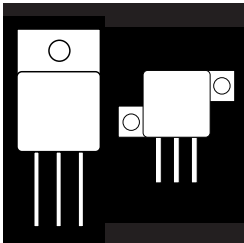


# POWER MOSFET IN HERMETIC ISOLATED TO-254AA PACKAGE



100V Thru 500V, Up To 25 Amp, N-Channel MOSFET In Hermetic Metal Package

## FEATURES

- Isolated Hermetic Metal Package
- Fast Switching
- Low  $R_{DS(on)}$
- Available Screened To MIL-S-19500, TX, TXV And S Levels
- Same as IRFM 150 - 450 Series
- Ceramic Feedthroughs Available

## DESCRIPTION

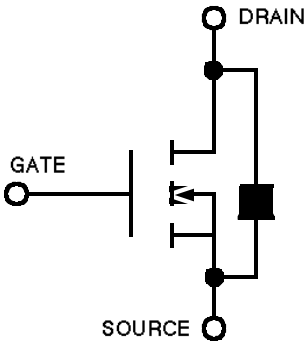
This series of hermetically packaged products feature the latest advanced MOSFET and packaging technology. They are ideally suited for Military requirements where small size, high performance and high reliability are required, and in applications such as switching power supplies, motor controls, inverters,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

## MAXIMUM RATINGS @ 25 C

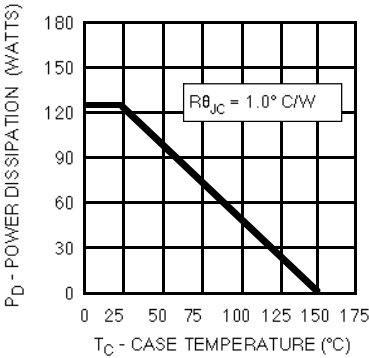
| PART NUMBER | $V_{DS}$ | $R_{DS(on)}$ | $I_D$ |
|-------------|----------|--------------|-------|
| OM6017SA    | 100 V    | .065         | 25 A  |
| OM6018SA    | 200 V    | .100         | 25 A  |
| OM6019SA    | 400 V    | .33          | 13 A  |
| OM6020SA    | 500 V    | .42          | 11 A  |

3.1

## SCHEMATIC



## POWER RATING



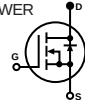
**ELECTRICAL CHARACTERISTICS: ( $T_C = 25^\circ\text{C}$  unless otherwise noted)**  
**STATIC P/N OM6017SA**

| Parameter                                                         | Min. | Typ. | Max.  | Units | Test Conditions                                                                |
|-------------------------------------------------------------------|------|------|-------|-------|--------------------------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 100  |      |       | V     | $V_{GS} = 0$ ,<br>$I_D = 250\text{ mA}$                                        |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0   | V     | $V_{DS} = V_{GS}$ , $I_D = 250\text{ mA}$                                      |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100   | nA    | $V_{GS} = +20\text{ V}$                                                        |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | - 100 | nA    | $V_{GS} = -20\text{ V}$                                                        |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25  | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                                     |
|                                                                   |      | 0.2  | 1.0   | mA    | $V_{DS} = 0.8\text{ Max. Rat.}$ , $V_{GS} = 0$ ,<br>$T_C = 125^\circ\text{ C}$ |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 35   |      |       | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10\text{ V}$                               |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 1.1  | 1.3   | V     | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.55 | 0.65  |       | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | .09  | 0.11  |       | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ ,<br>$T_C = 125^\circ\text{ C}$   |

**DYNAMIC**

|                                                |     |      |  |       |                                                                                |
|------------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 9.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 20\text{ A}$                                  |
| $C_{iss}$ Input Capacitance                    |     | 2700 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |     | 1300 |  | pF    | $V_{DS} = 25\text{ V}$                                                         |
| $C_{rss}$ Reverse Transfer Capacitance         |     | 470  |  | pF    | $f = 1\text{ MHz}$                                                             |
| $t_{d(on)}$ Turn-On Delay Time                 |     | 28   |  | ns    | $V_{DD} = 30\text{ V}$ , $I_D @ 20\text{ A}$                                   |
| $t_r$ Rise Time                                |     | 45   |  | ns    | $R_g = 5.0\text{ W}$ , $V_{GS} = 10\text{ V}$                                  |
| $t_{d(off)}$ Turn-Off Delay Time               |     | 100  |  | ns    | (MOSFET switching times are essentially independent of operating temperature.) |
| $t_f$ Fall Time                                |     | 50   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |       |    |                                                                                                                                                          |
|---------------------------------------------------|--|-----|-------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 40  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier.  |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 160 | A  |                                                                                                                                                          |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2.5 | V  |                                                                                                                                                          |
| $t_{rr}$ Reverse Recovery Time                    |  | 400 |       | ns |                                                                                                                                                          |

