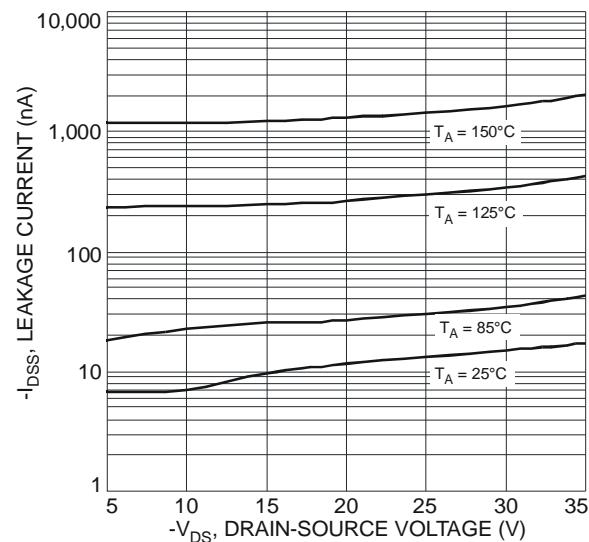


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

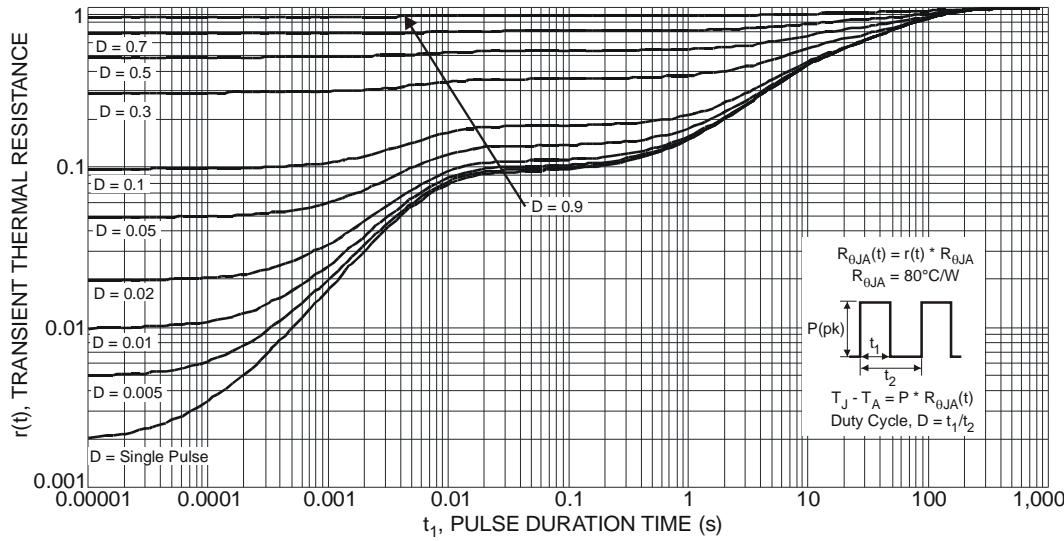
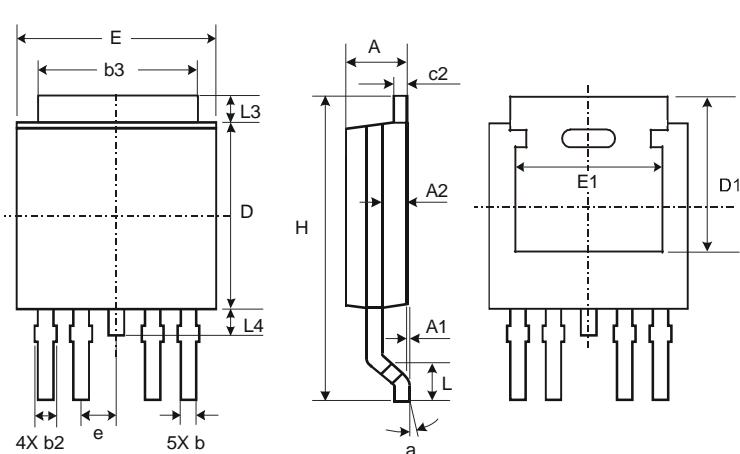


Fig. 22 Transient Thermal Response

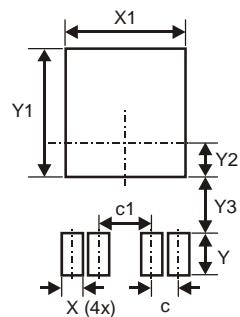
## Package Outline Dimensions



| 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



| 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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A. Life support devices or systems are devices or systems which:

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.

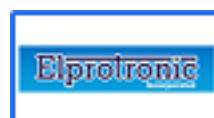
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