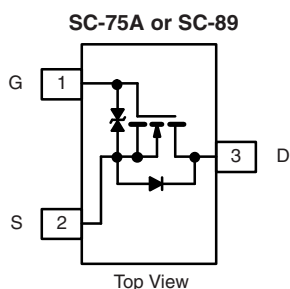


## N-Channel 1.8 V (G-S) MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (mA) |
|--------------|---------------------------|------------|
| 20           | 0.70 at $V_{GS} = 4.5$ V  | 600        |
|              | 0.85 at $V_{GS} = 2.5$ V  | 500        |
|              | 1.25 at $V_{GS} = 1.8$ V  | 350        |



### ORDERING INFORMATION

| Part Number                                      | Package          | Marking Code |
|--------------------------------------------------|------------------|--------------|
| Si1012R-T1-GE3 (Lead (Pb)-free and Halogen-free) | SC-75A (SOT-416) | C            |
| Si1012X-T1-GE3 (Lead (Pb)-free and Halogen-free) | SC-89 (SOT-490)  | A            |

### FEATURES

- TrenchFET® Power MOSFET: 1.8 V Rated
- Gate-Source ESD Protected: 2000 V
- High-Side Switching
- Low On-Resistance: 0.7  $\Omega$
- Low Threshold: 0.8 V (typ.)
- Fast Switching Speed: 10 ns
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?999912](http://www.vishay.com/doc?999912)



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

### APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers

### BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

| Parameter                                                 | Symbol         | 5 s         | Steady State | Unit |
|-----------------------------------------------------------|----------------|-------------|--------------|------|
| Drain-Source Voltage                                      | $V_{DS}$       | 20          |              | V    |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 6$     |              |      |
| Continuous Drain Current ( $T_J = 150$ °C) <sup>b</sup>   | $I_D$          | 600         | 500          | mA   |
|                                                           |                | 400         | 350          |      |
| Pulsed Drain Current <sup>a</sup>                         | $I_{DM}$       | 1000        |              |      |
| Continuous Source Current (Diode Conduction) <sup>b</sup> | $I_S$          | 275         | 250          |      |
| Maximum Power Dissipation <sup>b</sup> for SC-75          | $P_D$          | 175         | 150          | mW   |
|                                                           |                | 90          | 80           |      |
| Maximum Power Dissipation <sup>b</sup> for SC-89          |                | 275         | 250          |      |
|                                                           |                | 160         | 140          |      |
| Operating Junction and Storage Temperature Range          | $T_J, T_{stg}$ | - 55 to 150 |              | °C   |
| Gate-Source ESD Rating (HBM, Method 3015)                 | ESD            | 2000        |              | V    |

Notes:

a. Pulse width limited by maximum junction temperature.

b. Surface mounted on FR4 board.

