

**RoHS Compliant Product**

A suffix of "-C" specifies halogen and lead-free

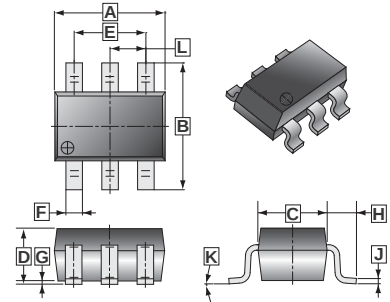
**DESCRIPTION**

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $R_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

**FEATURES**

- Low  $R_{DS(on)}$  provides higher efficiency and extends battery life.
- Low thermal impedance copper leadframe TSOP-6 saves board space.
- Fast switching speed.
- High performance trench technology.

**TSOP-6**

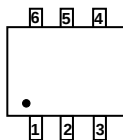


| REF. | Millimeter |      | REF. | Millimeter |      |
|------|------------|------|------|------------|------|
|      | Min.       | Max. |      | Min.       | Max. |
| A    | 2.70       | 3.10 | G    | 0          | 0.10 |
| B    | 2.60       | 3.00 | H    | 0.60       | REF. |
| C    | 1.40       | 1.80 | J    | 0.12       | REF. |
| D    | 1.10       | MAX. | K    | 0°         | 10°  |
| E    | 1.90       | REF. | L    | 0.95       | REF. |
| F    | 0.30       | 0.50 |      |            |      |

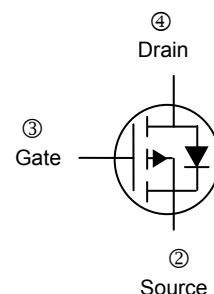
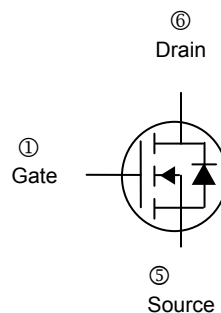
**PRODUCT SUMMARY**

| PRODUCT SUMMARY |                       |          |
|-----------------|-----------------------|----------|
| $V_{DS}(V)$     | $R_{DS(on)} (\Omega)$ | $I_D(A)$ |
| 30              | 0.063@ $V_{GS}=10V$   | 3.7      |
|                 | 0.090@ $V_{GS}=4.5V$  | 3.1      |
| -30             | 0.112@ $V_{GS}=-10V$  | -2.7     |
|                 | 0.172@ $V_{GS}=-4.5V$ | -2.2     |

D1 S1 D2



G1 S2 G2



**ABSOLUTE MAXIMUM RATINGS( $T_A=25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

| Parameter                                                 | Symbol         | Ratings    |           | Unit |
|-----------------------------------------------------------|----------------|------------|-----------|------|
|                                                           |                | N-Channel  | P-Channel |      |
| Drain-Source Voltage                                      | $V_{DS}$       | 30         | -30       | V    |
| Gate-Source Voltage                                       | $V_{GS}$       | ±20        | ±20       | V    |
| Continuous Drain Current <sup>a</sup>                     | $I_D$ @TA=25°C | 3.7        | -2.7      | A    |
|                                                           | $I_D$ @TA=70°C | 2.9        | -2.1      |      |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$       | 8          | -8        | A    |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | 1.05       | -1.05     | A    |
| Power Dissipation <sup>a</sup>                            | $P_D$ @TA=25°C | 1.15       |           | W    |
|                                                           | $P_D$ @TA=70°C | 0.7        |           |      |
| Operating Junction and Storage Temperature Range          | Tj, Tstg       | -55 ~ +150 |           | °C   |

**THERMAL RESISTANCE RATINGS**

| Parameter                                | Symbol          | N-Channel |     | P-Channel |     | Unit                        |
|------------------------------------------|-----------------|-----------|-----|-----------|-----|-----------------------------|
|                                          |                 | Typ       | Max | Typ       | Max |                             |
| Maximum Junction to Ambient <sup>a</sup> | $R_{\theta JA}$ | 93        | 110 | 93        | 110 | $^\circ\text{C} / \text{W}$ |
|                                          |                 | 130       | 150 | 130       | 150 |                             |

**Notes**

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature.