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

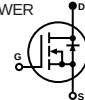
**ELECTRICAL CHARACTERISTICS: ( $T_C = 25^\circ\text{C}$  unless otherwise noted)**  
**STATIC P/N OM6018SA**

| Parameter                                                         | Min. | Typ. | Max. | Units | Test Conditions                                                                |
|-------------------------------------------------------------------|------|------|------|-------|--------------------------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 200  |      |      | V     | $V_{GS} = 0$ ,<br>$I_D = 250\text{ mA}$                                        |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0  | V     | $V_{DS} = V_{GS}$ , $I_D = 250\text{ mA}$                                      |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100  | nA    | $V_{GS} = +20\text{ V}$                                                        |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | -100 | nA    | $V_{GS} = -20\text{ V}$                                                        |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25 | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                                     |
|                                                                   |      | 0.2  | 1.0  | mA    | $V_{DS} = 0.8\text{ Max. Rat.}$ , $V_{GS} = 0$ ,<br>$T_C = 125^\circ\text{ C}$ |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 30   |      |      | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10\text{ V}$                               |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 1.36 | 1.60 | V     | $V_{GS} = 10\text{ V}$ , $I_D = 16\text{ A}$                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | .085 | .100 |       | $V_{GS} = 10\text{ V}$ , $I_D = 16\text{ A}$                                   |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.14 | 0.17 |       | $V_{GS} = 10\text{ V}$ , $I_D = 16\text{ A}$ ,<br>$T_C = 125^\circ\text{ C}$   |

**DYNAMIC**

|                                                |      |      |  |       |                                                                                |
|------------------------------------------------|------|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transconductance <sup>1</sup> | 10.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 16\text{ A}$                                  |
| $C_{iss}$ Input Capacitance                    |      | 2400 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                   |      | 600  |  | pF    | $V_{DS} = 25\text{ V}$                                                         |
| $C_{rss}$ Reverse Transfer Capacitance         |      | 250  |  | pF    | $f = 1\text{ MHz}$                                                             |
| $t_{d(on)}$ Turn-On Delay Time                 |      | 25   |  | ns    | $V_{DD} = 75\text{ V}$ , $I_D @ 16\text{ A}$                                   |
| $t_r$ Rise Time                                |      | 60   |  | ns    | $R_g = 5.0\text{ W}$ , $V_{GS} = 10\text{ V}$                                  |
| $t_{d(off)}$ Turn-Off Delay Time               |      | 85   |  | ns    | (MOSFET switching times are essentially independent of operating temperature.) |
| $t_f$ Fall Time                                |      | 38   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |       |    |                                                                                                                                                            |
|---------------------------------------------------|--|-----|-------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 30  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier.  |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 120 | A  |                                                                                                                                                            |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 2   | V  |                                                                                                                                                            |
| $t_{rr}$ Reverse Recovery Time                    |  | 350 |       | ns |                                                                                                                                                            |

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

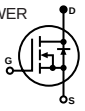
**ELECTRICAL CHARACTERISTICS: ( $T_C = 25^\circ\text{C}$  unless otherwise noted)**  
**STATIC P/N OM6019SA**

| Parameter                                                         | Min. | Typ. | Max.  | Units | Test Conditions                                                                |
|-------------------------------------------------------------------|------|------|-------|-------|--------------------------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 400  |      |       | V     | $V_{GS} = 0$ ,<br>$I_D = 250\text{ mA}$                                        |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0   | V     | $V_{DS} = V_{GS}$ , $I_D = 250\text{ mA}$                                      |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100   | nA    | $V_{GS} = +20\text{ V}$                                                        |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | - 100 | nA    | $V_{GS} = - 20\text{ V}$                                                       |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25  | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                                     |
|                                                                   |      | 0.2  | 1.0   | mA    | $V_{DS} = 0.8\text{ Max. Rat.}$ , $V_{GS} = 0$ ,<br>$T_C = 125^\circ\text{ C}$ |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 15   |      |       | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10\text{ V}$                               |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 2.0  | 2.64  | V     | $V_{GS} = 10\text{ V}$ , $I_D = 8.0\text{ A}$                                  |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.25 | .33   |       | $V_{GS} = 10\text{ V}$ , $I_D = 8.0\text{ A}$                                  |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.50 | 0.66  |       | $V_{GS} = 10\text{ V}$ , $I_D = 8.0\text{ A}$ ,<br>$T_C = 125\text{ C}$        |