| <b>SPECIFICATIONS</b> ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |              |                                                                                                                                      |      |           |         |               |
|------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------|------|-----------|---------|---------------|
| Parameter                                                                          | Symbol       | Test Conditions                                                                                                                      | Min. | Typ.      | Max.    | Unit          |
| <b>Static</b>                                                                      |              |                                                                                                                                      |      |           |         |               |
| Gate Threshold Voltage                                                             | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                   | 0.45 |           | 0.9     | V             |
| Gate-Body Leakage                                                                  | $I_{GSS}$    | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 4.5\text{ V}$                                                                                  |      | $\pm 0.5$ | $\pm 1$ | $\mu\text{A}$ |
| Zero Gate Voltage Drain Current                                                    | $I_{DSS}$    | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                       |      | 0.3       | 100     | nA            |
|                                                                                    |              | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 85\text{ }^\circ\text{C}$                                                    |      |           | 5       | $\mu\text{A}$ |
| On-State Drain Current <sup>a</sup>                                                | $I_{D(on)}$  | $V_{DS} = 5\text{ V}$ , $V_{GS} = 4.5\text{ V}$                                                                                      | 700  |           |         | mA            |
| Drain-Source On-State Resistance <sup>a</sup>                                      | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}$ , $I_D = 600\text{ mA}$                                                                                      |      | 0.41      | 0.70    | $\Omega$      |
|                                                                                    |              | $V_{GS} = 2.5\text{ V}$ , $I_D = 500\text{ mA}$                                                                                      |      | 0.53      | 0.85    |               |
|                                                                                    |              | $V_{GS} = 1.8\text{ V}$ , $I_D = 350\text{ mA}$                                                                                      |      | 0.70      | 1.25    |               |
| Forward Transconductance <sup>a</sup>                                              | $g_{fs}$     | $V_{DS} = 10\text{ V}$ , $I_D = 400\text{ mA}$                                                                                       |      | 1         |         | S             |
| Diode Forward Voltage <sup>a</sup>                                                 | $V_{SD}$     | $I_S = 150\text{ mA}$ , $V_{GS} = 0\text{ V}$                                                                                        |      | 0.8       | 1.2     | V             |
| <b>Dynamic<sup>b</sup></b>                                                         |              |                                                                                                                                      |      |           |         |               |
| Total Gate Charge                                                                  | $Q_g$        | $V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 250\text{ mA}$                                                             |      | 750       |         | pC            |
| Gate-Source Charge                                                                 | $Q_{gs}$     |                                                                                                                                      |      | 75        |         |               |
| Gate-Drain Charge                                                                  | $Q_{gd}$     |                                                                                                                                      |      | 225       |         |               |
| Turn-On Delay Time                                                                 | $t_{d(on)}$  | $V_{DD} = 10\text{ V}$ , $R_L = 47\text{ }\Omega$<br>$I_D \cong 200\text{ mA}$ , $V_{GEN} = 4.5\text{ V}$ , $R_g = 10\text{ }\Omega$ |      | 5         |         | ns            |
| Rise Time                                                                          | $t_r$        |                                                                                                                                      |      | 5         |         |               |
| Turn-Off Delay Time                                                                | $t_{d(off)}$ |                                                                                                                                      |      | 25        |         |               |
| Fall Time                                                                          | $t_f$        |                                                                                                                                      |      | 11        |         |               |

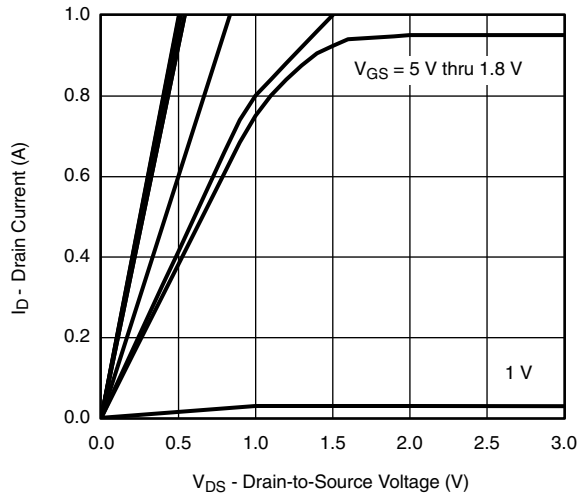
Notes:

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

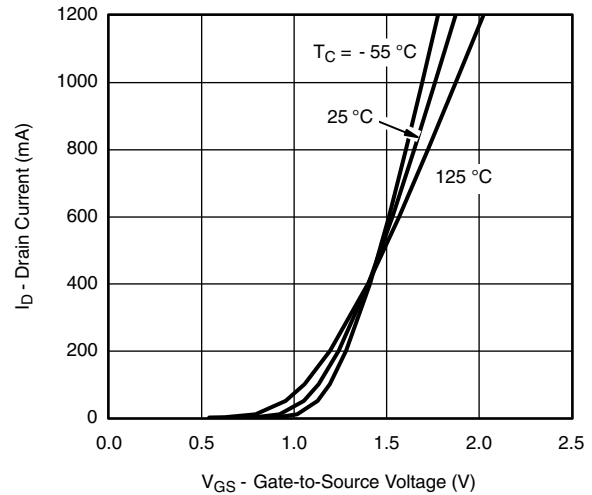
b. Guaranteed by design, not subject to production testing.