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

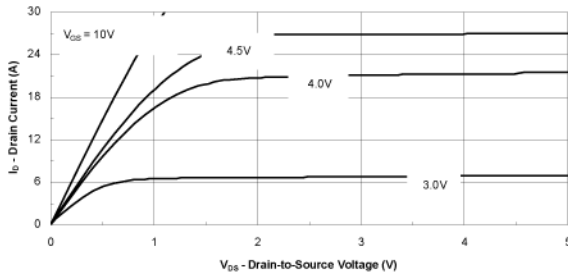
| Parameter                               |      | Symbol       | Min. | Typ.   | Max.  | Unit     | Test Conditions                                                      |
|-----------------------------------------|------|--------------|------|--------|-------|----------|----------------------------------------------------------------------|
| Gate-Threshold Voltage                  | N-Ch | $V_{GS(th)}$ | 1    | 1.6    | 2.5   | V        | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                               |
|                                         | P-Ch |              | -1   | -1.6   | -2.5  |          | $V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$                              |
| Gate-Body Leakage Current               | N-Ch | $I_{GSS}$    | -    | 4.5nA  | 100   | uA       | $V_{DS}=0\text{ V}$ , $V_{GS}=20\text{ V}$                           |
|                                         | P-Ch |              | -    | -4.5nA | -100  |          | $V_{DS}=0\text{ V}$ , $V_{GS}=-20\text{ V}$                          |
| Zero Gate Voltage Drain Current         | N-Ch | $I_{DSS}$    | -    | 12nA   | 1     | uA       | $V_{DS}=24\text{ V}$ , $V_{GS}=0\text{ V}$                           |
|                                         | P-Ch |              | -    | -12nA  | -1    |          | $V_{DS}=-24\text{ V}$ , $V_{GS}=0\text{ V}$                          |
|                                         | N-Ch |              | -    | -      | 10    |          | $V_{DS}=24\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_J=55^\circ\text{C}$  |
|                                         | P-Ch |              | -    | -      | -10   |          | $V_{DS}=-24\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_J=55^\circ\text{C}$ |
| On-State Drain Current <sup>a</sup>     | N-Ch | $I_{D(on)}$  | 5    | -      | -     | A        | $V_{DS}=5\text{ V}$ , $V_{GS}=10\text{ V}$                           |
|                                         | P-Ch |              | -5   | -      | -     |          | $V_{DS}=-5\text{ V}$ , $V_{GS}=-10\text{ V}$                         |
| Drain-Source On-Resistance <sup>a</sup> | N-Ch | $R_{DS(ON)}$ | -    | 0.057  | 0.063 | $\Omega$ | $V_{GS}=10\text{ V}$ , $I_D=3.7\text{ A}$                            |
|                                         | P-Ch |              | -    | 0.100  | 0.112 |          | $V_{GS}=-10\text{ V}$ , $I_D=-2.7\text{ A}$                          |
|                                         | N-Ch |              | -    | 0.075  | 0.090 |          | $V_{GS}=4.5\text{ V}$ , $I_D=3.1\text{ A}$                           |
|                                         | P-Ch |              | -    | 0.148  | 0.172 |          | $V_{GS}=-4.5\text{ V}$ , $I_D=-2.2\text{ A}$                         |
| Forward Transconductance <sup>a</sup>   | N-Ch | $g_{fs}$     | -    | 10     | -     | S        | $V_{DS}=5\text{ V}$ , $I_D=3.7\text{ A}$                             |
|                                         | P-Ch |              | -    | 5      | -     |          | $V_{DS}=-5\text{ V}$ , $I_D=3.1\text{ A}$                            |
| Diode Forward Voltage <sup>a</sup>      | N-Ch | $V_{SD}$     | -    | 0.80   | -     | S        | $I_S=1.05\text{ A}$ , $V_{GS}=0\text{ V}$                            |
|                                         | P-Ch |              | -    | -0.83  | -     |          | $I_S=-1.05\text{ A}$ , $V_{GS}=0\text{ V}$                           |

