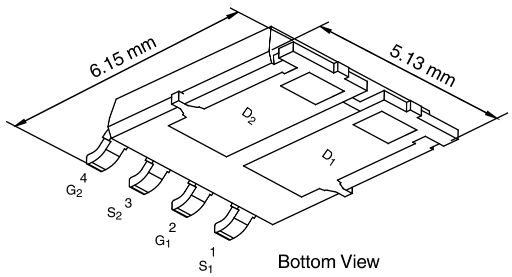
# Automotive Dual N-Channel 40 V (D-S) 175 °C MOSFET

| PRODUCT SUMMARY | |
|---|---|
| $V_{DS}$ (V) | 40 |
| $R_{DS(on)}$ (Ω) at $V_{GS}$ = 10 V | 0.020 |
| $R_{DS(on)}$ (Ω) at $V_{GS}$ = 4.5 V | 0.028 |
| $I_D$ (A) per leg | 8 |
| Configuration | Dual |

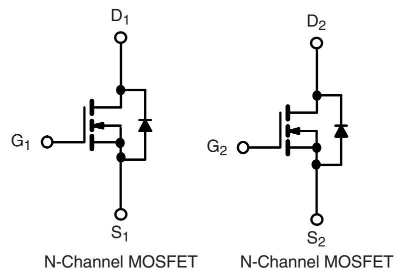
**PowerPAK® SO-8L Dual**




## FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- AEC-Q101 Qualified[d]
- 100 % $R_g$ and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

AUTOMOTIVE GRADE
Pb-free
RoHS COMPLIANT
HALOGEN FREE




| ORDERING INFORMATION | |
|---|---|
| Package | PowerPAK SO-8L |
| Lead (Pb)-free and Halogen-free | SQJ970EP-T1-GE3 |

**ABSOLUTE MAXIMUM RATINGS** ($T_C$ = 25 °C, unless otherwise noted)

| PARAMETER | | SYMBOL | LIMIT | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | V |
| Continuous Drain Current[a] | $T_C$ = 25 °C | $I_D$ | 8 | A |
| | $T_C$ = 125 °C | | 8 | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | 8 | |
| Pulsed Drain Current[b] | | $I_{DM}$ | 32 | |
| Single Pulse Avalanche Current | L = 0.1 mH | $I_{AS}$ | 28 | |
| Single Pulse Avalanche Energy | | $E_{AS}$ | 39 | mJ |
| Maximum Power Dissipation[b] | $T_C$ = 25 °C | $P_D$ | 48 | W |
| | $T_C$ = 125 °C | | 16 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to + 175 | °C |
| Soldering Recommendations (Peak Temperature)[e, f] | | | 260 | |

| THERMAL RESISTANCE RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Junction-to-Ambient | PCB Mount[c] | $R_{thJA}$ | 85 | °C/W |
| Junction-to-Case (Drain) | | $R_{thJC}$ | 3.1 | |

**Notes**

a. Package limited.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
c. When mounted on 1" square PCB (FR4 material).
d. Parametric verification ongoing.
e. See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8L. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection..
f. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

