

## N-Channel 40-V (D-S) MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 40           | 0.045 at $V_{GS} = 10$ V  | 3.9       |
|              | 0.058 at $V_{GS} = 4.5$ V | 3.5       |

### FEATURES

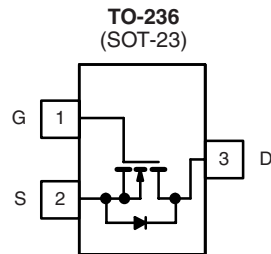
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET

### APPLICATIONS

- Stepper Motors
- Load Switch



**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**  
Available



Top View  
Si2318DS( C8)\*  
\*Marking Code

Ordering Information: Si2318DS-T1-E3 (Lead (Pb)-free)  
Si2318DS-T1-GE3 (Lead (Pb)-free and Halogen-free)

### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                                              | Symbol         | 5 s         | Steady State | Unit             |
|------------------------------------------------------------------------|----------------|-------------|--------------|------------------|
| Drain-Source Voltage                                                   | $V_{DS}$       | 40          |              | V                |
| Gate-Source Voltage                                                    | $V_{GS}$       | $\pm 20$    |              |                  |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a, b</sup> | $I_D$          | 3.9         | 3.0          | A                |
|                                                                        |                | 3.1         | 2.4          |                  |
| Pulsed Drain Current <sup>b</sup>                                      | $I_{DM}$       | 16          |              |                  |
| Continuous Source Current (Diode Conduction) <sup>a, b</sup>           | $I_S$          | 0.8         |              |                  |
| Power Dissipation <sup>a, b</sup>                                      | $P_D$          | 1.25        | 0.75         | W                |
|                                                                        |                | 0.8         | 0.48         |                  |
| 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> | $R_{thJA}$ | 75      | 100     | $^\circ\text{C/W}$ |
|                                          |            | 120     | 166     |                    |
| Maximum Junction-to-Foot (Drain)         | $R_{thJF}$ | 40      | 50      |                    |

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Pulse width limited by maximum junction temperature

**SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

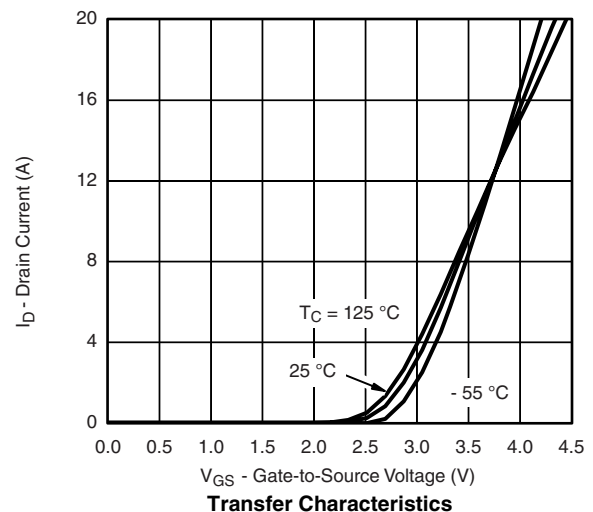
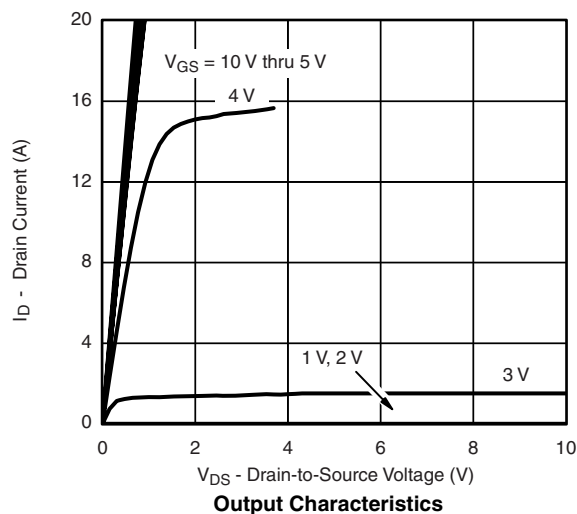
| Parameter                               | Symbol        | Test Conditions                                                                                                                   | Limits |       |           | Unit          |
|-----------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|--------|-------|-----------|---------------|
|                                         |               |                                                                                                                                   | Min.   | Typ.  | Max.      |               |
| Static                                  |               |                                                                                                                                   |        |       |           |               |
| Drain-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$                                                                            | 40     |       |           | V             |
| Gate-Threshold Voltage                  | $V_{GS(th)}$  | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                | 1      |       | 3         |               |
| Gate-Body Leakage                       | $I_{GSS}$     | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$                                                                                |        |       | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current         | $I_{DSS}$     | $V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                    |        |       | 0.5       | $\mu\text{A}$ |
|                                         |               | $V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^\circ\text{C}$                                                 |        |       | 10        |               |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$   | $V_{DS} \geq 4.5\text{ V}$ , $V_{GS} = 10\text{ V}$                                                                               | 6      |       |           | A             |
| Drain-Source On-Resistance <sup>a</sup> | $R_{DS(on)}$  | $V_{GS} = 10\text{ V}$ , $I_D = 3.9\text{ A}$                                                                                     |        | 0.036 | 0.045     | $\Omega$      |
|                                         |               | $V_{GS} = 4.5\text{ V}$ , $I_D = 3.5\text{ A}$                                                                                    |        | 0.045 | 0.058     |               |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$      | $V_{DS} = 10\text{ V}$ , $I_D = 3.9\text{ A}$                                                                                     |        | 11    |           | S             |
| Diode Forward Voltage                   | $V_{SD}$      | $I_S = 1.25\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                     |        | 0.8   | 1.2       | V             |
| Dynamic <sup>b</sup>                    |               |                                                                                                                                   |        |       |           |               |
| Total Gate Charge                       | $Q_g$         | $V_{DS} = 20\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3.9\text{ A}$                                                            |        | 10    | 15        | nC            |
| Gate-Source Charge                      | $Q_{gs}$      |                                                                                                                                   |        | 1.6   |           |               |
| Gate-Drain Charge                       | $Q_{gd}$      |                                                                                                                                   |        | 2.1   |           |               |
| Gate Resistance                         | $R_g$         |                                                                                                                                   |        | 1.8   |           | $\Omega$      |
| Input Capacitance                       | $C_{iss}$     | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$                                                               |        | 540   |           | pF            |
| Output Capacitance                      | $C_{oss}$     |                                                                                                                                   |        | 80    |           |               |
| Reverse Transfer Capacitance            | $C_{rss}$     |                                                                                                                                   |        | 45    |           |               |
| Switching                               |               |                                                                                                                                   |        |       |           |               |
| Turn-On Delay Time                      | $t_{d(on)}$   | $V_{DD} = 20\text{ V}$ , $R_L = 20\text{ }\Omega$<br>$I_D \cong 1.0\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_G = 6\text{ }\Omega$ |        | 5     | 10        | ns            |
| Rise Time                               | $t_r$         |                                                                                                                                   |        | 12    | 20        |               |
| Turn-Off Delay Time                     | $t_{d(off)}$  |                                                                                                                                   |        | 20    | 30        |               |
| Fall Time                               | $t_f$         |                                                                                                                                   |        | 15    | 25        |               |

Notes:

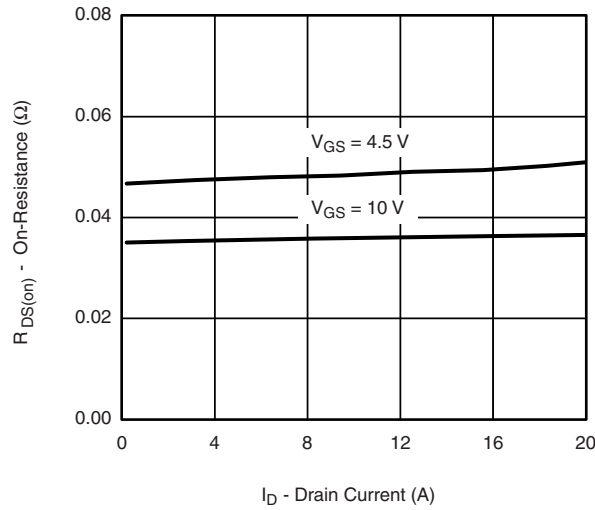
a. Pulse test;  $PW \leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

