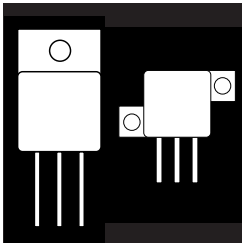


OM6009SA OM6011SA OM6109SA OM6111SA  
OM6010SA OM6012SA OM6110SA OM6112SA

## POWER MOSFETS IN HERMETIC ISOLATED TO-254AA PACKAGE



**100V Thru 500V, Up To 22 Amp, N-Channel MOSFET In Hermetic Metal Package, With Optional Zener Gate Clamp Protection**

### FEATURES

- Isolated Hermetic Metal Package
- Fast Switching
- Low  $R_{DS(on)}$
- Available Hi-Rel Screened To MIL-S-19500, TX, TXV And S Levels
- Bi-Lateral Zener Gate Protection (Optional)
- Ceramic Feedthroughs Available

### DESCRIPTION

This series of hermetically packaged products feature the latest advanced MOSFET and packaging technology. They are ideally suited for Military requirements where small size, high performance and high reliability are required, and in applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits. The MOSFET gates are protected using bi-lateral zeners in the OM6109SA series.

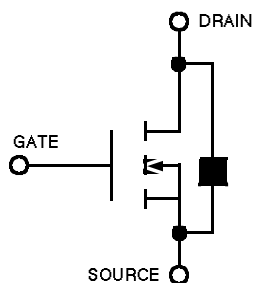
### MAXIMUM RATINGS

| PART NUMBER        | $V_{DS}$ | $R_{DS(ON)}$ | $I_{D(MAX)}$ |
|--------------------|----------|--------------|--------------|
| OM6009SA, OM6109SA | 100V     | .095         | 22A          |
| OM6010SA, OM6110SA | 200V     | .18          | 18A          |
| OM6011SA, OM6111SA | 400V     | .55          | 10A          |
| OM6012SA, OM6112SA | 500V     | .85          | 8A           |

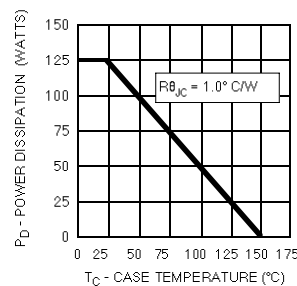
Note: OM61XX Series include gate protection circuitry.

3.1

### SCHEMATIC



### POWER RATING



**ELECTRICAL CHARACTERISTICS:  $T_C = 25^\circ$  unless otherwise noted**  
**STATIC P/N OM6009SA / OM6109SA**

| Parameter                                                         | Min. | Typ.  | Max.      | Units | Test Conditions                                                 |
|-------------------------------------------------------------------|------|-------|-----------|-------|-----------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 100  |       |           | V     | $V_{GS} = 0$ ,<br>$I_D = 250$ mA                                |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |       | 4.0       | V     | $V_{DS} = V_{GS}$ , $I_D = 250$ mA                              |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |       | 100       | nA    | $V_{GS} = 20$ V                                                 |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |       | -100      | nA    | $V_{GS} = -20$ V                                                |
| $I_{GSS}$ Gate-Body Leakage (OM6109)                              |      |       | $\pm 500$ | nA    | $V_{GS} = \pm 12.8$ V                                           |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1   | 0.25      | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                      |
|                                                                   |      | 0.2   | 1.0       | mA    | $V_{DS} = 0.8$ Max. Rat., $V_{GS} = 0$ ,<br>$T_C = 125^\circ$ C |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 22   |       |           | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10$ V                       |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 1.275 | 1.425     | V     | $V_{GS} = 10$ V, $I_D = 15$ A                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | .085  | .095      |       | $V_{GS} = 10$ V, $I_D = 15$ A                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | .130  | .155      |       | $V_{GS} = 10$ V, $I_D = 15$ A,<br>$T_C = 125^\circ$ C           |

**DYNAMIC**

|                                                |      |      |  |       |                                                                                |
|------------------------------------------------|------|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 10.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 15$ A                                         |
| $C_{iss}$ Input Capacitance                    |      | 1275 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |      | 550  |  | pF    | $V_{DS} = 25$ V                                                                |
| $C_{rss}$ Reverse Transfer Capacitance         |      | 160  |  | pF    | $f = 1$ MHz                                                                    |
| $T_{d(on)}$ Turn-On Delay Time                 |      | 16   |  | ns    | $V_{DD} = 30$ V, $I_D = 5$ A                                                   |
| $t_r$ Rise Time                                |      | 19   |  | ns    | $R_{\theta} = 5$ W, $V_{GS} = 10$ V                                            |
| $T_{d(off)}$ Turn-Off Delay Time               |      | 42   |  | ns    | (MOSFET) switching times are essentially independent of operating temperature. |
| $t_f$ Fall Time                                |      | 24   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |       |    |                                                                       |
|---------------------------------------------------|--|-----|-------|----|-----------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 27  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier. |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 108 | A  |                                                                       |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2.5 | V  | $T_C = 25^\circ$ C, $I_S = -24$ A, $V_{GS} = 0$                       |
| $t_{rr}$ Reverse Recovery Time                    |  | 200 |       | ns | $T_J = 150^\circ$ C, $I_F = I_S$ ,<br>$dI_F/ds = 100$ A/ms            |