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.

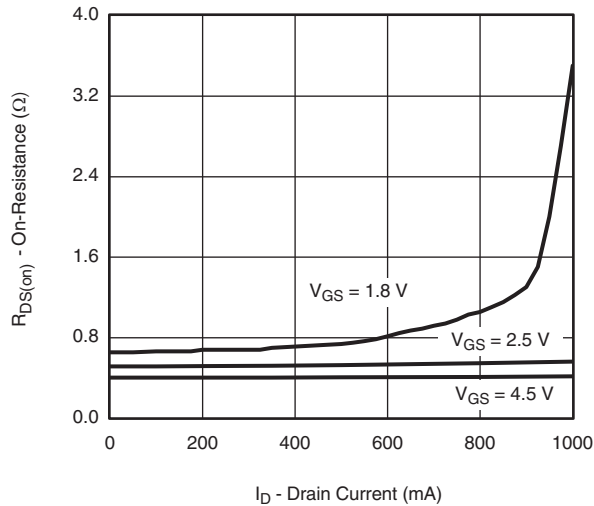
## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



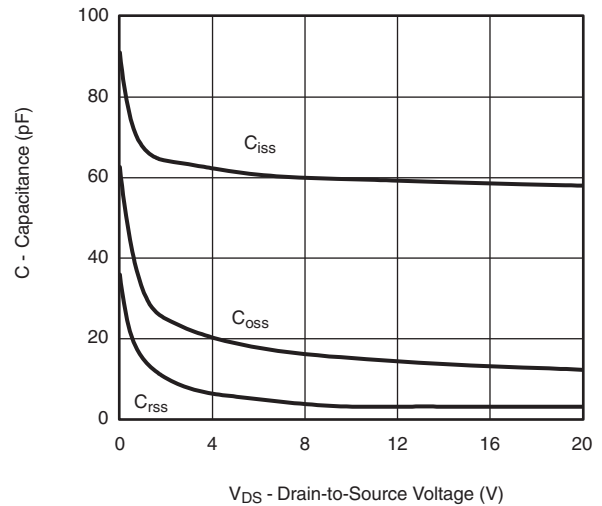
Output Characteristics



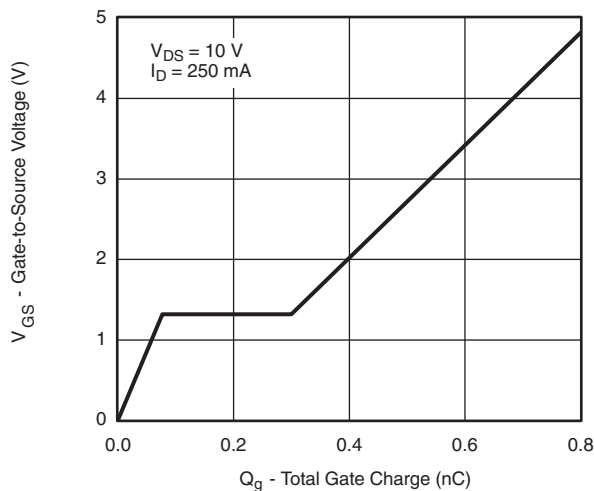
Transfer Characteristics



