

**5A LOW DROPOUT POSITIVE
 FIXED 3.3V REGULATOR**

FEATURES

- Guaranteed < 1.3V Dropout at Full Load Current
- Fast Transient Response
- 1% Voltage Reference Initial Accuracy
- Output Current Limiting
- Built-In Thermal Shutdown

APPLICATIONS

- Standard 3.3V Chip Set and Logic Applications

DESCRIPTION

The IRU1050-33 is a low dropout three-terminal fixed 3.3V output regulator with minimum of 5A output current capability. This product is specifically designed to provide well regulated supply for low voltage IC applications requiring 3.3V output. The IRU1050-33 is guaranteed to have <1.3V dropout at full load current making it ideal to provide well regulated output with supply voltage as low as 4.6V input.

TYPICAL APPLICATION

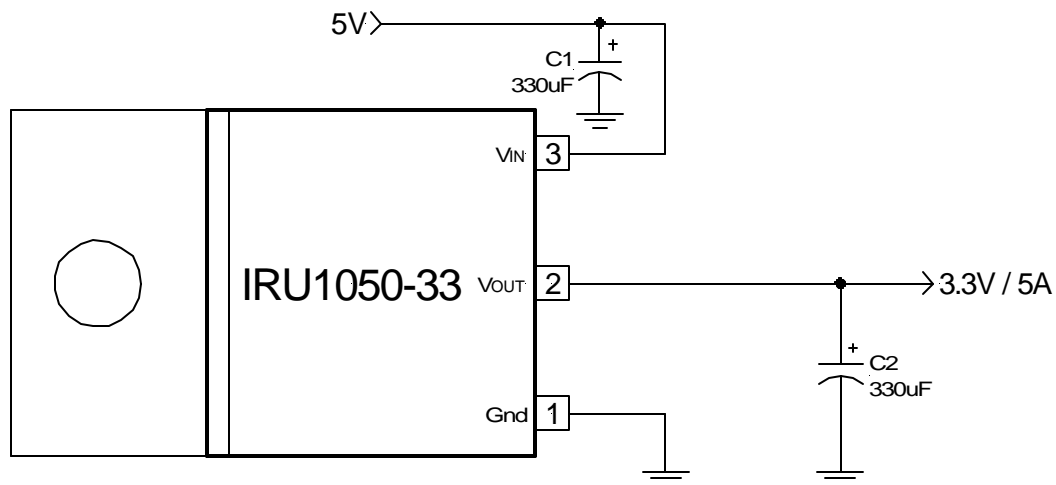


Figure 1 - Typical application of IRU1050-33.

PACKAGE ORDER INFORMATION

| T _J (°C) | 3-PIN PLASTIC TO-220 (T) | 3-PIN PLASTIC TO-263 (M) | 2-PIN PLASTIC Ultra Thin-Pak™ (P) | 2-PIN PLASTIC TO-252 (D-Pak) |
|---------------------|-----------------------------|-----------------------------|--------------------------------------|---------------------------------|
| 0 To 150 | IRU1050-33CT | IRU1050-33CM | IRU1050-33CP | IRU1050-33CD |

ABSOLUTE MAXIMUM RATINGS

| | |
|--|--------------------|
| Input Voltage (V_{IN}) | 7V |
| Power Dissipation | Internally Limited |
| Storage Temperature Range | -65°C To 150°C |
| Operating Junction Temperature Range | 0°C To 150°C |

PACKAGE INFORMATION

| 3-Pin Plastic TO-220 (T) | 3-Pin Plastic TO-263 (M) | 2-Pin Plastic ULTRA THIN-PAK™ (P) | 2-Pin Plastic TO-252 (D-Pak) |
|---|--|--|--|
| <p>$\theta_{JT}=2.7^{\circ}\text{C/W}$ $\theta_{JA}=60^{\circ}\text{C/W}$</p> | <p>$\theta_{JA}=35^{\circ}\text{C/W}$ for 1" Square pad</p> | <p>$\theta_{JA}=70^{\circ}\text{C/W}$ for 1" Square pad</p> | <p>$\theta_{JA}=70^{\circ}\text{C/W}$ for 0.5" Sq pad</p> |