**1 Pulse Test:** Pulse Width 300msec, Duty Cycle 2%.

**ELECTRICAL CHARACTERISTICS:  $T_C = 25^\circ$  unless otherwise noted**  
**STATIC P/N OM6010SA / OM6110SA**

| Parameter                                                         | Min. | Typ. | Max.      | Units | Test Conditions                                                 |
|-------------------------------------------------------------------|------|------|-----------|-------|-----------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 200  |      |           | V     | $V_{GS} = 0$ ,<br>$I_D = 250$ mA                                |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0       | V     | $V_{DS} = V_{GS}$ , $I_D = 250$ mA                              |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100       | nA    | $V_{GS} = 20$ V                                                 |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | - 100     | nA    | $V_{GS} = -20$ V                                                |
| $I_{GSS}$ Gate-Body Leakage (OM6110)                              |      |      | $\pm 500$ | nA    | $V_{GS} = \pm 12.8$ V                                           |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25      | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                      |
|                                                                   |      | 0.2  | 1.0       | mA    | $V_{DS} = 0.8$ Max. Rat., $V_{GS} = 0$ ,<br>$T_C = 125^\circ$ C |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 18   |      |           | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10$ V                       |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 1.4  | 1.8       | V     | $V_{GS} = 10$ V, $I_D = 10$ A                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.14 | 0.18      |       | $V_{GS} = 10$ V, $I_D = 10$ A                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.28 | 0.36      |       | $V_{GS} = 10$ V, $I_D = 10$ A,<br>$T_C = 125^\circ$ C           |

**DYNAMIC**

|                                                |     |      |  |       |                                                                                |
|------------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 6.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 10$ A                                         |
| $C_{iss}$ Input Capacitance                    |     | 1000 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |     | 250  |  | pF    | $V_{DS} = 25$ V                                                                |
| $C_{rss}$ Reverse Transfer Capacitance         |     | 100  |  | pF    | $f = 1$ MHz                                                                    |
| $T_{d(on)}$ Turn-On Delay Time                 |     | 17   |  | ns    | $V_{DD} = 75$ V, $I_D @ 18$ A                                                  |
| $t_r$ Rise Time                                |     | 52   |  | ns    | $R_{\theta} = 5$ W, $V_{GS} = 10$ V                                            |
| $T_{d(off)}$ Turn-Off Delay Time               |     | 36   |  | ns    | (MOSFET) switching times are essentially independent of operating temperature. |
| $t_f$ Fall Time                                |     | 30   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |      |    |                                                                       |
|---------------------------------------------------|--|-----|------|----|-----------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 18 | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier. |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 72 | A  |                                                                       |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2  | V  | $T_C = 25^\circ$ C, $I_S = -18$ A, $V_{GS} = 0$                       |
| $t_{rr}$ Reverse Recovery Time                    |  | 350 |      | ns | $T_J = 150^\circ$ C, $I_F = I_S$ ,<br>$dI_F/ds = 100$ A/ms            |

**1 Pulse Test:** Pulse Width 300msec, Duty Cycle 2%.

**ELECTRICAL CHARACTERISTICS:  $T_C = 25^\circ$  unless otherwise noted  
STATIC P/N OM6011SA / OM6111SA**

| Parameter                                                         | Min. | Typ. | Max.      | Units | Test Conditions                                                 |
|-------------------------------------------------------------------|------|------|-----------|-------|-----------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 400  |      |           | V     | $V_{GS} = 0$ ,<br>$I_D = 250$ mA                                |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0       | V     | $V_{DS} = V_{GS}$ , $I_D = 250$ mA                              |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100       | nA    | $V_{GS} = 20$ V                                                 |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | -100      | nA    | $V_{GS} = -20$ V                                                |
| $I_{GSS}$ Gate-Body Leakage (OM6111)                              |      |      | $\pm 500$ | nA    | $V_{GS} = \pm 12.8$ V                                           |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25      | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                      |
|                                                                   |      | 0.2  | 1.0       | mA    | $V_{DS} = 0.8$ Max. Rat., $V_{GS} = 0$ ,<br>$T_C = 125^\circ$ C |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 10   |      |           | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10$ V                       |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 2.35 | 2.75      | V     | $V_{GS} = 10$ V, $I_D = 5$ A                                    |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.47 | 0.55      |       | $V_{GS} = 10$ V, $I_D = 5$ A                                    |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.93 | 1.10      |       | $V_{GS} = 10$ V, $I_D = 5$ A,<br>$T_C = 125^\circ$ C            |

