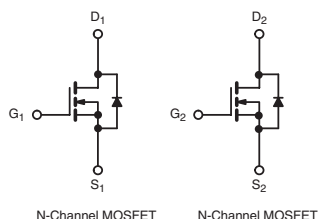
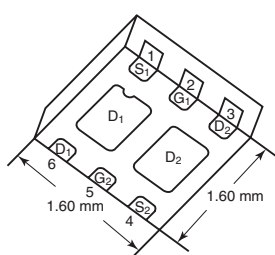


## Dual N-Channel 20 V (D-S) MOSFET

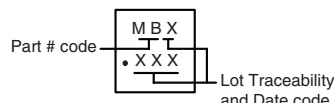
### PRODUCT SUMMARY

|   |       |
|---|-------|
| $V_{DS}$ (V)                                  | 20    |
| $R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V | 0.216 |
| $R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 2.5$ V | 0.268 |
| $R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 1.8$ V | 0.375 |
| $I_D$ (A) <sup>a</sup>                        | 1.5   |
| Configuration                                 | Dual  |

PowerPAK SC75-6L-Dual



### Marking Code



### FEATURES

- High Quality Manufacturing Process Using SMM Process Flow
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- New Thermally Enhanced PowerPAK® SC-75 Package
  - Small Footprint Area
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC
- Find out more about Vishay's Medical Products at: [www.vishay.com/medical-mosfets](http://www.vishay.com/medical-mosfets)



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

### APPLICATION EXAMPLES

- Medical Implantable Applications Including
  - Drug Delivery Systems
  - Defibrillators
  - Pacemakers
  - Hearing Aids
  - Other Implantable Devices
- Load Switch, PA Switch and Battery Switch for Portable Devices
- DC/DC Converter

### ORDERING INFORMATION

|                                 |                  |
|---------------------------------|------------------|
| Package                         | PowerPAK SC-75   |
| Lead (Pb)-free and Halogen-free | SMMB912DK-T1-GE3 |

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

| PARAMETER  | SYMBOL         | LIMIT                         | UNIT |
|--|----------------|-------------------------------|------|
| Drain-Source Voltage   | $V_{DS}$       | 20                            | V    |
| Gate-Source Voltage  | $V_{GS}$       | $\pm 8$                       |      |
| Continuous Drain Current ( $T_J = 150$ °C)                   | $I_D$          | $T_C = 25$ °C <sup>a</sup>    | A    |
|  |                | $T_C = 70$ °C <sup>a</sup>    |      |
|  |                | $T_A = 25$ °C <sup>b, c</sup> |      |
|  |                | $T_A = 70$ °C <sup>b, c</sup> |      |
| Pulsed Drain Current   | $I_{DM}$       | 5                             |      |
| Continuous Source-Drain Diode Current                        | $I_S$          | $T_C = 25$ °C <sup>a</sup>    | A    |
|  |                | $T_A = 25$ °C <sup>b, c</sup> |      |
| Maximum Power Dissipation                                    | $P_D$          | $T_C = 25$ °C                 | W    |
|  |                | $T_C = 70$ °C                 |      |
|  |                | $T_A = 25$ °C <sup>b, c</sup> |      |
|  |                | $T_A = 70$ °C <sup>b, c</sup> |      |
| Operating Junction and Storage Temperature Range             | $T_J, T_{stg}$ | - 55 to + 150                 | °C   |
| Soldering Recommendations (Peak Temperature) <sup>c, d</sup> |                | 260                           |      |

**THERMAL RESISTANCE RATINGS**

| PARAMETER                           |              | SYMBOL     | TYPICAL | MAXIMUM | UNIT |
|-------------------------------------|--------------|------------|---------|---------|------|
| Junction-to-Ambient <sup>b, f</sup> | $t \leq 5$ s | $R_{thJA}$ | 90      | 115     | °C/W |
| Junction-to-Case (Drain)            | Steady State | $R_{thJC}$ | 32      | 40      |      |

**Notes**

- a. Package limited.  
b. Surface mounted on 1" x 1" FR4 board.  
c.  $t = 5$  s.  
d. See Solder Profile ([www.vishay.com/ppg?73257](http://www.vishay.com/ppg?73257)). The PowerPAK SC-75 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.  
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.  
f. Maximum under steady state conditions is 125 °C/W.

