

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

| PRODUCT SUMMARY     |                                  |                                 |                       |
|---------------------|----------------------------------|---------------------------------|-----------------------|
| V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)          | I <sub>D</sub> (A) <sup>a</sup> | Q <sub>g</sub> (Typ.) |
| 30                  | 0.270 at V <sub>GS</sub> = 4.5 V | 0.90                            | 1.1                   |
|                     | 0.385 at V <sub>GS</sub> = 2.5 V | 0.75                            |                       |

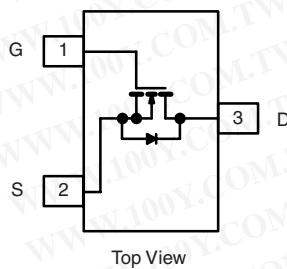
### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> Tested
- Compliant to RoHS Directive 2002/95/EC



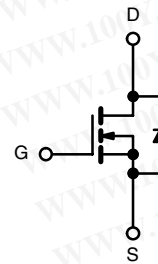
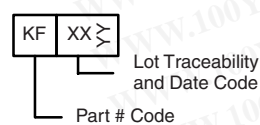
**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**  
 Available

SC-70 (3-LEADS)



Top View

Marking Code



N-Channel MOSFET

Ordering Information: Si1304BDL-T1-E3 (Lead (Pb)-free)  
 Si1304BDL-T1-GE3 (Lead (Pb)-free and Halogen-free)

| ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted |                                   |                      |      |
|---|-----------------------------------|----------------------|------|
| Parameter   | Symbol                            | Limit                | Unit |
| Drain-Source Voltage  | V <sub>DS</sub>                   | 30                   | V    |
| Gate-Source Voltage   | V <sub>GS</sub>                   | ± 12                 |      |
| Continuous Drain Current (T <sub>J</sub> = 150 °C)                      | T <sub>C</sub> = 25 °C            | 0.90                 | A    |
|   | T <sub>C</sub> = 70 °C            | 0.71                 |      |
|   | T <sub>A</sub> = 25 °C            | 0.85 <sup>b, c</sup> |      |
|   | T <sub>A</sub> = 70 °C            | 0.68 <sup>b, c</sup> |      |
| Pulsed Drain Current  | I <sub>DM</sub>                   | 4                    |      |
| Continuous Source-Drain Diode Current                                   | T <sub>C</sub> = 25 °C            | 0.31                 |      |
|   | T <sub>A</sub> = 25 °C            | 0.28 <sup>b, c</sup> |      |
| Maximum Power Dissipation   | T <sub>C</sub> = 25 °C            | 0.37                 | W    |
|   | T <sub>C</sub> = 70 °C            | 0.24                 |      |
|   | T <sub>A</sub> = 25 °C            | 0.34 <sup>b, c</sup> |      |
|   | T <sub>A</sub> = 70 °C            | 0.22 <sup>b, c</sup> |      |
| Operating Junction and Storage Temperature Range                        | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150          | °C   |

| THERMAL RESISTANCE RATINGS                  |                   |         |         |      |  |
|---|-------------------|---------|---------|------|--|
| Parameter                                   | Symbol            | Typical | Maximum | Unit |  |
| Maximum Junction-to-Ambient <sup>b, d</sup> | R <sub>thJA</sub> | 315     | 375     | °C/W |  |
| Maximum Junction-to-Foot (Drain)            | R <sub>thJF</sub> | 285     | 340     |      |  |

Notes:

- Based on T<sub>C</sub> = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under steady state conditions is 360 °C/W.

| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted |                         |  |  |       |           |                      |
|--|-------------------------|--|--|-------|-----------|----------------------|
| Parameter  | Symbol                  | Test Conditions  | Min.   | Typ.  | Max.      | Unit                 |
| <b>Static</b>  |                         |  |  |       |           |                      |
| Drain-Source Breakdown Voltage   | $V_{DS}$                | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$  | 30   |       |           | V                    |
| $V_{DS}$ Temperature Coefficient   | $\Delta V_{DS}/T_J$     | $I_D = 250\text{ }\mu\text{A}$   |  | 27.3  |           | mV/ $^\circ\text{C}$ |
| $V_{GS(th)}$ Temperature Coefficient                                     | $\Delta V_{GS(th)}/T_J$ |  |  | 3     |           |                      |
| Gate-Source Threshold Voltage  | $V_{GS(th)}$            | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$  | 0.6  |       | 1.3       | V                    |
| Gate-Source Leakage  | $I_{GSS}$               | $V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$  |  |       | $\pm 100$ | nA                   |
| Zero Gate Voltage Drain Current  | $I_{DSS}$               | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$  |  |       | 1         | $\mu\text{A}$        |
|  |                         | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$  |  |       | 5         |                      |
| On-State Drain Current <sup>a</sup>                                      | $I_{D(on)}$             | $V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$  | 4  |       |           | A                    |
| Drain-Source On-State Resistance <sup>a</sup>                            | $R_{DS(on)}$            | $V_{GS} = 4.5\text{ V}, I_D = 0.9$   |  | 0.216 | 0.270     | $\Omega$             |
|  |                         | $V_{GS} = 2.5\text{ V}, I_D = 0.75$  |  | 0.308 | 0.385     |                      |
| Forward Transconductance <sup>a</sup>                                    | $g_{fs}$                | $V_{DS} = 15\text{ V}, I_D = 0.9$  |  | 2     |           | S                    |
| <b>Dynamic<sup>b</sup></b>   |                         |  |  |       |           |                      |
| Input Capacitance  | $C_{iss}$               | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$  |  | 100   |           | pF                   |
| Output Capacitance   | $C_{oss}$               |  |  | 30    |           |                      |
| Reverse Transfer Capacitance   | $C_{rss}$               |  |  | 20    |           |                      |
| Total Gate Charge  | $Q_g$                   | $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 0.9$   |  | 1.8   | 2.7       | nC                   |
|  |                         |  | $V_{DS} = 15\text{ V}, V_{GS} = 2.5\text{ V}, I_D = 0.9$ |       | 1.1       |                      |
| $Q_{gs}$   |                         | 0.4  |  |       |           |                      |
| $Q_{gd}$   |                         | 0.6  |  |       |           |                      |
| Gate Resistance  | $R_g$                   | $f = 1\text{ MHz}$   |  | 1.5   | 2.3       | $\Omega$             |
| Turn-On Delay Time   | $t_{d(on)}$             | $V_{DD} = 15\text{ V}, R_L = 22\text{ }\Omega$<br>$I_D \cong 0.68\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$ |  | 10    | 15        | ns                   |
| Rise Time  | $t_r$                   |  |  | 30    | 45        |                      |
| Turn-Off Delay Time  | $t_{d(off)}$            |  |  | 5     | 25        |                      |
| Fall Time  | $t_f$                   |  |  | 10    | 15        |                      |
| <b>Drain-Source Body Diode Characteristics</b>                           |                         |  |  |       |           |                      |
| Continuous Source-Drain Diode  | $I_S$                   | $T_C = 25\text{ }^\circ\text{C}$   |  |       | 0.31      | A                    |
| Pulse Diode Forward Current <sup>a</sup>                                 | $I_{SM}$                |  |  |       | 4         |                      |
| Body Diode Voltage   | $V_{SD}$                | $I_S = 0.28\text{ A}$  |  | 0.8   | 1.2       | V                    |
| Body Diode Reverse Recovery Time   | $t_{rr}$                | $I_F = 0.28\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$                                    |  | 50    | 75        | ns                   |
| Body Diode Reverse Recovery Charge                                       | $Q_{rr}$                |  |  | 105   | 160       | nC                   |
| Reverse Recovery Fall Time   | $t_a$                   |  |  | 34    |           | ns                   |
| Reverse Recovery Rise Time   | $t_b$                   |  |  | 16    |           |                      |