ELECTRICAL SPECIFICATIONS

Unless otherwise specified, these specifications apply over $C_{IN}=1\mu\text{F}$, $C_{OUT}=10\mu\text{F}$, and $T_J=0$ to 150°C . Typical values refer to $T_J=25^{\circ}\text{C}$.

| PARAMETER | SYM | TEST CONDITION | MIN | TYP | MAX | UNITS |
|-------------------------------|--------------|---|----------------|------------|----------------|---------|
| Output Voltage | V_o | $I_o=10\text{mA}$, $T_J=25^{\circ}\text{C}$, $V_{IN}=5\text{V}$ $I_o=10\text{mA}$, $V_{IN}=5\text{V}$ | 3.267 3.234 | 3.3 3.3 | 3.333 3.366 | V |
| Line Regulation | | $I_o=10\text{mA}$, $4.7\text{V}<V_{IN}<7\text{V}$ | | | 0.2 | % |
| Load Regulation (Note 1) | | $V_{IN}=3.3\text{V}$, $10\text{mA}<I_o<5\text{A}$ | | | 0.4 | % |
| Dropout Voltage (Note 2) | ΔV_o | Note 2, $I_o=5\text{A}$ | | 1.1 | 1.3 | V |
| Current Limit | | $V_{IN}=5\text{V}$, $\Delta V_o=100\text{mV}$ | 5.1 | | | A |
| Minimum Load Current (Note 3) | | $V_{IN}=5\text{V}$ | | 5 | 10 | mA |
| Thermal Regulation | | 30ms Pulse, $V_{IN}-V_o=3\text{V}$, $I_o=5\text{A}$ | | 0.01 | 0.02 | %/W |
| Ripple Rejection | | $f=120\text{Hz}$, $C_o=25\mu\text{F}$ Tantalum, $I_o=2.5\text{A}$, $V_{IN}-V_o=3\text{V}$ | 60 | 70 | | dB |
| Temperature Stability | | $V_{IN}=5\text{V}$, $I_o=10\text{mA}$ | | 0.5 | | % |
| Long Term Stability | | $T_J=25^{\circ}\text{C}$, 1000Hrs | | 0.3 | 1 | % |
| RMS Output Noise | | $T_J=25^{\circ}\text{C}$, $10\text{Hz}<f<10\text{KHz}$ | | 0.003 | | % V_o |

Note 1: Low duty cycle pulse testing with Kelvin connections is required in order to maintain accurate data.

Note 2: Dropout voltage is defined as the minimum differential voltage between V_{IN} and V_{OUT} required to maintain regulation at V_{OUT} . It is measured when the output voltage drops 1% below its nominal value.

Note 3: Minimum load current is defined as the minimum current required at the output in order for the output voltage to maintain regulation. Typically the resistor dividers are selected such that it automatically maintains this current.

PIN DESCRIPTIONS

| PIN # | PIN SYMBOL | PIN DESCRIPTION |
|-------|------------------|--|
| 1 | Gnd | This pin must be connected to ground plane using a low inductance short connection. |
| 2 | V _{OUT} | The output of the regulator. A minimum of 10μF capacitor must be connected from this pin to ground to insure stability. |
| 3 | V _{IN} | The input pin of the regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than V _{OUT} in order for the device to regulate properly. |