**SPECIFICATIONS**  $T_J = 25$  °C, unless otherwise noted

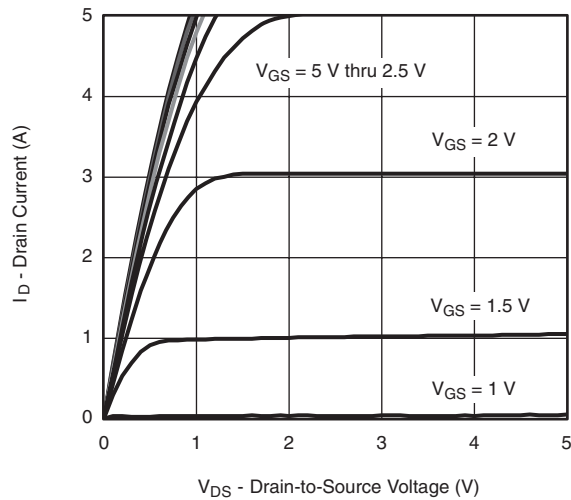
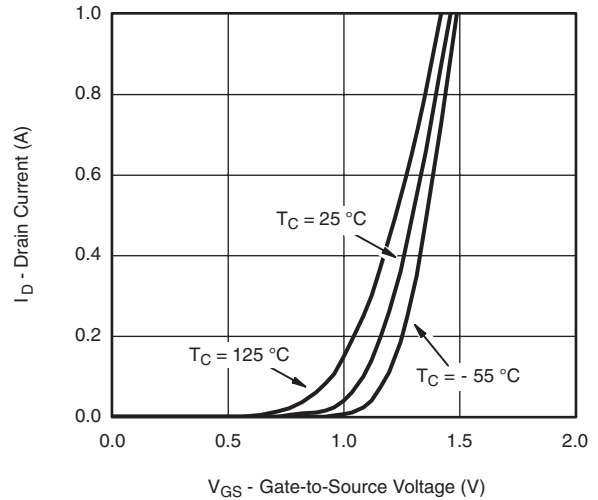
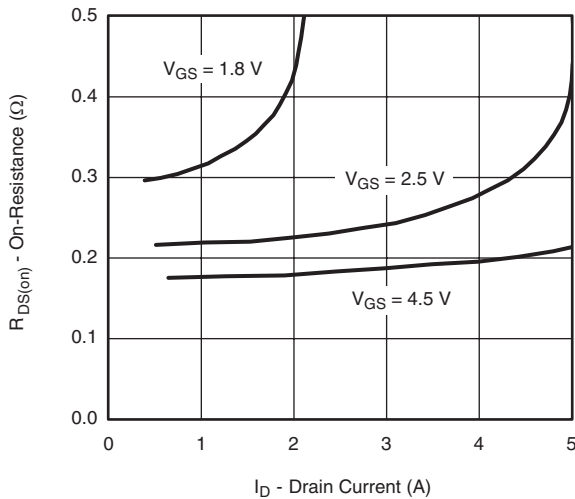
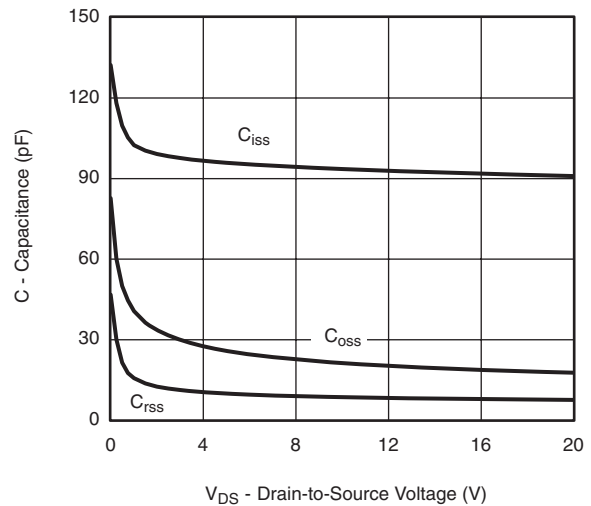
| PARAMETER  | SYMBOL                               | TEST CONDITIONS  |  | MIN. | TYP.  | MAX.  | UNIT  |
|--|--------------------------------------|--|--|------|-------|-------|-------|
| Static   |                                      |  |  |      |       |       |       |
| Drain-Source Breakdown Voltage                     | V <sub>DS</sub>                      | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA   |  | 20   | -     | -     | V     |
| V <sub>DS</sub> Temperature Coefficient            | ΔV <sub>DS</sub> /T <sub>J</sub>     | I <sub>D</sub> = 250 μA  |  | -    | 22    | -     | mV/°C |
| V <sub>GS(th)</sub> Temperature Coefficient        | ΔV <sub>GS(th)</sub> /T <sub>J</sub> |  |  | -    | - 2   | -     |       |
| Gate-Source Threshold Voltage                      | V <sub>GS(th)</sub>                  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA  |  | 0.4  | -     | 1     | V     |
| Gate-Source Leakage                                | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V   |  | -    | -     | ± 100 | nA    |
| Zero Gate Voltage Drain Current                    | I <sub>DSS</sub>                     | V <sub>GS</sub> = 0 V  | V <sub>DS</sub> = 20 V                         | -    | -     | 1     | μA    |
|  |                                      | V <sub>GS</sub> = 0 V  | V <sub>DS</sub> = 20 V, T <sub>J</sub> = 55 °C | -    | -     | 10    |       |
| On-State Drain Current <sup>a</sup>                | I <sub>D(on)</sub>                   | V <sub>GS</sub> = 4.5 V  | V <sub>DS</sub> ≥ 5 V                          | 5    | -     | -     | A     |
| Drain-Source On-State Resistance <sup>a</sup>      | R <sub>DS(on)</sub>                  | V <sub>GS</sub> = 4.5 V  | I <sub>D</sub> = 1.8 A                         | -    | 0.180 | 0.216 | Ω     |
|  |                                      | V <sub>GS</sub> = 2.5 V  | I <sub>D</sub> = 1.6 A                         | -    | 0.223 | 0.268 |       |
|  |                                      | V <sub>GS</sub> = 1.8 V  | I <sub>D</sub> = 0.3 A                         | -    | 0.300 | 0.375 |       |
|  |                                      |  |  |      |       |       |       |
| Forward Transconductance <sup>a</sup>              | g <sub>fs</sub>                      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.8 A   |  | -    | 3     | -     | S     |
| Dynamic <sup>b</sup>                               |                                      |  |  |      |       |       |       |
| Input Capacitance                                  | C <sub>iss</sub>                     | V <sub>GS</sub> = 0 V  | V <sub>DS</sub> = 10 V, f = 1 MHz              | -    | 95    | -     | pF    |