## 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.

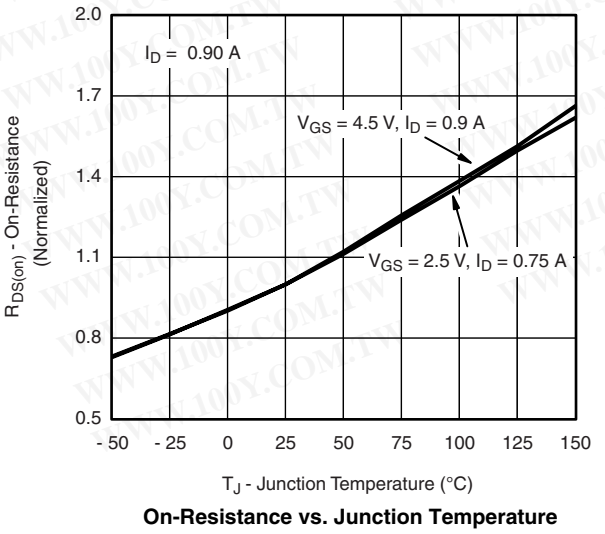
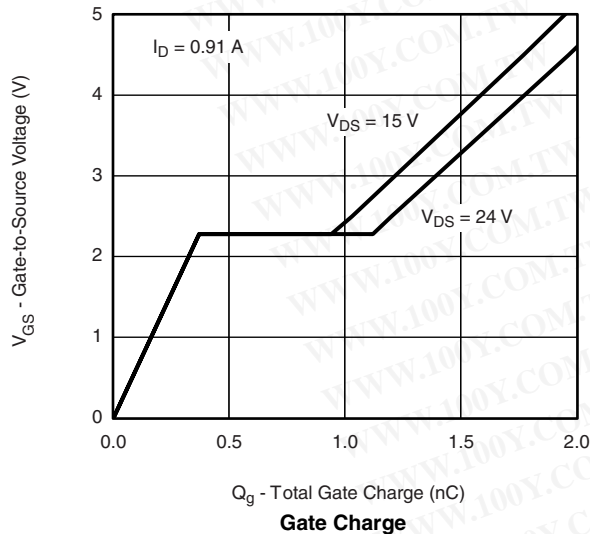
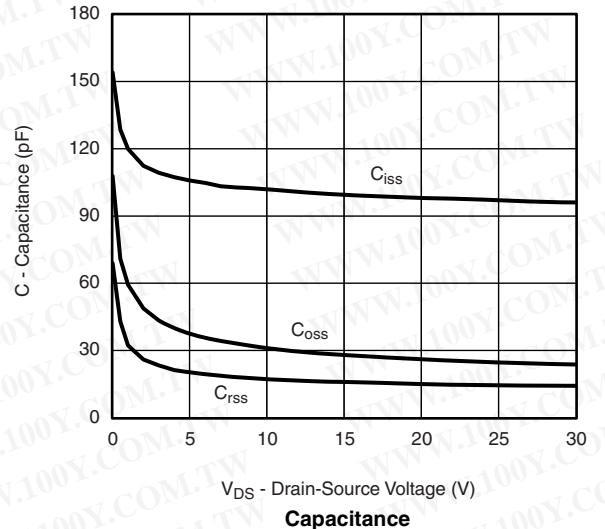
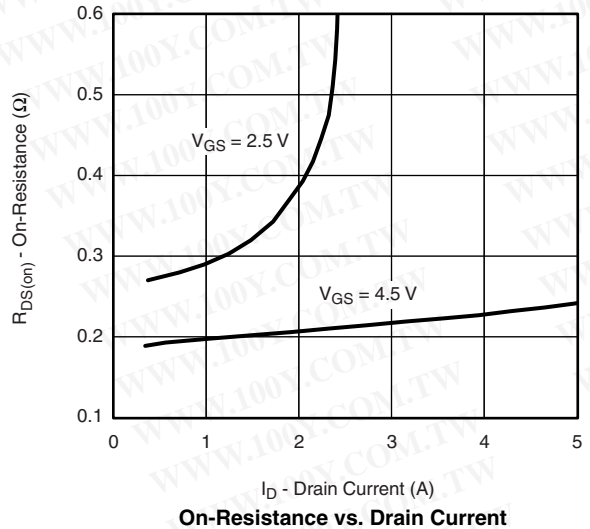
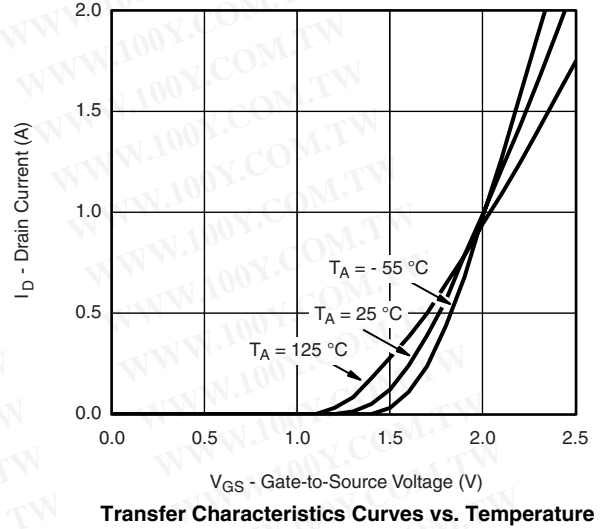
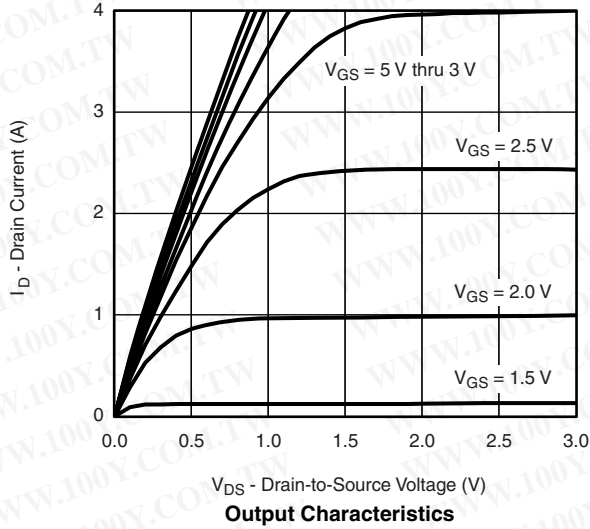
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**Si1304BDL**  
 Vishay Siliconix

