



New Product

SUD50N03-06AP

Vishay Siliconix

## N-Channel 30-V (D-S) MOSFET

| PRODUCT SUMMARY |                           |                           |             |
|-----------------|---------------------------|---------------------------|-------------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>a, e</sup> | $Q_g$ (Typ) |
| 30              | 0.0057 @ $V_{GS} = 10$ V  | 90                        | 30          |
|                 | 0.0078 @ $V_{GS} = 4.5$ V | 77                        |             |

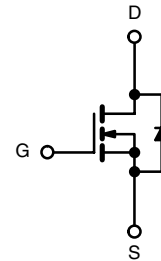
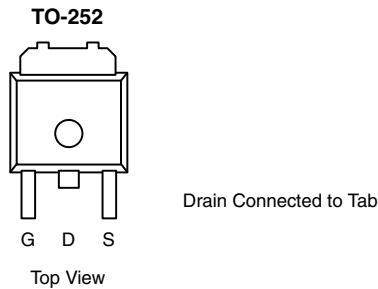
### FEATURES

- TrenchFET® Power MOSFET
- Optimized for Low-Side Synchronous Rectifier Operation
- 100%  $R_g$  Tested



### APPLICATIONS

- DC/DC Converters
- Synchronous Rectifiers



Ordering Information: SUD50N03-06AP—E3 (Lead (Pb)-free)

N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                          |                |                     |                  |
|---|--------------------------|----------------|---------------------|------------------|
| Parameter   |                          | Symbol         | Limit               | Unit             |
| Drain-Source Voltage  |                          | $V_{DS}$       | 30                  | V                |
| Gate-Source Voltage   |                          | $V_{GS}$       | $\pm 20$            |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )                      | $T_C = 25^\circ\text{C}$ | $I_D$          | 90 <sup>a, e</sup>  | A                |
|   | $T_C = 70^\circ\text{C}$ |                | 75 <sup>a, e</sup>  |                  |
|   | $T_A = 25^\circ\text{C}$ |                | 30 <sup>b, c</sup>  |                  |
|   | $T_A = 70^\circ\text{C}$ |                | 25 <sup>b, c</sup>  |                  |
| Pulsed Drain Current  |                          | $I_{DM}$       | 100                 |                  |
| Continuous Source-Drain Diode Current                                       | $T_C = 25^\circ\text{C}$ | $I_S$          | 55 <sup>a, e</sup>  |                  |
|   | $T_A = 25^\circ\text{C}$ |                | 6.7 <sup>b, c</sup> |                  |
| Avalanche Current Pulse   |                          | $I_{AS}$       | 45                  | mJ               |
| Single Pulse Avalanche Energy   |                          |                | $E_{AS}$            |                  |
| Maximum Power Dissipation   | $T_C = 25^\circ\text{C}$ | $P_D$          | 83                  | W                |
|   | $T_C = 70^\circ\text{C}$ |                | 58                  |                  |
|   | $T_A = 25^\circ\text{C}$ |                | 10 <sup>b, c</sup>  |                  |
|   | $T_A = 70^\circ\text{C}$ |                | 7 <sup>b, c</sup>   |                  |
| Operating Junction and Storage Temperature Range                            |                          | $T_J, T_{stg}$ | -55 to 175          | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS                  |                 |            |         |         |                    |
|---|-----------------|------------|---------|---------|--------------------|
| Parameter                                   |                 | Symbol     | Typical | Maximum | Unit               |
| Maximum Junction-to-Ambient <sup>b, d</sup> | $t \leq 10$ sec | $R_{thJA}$ | 12      | 15      | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                    | Steady State    | $R_{thJC}$ | 1.5     | 1.8     |                    |

Notes:

- Based on  $T_C = 25^\circ\text{C}$ .
- Surface mounted on 1" x 1" FR4 board.
- $t = 10$  sec
- Maximum under steady state conditions is  $50^\circ\text{C/W}$ .
- Calculated based on maximum junction temperature. Package limitation current is 50 A.

| SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED) |                                      |   |           |        |        |       |
|--|--------------------------------------|---|-----------|--------|--------|-------|
| Parameter  | Symbol                               | Test Condition  | Min       | Typ    | Max    | Unit  |
| <b>Static</b>  |                                      |   |           |        |        |       |
| Drain-Source Breakdown Voltage                                 | V <sub>DS</sub>                      | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA  | 30        |        |        | V     |
| V <sub>DS</sub> Temperature Coefficient                        | ΔV <sub>DS</sub> /T <sub>J</sub>     | I <sub>D</sub> = 250 μA   |           | 25     |        | mV/°C |
| V <sub>GS(th)</sub> Temperature Coefficient                    | ΔV <sub>GS(th)</sub> /T <sub>J</sub> |   |           | -6.3   |        |       |
| Gate-Source Threshold Voltage                                  | V <sub>GS(th)</sub>                  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA   | 1.2       |        | 2.4    | V     |
| Gate-Source Leakage  | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V  |           |        | ±100   | nA    |
| Zero Gate Voltage Drain Current                                | I <sub>DSS</sub>                     | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V   |           |        | 1      | μA    |
|  |                                      | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C  |           |        | 10     |       |
| On-State Drain Current <sup>a</sup>                            | I <sub>D(on)</sub>                   | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V   | 50        |        |        | A     |
| Drain-Source On-State Resistance <sup>a</sup>                  | r <sub>DS(on)</sub>                  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A   |           | 0.0046 | 0.0057 | Ω     |
|  |                                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A  |           | 0.0062 | 0.0078 |       |
| Forward Transconductance <sup>a</sup>                          | g <sub>fs</sub>                      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A   |           | 70     |        | S     |
| <b>Dynamic<sup>b</sup></b>                                     |                                      |   |           |        |        |       |
| Input Capacitance  | C <sub>iss</sub>                     | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz  |           | 3800   |        | pF    |
| Output Capacitance   | C <sub>oss</sub>                     |   |           | 615    |        |       |
| Reverse Transfer Capacitance                                   | C <sub>rss</sub>                     |   |           | 305    |        |       |
| Total Gate Charge  | Q <sub>g</sub>                       | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A   |           | 62     | 95     | nC    |
|  |                                      | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 25 A  |           | 30     | 45     |       |
| Gate-Source Charge   | Q <sub>gs</sub>                      | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 25 A  |           | 11     |        | nC    |
| Gate-Drain Charge  | Q <sub>gd</sub>                      |   |           | 9      |        |       |
| Gate Resistance  | R <sub>g</sub>                       |   | f = 1 MHz |        | 0.9    |       |
| Turn-On Delay Time   | t <sub>d(on)</sub>                   | V <sub>DD</sub> = 15 V, R <sub>L</sub> = 0.5 Ω<br>I <sub>D</sub> ≅ 30 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω  |           | 12     | 18     | ns    |
| Rise Time  | t <sub>r</sub>                       |   |           | 10     | 15     |       |
| Turn-Off Delay Time  | t <sub>d(off)</sub>                  |   |           | 30     | 45     |       |
| Fall Time  | t <sub>f</sub>                       |   |           | 8      | 12     |       |
| Turn-On Delay Time   | t <sub>d(on)</sub>                   | V <sub>DD</sub> = 15 V, R <sub>L</sub> = 0.6 Ω<br>I <sub>D</sub> ≅ 25 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω |           | 26     | 40     | ns    |
| Rise Time  | t <sub>r</sub>                       |   |           | 230    | 345    |       |
| Turn-Off Delay Time  | t <sub>d(off)</sub>                  |   |           | 25     | 40     |       |
| Fall Time  | t <sub>f</sub>                       |   |           | 9      | 14     |       |
| <b>Drain-Source Body Diode Characteristics</b>                 |                                      |   |           |        |        |       |
| Continuous Source-Drain Diode Current                          | I <sub>S</sub>                       | T <sub>C</sub> = 25°C   |           |        | 55°    | A     |
| Pulse Diode Forward Current <sup>a</sup>                       | I <sub>SM</sub>                      |   |           |        | 100    |       |
| Body Diode Voltage   | V <sub>SD</sub>                      | I <sub>S</sub> = 6.7 A  |           | 0.9    | 1.5    | V     |
| Body Diode Reverse Recovery Time                               | t <sub>rr</sub>                      | I <sub>F</sub> = 6.7 A, di/dt = 100 A/μs, T <sub>J</sub> = 25°C   |           | 65     | 100    | ns    |
| Body Diode Reverse Recovery Charge                             | Q <sub>rr</sub>                      |   |           | 38     | 60     | nC    |
| Reverse Recovery Fall Time                                     | t <sub>a</sub>                       |   |           | 50     |        | ns    |
| Reverse Recovery Rise Time                                     | t <sub>b</sub>                       |   |           | 15     |        |       |