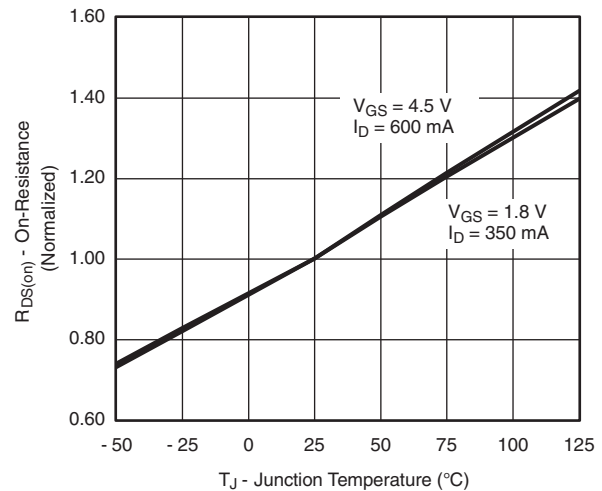
On-Resistance vs. Drain Current



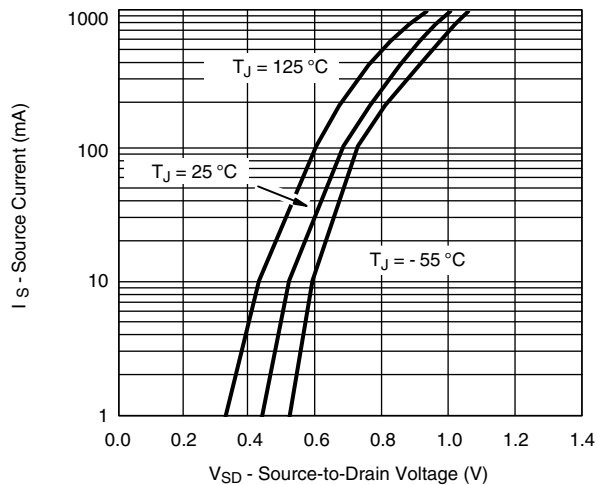
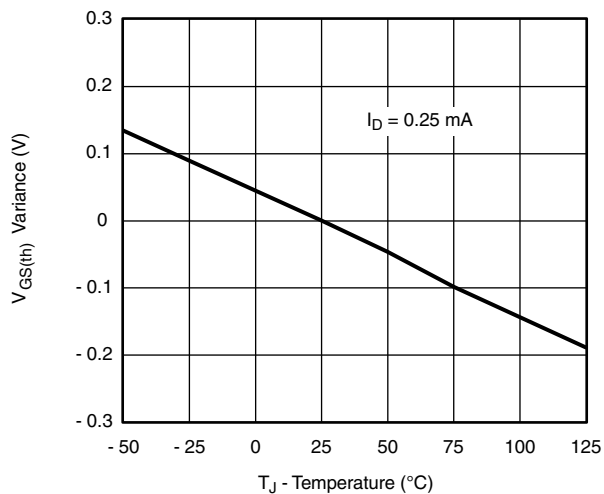
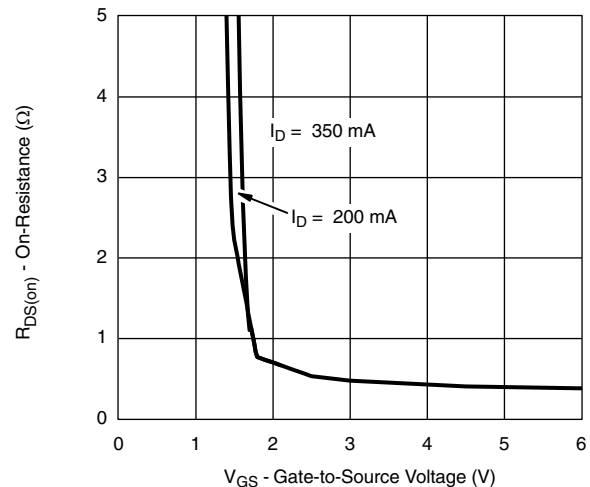
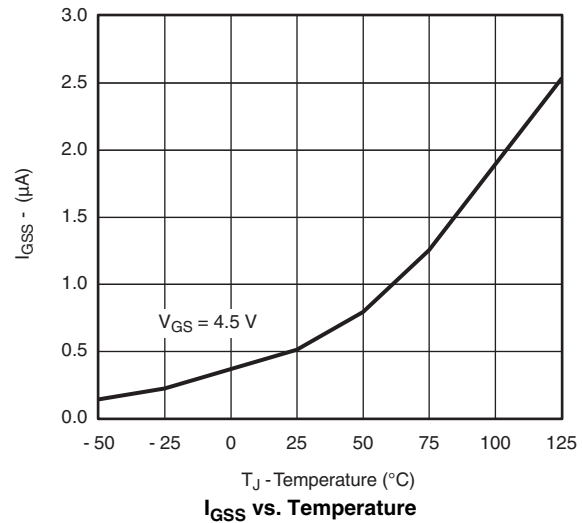
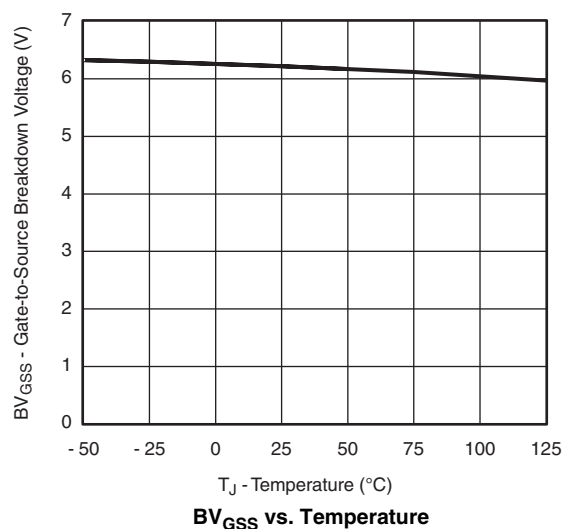
Capacitance