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



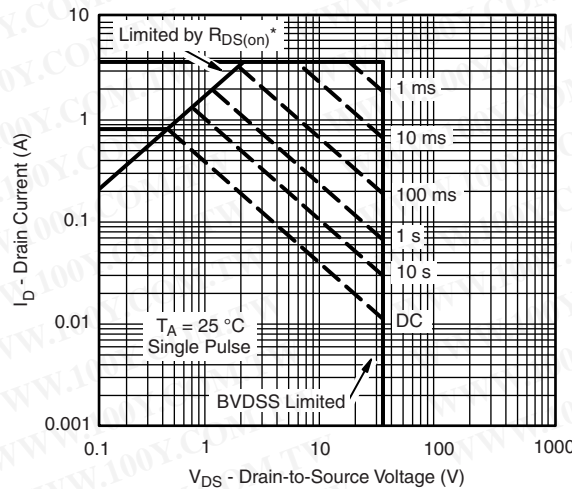
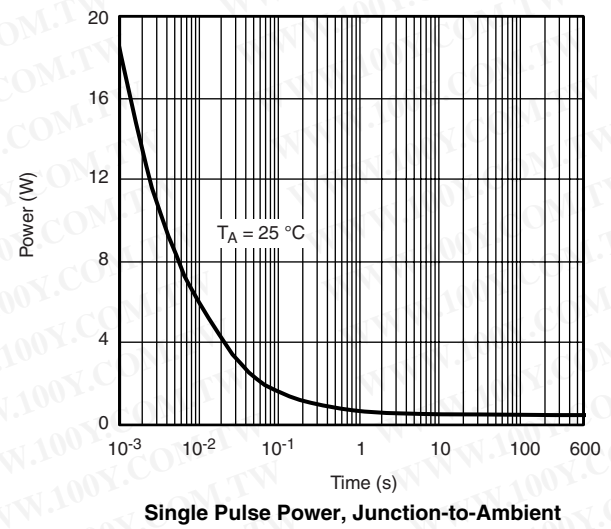
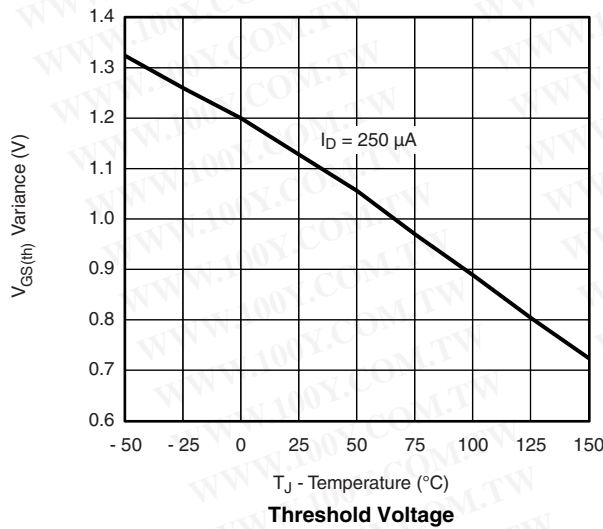
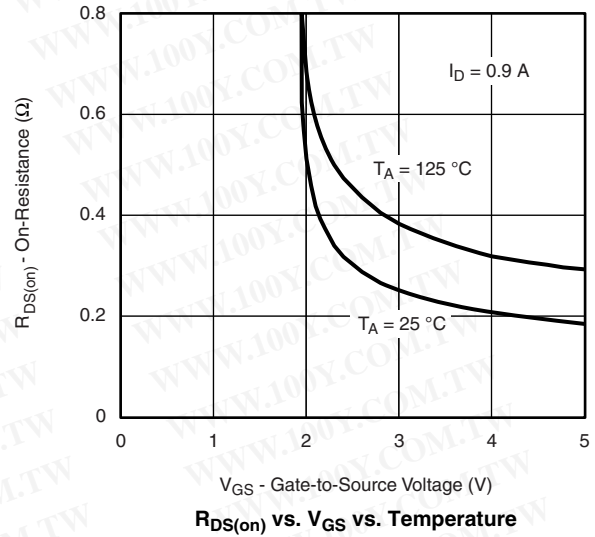
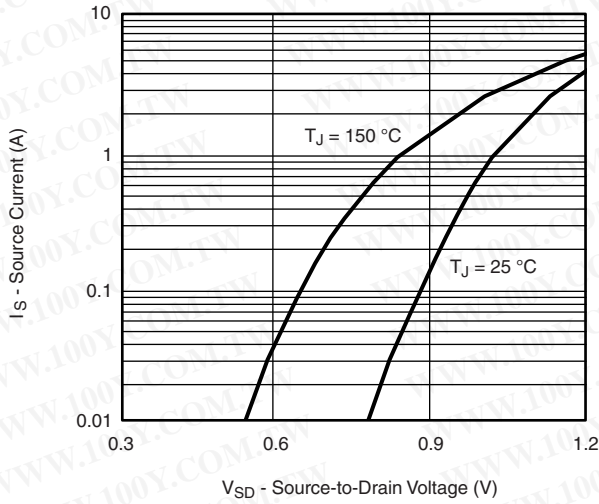