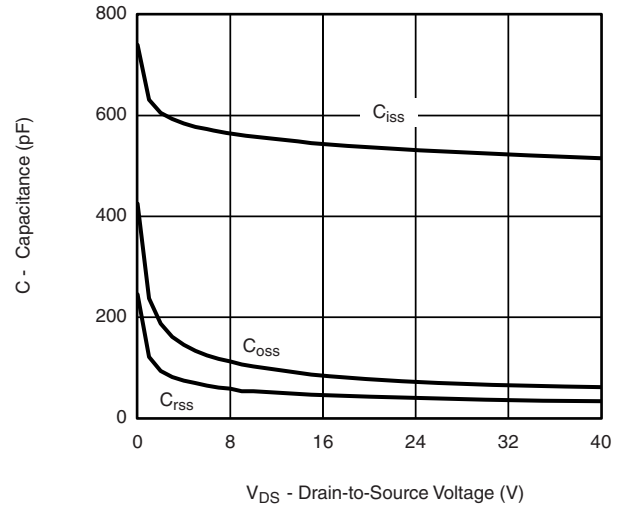
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS**  $25^\circ\text{C}$ , unless otherwise noted

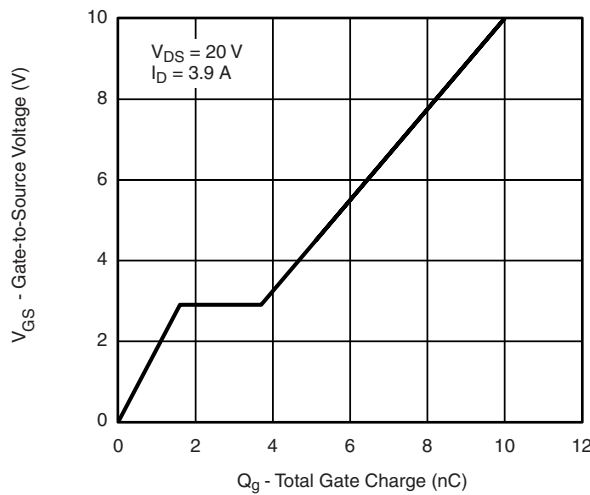
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