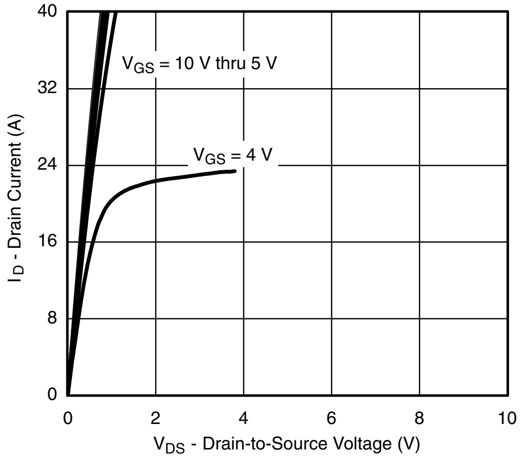
| **SPECIFICATIONS** ($T_C$ = 25 °C, unless otherwise noted) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Static** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0, $I_D$ = 250 µA | | 40 | - | - | V |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | | 1.5 | 2.0 | 2.5 | |
| Gate-Source Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 40 V | - | - | 1 | µA |
| | | $V_{GS}$ = 0 V | $V_{DS}$ = 40 V, $T_J$ = 125 °C | - | - | 50 | |
| | | $V_{GS}$ = 0 V | $V_{DS}$ = 40 V, $T_J$ = 175 °C | - | - | 150 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{GS}$ = 10 V | $V_{DS}$ ≥ 5 V | 30 | - | - | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = 10 V | $I_D$ = 10.2 A | - | 0.016 | 0.020 | Ω |
| | | $V_{GS}$ = 4.5 V | $I_D$ = 8.7 A | - | 0.022 | 0.028 | |
| | | $V_{GS}$ = 10 V | $I_D$ = 10.2 A, $T_J$ = 125 °C | - | 0.025 | 0.031 | |
| | | $V_{GS}$ = 10 V | $I_D$ = 10.2 A, $T_J$ = 175 °C | - | 0.029 | 0.036 | |
| Forward Transconductance[b] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 10.2 A | | - | 28 | - | S |
| **Dynamic[b]** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 20 V, f = 1 MHz | - | 1730 | 2165 | pF |
| Output Capacitance | $C_{oss}$ | | | - | 260 | 325 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | - | 130 | 165 | |
| Total Gate Charge[c] | $Q_g$ | $V_{GS}$ = 10 V | $V_{DS}$ = 20 V, $I_D$ = 10.2 A | - | 34 | 55 | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | - | 5.2 | - | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | - | 6.5 | - | |
| Gate Resistance | $R_g$ | f = 1 MHz | | 0.71 | 3.92 | 7.12 | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = 20 V, $R_L$ = 20 Ω<br>$I_D$ ≅ 1 A, $V_{GEN}$ = 10 V, $R_g$ = 1 Ω | | - | 10 | 15 | ns |
| Rise Time[c] | $t_r$ | | | - | 8 | 12 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | - | 50 | 75 | |
| Fall Time[c] | $t_f$ | | | - | 10 | 15 | |
| **Source-Drain Diode Ratings and Characteristics[b]** | | | | | | | |
| Pulsed Current[a] | $I_{SM}$ | | | - | - | 32 | A |
| Forward Voltage | $V_{SD}$ | $I_F$ = 2.9 A, $V_{GS}$ = 0 | | - | 0.8 | 1.1 | V |

**Notes**

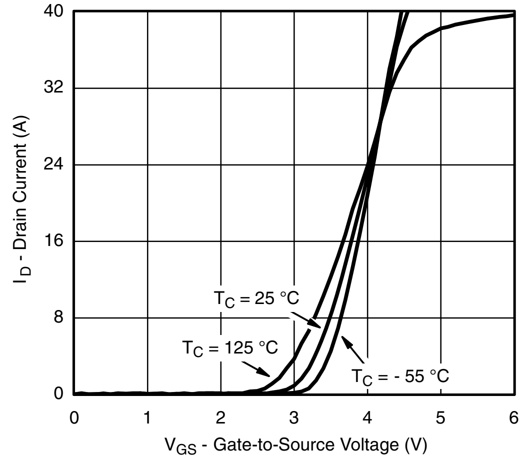
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

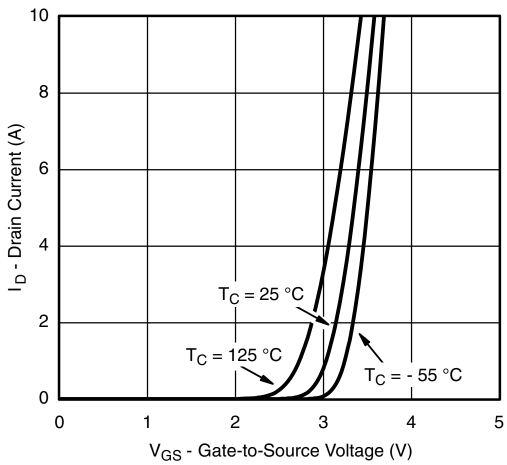
**TYPICAL CHARACTERISTICS** ($T_A$ = 25 °C, unless otherwise noted)