BLOCK DIAGRAM

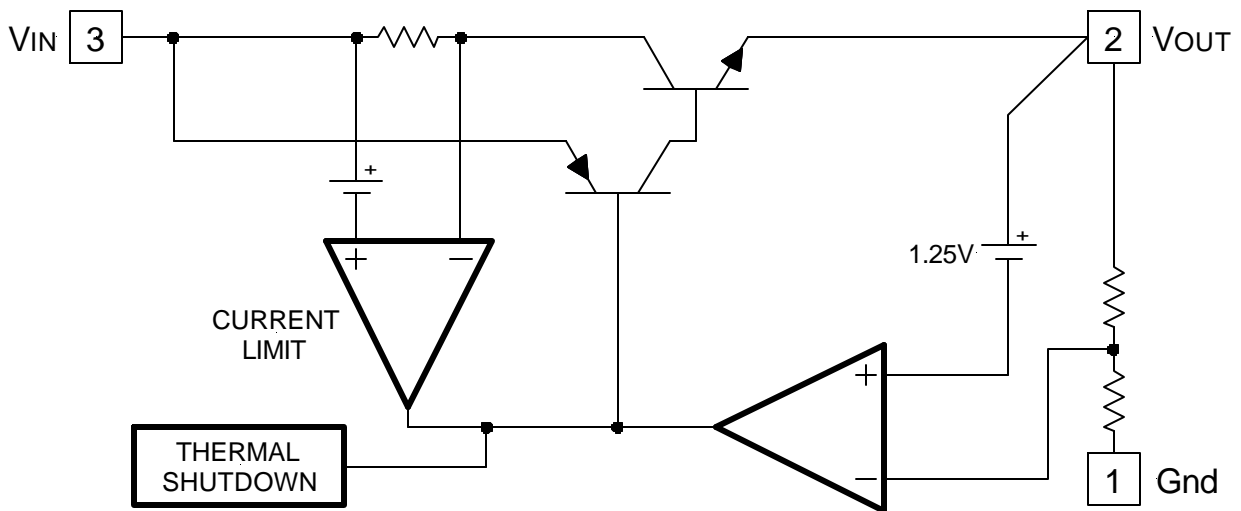


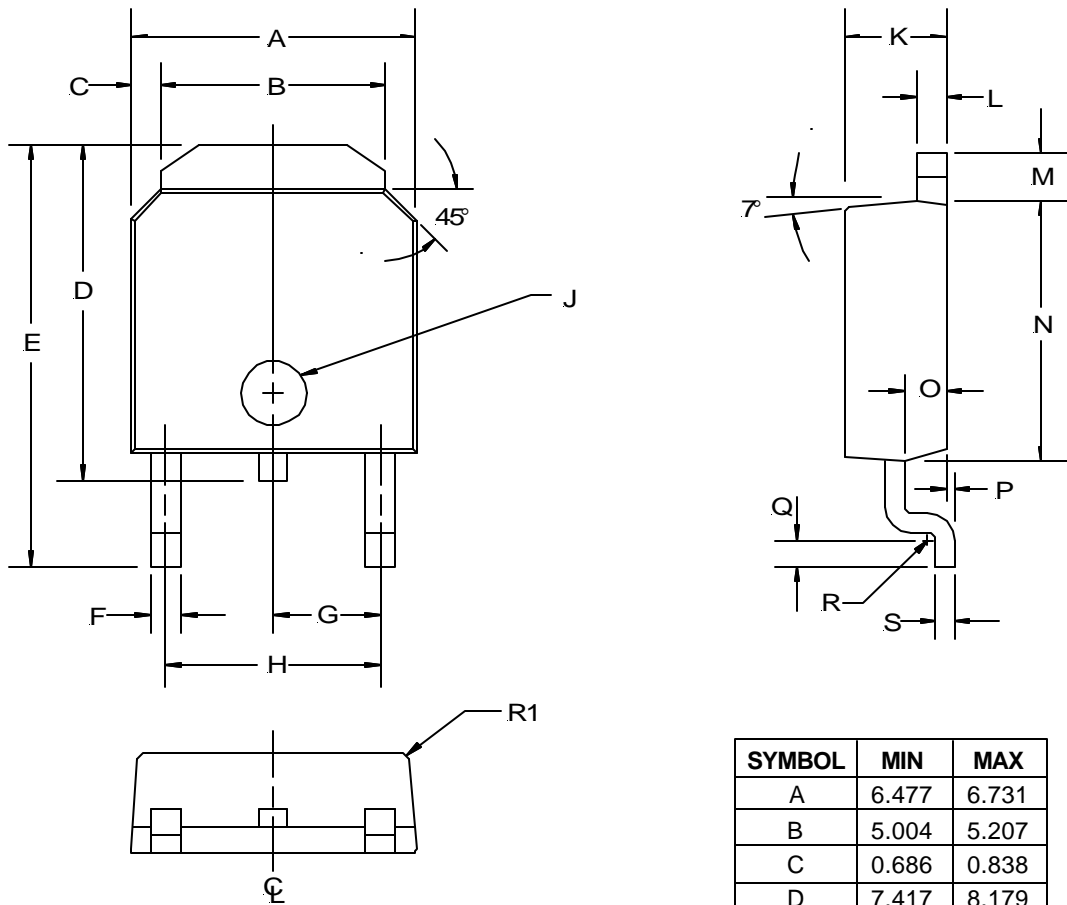
Figure 1 - Simplified block diagram of the IRU1050-33.