## Notes

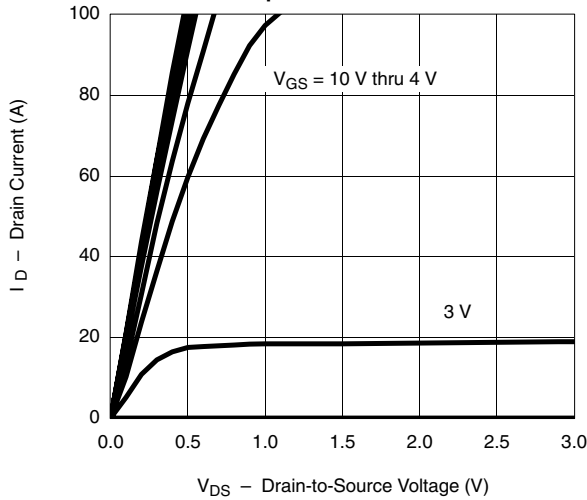
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Calculated based on maximum junction temperature. Package limitation current is 50 A.

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.

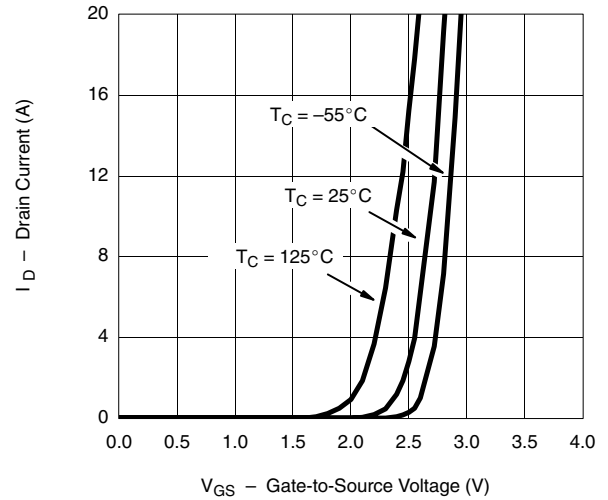


