

## Dual N-Channel 20-V (D-S) MOSFET

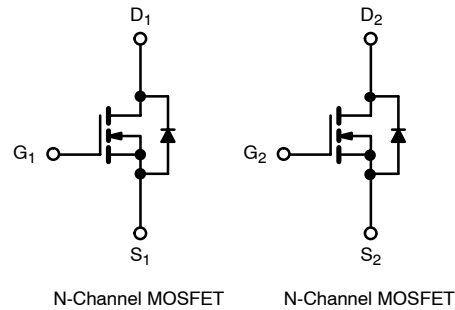
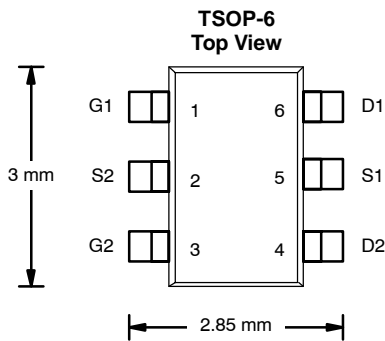
| PRODUCT SUMMARY |                           |           |
|-----------------|---------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
| 20              | 0.125 @ $V_{GS} = 4.5$ V  | 2.4       |
|                 | 0.200 @ $V_{GS} = 2.5$ V  | 1.8       |

### FEATURES

- TrenchFET® Power MOSFET



Pb-free Available



Ordering Information: Si3900DV-T1  
Si3900DV-T1—E3 (Lead (Pb)-Free)

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                |                          |              |                  |      |
|---|----------------|--------------------------|--------------|------------------|------|
| Parameter   | Symbol         | 5 sec                    | Steady State | Unit             |      |
| Drain-Source Voltage  | $V_{DS}$       | 20                       |              | V                |      |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 12$                 |              |                  |      |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>         | $I_D$          | $T_A = 25^\circ\text{C}$ | 2.4          | 2.0              | A    |
|   |                | $T_A = 85^\circ\text{C}$ | 1.7          | 1.4              |      |
| Pulsed Drain Current (10 $\mu\text{s}$ Pulse Width)                         | $I_{DM}$       | 8                        |              |                  |      |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                   | $I_S$          | 1.05                     | 0.75         | W                |      |
| Maximum Power Dissipation <sup>a</sup>                                      | $P_D$          | $T_A = 25^\circ\text{C}$ | 1.15         |                  | 0.83 |
|   |                | $T_A = 85^\circ\text{C}$ | 0.59         | 0.53             |      |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{stg}$ | -55 to 150               |              | $^\circ\text{C}$ |      |

| THERMAL RESISTANCE RATINGS               |            |                |         |      |                           |
|--|------------|----------------|---------|------|---------------------------|
| Parameter                                | Symbol     | Typical        | Maximum | Unit |                           |
| Maximum Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | $t \leq 5$ sec | 93      | 110  | $^\circ\text{C}/\text{W}$ |
|  |            | Steady State   | 130     | 150  |                           |
| Maximum Junction-to-Foot (Drain)         | $R_{thJF}$ | 75             | 90      |      |                           |

**Notes**

a. Surface Mounted on 1" x 1" FR4 Board.