| DYNAMIC <sup>b</sup>         |      |              |   |     |     |    |
|------------------------------|------|--------------|---|-----|-----|----|
| Total Gate Charge            | N-Ch | $Q_g$        | - | 2.2 | 5   | nC |
|                              | P-Ch |              | - | 3.8 | 8   |    |
| Gate-Source Charge           | N-Ch | $Q_{gs}$     | - | 0.5 | 1   |    |
|                              | P-Ch |              | - | 0.6 | 2   |    |
| Gate-Drain Charge            | N-Ch | $Q_{gd}$     | - | 0.8 | 2   |    |
|                              | P-Ch |              | - | 1.5 | 3   |    |
| Input Capacitance            | N-Ch | $C_{iss}$    | - | 184 | 400 | pF |
|                              | P-Ch |              | - | 378 | 800 |    |
| Output Capacitance           | N-Ch | $C_{oss}$    | - | 62  | 200 |    |
|                              | P-Ch |              | - | 126 | 300 |    |
| Reverse Transfer Capacitance | N-Ch | $C_{rss}$    | - | 30  | 200 |    |
|                              | P-Ch |              | - | 52  | 300 |    |
| Turn-on Delay Time           | N-Ch | $T_{d(on)}$  | - | 5   | 10  | nS |
|                              | P-Ch |              | - | 5   | 10  |    |
| Rise Time                    | N-Ch | $T_r$        | - | 12  | 30  |    |
|                              | P-Ch |              | - | 15  | 30  |    |
| Turn-off Delay Time          | N-Ch | $T_{d(off)}$ | - | 13  | 30  |    |
|                              | P-Ch |              | - | 20  | 40  |    |
| Fall Time                    | N-Ch | $T_f$        | - | 7   | 20  |    |
|                              | P-Ch |              | - | 20  | 40  |    |

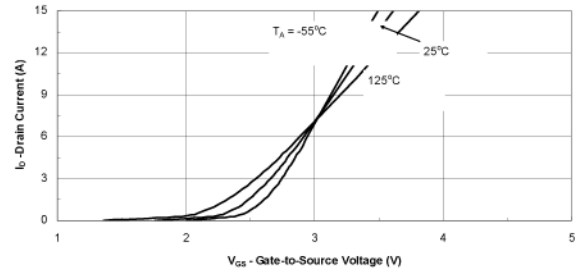
Notes

- Pulse test :  $PW \leq 300 \mu s$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

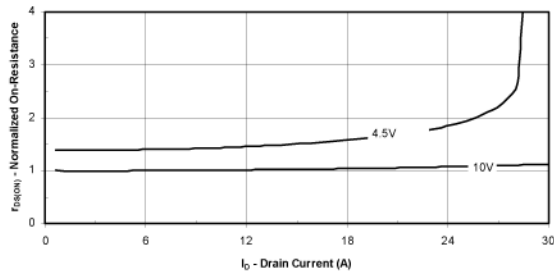
## CHARACTERISTIC CURVES (N-Channel)