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

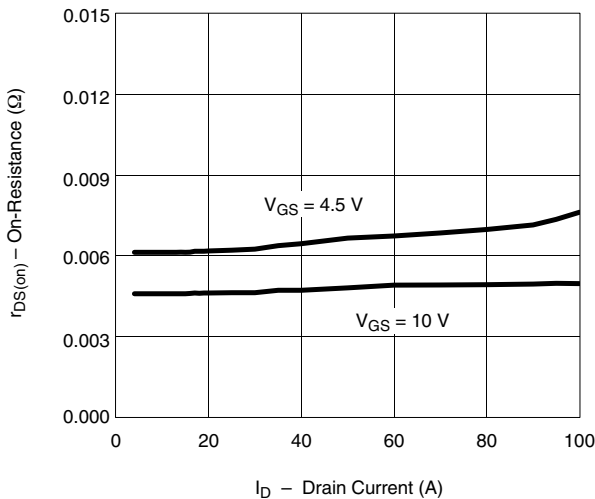
**Output Characteristics**



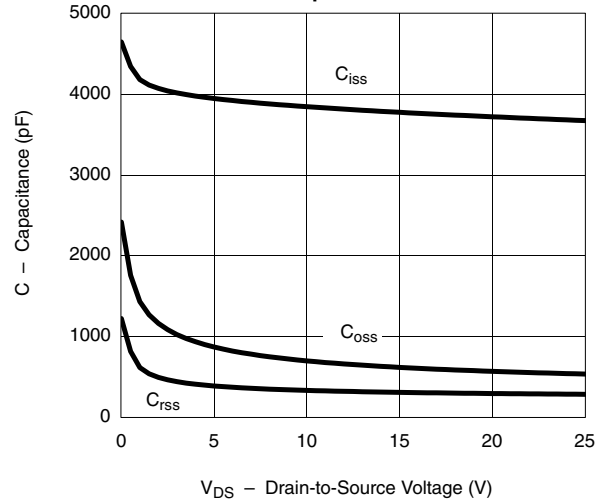
**Transfer Characteristics**



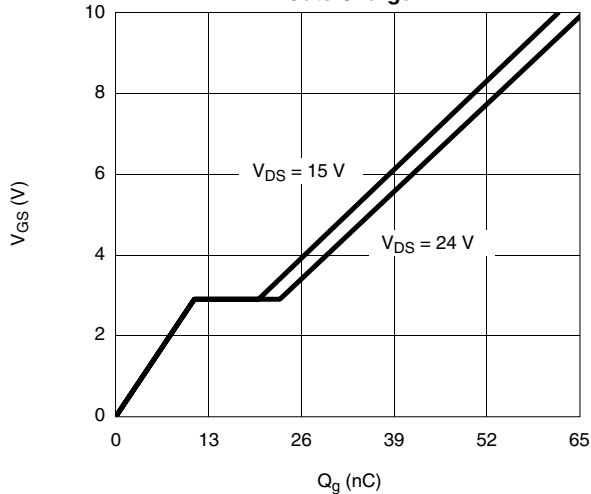
