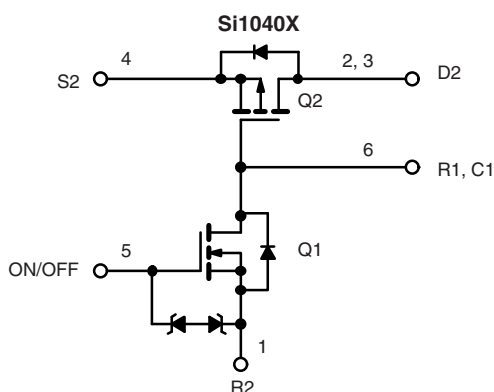


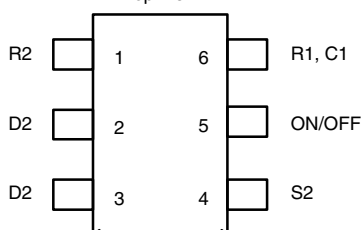
## Load Switch with Level-Shift

### PRODUCT SUMMARY

| $V_{DS2}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A)  |
|---------------|---------------------------|------------|
| 1.8 to 8      | 0.625 at $V_{IN} = 4.5$ V | $\pm 0.43$ |
|               | 0.890 at $V_{IN} = 2.5$ V | $\pm 0.36$ |
|               | 1.25 at $V_{IN} = 1.8$ V  | $\pm 0.3$  |

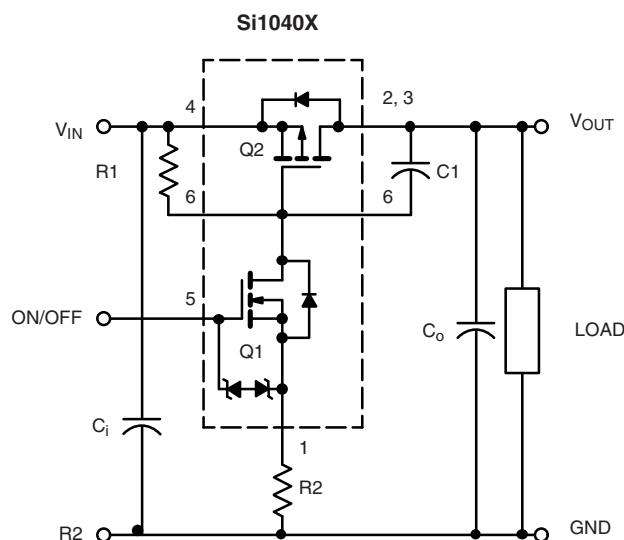


SC89-6  
Top View



Ordering Information: Si1040X-T1-GE3 (Lead (Pb)-free and Halogen-free)

### TYPICAL APPLICATION CIRCUIT



### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 1.8 V to 8 V Input
- 1.5 V to 8 V Logic Level Control
- Smallest LITTLE FOOT® Package: 1.6 mm x 1.6 mm
- 2000 V ESD Protection On Input Switch,  $V_{ON/OFF}$
- Adjustable Slew-Rate
- Compliant to RoHS Directive 2002/95/EC

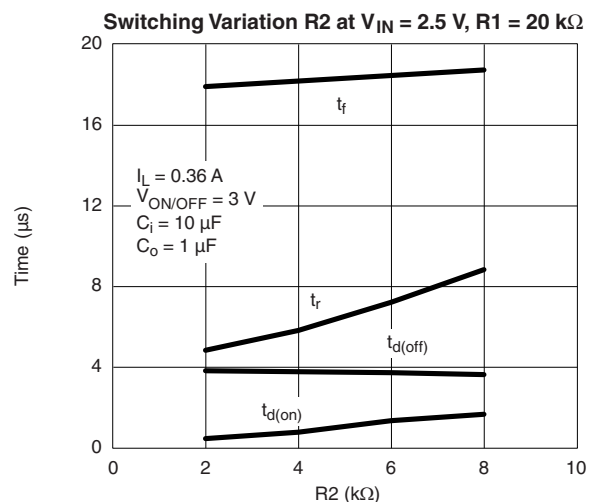
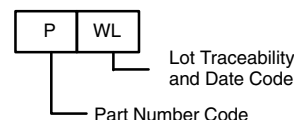


RoHS  
COMPLIANT  
HALOGEN  
FREE

### DESCRIPTION

The Si1040X includes a p- and n-Channel MOSFET in a single SC89-6 package. The low on-resistance p-channel TrenchFET is tailored for use as a load switch. The n-channel, with an external resistor, can be used as a level-shift to drive the p-channel load-switch. The n-channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The Si1040X operates on supply lines from 1.8 V to 8 V, and can drive loads up to 0.43 A.