APPLICATION INFORMATION

Stability

The IRU1050-33 requires the use of an output capacitor as part of the frequency compensation in order to make the regulator stable. Typical designs for microprocessor applications use standard electrolytic capacitors with a typical ESR in the range of 50 to 100mΩ and an output capacitance of 500 to 1000μF. Fortunately as the capacitance increases, the ESR decreases resulting in a fixed RC time constant. The IRU1050-33 takes advantage of this phenomena in making the overall regulator loop stable. For most applications a minimum of 100μF aluminum electrolytic capacitor such as Sanyo MVGX series, Panasonic FA series as well as the Nichicon PL series insures both stability and good transient response.

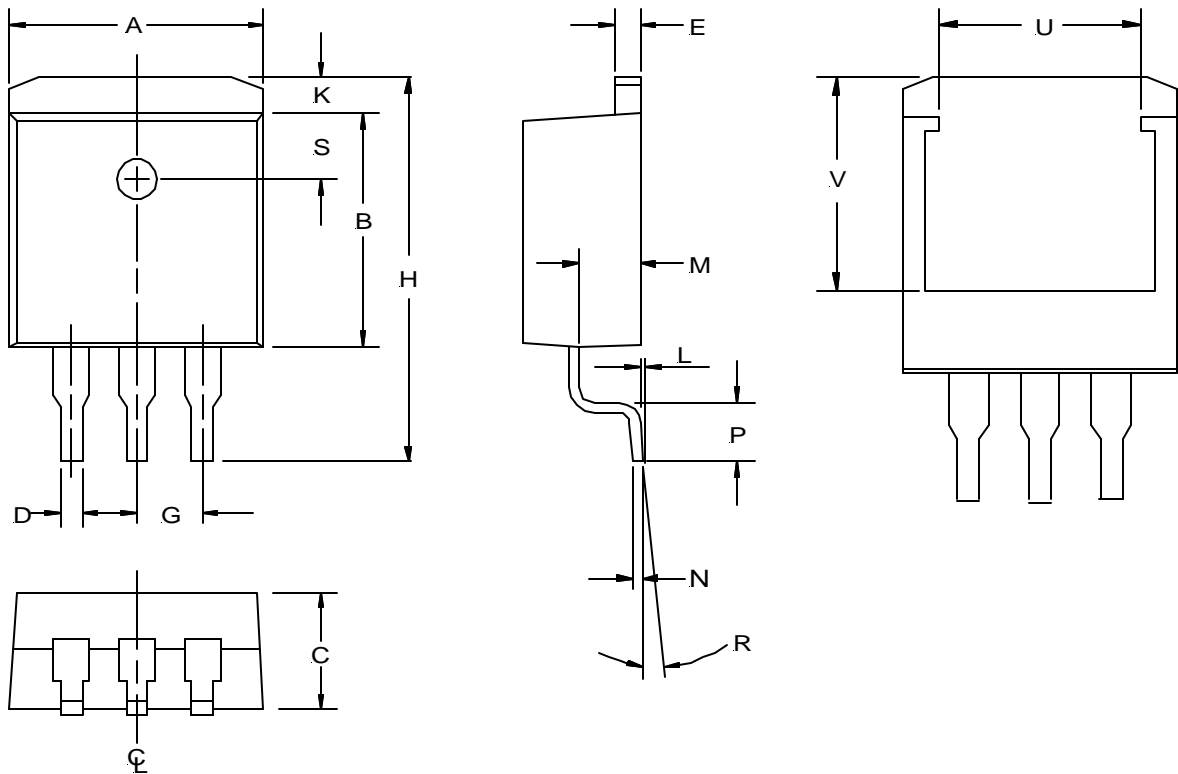
**(D) TO-252 Package
 2-Pin**



| SYMBOL | MIN | MAX |
|--------|-----------|--------|
| A | 6.477 | 6.731 |
| B | 5.004 | 5.207 |
| C | 0.686 | 0.838 |
| D | 7.417 | 8.179 |
| E | 9.703 | 10.084 |
| F | 0.635 | 0.889 |
| G | 2.286 BSC | |
| H | 4.521 | 4.623 |
| J | Ø1.52 | Ø1.62 |
| K | 2.184 | 2.388 |
| L | 0.762 | 0.864 |
| M | 1.016 | 1.118 |
| N | 5.969 | 6.223 |
| O | 1.016 | 1.118 |
| P | 0 | 0.102 |
| Q | 0.534 | 0.686 |
| R | R0.31 TYP | |
| R1 | R0.51 TYP | |
| S | 0.428 | 0.588 |

NOTE: ALL MEASUREMENTS
 ARE IN MILLIMETERS.