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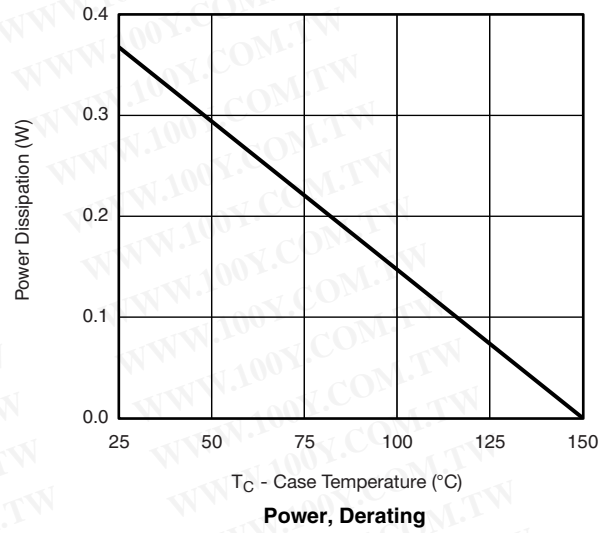
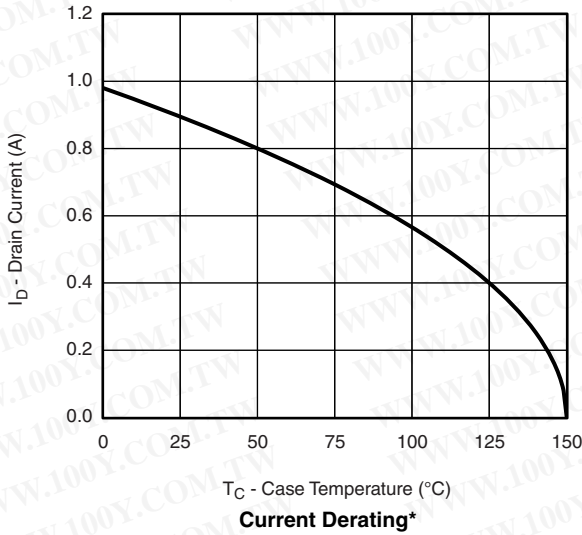
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



\* V<sub>GS</sub> > minimum V<sub>GS</sub> at which R<sub>DS(on)</sub> is specified