| Output Capacitance                                 | C <sub>oss</sub>                     |  |  | -    | 24    | -     |       |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>                     |  |  | -    | 11    | -     |       |
| Total Gate Charge                                  | Q <sub>g</sub>                       | V <sub>GS</sub> = 8 V  | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.8 A | -    | 2     | 3     | nC    |
| Gate-Source Charge                                 | Q <sub>gs</sub>                      | V <sub>GS</sub> = 4.5 V  | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.8 A | -    | 1.2   | 1.8   |       |
| Gate-Drain Charge                                  | Q <sub>gd</sub>                      |  |  | -    | 0.3   | -     |       |
| Gate Resistance                                    | R <sub>g</sub>                       |  |  | -    | 0.15  | -     |       |
| Gate Resistance                                    | R <sub>g</sub>                       | f = 1 MHz  |  | 0.5  | 2.5   | 5     | Ω     |
| Turn-On Delay Time                                 | t <sub>d(on)</sub>                   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 7.1 Ω<br>I <sub>D</sub> ≅ 1.4 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω |  | -    | 5     | 10    | ns    |
| Rise Time  | t <sub>r</sub>                       |  |  | -    | 10    | 20    |       |
| Turn-Off Delay Time                                | t <sub>d(off)</sub>                  |  |  | -    | 24    | 36    |       |
| Fall Time  | t <sub>f</sub>                       |  |  | -    | 8     | 16    |       |
| Turn-On Delay Time                                 | t <sub>d(on)</sub>                   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 7.1 Ω<br>I <sub>D</sub> ≅ 1.4 A, V <sub>GEN</sub> = 8 V, R <sub>g</sub> = 1 Ω   |  | -    | 2     | 4     |       |
| Rise Time  | t <sub>r</sub>                       |  |  | -    | 9     | 18    |       |
| Turn-Off Delay Time                                | t <sub>d(off)</sub>                  |  |  | -    | 8     | 16    |       |
| Fall Time  | t <sub>f</sub>                       |  |  | -    | 7     | 14    |       |
| Source-Drain Body Diode Characteristics            |                                      |  |  |      |       |       |       |
| Continuous Source-Drain Diode Current <sup>c</sup> | I <sub>S</sub>                       | T <sub>C</sub> = 25 °C   |  | -    | -     | 1.5   | A     |
| Pulse Diode Forward Current                        | I <sub>SM</sub>                      |  |  | -    | -     | 5     |       |
| Body Diode Voltage                                 | V <sub>SD</sub>                      | I <sub>S</sub> = 1.4 A, V <sub>GS</sub> = 0 V  |  | -    | 0.7   | 1.2   | V     |