### Marking Code



Note: For R2 switching variations with other  $V_{IN}/R1$  combinations See Typical Characteristics

**COMPONENTS**

|    |                            |                                                    |
|----|----------------------------|----------------------------------------------------|
| R1 | Pull-Up Resistor           | Typical 10 k $\Omega$ to 1 m $\Omega$ <sup>a</sup> |
| R2 | Optional Slew-Rate Control | Typical 0 to 100 k $\Omega$ <sup>a</sup>           |
| C1 | Optional Slew-Rate Control | Typical 1000 pF                                    |

Notes:

a. Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on.

The Si1040X is ideally suited for high-side load switching in portable applications. The integrated N-Channel level-shift device saves space by reducing external components. The slew rate is set externally so that rise-times can be tailored to different load types.

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

| Parameter                                                          | Symbol                     | Limit       | Unit             |
|--------------------------------------------------------------------|----------------------------|-------------|------------------|
| Input Voltage                                                      | $V_{IN}$                   | 8           | V                |
| ON/OFF Voltage                                                     | $V_{ON/OFF}$               | 8           |                  |
| Load Current                                                       | Continuous <sup>a, b</sup> | $\pm 0.43$  | A                |
|                                                                    | Pulsed <sup>b, c</sup>     | $\pm 1.0$   |                  |
| Continuous Intrinsic Diode Conduction <sup>a</sup>                 | $I_S$                      | - 0.15      |                  |
| Maximum Power Dissipation <sup>a</sup>                             | $P_D$                      | 0.174       | W                |
| Operating Junction and Storage Temperature Range                   | $T_J, T_{stg}$             | - 55 to 150 | $^\circ\text{C}$ |
| ESD Rating, MIL-STD-883D Human Body Model (100 pF, 1500 $\Omega$ ) | ESD                        | 2           | kV               |

**THERMAL RESISTANCE RATINGS**

| Parameter                                                     | Symbol     | Typical | Maximum | Unit               |
|---------------------------------------------------------------|------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient (Continuous Current) <sup>a</sup> | $R_{thJA}$ | 600     | 720     | $^\circ\text{C/W}$ |
| Maximum Junction-to-Foot (Q2)                                 | $R_{thJC}$ | 450     | 540     |                    |

Notes:

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

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

| Parameter                          | Symbol       | Test Conditions                                                                | Min. | Typ.  | Max.  | Unit          |
|------------------------------------|--------------|--------------------------------------------------------------------------------|------|-------|-------|---------------|
| <b>OFF Characteristics</b>         |              |                                                                                |      |       |       |               |
| Reverse Leakage Current            | $I_{FL}$     | $V_{IN} = 8\text{ V}, V_{ON/OFF} = 0\text{ V}$                                 |      |       | 1     | $\mu\text{A}$ |
| Diode Forward Voltage              | $V_{SD}$     | $I_S = - 0.15\text{ A}$                                                        |      | 0.85  | 1.2   | V             |
| <b>ON Characteristics</b>          |              |                                                                                |      |       |       |               |
| Input Voltage Range                | $V_{IN}$     |                                                                                | 1.8  |       | 8     | V             |
| On-Resistance (P-Channel) at 1 A   | $R_{DS(on)}$ | $V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 4.5\text{ V}, I_D = 0.43\text{ A}$        |      | 0.500 | 0.625 | $\Omega$      |
|                                    |              | $V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 2.5\text{ V}, I_D = 0.36\text{ A}$        |      | 0.710 | 0.890 |               |
|                                    |              | $V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 1.8\text{ V}, I_D = 0.3\text{ A}$         |      | 1.0   | 1.25  |               |
| On-State (P-Channel) Drain Current | $I_{D(on)}$  | $V_{IN-OUT} \leq 0.2\text{ V}, V_{IN} = 5\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1    |       |       | A             |
|                                    |              | $V_{IN-OUT} \leq 0.3\text{ V}, V_{IN} = 3\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 0.8  |       |       |               |

Notes:

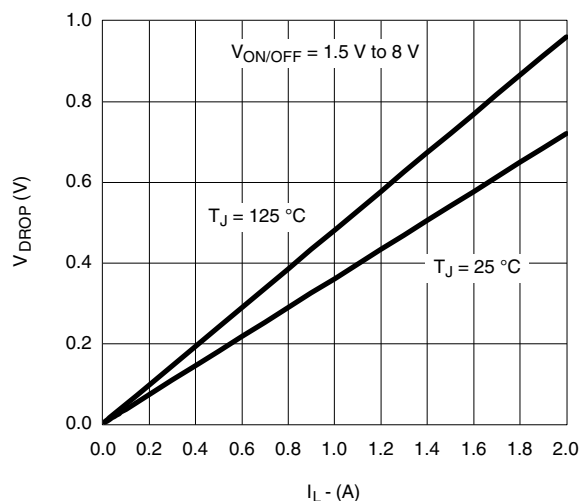
a. Surface mounted on FR4 board.

b.  $V_{IN} = 8\text{ V}, V_{ON/OFF} = 8\text{ V}, T_A = 25^\circ\text{C}$ .

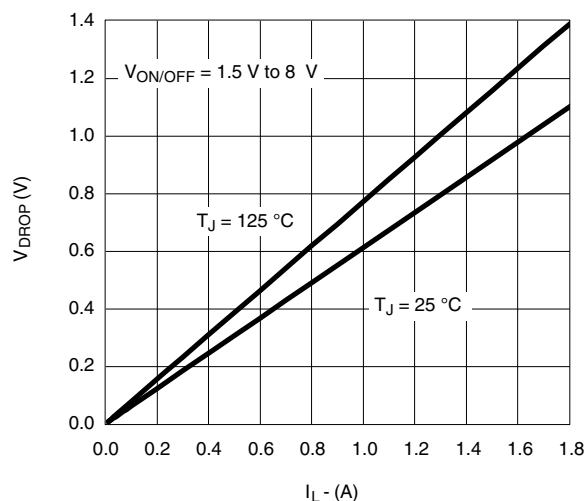
c. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

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.

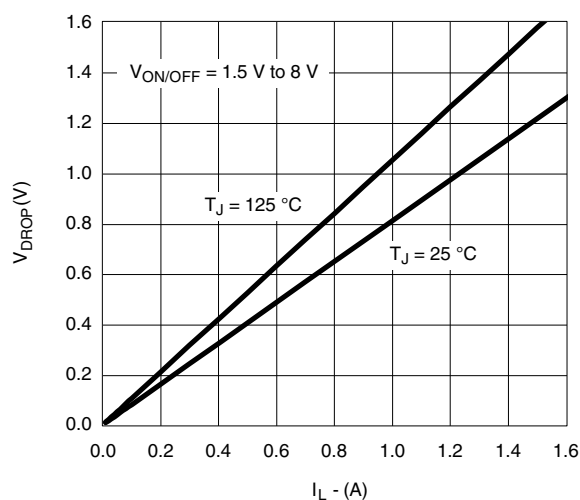
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



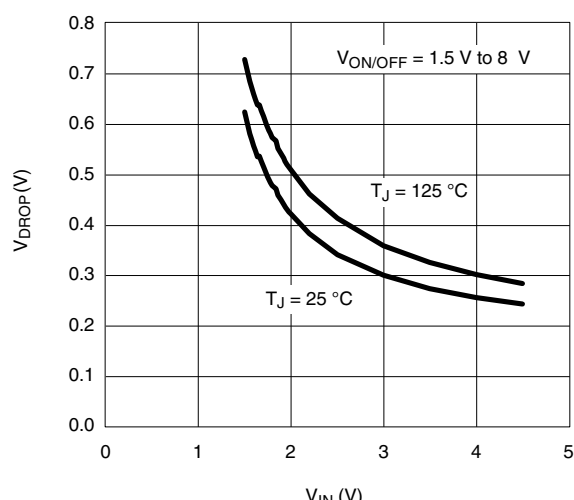
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 4.5$  V