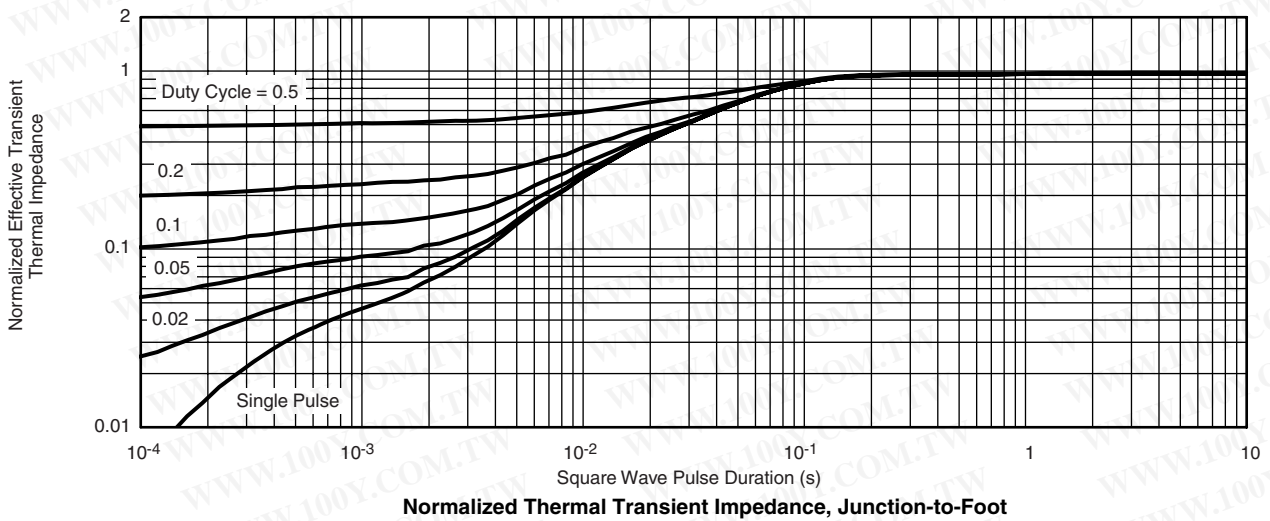
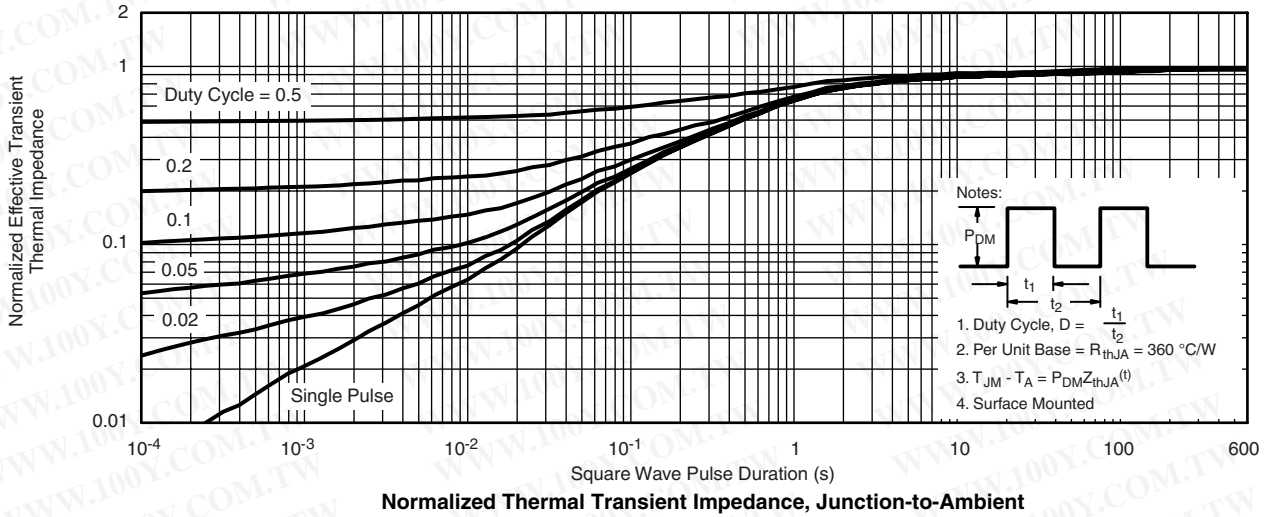
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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