**DYNAMIC**

|                                             |     |      |  |       |                                                                                |
|---------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transductance <sup>1</sup> | 6.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 8.0\text{ A}$                                 |
| $C_{iss}$ Input Capacitance                 |     | 2900 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                |     | 450  |  | pF    | $V_{DS} = 25\text{ V}$                                                         |
| $C_{riss}$ Reverse Transfer Capacitance     |     | 150  |  | pF    | $f = 1\text{ MHz}$                                                             |
| $t_{d(on)}$ Turn-On Delay Time              |     | 30   |  | ns    | $V_{DD} = 200\text{ V}$ , $I_D @ 8.0\text{ A}$                                 |
| $t_r$ Rise Time                             |     | 40   |  | ns    | $R_{\theta} = 5.0\text{ W}$ , $V_{GS} = 10\text{ V}$                           |
| $t_{d(off)}$ Turn-Off Delay Time            |     | 80   |  | 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)      |  |     | - 15  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier.  |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 60  | A  |                                                                                                                                                           |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 1.6 | V  |                                                                                                                                                           |
| $t_{rr}$ Reverse Recovery Time                    |  | 600 |       | ns | $T_J = 100\text{ C}$ , $I_F = I_S$ ,<br>$di_F/ds = 100\text{ A/ms}$                                                                                       |

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

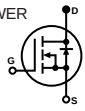
**ELECTRICAL CHARACTERISTICS: ( $T_C = 25^\circ\text{C}$  unless otherwise noted)**  
**STATIC P/N OM6020SA**

| Parameter                                                         | Min. | Typ. | Max.  | Units | Test Conditions                                                                |
|-------------------------------------------------------------------|------|------|-------|-------|--------------------------------------------------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                         | 500  |      |       | V     | $V_{GS} = 0$ ,<br>$I_D = 250\text{ mA}$                                        |
| $V_{GS(th)}$ Gate-Threshold Voltage                               | 2.0  |      | 4.0   | V     | $V_{DS} = V_{GS}$ , $I_D = 250\text{ mA}$                                      |
| $I_{GSSF}$ Gate-Body Leakage Forward                              |      |      | 100   | nA    | $V_{GS} = +20\text{ V}$                                                        |
| $I_{GSSR}$ Gate-Body Leakage Reverse                              |      |      | - 100 | nA    | $V_{GS} = - 20\text{ V}$                                                       |
| $I_{DSS}$ Zero Gate Voltage Drain Current                         |      | 0.1  | 0.25  | mA    | $V_{DS} = \text{Max. Rat.}$ , $V_{GS} = 0$                                     |
|                                                                   |      | 0.2  | 1.0   | mA    | $V_{DS} = 0.8\text{ Max. Rat.}$ , $V_{GS} = 0$ ,<br>$T_C = 125^\circ\text{ C}$ |
| $I_{D(on)}$ On-State Drain Current <sup>1</sup>                   | 13   |      |       | A     | $V_{DS} = 2 V_{DS(on)}$ , $V_{GS} = 10\text{ V}$                               |
| $V_{DS(on)}$ Static Drain-Source On-State Voltage <sup>1</sup>    |      | 2.1  | 2.94  | V     | $V_{GS} = 10\text{ V}$ , $I_D = 7.0\text{ A}$                                  |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.3  | 0.42  |       | $V_{GS} = 10\text{ V}$ , $I_D = 7.0\text{ A}$                                  |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance <sup>1</sup> |      | 0.66 | 0.88  |       | $V_{GS} = 10\text{ V}$ , $I_D = 7.0\text{ A}$ ,<br>$T_C = 125\text{ C}$        |