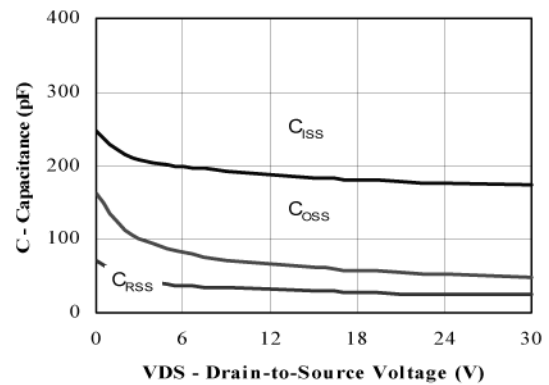
Output Characteristics



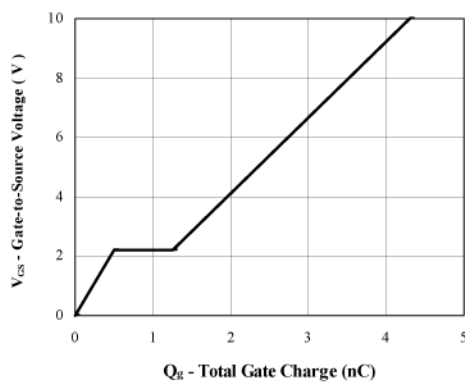
Transfer Characteristics



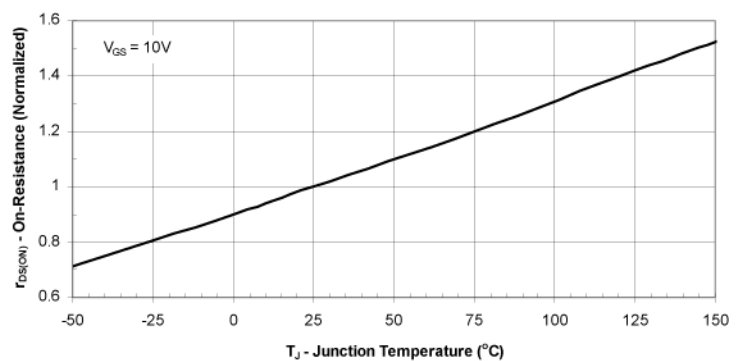
On-Resistance vs. Drain Current



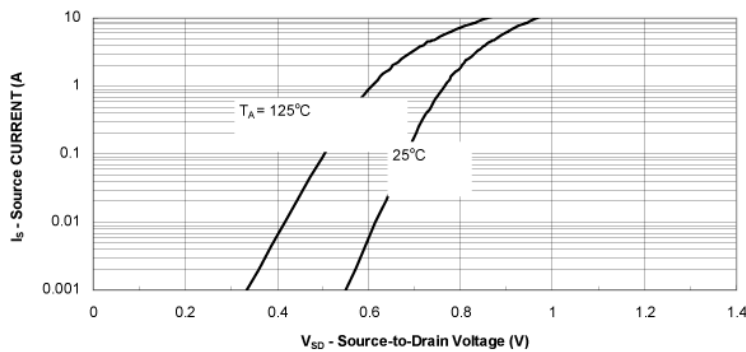