**On-Resistance vs. Drain Current**



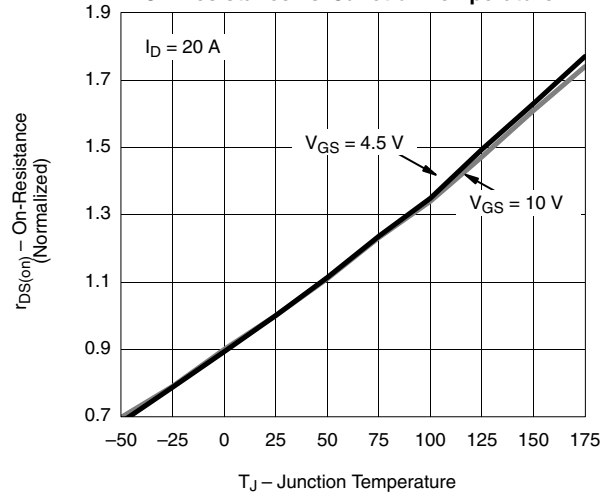
**Capacitance**



**Gate Charge**

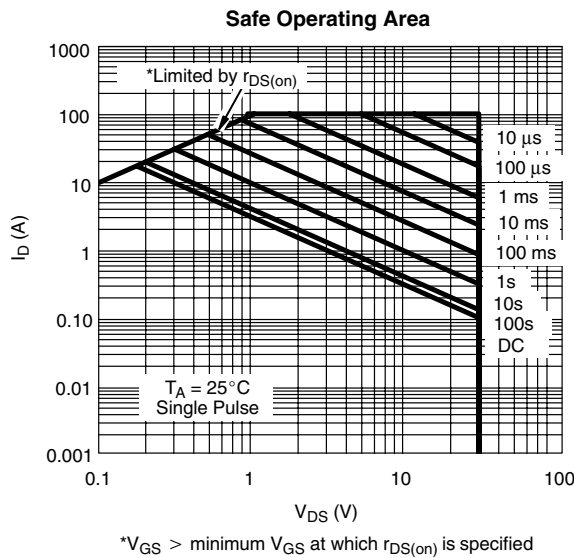
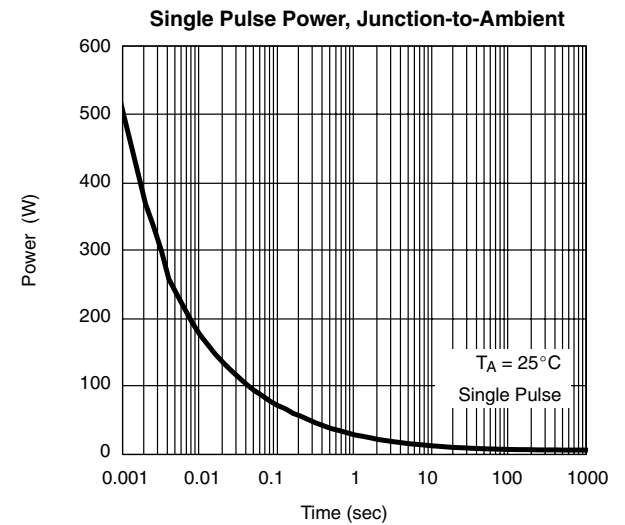
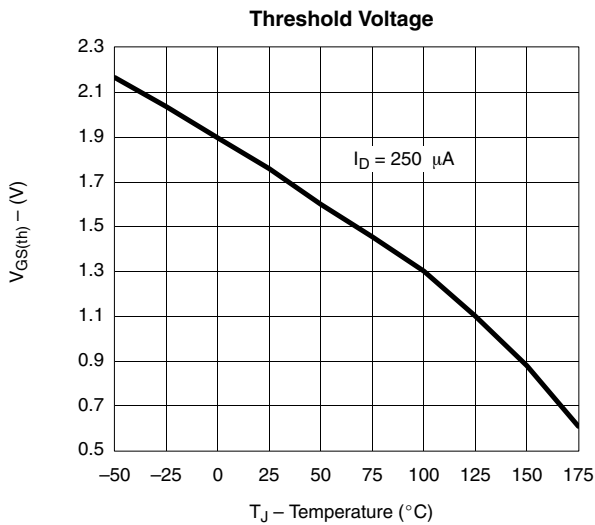
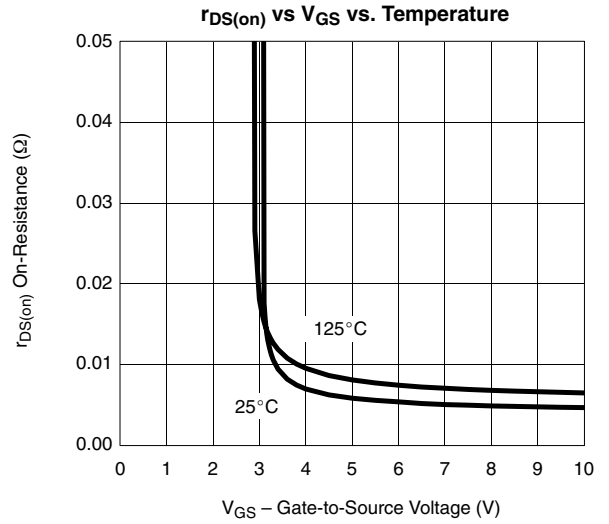
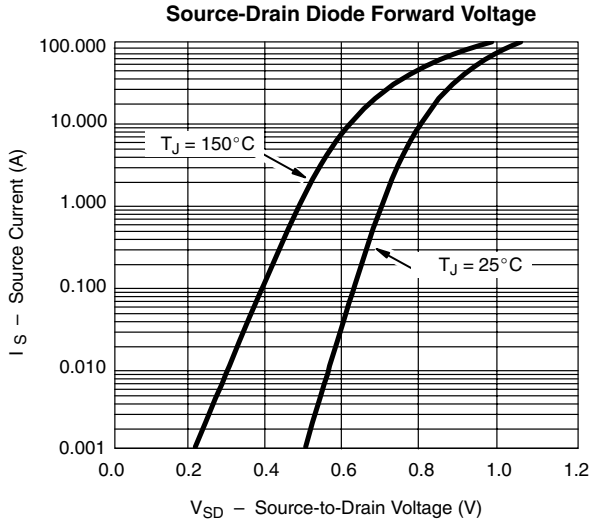