| <b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted |          |  |      |      |      |      |
|---|----------|--|------|------|------|------|
| PARAMETER   | SYMBOL   | TEST CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
| <b>Source-Drain Body Diode Characteristics</b>                                    |          |  |      |      |      |      |
| Body Diode Reverse Recovery Time  | $t_{rr}$ | $I_F = 1.4\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^{\circ}\text{C}$ | -    | 9    | 18   | ns   |
| Body Diode Reverse Recovery Charge  | $Q_{rr}$ |  | -    | 3    | 6    | nC   |
| Reverse Recovery Fall Time  | $t_a$    |  | -    | 6    | -    | ns   |
| Reverse Recovery Rise Time  | $t_b$    |  | -    | 3    | -    |      |

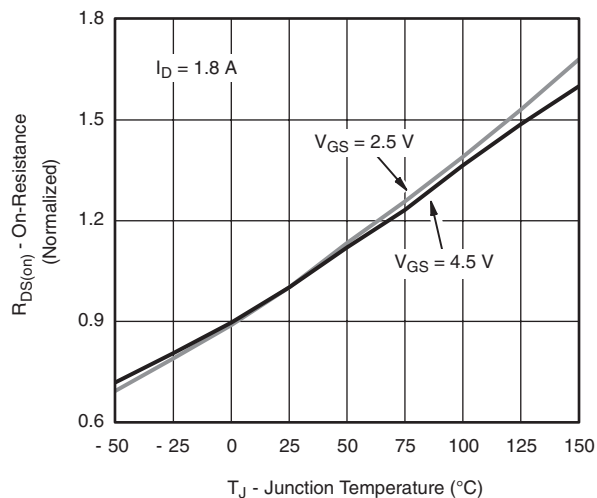
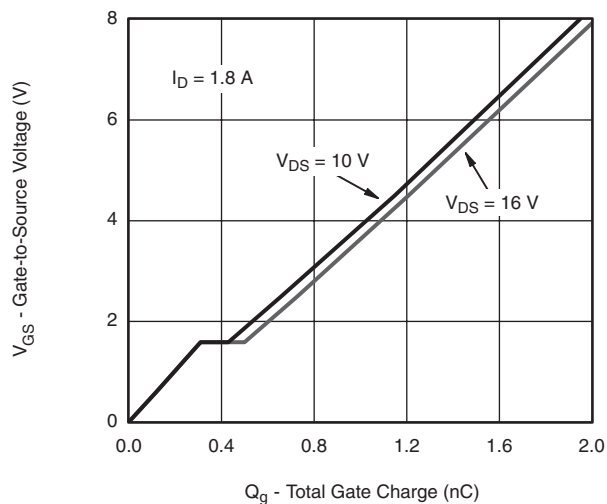
**Notes**

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Package limited.

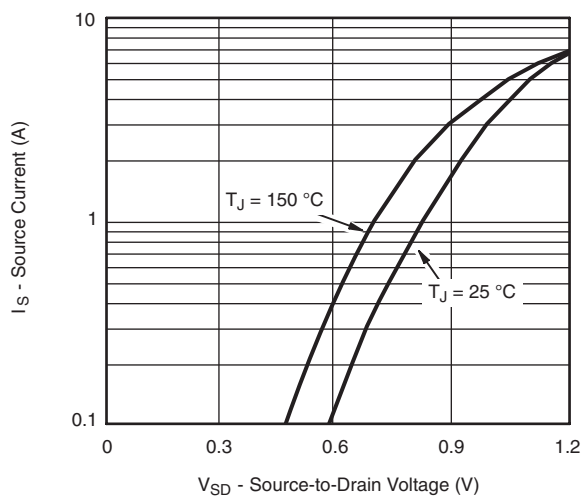
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current and Gate Voltage**