**DYNAMIC**

|                                             |     |      |  |       |                                                                                |
|---------------------------------------------|-----|------|--|-------|--------------------------------------------------------------------------------|
| $g_{fs}$ Forward Transductance <sup>1</sup> | 6.0 |      |  | S (M) | $V_{DS} = 2 V_{DS(on)}$ , $I_D = 7.0\text{ A}$                                 |
| $C_{iss}$ Input Capacitance                 |     | 2600 |  | pF    | $V_{GS} = 0$                                                                   |
| $C_{oss}$ Output Capacitance                |     | 280  |  | pF    | $V_{DS} = 25\text{ V}$                                                         |
| $C_{riss}$ Reverse Transfer Capacitance     |     | 40   |  | pF    | $f = 1\text{ MHz}$                                                             |
| $t_{d(on)}$ Turn-On Delay Time              |     | 30   |  | ns    | $V_{DD} = 210\text{ V}$ , $I_D @ 7.0\text{ A}$                                 |
| $t_r$ Rise Time                             |     | 46   |  | ns    | $R_{\theta} = 5.0\text{ W}$ , $V_{GS} = 10\text{ V}$                           |
| $t_{d(off)}$ Turn-Off Delay Time            |     | 75   |  | ns    | (MOSFET switching times are essentially independent of operating temperature.) |
| $t_f$ Fall Time                             |     | 31   |  | ns    |                                                                                |

**BODY-DRAIN DIODE RATINGS AND CHARACTERISTICS**

|                                                   |  |     |       |    |                                                                                                                                                             |
|---------------------------------------------------|--|-----|-------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$ Continuous Source Current (Body Diode)      |  |     | - 13  | A  | Modified MOSPOWER symbol showing the integral P-N Junction rectifier.  |
| $I_{SM}$ Source Current <sup>1</sup> (Body Diode) |  |     | - 52  | A  |                                                                                                                                                             |
| $V_{SD}$ Diode Forward Voltage <sup>1</sup>       |  |     | - 1.4 | V  |                                                                                                                                                             |
| $t_{rr}$ Reverse Recovery Time                    |  | 700 |       | ns | $T_J = 150\text{ C}$ , $I_F = I_S$ ,<br>$di_F/ds = 100\text{ A/ms}$                                                                                         |

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

OM6017SA - OM6020SA

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

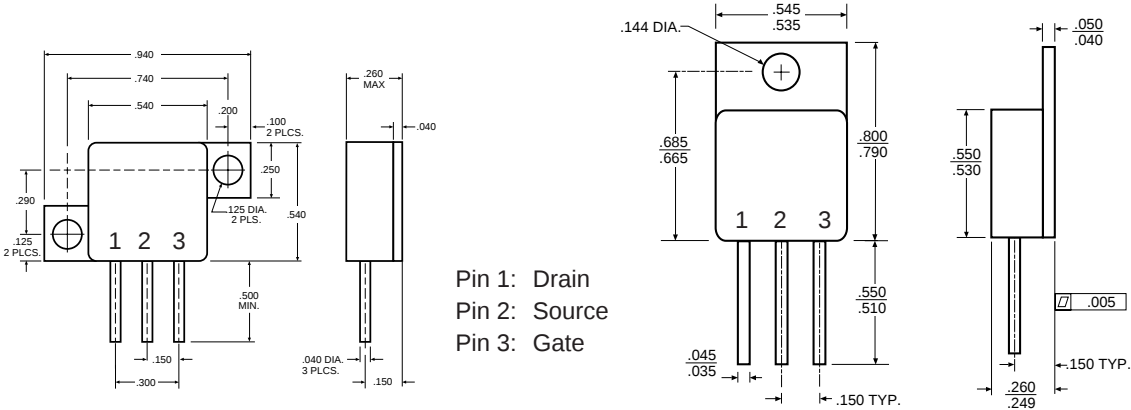
|                                         | Parameter                                   | OM6017SA   | OM6018SA   | OM6019SA   | OM6020SA   | Units |
|-----------------------------------------|---------------------------------------------|------------|------------|------------|------------|-------|
| 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>       | ±25        | ±25        | ±13        | ±11        | A     |
| I <sub>D</sub> @ T <sub>C</sub> = 100°C | Continuous Drain Current <sup>2</sup>       | ±16        | ±16        | ±8         | ±7         | A     |
| I <sub>DM</sub>                         | Pulsed Drain Current <sup>1</sup>           | ±100       | ±80        | ±54        | ±40        | A     |
| V <sub>GS</sub>                         | Gate-Source Voltage                         | ± 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 = 15 Amps

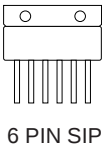
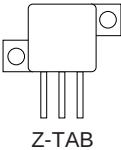
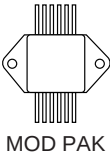
THERMAL RESISTANCE

|                   |                     |     |                         |
|-------------------|---------------------|-----|-------------------------|
| 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



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