**DYNAMIC**

|                                                |     |      |  |       |                                                                                |
|------------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 4.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 5$ A                                          |
| $C_{iss}$ Input Capacitance                    |     | 1150 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |     | 165  |  | pF    | $V_{DS} = 25$ V                                                                |
| $C_{rss}$ Reverse Transfer Capacitance         |     | 70   |  | pF    | $f = 1$ MHz                                                                    |
| $T_{d(on)}$ Turn-On Delay Time                 |     | 17   |  | ns    | $V_{DD} = 175$ V, $I_D @ 5$ A                                                  |
| $t_r$ Rise Time                                |     | 12   |  | ns    | $R_\theta = 5$ W, $V_{GS} = 10$ V                                              |
| $T_{d(off)}$ Turn-Off Delay Time               |     | 45   |  | ns    | (MOSFET) switching times are essentially independent of operating temperature. |
| $t_f$ Fall Time                                |     | 30   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |      |    |                                                                       |
|---------------------------------------------------|--|-----|------|----|-----------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 10 | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier. |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 40 | A  |                                                                       |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2  | V  | $T_C = 25^\circ$ C, $I_S = -10$ A, $V_{GS} = 0$                       |
| $t_{rr}$ Reverse Recovery Time                    |  | 530 |      | ns | $T_J = 150^\circ$ C, $I_F = I_S$ ,<br>$dI_F/ds = 100$ A/ms            |

**1 Pulse Test:** Pulse Width 300msec, Duty Cycle 2%.

**ELECTRICAL CHARACTERISTICS:  $T_C = 25^\circ$  unless otherwise noted  
STATIC P/N OM6012SA / OM6112SA**

| Parameter                                                         | Min. | Typ. | Max.      | Units | Test Conditions                                                 |
|-------------------------------------------------------------------|------|------|-----------|-------|-----------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 500  |      |           | V     | $V_{GS} = 0$ ,<br>$I_D = 250$ mA                                |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0       | V     | $V_{DS} = V_{GS}$ , $I_D = 250$ mA                              |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100       | nA    | $V_{GS} = 20$ V                                                 |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | - 100     | nA    | $V_{GS} = -20$ V                                                |
| $I_{GSS}$ Gate-Body Leakage (OM6112)                              |      |      | $\pm 500$ | nA    | $V_{GS} = \pm 12.8$ V                                           |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25      | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                      |
|                                                                   |      | 0.2  | 1.0       | mA    | $V_{DS} = 0.8$ Max. Rat., $V_{GS} = 0$ ,<br>$T_C = 125^\circ$ C |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 8.0  |      |           | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10$ V                       |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 3.2  | 3.4       | V     | $V_{GS} = 10$ V, $I_D = 4$ A                                    |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.8  | 0.85      |       | $V_{GS} = 10$ V, $I_D = 4$ A                                    |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 1.50 | 1.65      |       | $V_{GS} = 10$ V, $I_D = 4$ A,<br>$T_C = 125^\circ$ C            |

**DYNAMIC**

|                                                |     |      |  |       |                                                                                |
|------------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 4.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 4$ A                                          |
| $C_{iss}$ Input Capacitance                    |     | 1275 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |     | 200  |  | pF    | $V_{DS} = 25$ V                                                                |
| $C_{rss}$ Reverse Transfer Capacitance         |     | 85   |  | pF    | $f = 1$ MHz                                                                    |
| $T_{d(on)}$ Turn-On Delay Time                 |     | 17   |  | ns    | $V_{DD} = 200$ V, $I_D = 4$ A                                                  |
| $t_r$ Rise Time                                |     | 5    |  | ns    | $R_\theta = 5$ W, $V_{GS} = 10$ V                                              |
| $T_{d(off)}$ Turn-Off Delay Time               |     | 42   |  | ns    | (MOSFET) switching times are essentially independent of operating temperature. |
| $t_f$ Fall Time                                |     | 14   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |      |    |                                                                       |
|---------------------------------------------------|--|-----|------|----|-----------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 8  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier. |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 32 | A  |                                                                       |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2  | V  | $T_C = 25^\circ$ C, $I_S = -18$ A, $V_{GS} = 0$                       |
| $t_{rr}$ Reverse Recovery Time                    |  | 700 |      | ns | $T_J = 150^\circ$ C, $I_F = I_S$ ,<br>$dI_F/ds = 100$ A/ms            |