Capacitance



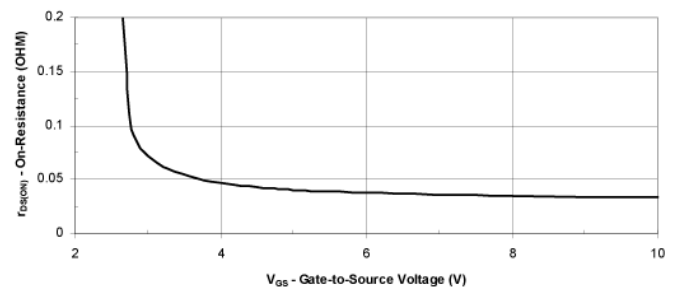
Gate Charge



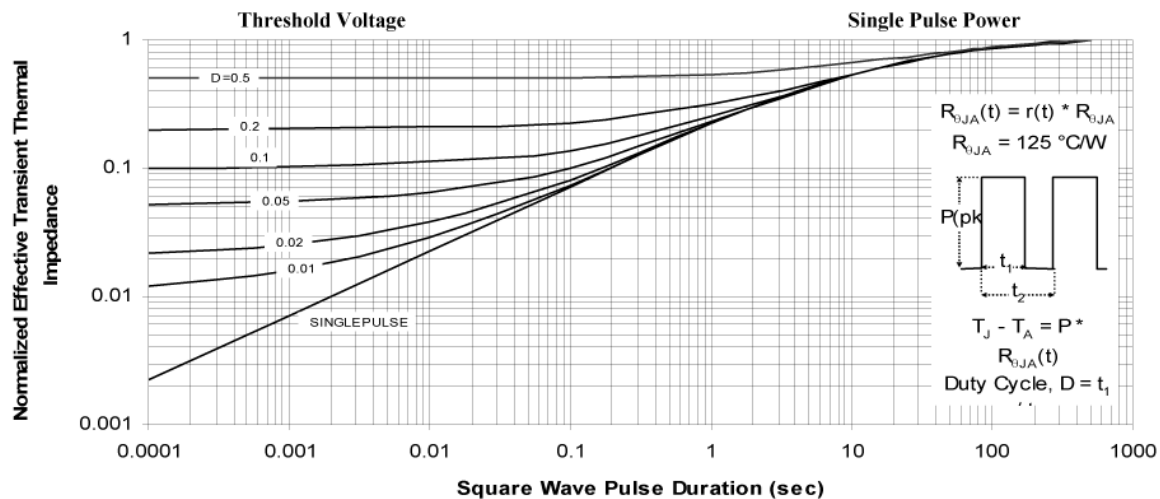
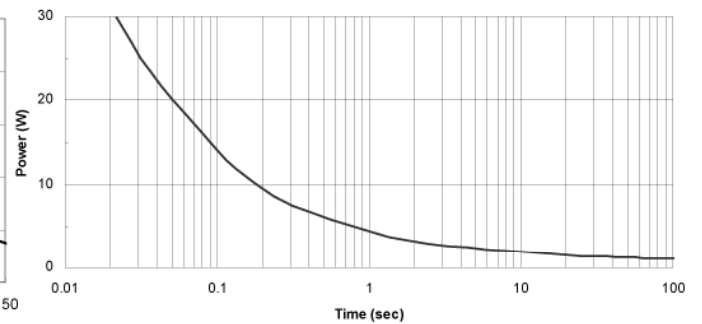
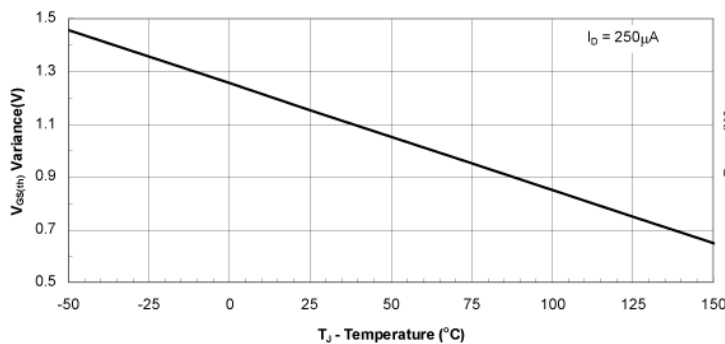
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