**On-Resistance vs. Junction Temperature**





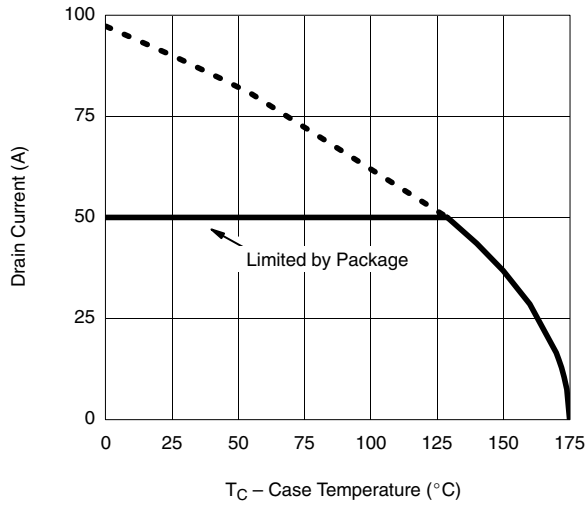
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



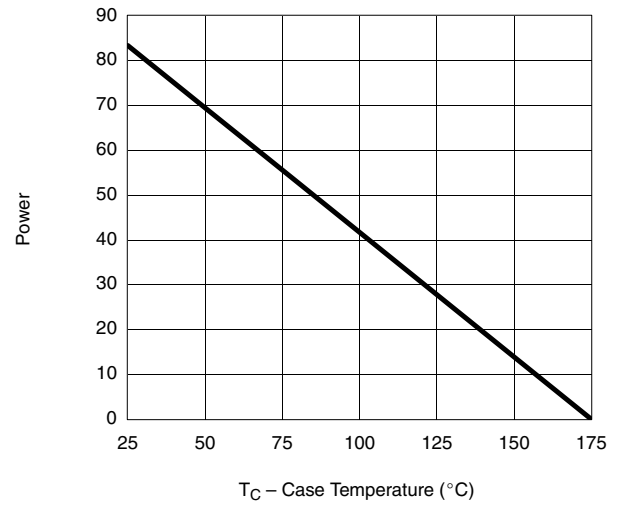


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

Current De-Rating

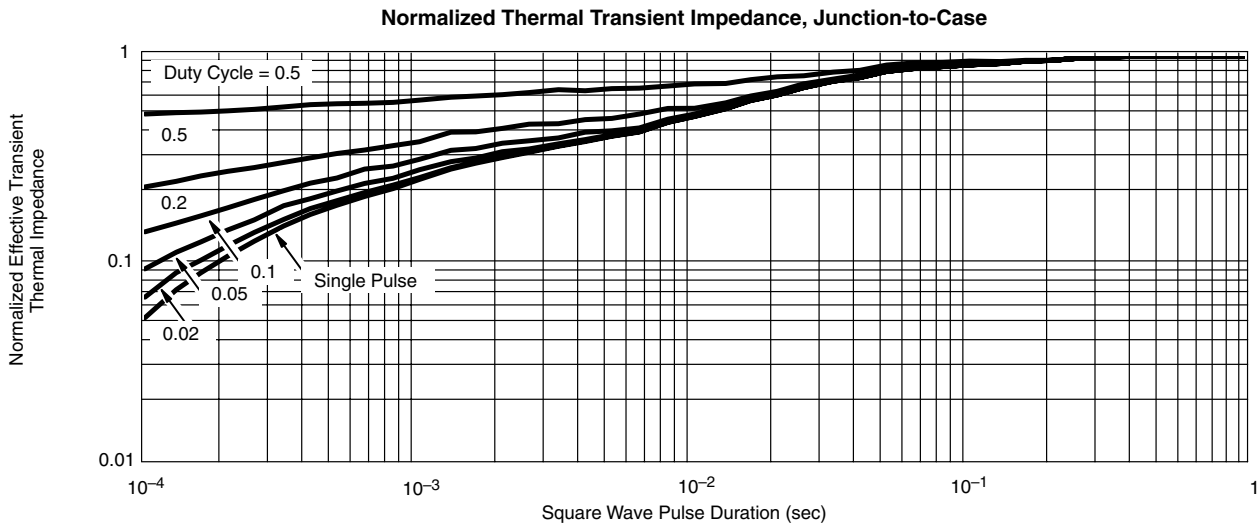
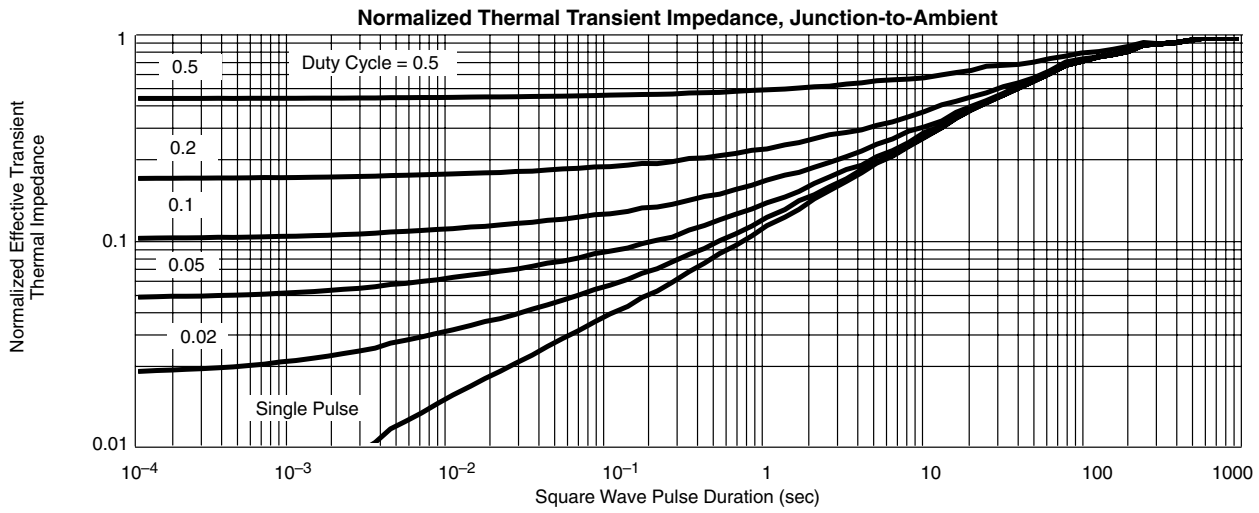


Power De-Rating





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



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?73540>.



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