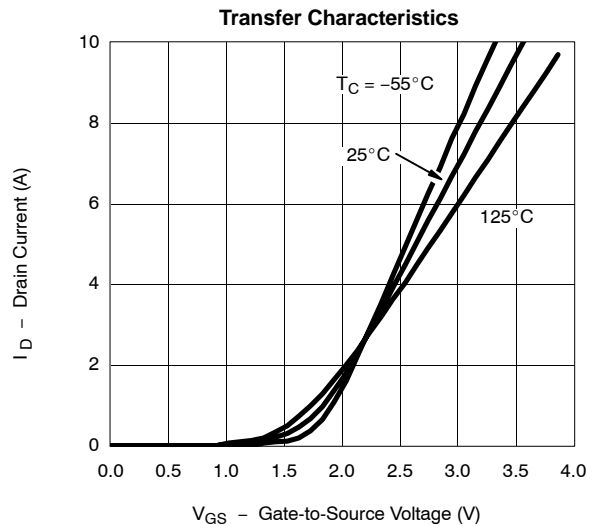
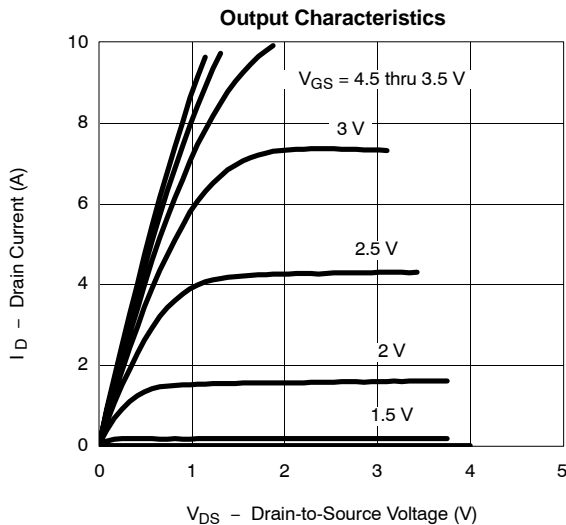
| SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED) |                     |   |     |       |       |      |
|--|---------------------|---|-----|-------|-------|------|
| Parameter  | Symbol              | Test Condition  | Min | Typ   | Max   | Unit |
| <b>Static</b>  |                     |   |     |       |       |      |
| Gate Threshold Voltage   | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA   | 0.6 |       | 1.5   | V    |
| Gate-Body Leakage  | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V  |     |       | ±100  | nA   |
| Zero Gate Voltage Drain Current                                | I <sub>DSS</sub>    | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V   |     |       | 1     | μA   |
|  |                     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C   |     |       | 10    |      |
| On-State Drain Current <sup>a</sup>                            | I <sub>D(on)</sub>  | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 4.5 V  | 5   |       |       | A    |
| Drain-Source On-State Resistance <sup>a</sup>                  | r <sub>DS(on)</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.4 A   |     | 0.100 | 0.125 | Ω    |
|  |                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 1.0 A   |     | 0.160 | 0.200 |      |
| Forward Transconductance <sup>a</sup>                          | g <sub>fs</sub>     | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 2.4 A   |     | 5     |       | S    |
| Diode Forward Voltage <sup>a</sup>                             | V <sub>SD</sub>     | I <sub>S</sub> = 1.05 A, V <sub>GS</sub> = 0 V  |     | 0.79  | 1.10  | V    |
| <b>Dynamic<sup>b</sup></b>                                     |                     |   |     |       |       |      |
| Total Gate Charge  | Q <sub>g</sub>      | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.4 A   |     | 2.1   | 4.0   | nC   |
| Gate-Source Charge   | Q <sub>gs</sub>     |   |     | 0.3   |       |      |
| Gate-Drain Charge  | Q <sub>gd</sub>     |   |     | 0.4   |       |      |
| Turn-On Delay Time   | t <sub>d(on)</sub>  | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω<br>I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 6 Ω |     | 10    | 17    | ns   |
| Rise Time  | t <sub>r</sub>      |   |     | 30    | 50    |      |
| Turn-Off Delay Time  | t <sub>d(off)</sub> |   |     | 14    | 25    |      |
| Fall Time  | t <sub>f</sub>      |   |     | 6     | 12    |      |
| Source-Drain Reverse Recovery Time                             | t <sub>rr</sub>     | I <sub>F</sub> = 3.0 A, di/dt = 100 A/μs  |     | 30    | 50    |      |