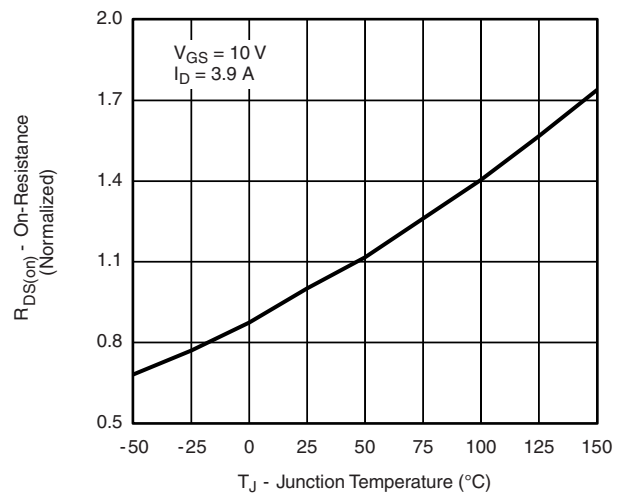
On-Resistance vs. Drain Current



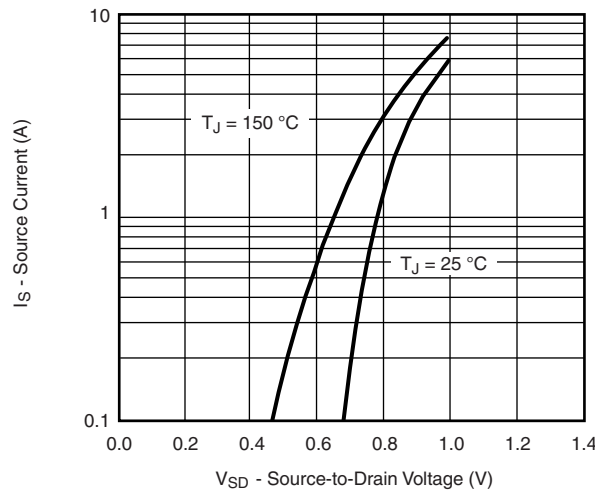
Capacitance



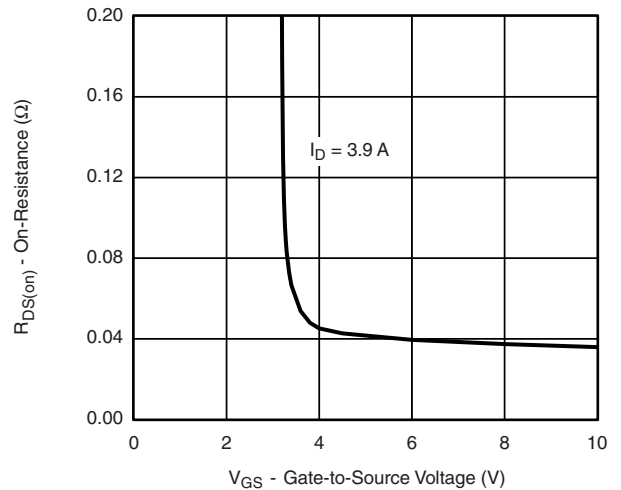
Gate Charge



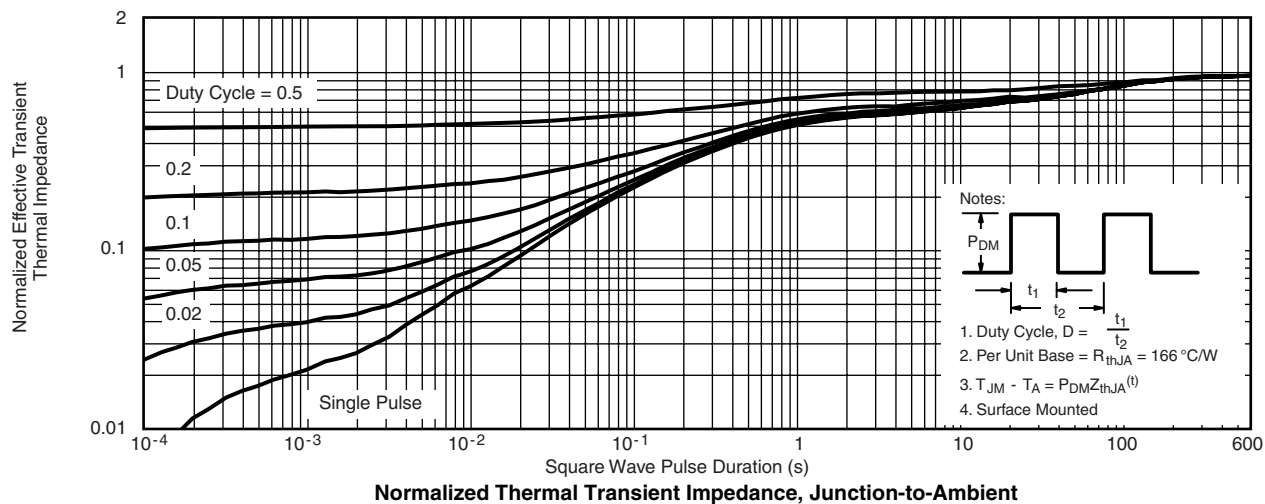
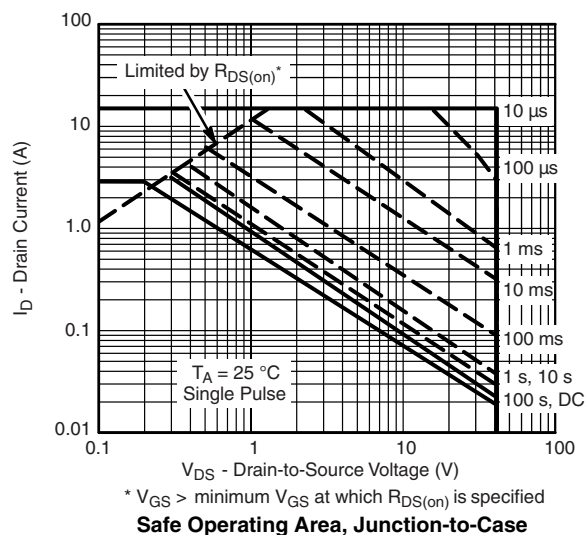
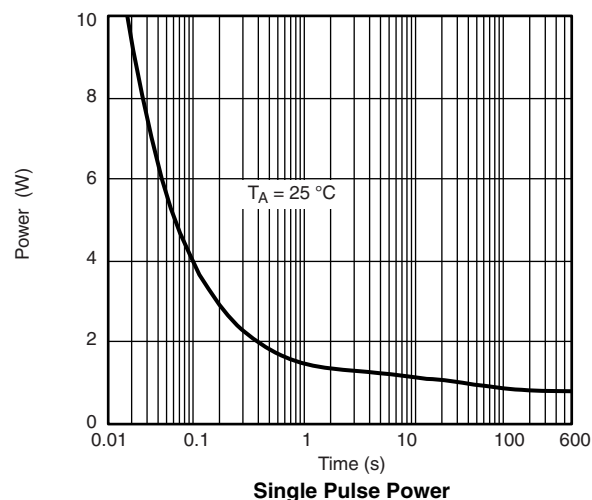
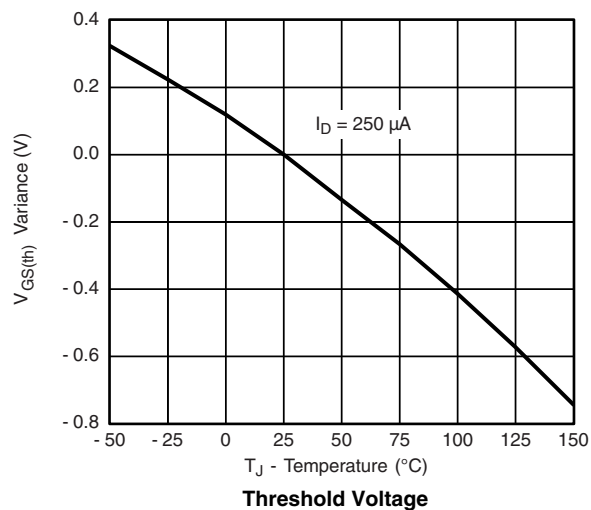
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