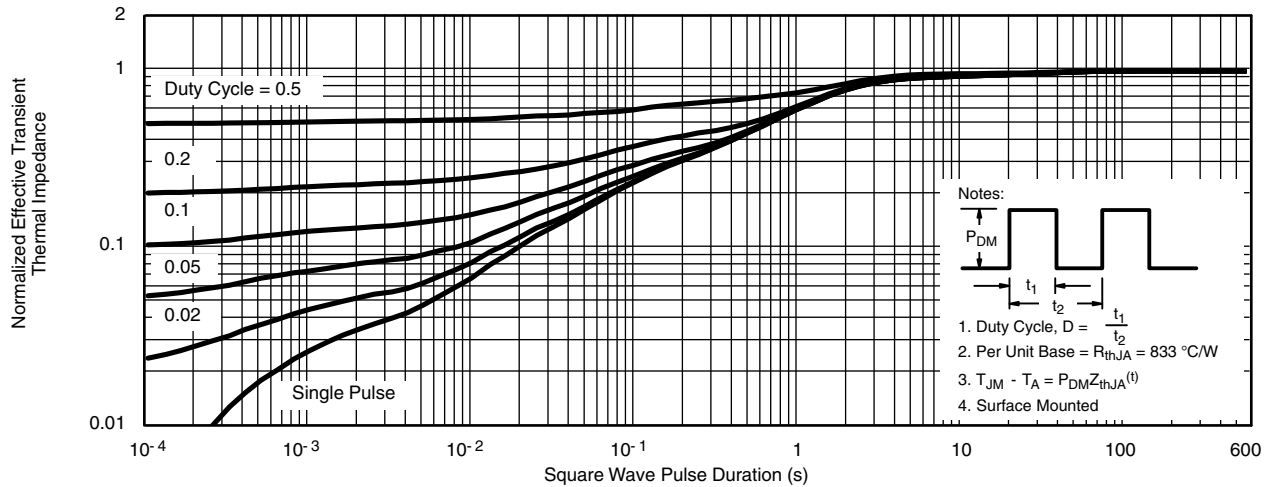
Gate Charge



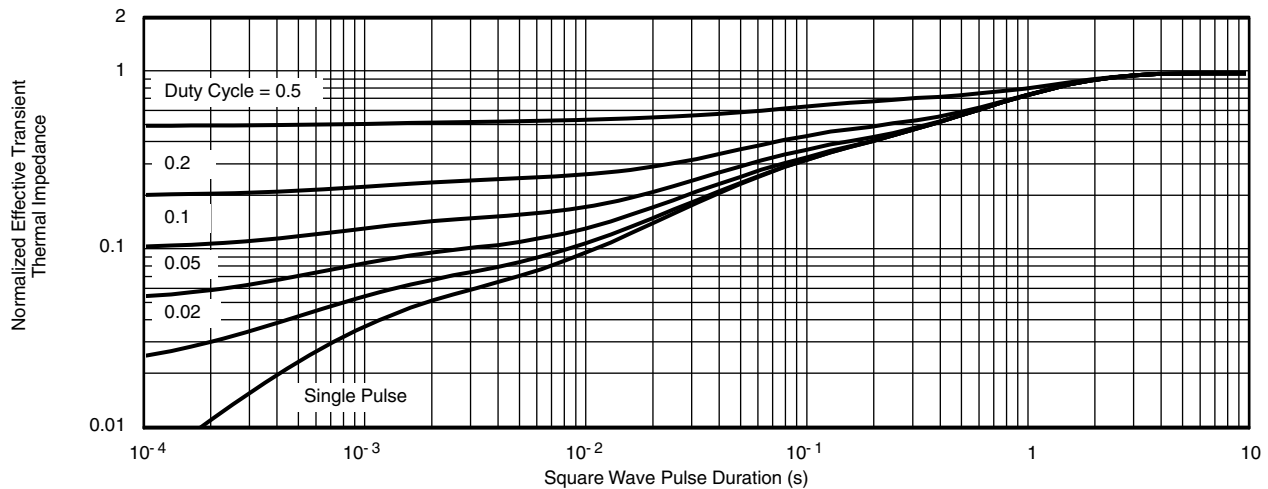
On-Resistance vs. Junction Temperature

**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)**Source-Drain Diode Forward Voltage****Threshold Voltage Variance vs. Temperature****On-Resistance