**Notes**

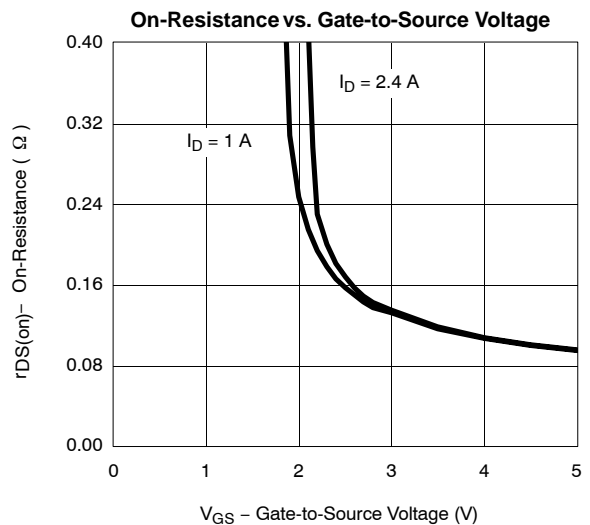
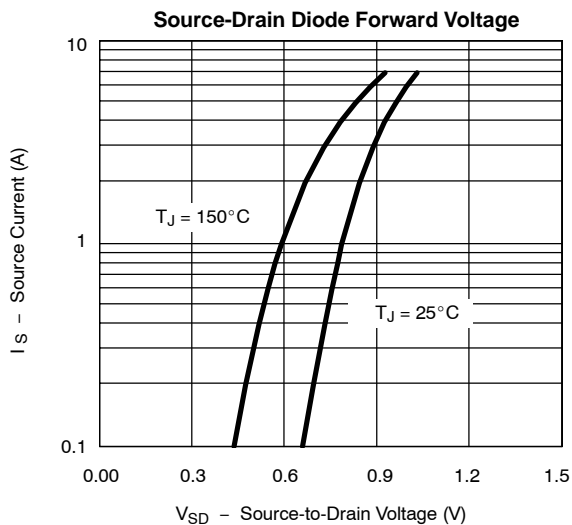
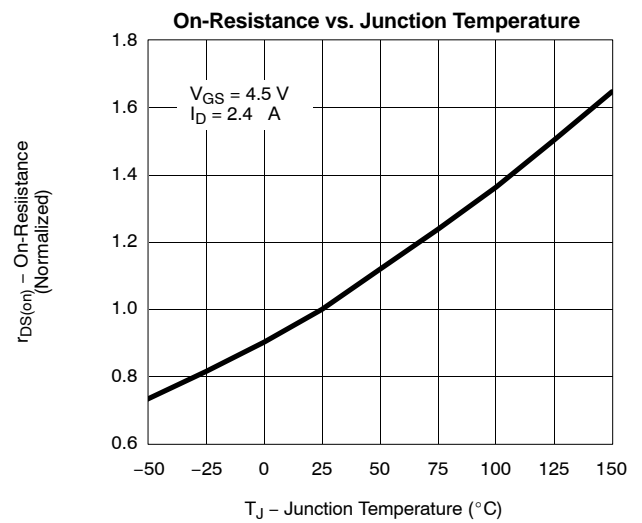
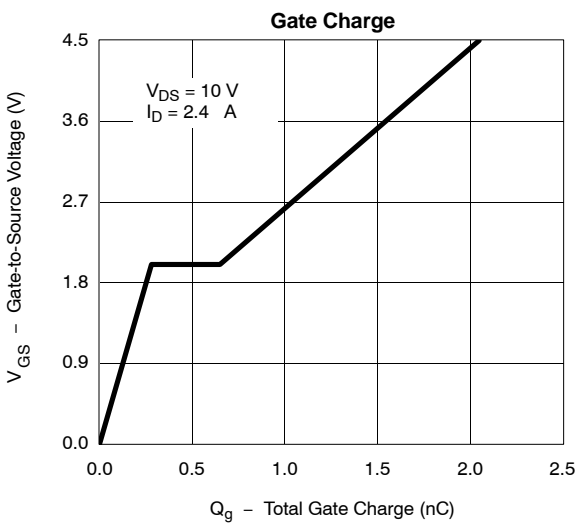
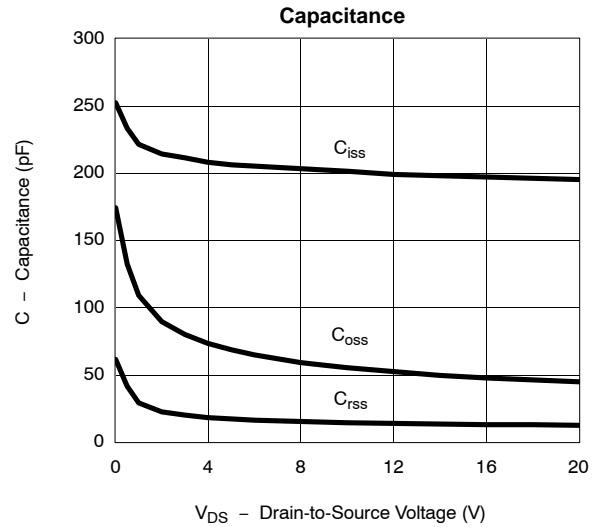
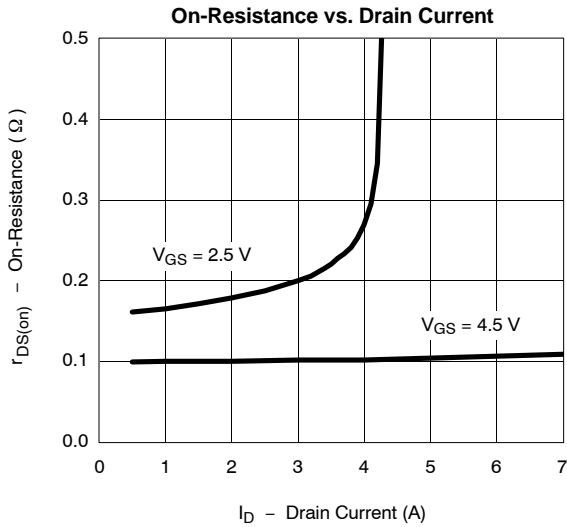
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