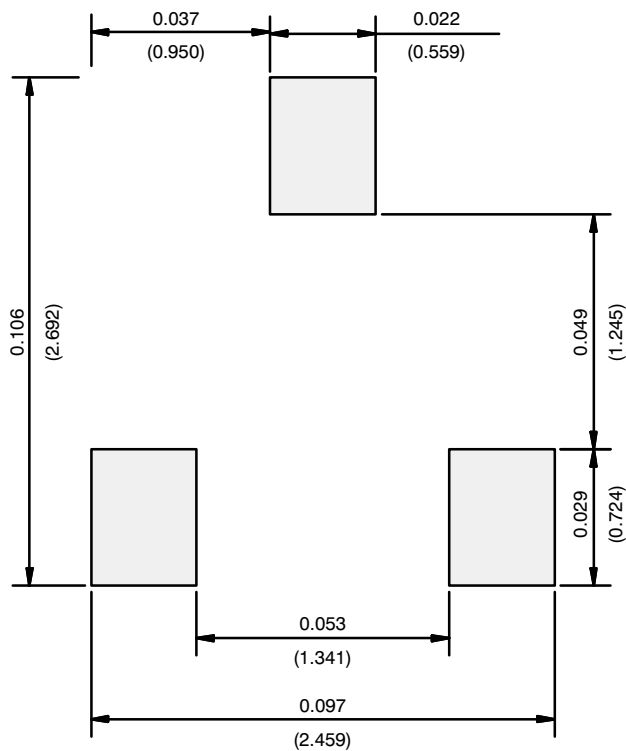
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## SOT-23 (TO-236): 3-LEAD



| Dim                            | MILLIMETERS |      | INCHES     |       |
|--------------------------------|-------------|------|------------|-------|
|                                | Min         | Max  | Min        | Max   |
| A                              | 0.89        | 1.12 | 0.035      | 0.044 |
| A <sub>1</sub>                 | 0.01        | 0.10 | 0.0004     | 0.004 |
| A <sub>2</sub>                 | 0.88        | 1.02 | 0.0346     | 0.040 |
| b                              | 0.35        | 0.50 | 0.014      | 0.020 |
| c                              | 0.085       | 0.18 | 0.003      | 0.007 |
| D                              | 2.80        | 3.04 | 0.110      | 0.120 |
| E                              | 2.10        | 2.64 | 0.083      | 0.104 |
| E <sub>1</sub>                 | 1.20        | 1.40 | 0.047      | 0.055 |
| e                              | 0.95 BSC    |      | 0.0374 Ref |       |
| e <sub>1</sub>                 | 1.90 BSC    |      | 0.0748 Ref |       |
| L                              | 0.40        | 0.60 | 0.016      | 0.024 |
| L <sub>1</sub>                 | 0.64 Ref    |      | 0.025 Ref  |       |
| S                              | 0.50 Ref    |      | 0.020 Ref  |       |
| q                              | 3°          | 8°   | 3°         | 8°    |
| ECN: S-03946-Rev. K, 09-Jul-01 |             |      |            |       |
| DWG: 5479                      |             |      |            |       |

## RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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