vs. Gate-to-Source Voltage** **$I_{GSS}$  vs. Temperature** **$BV_{GSS}$  vs. Temperature**

## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



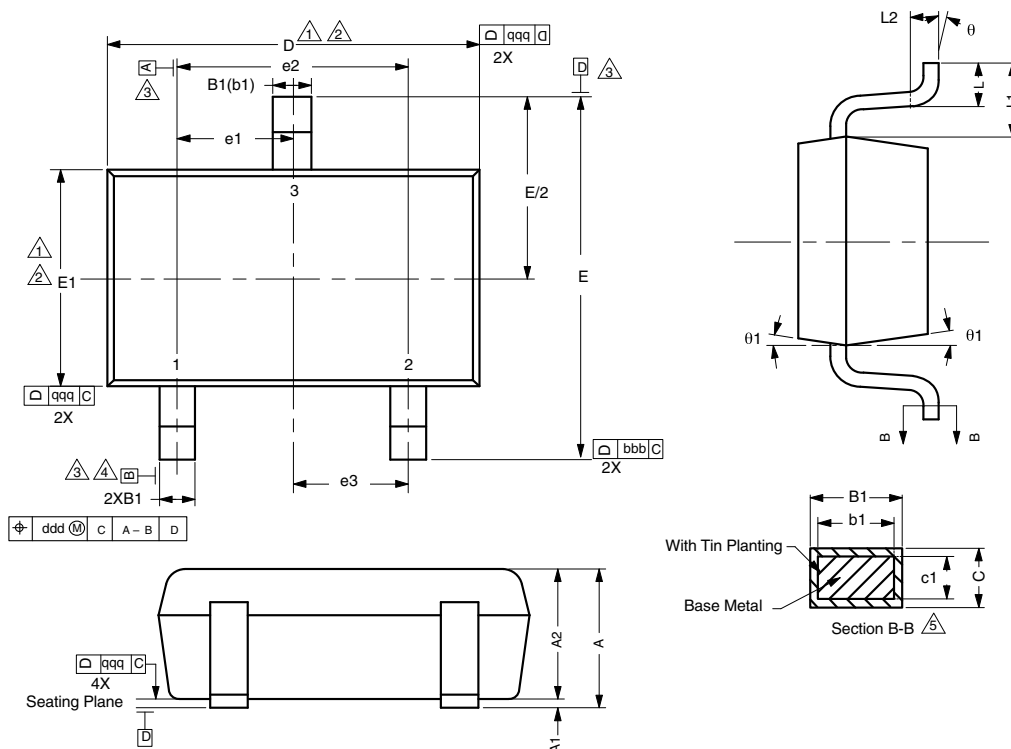
Normalized Thermal Transient Impedance, Junction-to-Ambient (SC-75A)