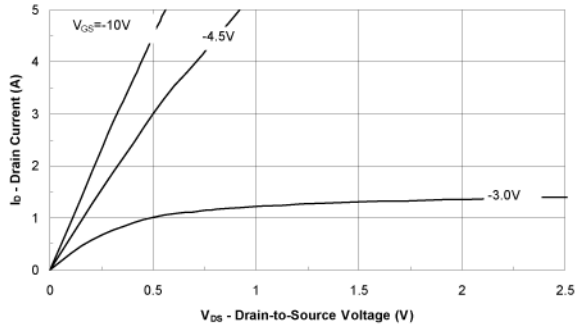


On-Resistance vs. Gate-to Source Voltage

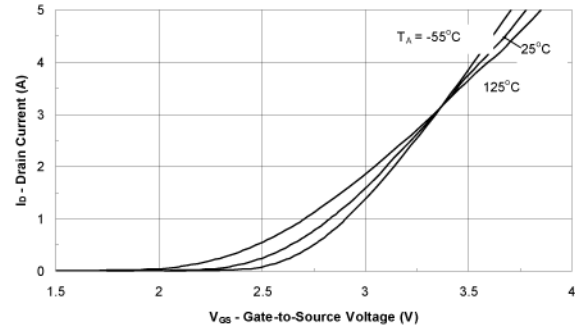


Normalized Thermal Transient Impedance, Junction-to-Ambient

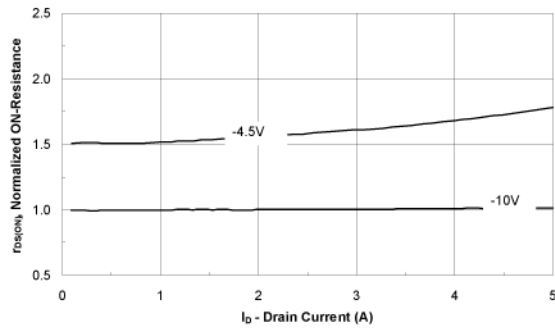
## CHARACTERISTIC CURVES (P-Channel)