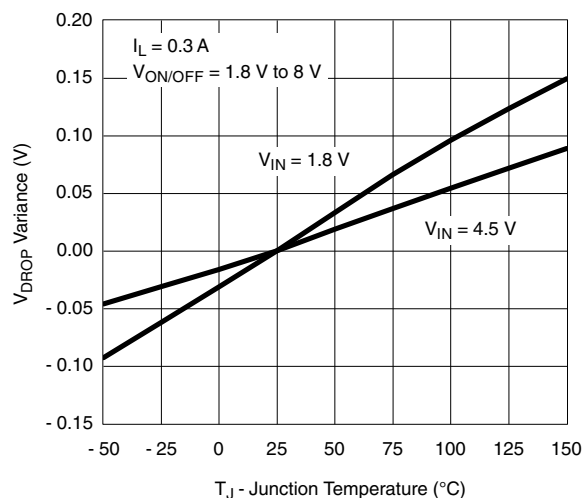
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 2.5$  V



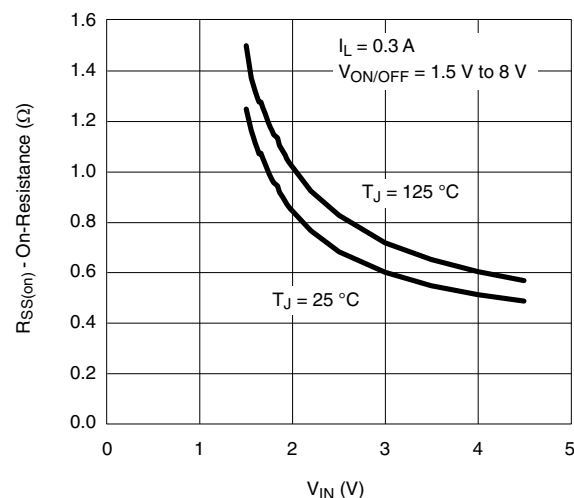
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 1.8$  V



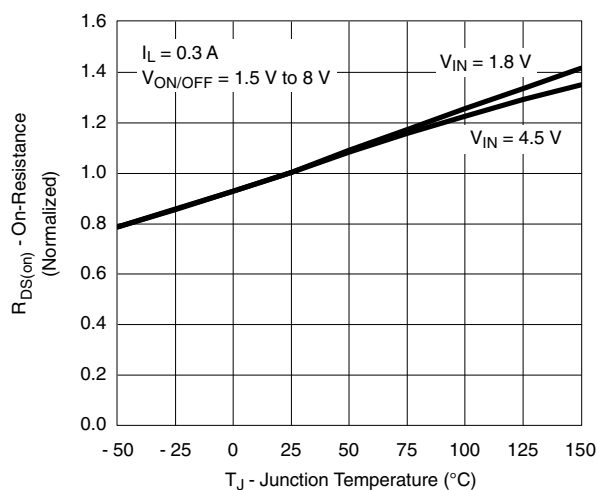
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 0.5$  V



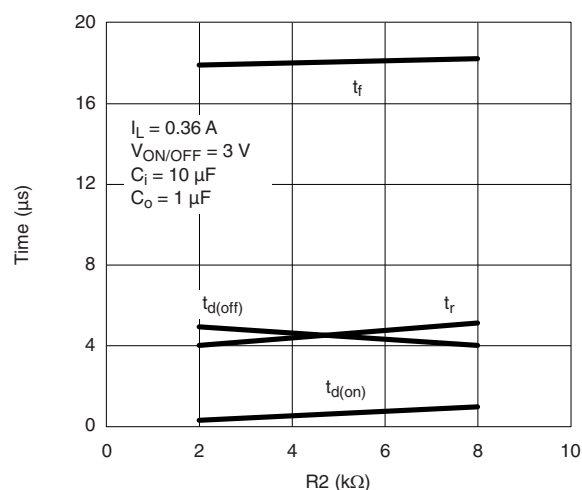
$V_{DROP}$  Variance vs. Junction Temperature