OM6009SA - OM6112SA

ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

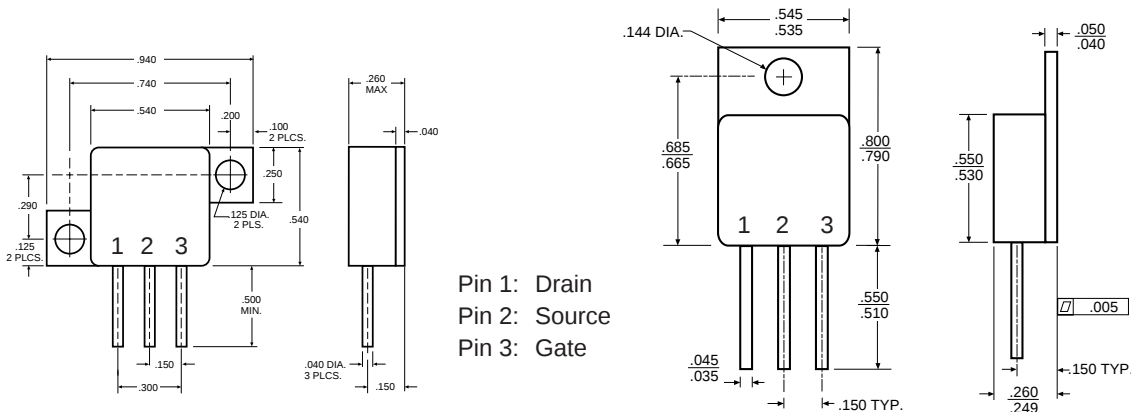
|                                         | Parameter                                   | OM6009<br>OM6109 | OM6010<br>OM6110 | OM6011<br>OM6111 | OM6012<br>OM6112 | Units |
|-----------------------------------------|---------------------------------------------|------------------|------------------|------------------|------------------|-------|
| V <sub>DS</sub>                         | Drain-Source Voltage                        | 100              | 200              | 400              | 500              | V     |
| V <sub>DGR</sub>                        | Drain-Gate Voltage (R <sub>GS</sub> = 1 M ) | 100              | 200              | 400              | 500              | V     |
| I <sub>D</sub> @ T <sub>C</sub> = 25°C  | Continuous Drain Current <sup>2</sup>       | ± 22             | ± 18             | ± 10             | ± 8              | A     |
| I <sub>D</sub> @ T <sub>C</sub> = 100°C | Continuous Drain Current <sup>2</sup>       | ± 17             | ± 11             | ± 6              | ± 5              | A     |
| I <sub>DM</sub>                         | Pulsed Drain Current <sup>1</sup>           | ± 88             | ± 72             | ± 40             | ± 32             | A     |
| V <sub>GS</sub>                         | Gate-Source Volt. (Unclamped Gate)          | ± 20             | ± 20             | ± 20             | ± 20             | V     |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C  | Maximum Power Dissipation                   | 125              | 125              | 125              | 125              | W     |
| P <sub>D</sub> @ T <sub>C</sub> = 100°C | Maximum Power Dissipation                   | 50               | 50               | 50               | 50               | W     |
| Junction To Case                        | Linear Derating Factor                      | 1.0              | 1.0              | 1.0              | 1.0              | W/°C  |
| Junction To Ambient                     | Linear Derating Factor                      | .020             | .020             | .020             | .020             | W/°C  |
| T <sub>J</sub>                          | Operating and                               |                  |                  |                  |                  |       |
| T <sub>stg</sub>                        | Storage Temperature Range                   | -55 to 150       | -55 to 150       | -55 to 150       | -55 to 150       | °C    |
| Lead Temperature                        | (1/16" from case for 10 secs.)              | 300              | 300              | 300              | 300              | °C    |

- 1 Pulse Test: Pulse width 300 μsec. Duty Cycle 2%.
- 2 Package Pin Limitation = 25 Amps

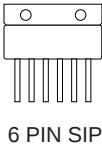
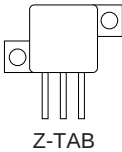
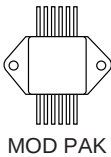
THERMAL RESISTANCE

|                   |                     |     |      |                    |
|-------------------|---------------------|-----|------|--------------------|
| R <sub>thJC</sub> | Junction-to-Case    | 1.0 | °C/W |                    |
| R <sub>thJA</sub> | Junction-to-Ambient | 50  | °C/W | Free Air Operation |

MECHANICAL OUTLINE



PACKAGE OPTIONS



NOTE: Standard Products are supplied with glass feedthroughs. For ceramic feedthroughs, add the letter "C" to the part number.  
Example - OMXXXXCSA MOSFETs are also available in Z-Tab, dual and quad pak styles - Please call the factory for more information.