Normalized Thermal Transient Impedance, Junction-to-Foot

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## SC-75A: 3 Leads



DWG: 5868

### Notes

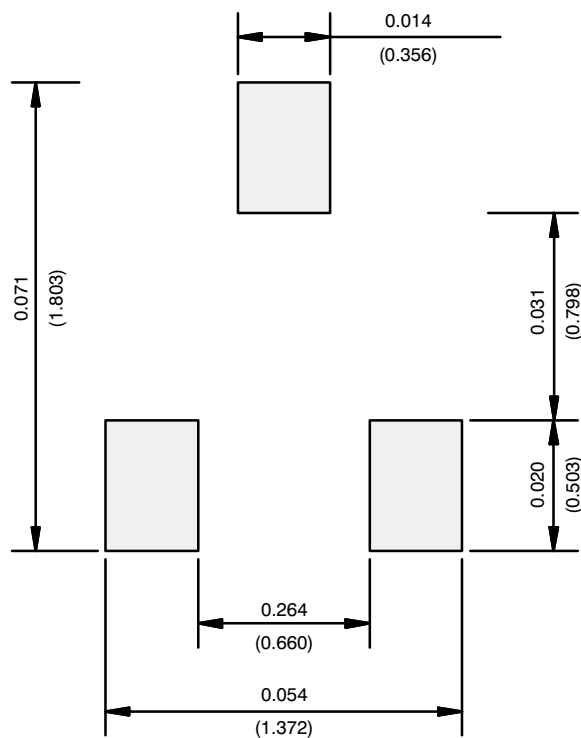
Dimensions in millimeters will govern.

1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash protrusions or gate burrs shall not exceed 0.10 mm per end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.10 mm per side.
2. Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3. Datums A, B and D to be determined 0.10 mm from the lead tip.
4. Terminal positions are shown for reference only.
5. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

| DIMENSIONS | TOLERANCES |
|------------|------------|
| aaa        | 0.10       |
| bbb        | 0.10       |
| ccc        | 0.10       |
| ddd        | 0.10       |

| DIM. | MILLIMETERS |       |      | NOTE |
|------|-------------|-------|------|------|
|      | MIN.        | NOM.  | MAX. |      |
| A    | -           | -     | 0.80 |      |
| A1   | 0.00        | -     | 0.10 |      |
| A2   | 0.65        | 0.70  | 0.80 |      |
| B1   | 0.19        | -     | 0.24 | 5    |
| b1   | 0.17        | -     | 0.21 |      |
| c    | 0.13        | -     | 0.15 | 5    |
| c1   | 0.10        | -     | 0.12 | 5    |
| D    | 1.48        | 1.575 | 1.68 | 1, 2 |
| E    | 1.50        | 1.60  | 1.70 |      |
| E1   | 0.66        | 0.76  | 0.86 | 1, 2 |
| e1   | 0.50 BSC    |       |      |      |
| e2   | 1.00 BSC    |       |      |      |
| e3   | 0.50 BSC    |       |      |      |
| L    | 0.15        | 0.205 | 0.30 |      |
| L1   | 0.40 ref.   |       |      |      |
| L2   | 0.15 BSC    |       |      |      |
| q    | 0°          | -     | 8°   |      |
| q1   | 4°          | -     | 10°  |      |

## RECOMMENDED MINIMUM PADS FOR SC-75A: 3-Lead



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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