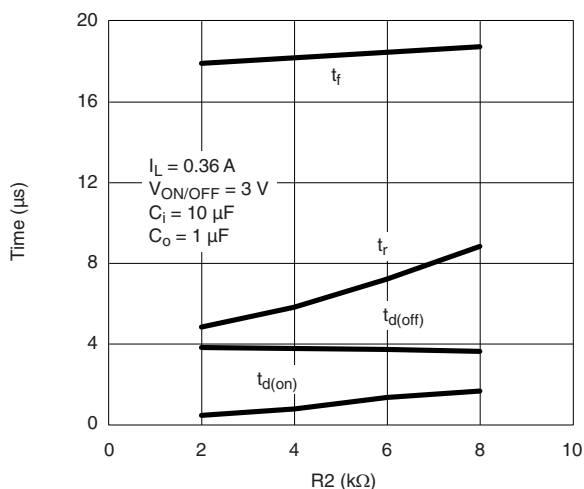
On-Resistance vs. Input Voltage

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

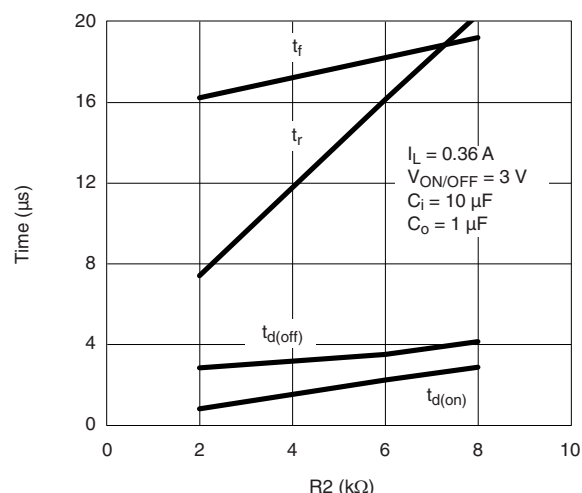
**Normalized On-Resistance  
vs. Junction Temperature**



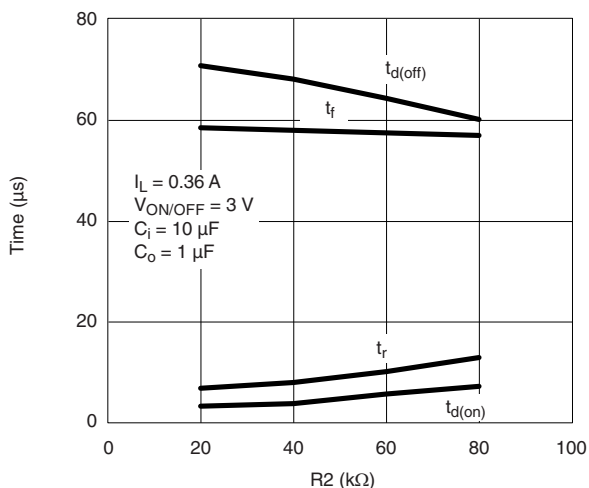
**Switching Variation  
R2 at  $V_{IN} = 4.5$  V,  $R_1 = 20$  k $\Omega$**



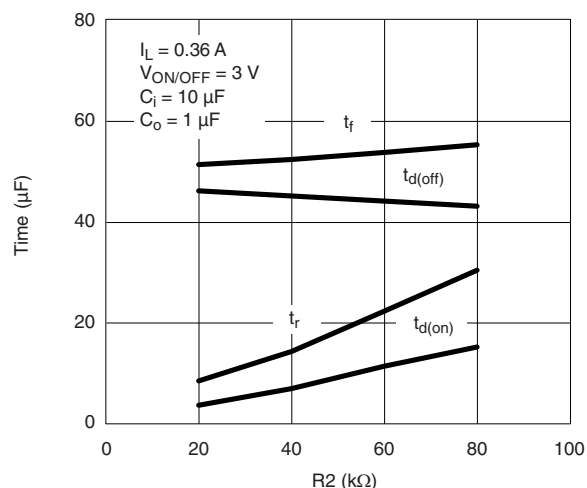
**Switching Variation  
R2 at  $V_{IN} = 2.5$  V,  $R_1 = 20$  k $\Omega$**