**Capacitance**

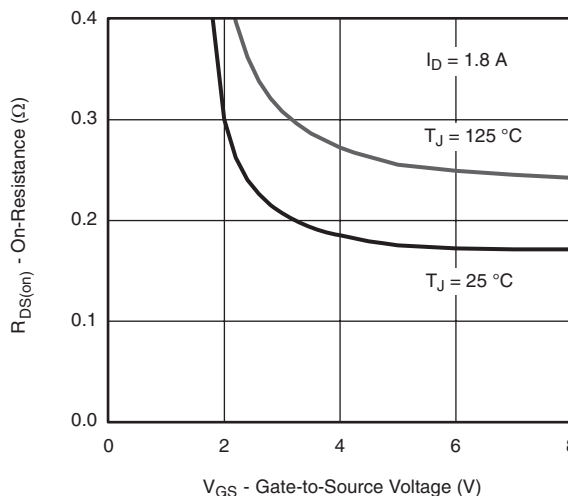
## TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted



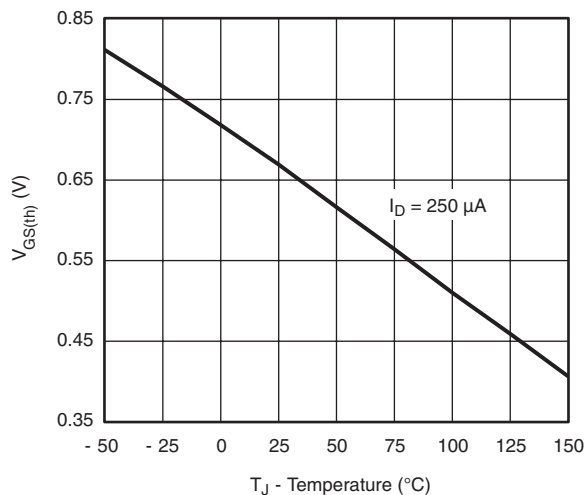
On-Resistance vs. Junction Temperature



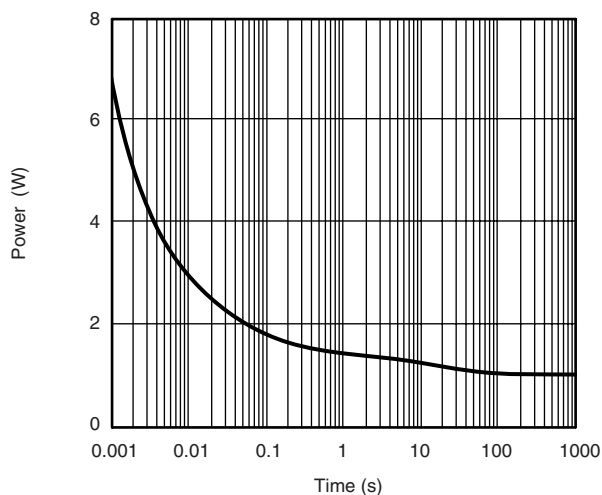
Source-Drain Diode Forward Voltage



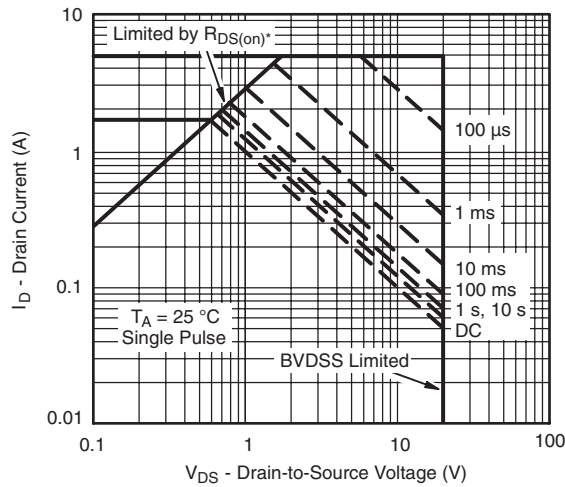
On-Resistance vs. Gate-to-Source Voltage