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.

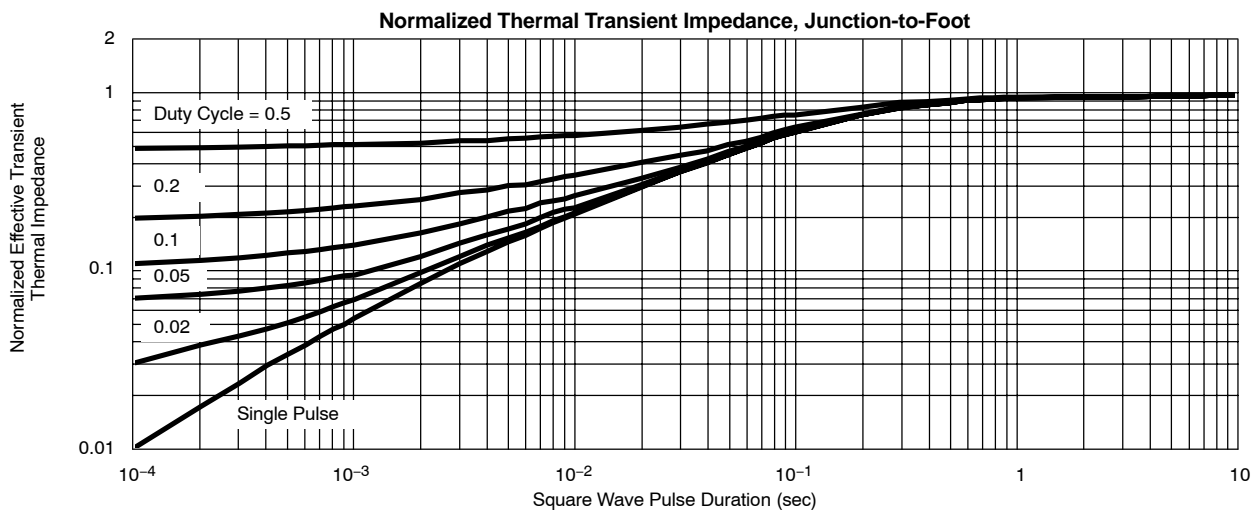
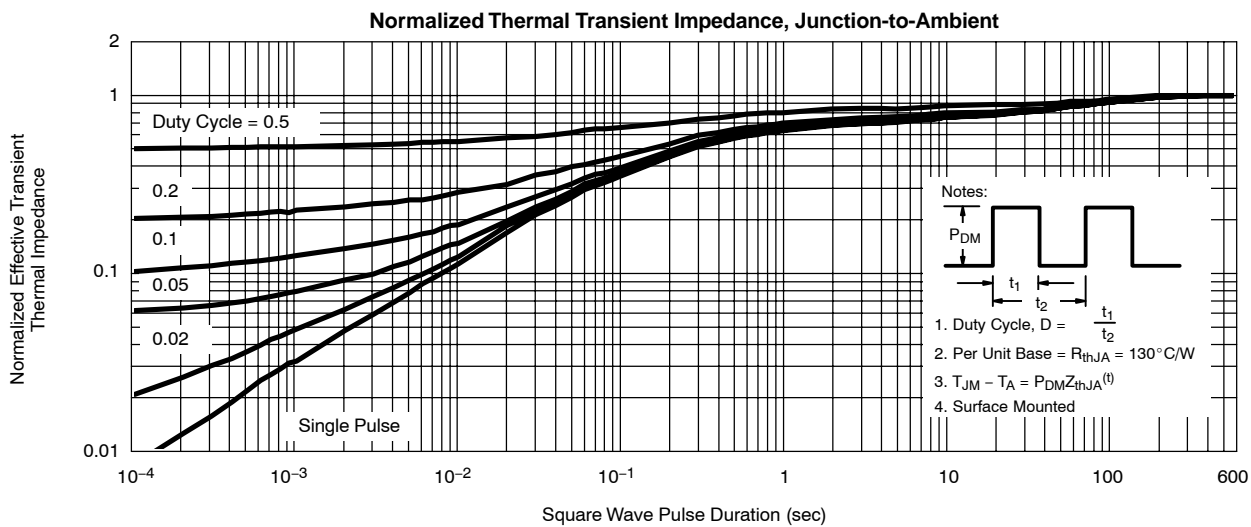
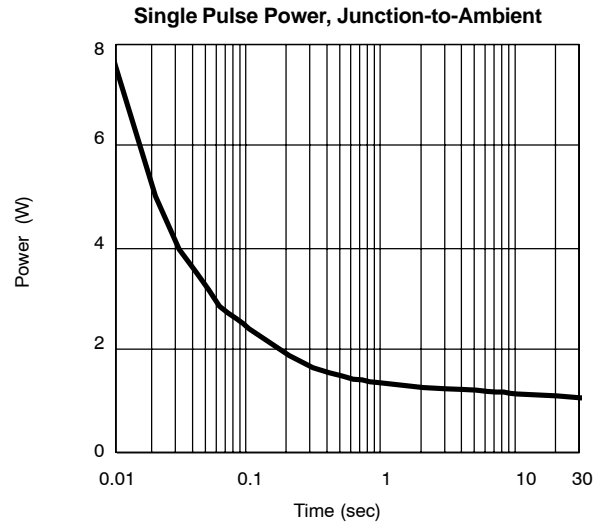
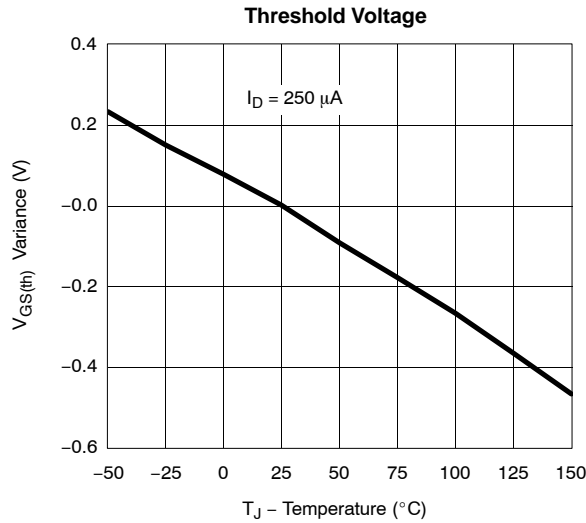
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



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