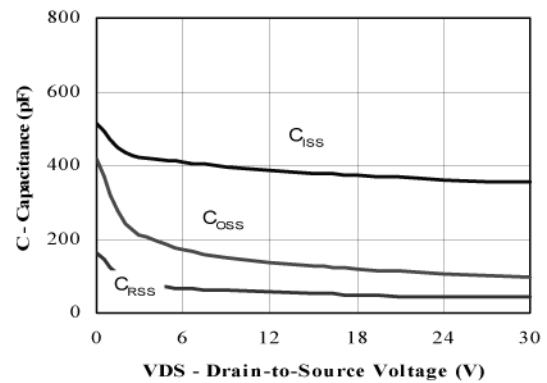
Output Characteristics



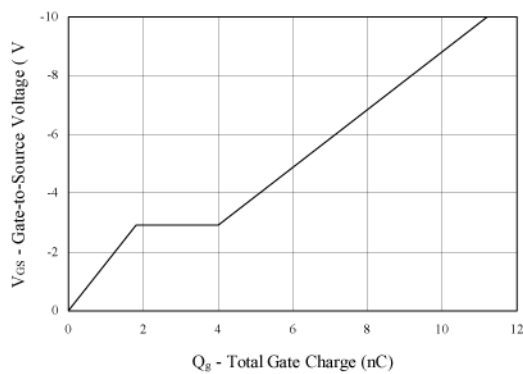
Transfer Characteristics



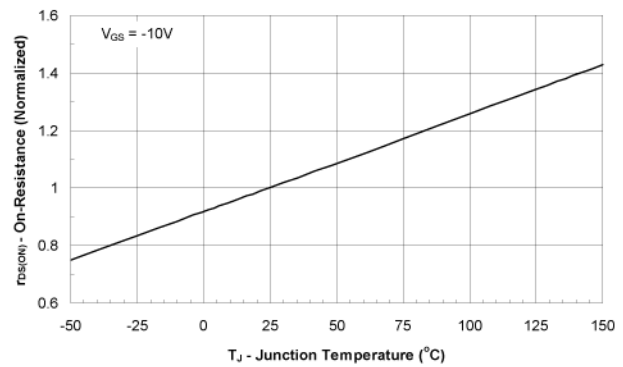
On-Resistance vs. Drain Current



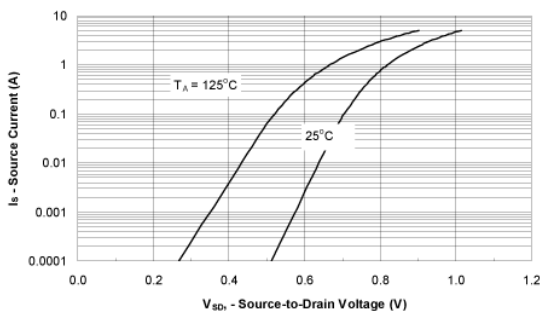
Capacitance



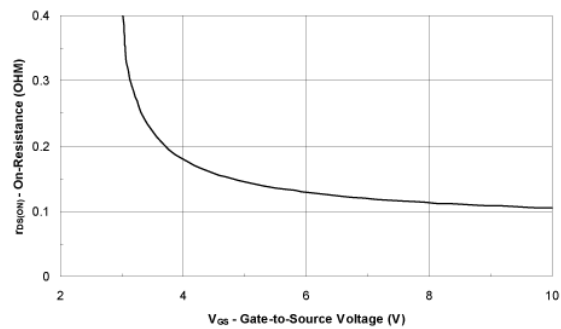
Gate Charge



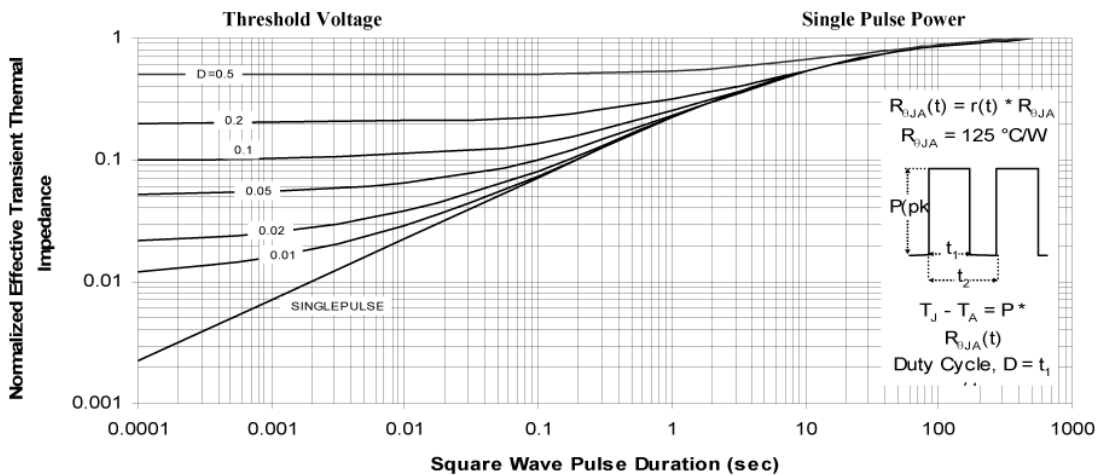
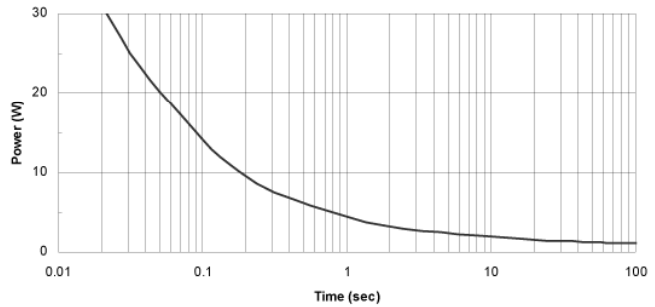
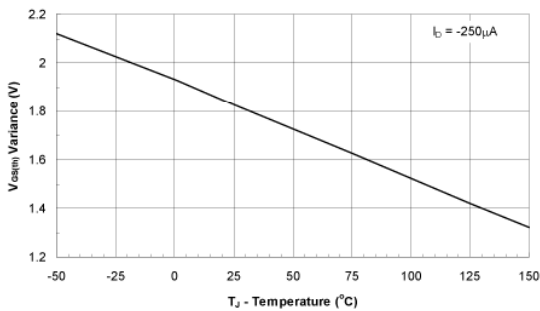
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Normalized Thermal Transient Impedance, Junction-to-Ambient