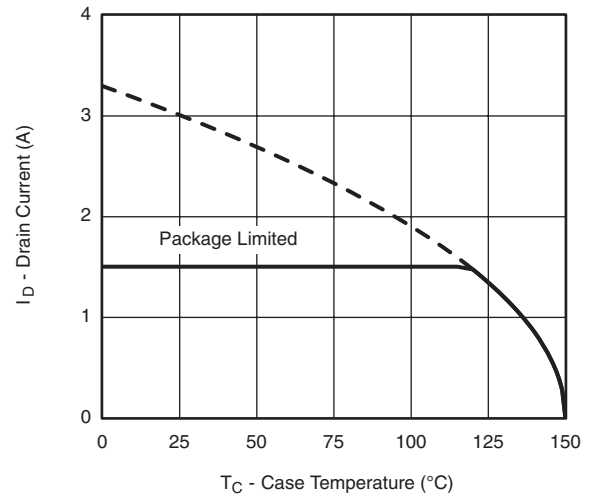
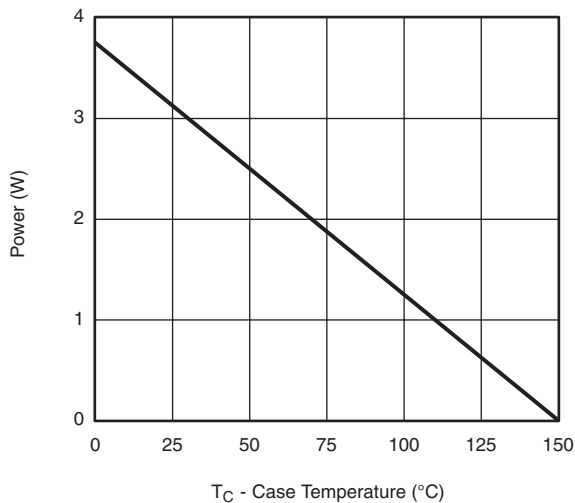
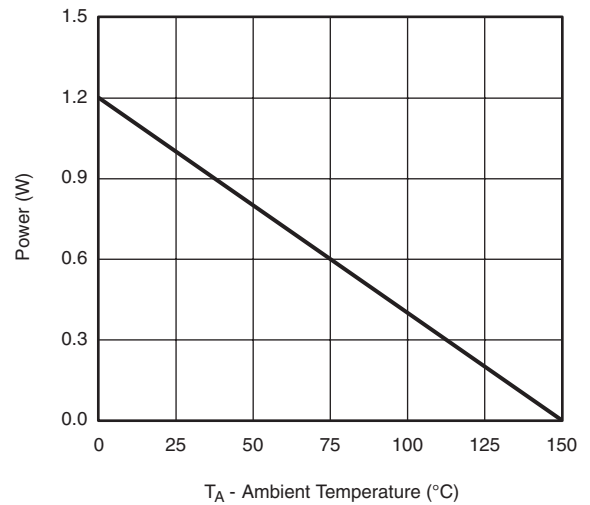
Threshold Voltage