**Switching Variation  
R2 at  $V_{IN} = 1.8$  V,  $R_1 = 20$  k $\Omega$**

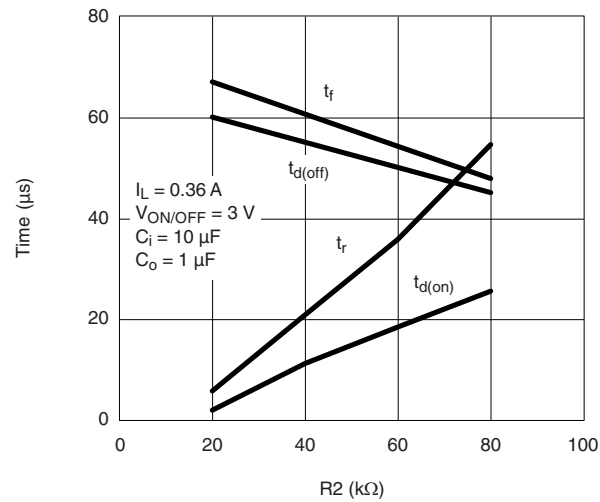


**Switching Variation  
R2 at  $V_{IN} = 4.5$  V,  $R_1 = 300$  k $\Omega$**

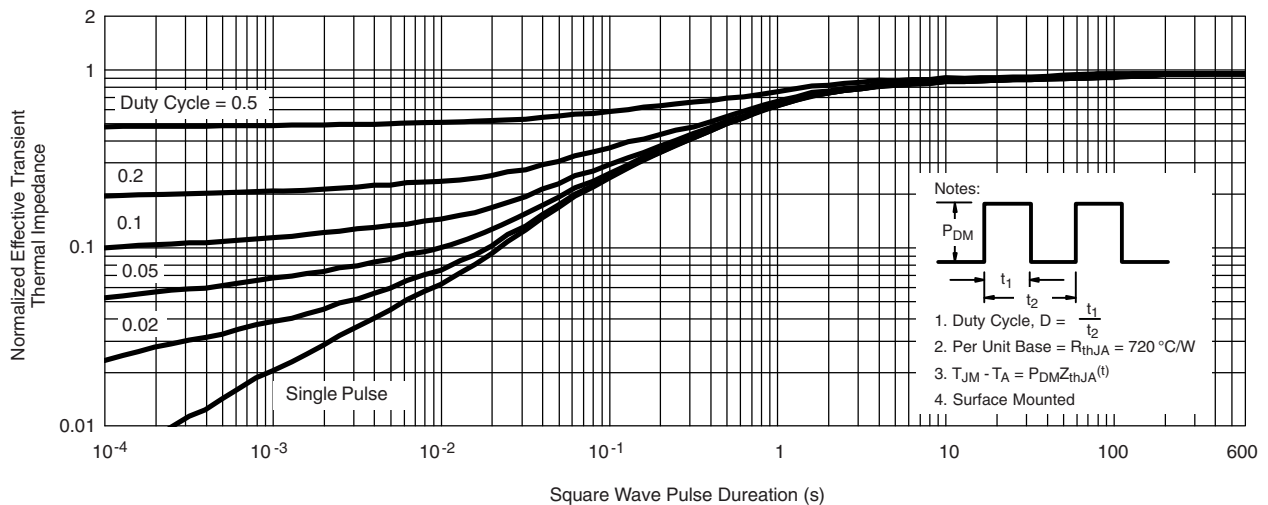


**Switching Variation  
R2 at  $V_{IN} = 2.5$  V,  $R_1 = 300$  k $\Omega$**

## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



**Switching Variation**  
R2 at  $V_{IN} = 1.8 \text{ V}$ ,  $R1 = 300 \text{ kΩ}$

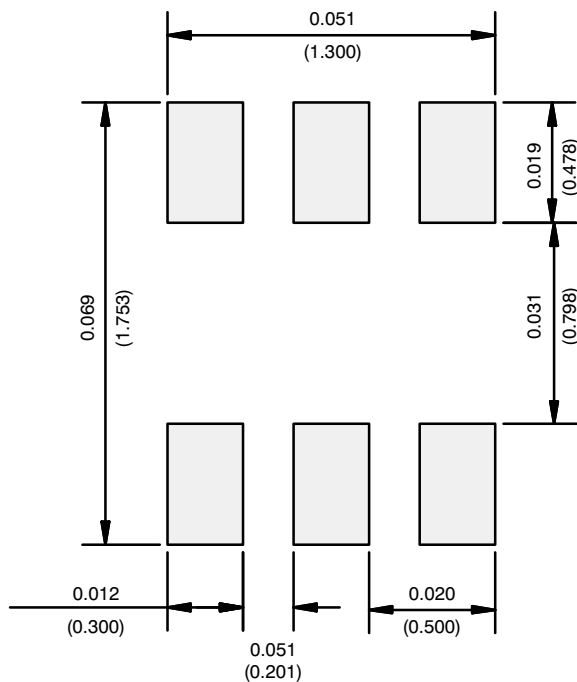


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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## RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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