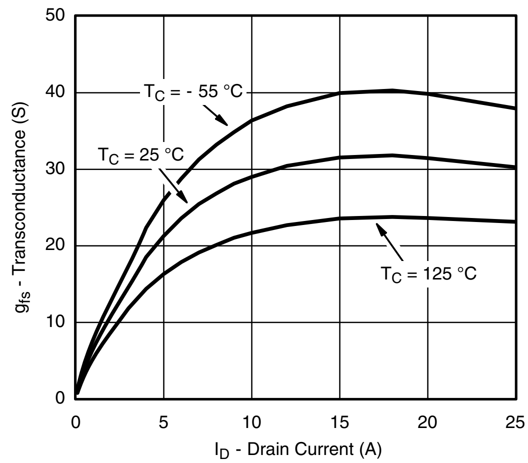

**Output Characteristics**



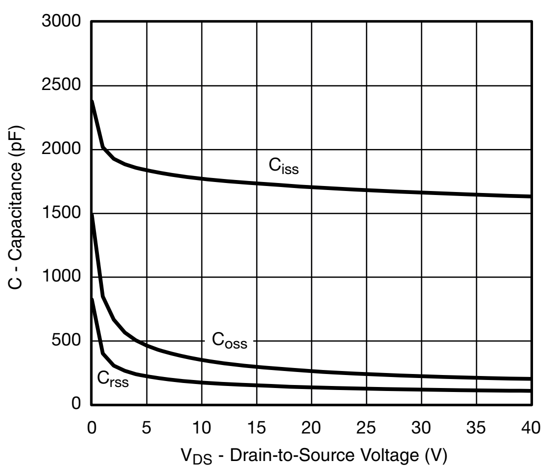

**Transfer Characteristics**



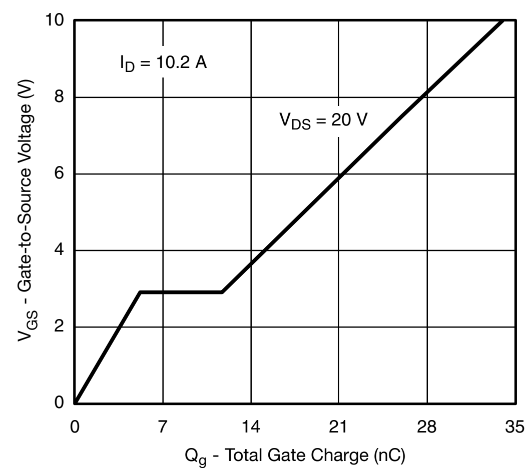

**Transfer Characteristics**




**Transconductance**

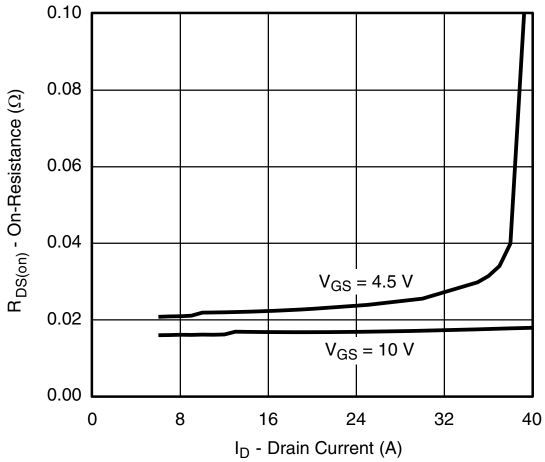



**Capacitance**

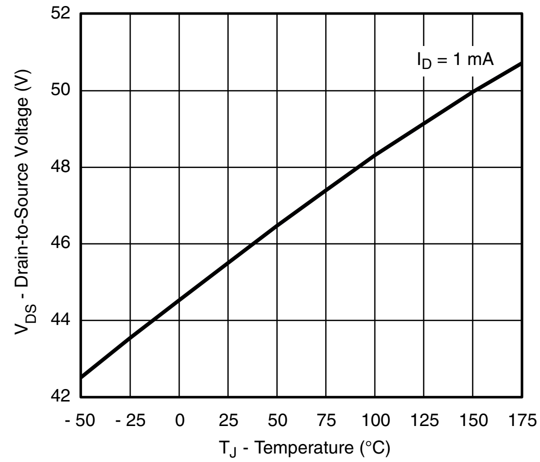



**Gate Charge**

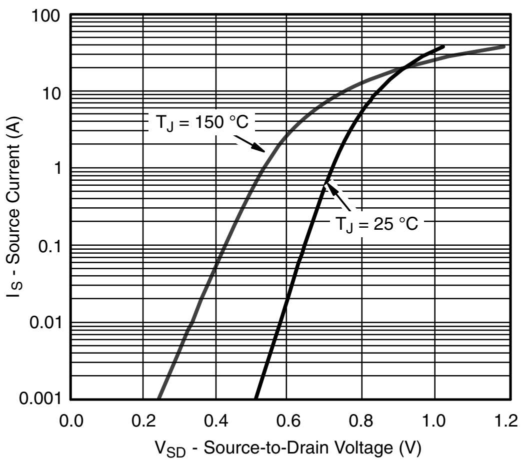
**TYPICAL CHARACTERISTICS** ($T_A$ = 25 °C, unless otherwise noted)