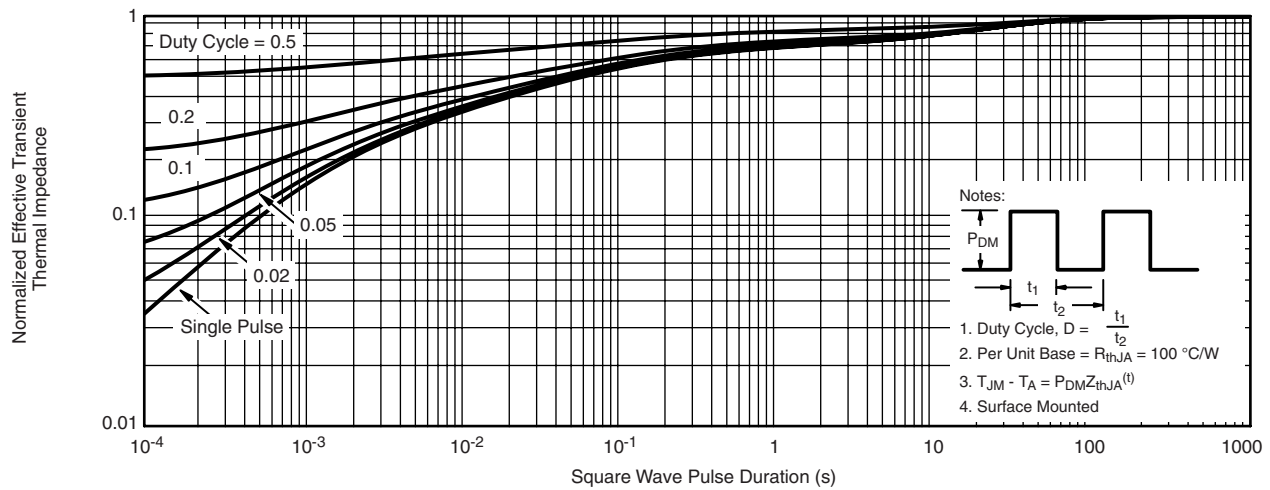
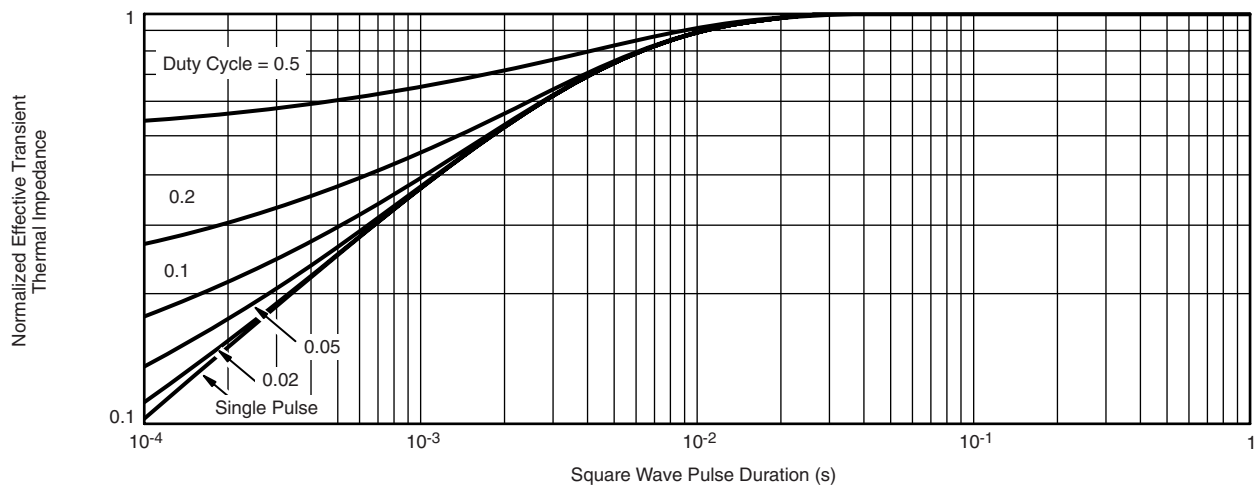
Single Pulse Power, Junction-to-Ambient

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


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**

**Current Derating\***

**Power Derating, Junction-to-Case**

**Power Derating, Junction-to-Ambient**

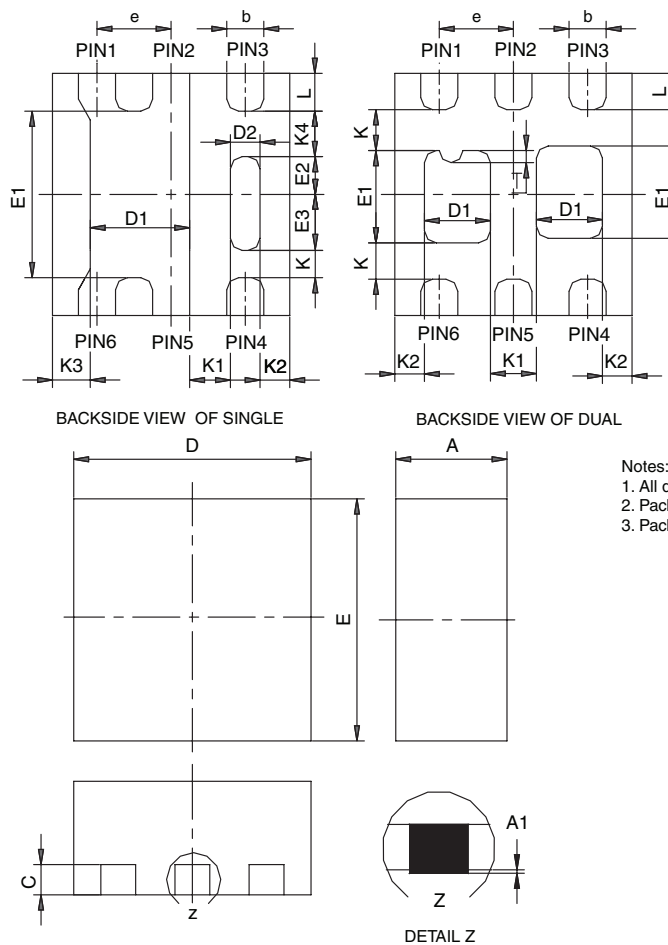
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^{\circ}\text{C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating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