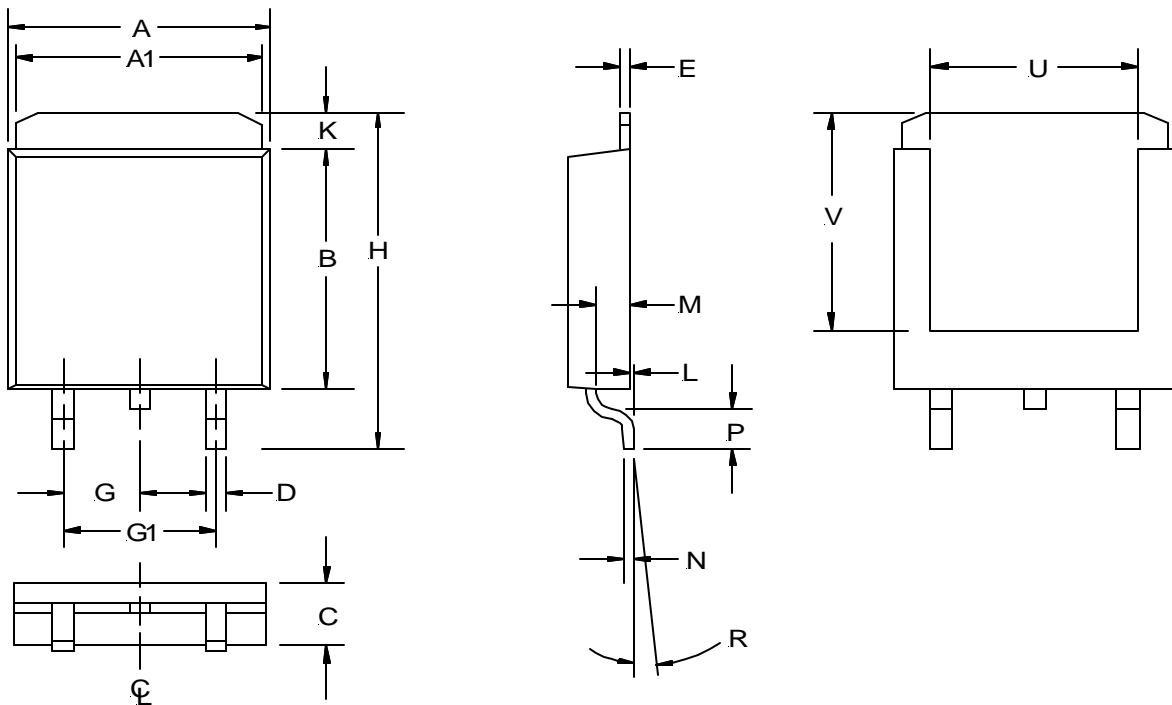
**(M) TO-263 Package
 3-Pin**



| SYMBOL | MIN | MAX |
|--------|----------|--------|
| A | 10.05 | 10.312 |
| B | 8.28 | 8.763 |
| C | 4.31 | 4.572 |
| D | 0.66 | 0.91 |
| E | 1.14 | 1.40 |
| G | 2.54 REF | |
| H | 14.73 | 15.75 |
| K | 1.40 | 1.68 |
| L | 0.00 | 0.254 |
| M | 2.49 | 2.74 |
| N | 0.33 | 0.58 |
| P | 2.286 | 2.794 |
| R | 0° | 8° |
| S | 2.41 | 2.67 |
| U | 6.50 REF | |
| V | 7.75 REF | |

NOTE: ALL MEASUREMENTS
 ARE IN MILLIMETERS.