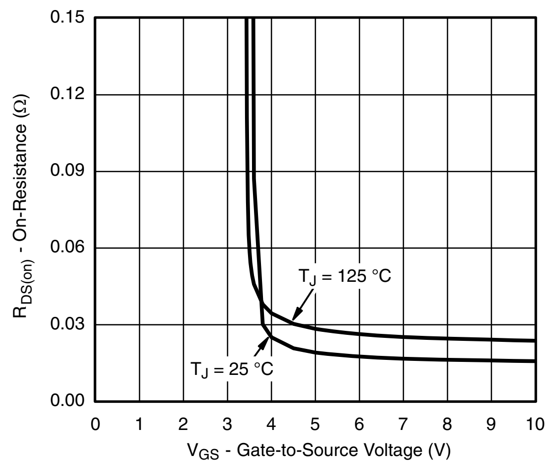

**On-Resistance vs. Drain Current**



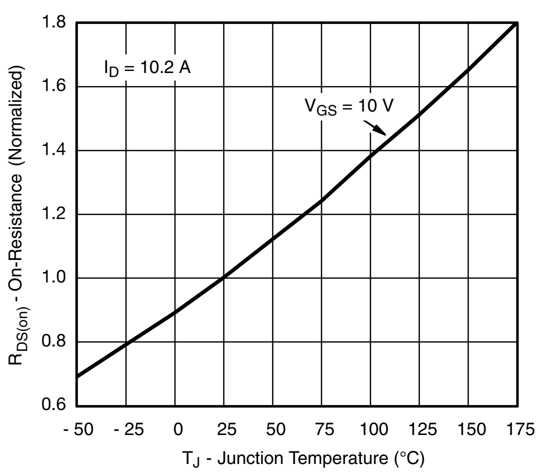

**Drain-Source Breakdown vs. Junction Temperature**



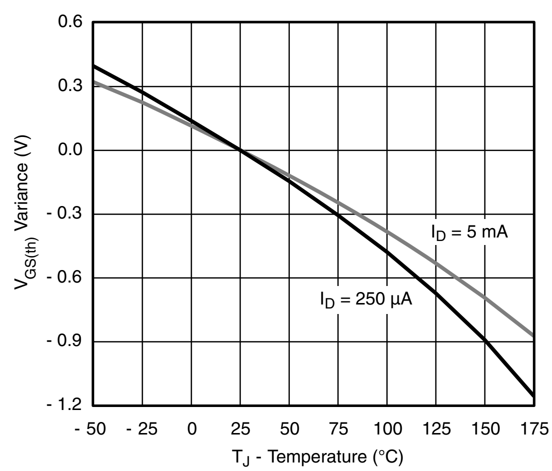

**Source Drain Diode Forward Voltage**




**On-Resistance vs. Gate-to-Source Voltage**

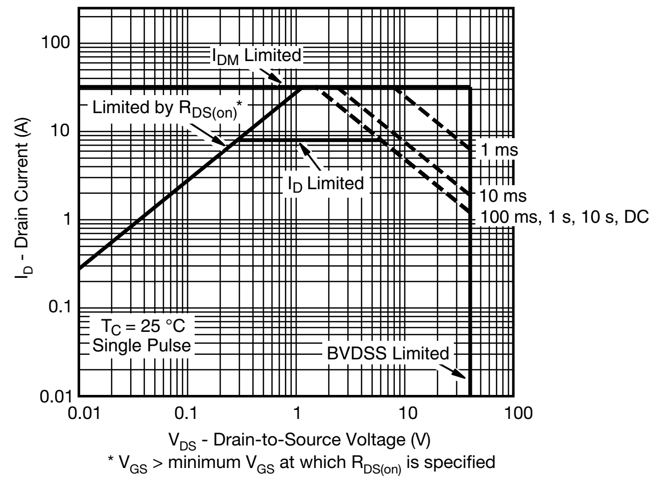



**On-Resistance vs. Junction Temperature**

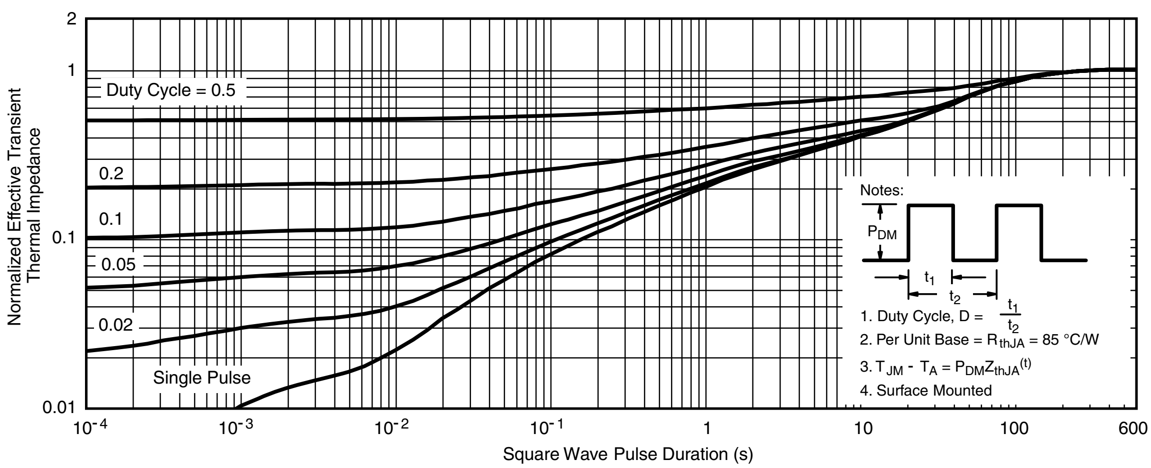