**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**

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 [www.vishay.com/ppg?65459](http://www.vishay.com/ppg?65459).



## PowerPAK® SC75-6L



- Notes:
1. All dimensions are in millimeters
  2. Package outline exclusive of mold flash and metal burr
  3. Package outline inclusive of plating

| DIM | SINGLE PAD  |      |      |           |       |       | DUAL PAD    |      |      |           |       |       |
|-----|-------------|------|------|-----------|-------|-------|-------------|------|------|-----------|-------|-------|
|     | MILLIMETERS |      |      | INCHES    |       |       | MILLIMETERS |      |      | INCHES    |       |       |
|     | Min         | Nom  | Max  | Min       | Nom   | Max   | Min         | Nom  | Max  | Min       | Nom   | Max   |
| A   | 0.675       | 0.75 | 0.80 | 0.027     | 0.030 | 0.032 | 0.675       | 0.75 | 0.80 | 0.027     | 0.030 | 0.032 |
| A1  | 0           | -    | 0.05 | 0         | -     | 0.002 | 0           | -    | 0.05 | 0         | -     | 0.002 |
| b   | 0.18        | 0.25 | 0.33 | 0.007     | 0.010 | 0.013 | 0.18        | 0.25 | 0.33 | 0.007     | 0.010 | 0.013 |
| C   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 |
| D   | 1.53        | 1.60 | 1.70 | 0.060     | 0.063 | 0.067 | 1.53        | 1.60 | 1.70 | 0.060     | 0.063 | 0.067 |
| D1  | 0.57        | 0.67 | 0.77 | 0.022     | 0.026 | 0.030 | 0.34        | 0.44 | 0.54 | 0.013     | 0.017 | 0.021 |
| D2  | 0.10        | 0.20 | 0.30 | 0.004     | 0.008 | 0.012 |             |      |      |           |       |       |
| E   | 1.53        | 1.60 | 1.70 | 0.060     | 0.063 | 0.067 | 1.53        | 1.60 | 1.70 | 0.060     | 0.063 | 0.067 |
| E1  | 1.00        | 1.10 | 1.20 | 0.039     | 0.043 | 0.047 | 0.51        | 0.61 | 0.71 | 0.020     | 0.024 | 0.028 |
| E2  | 0.20        | 0.25 | 0.30 | 0.008     | 0.010 | 0.012 |             |      |      |           |       |       |
| E3  | 0.32        | 0.37 | 0.42 | 0.013     | 0.015 | 0.017 |             |      |      |           |       |       |
| e   | 0.50 BSC    |      |      | 0.020 BSC |       |       | 0.50 BSC    |      |      | 0.020 BSC |       |       |
| K   | 0.180 TYP   |      |      | 0.007 TYP |       |       | 0.245 TYP   |      |      | 0.010 TYP |       |       |
| K1  | 0.275 TYP   |      |      | 0.011 TYP |       |       | 0.320 TYP   |      |      | 0.013 TYP |       |       |
| K2  | 0.200 TYP   |      |      | 0.008 TYP |       |       | 0.200 BSC   |      |      | 0.008 TYP |       |       |
| K3  | 0.255 TYP   |      |      | 0.010 TYP |       |       |             |      |      |           |       |       |
| K4  | 0.300 TYP   |      |      | 0.012 TYP |       |       |             |      |      |           |       |       |
| L   | 0.15        | 0.25 | 0.35 | 0.006     | 0.010 | 0.014 | 0.15        | 0.25 | 0.35 | 0.006     | 0.010 | 0.014 |
| T   |             |      |      |           |       |       | 0.03        | 0.08 | 0.13 | 0.001     | 0.003 | 0.005 |

ECN: C-07431 – Rev. C, 06-Aug-07  
DWG: 5935

[illegible]

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