**Threshold Voltage**

**THERMAL RATINGS** ($T_A$ = 25 °C, unless otherwise noted)

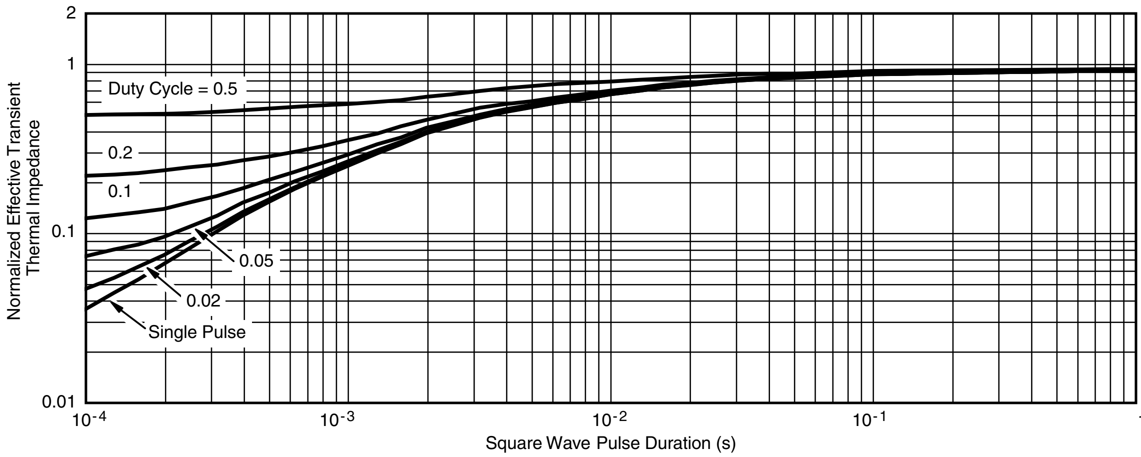



**Safe Operating Area**




**Normalized Thermal Transient Impedance, Junction-to-Ambient**

**THERMAL RATINGS** ($T_A$ = 25 °C, unless otherwise noted)




**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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