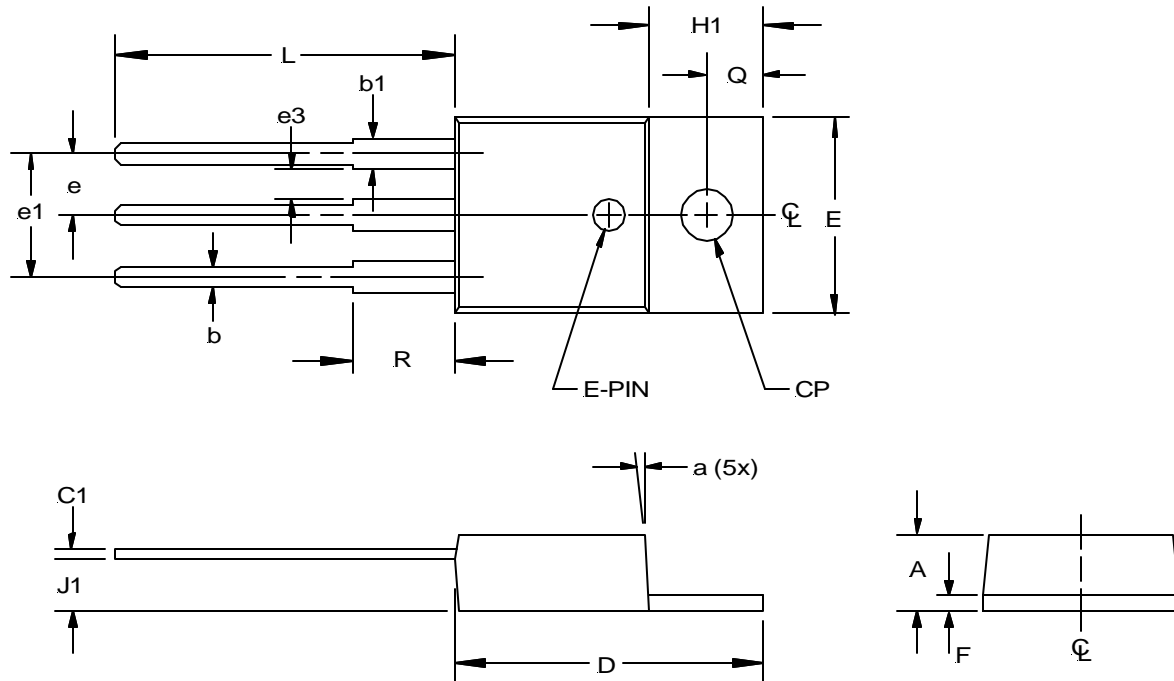
**(P) Ultra Thin-Pak™
 2-Pin**



| SYMBOL | MIN | MAX |
|--------|----------|------|
| A | 5.91 | 6.17 |
| A1 | 5.54 | 5.79 |
| B | 6.02 | 6.27 |
| C | 1.70 | 2.03 |
| D | 0.63 | 0.79 |
| E | 0.17 | 0.33 |
| G | 2.16 | 2.41 |
| G1 | 4.45 | 4.70 |
| H | 9.42 | 9.68 |
| K | 0.76 | 1.27 |
| L | 0.02 | 0.13 |
| M | 0.89 | 1.14 |
| N | 0.25 | 0.25 |
| P | 0.94 | 1.19 |
| R | 2° | 6° |
| U | 2.92 | 3.30 |
| V | 5.08 NOM | |

NOTE: ALL MEASUREMENTS
 ARE IN MILLIMETERS.

**(T) TO-220 Package
 3-Pin**



| SYMBOL | MIN | MAX |
|--------|--------|--------|
| A | 4.06 | 4.83 |
| a | 3° | 7.5° |
| b | 0.63 | 1.02 |
| b1 | 1.14 | 1.52 |
| C1 | 0.38 | 0.56 |
| CP | 3.71D | 3.96D |
| D | 14.22 | 15.062 |
| E | 9.78 | 10.54 |
| e | 2.29 | 2.79 |
| e1 | 4.83 | 5.33 |
| e3 | 1.14 | 1.40 |
| F | 1.14 | 1.40 |
| H1 | 5.94 | 6.55 |
| J1 | 2.29 | 2.92 |
| L | 13.716 | 14.22 |
| Q | 2.62 | 2.87 |
| R | 5.588 | 6.17 |

NOTE: ALL MEASUREMENTS
 ARE IN MILLIMETERS.

PACKAGE SHIPMENT METHOD

| PKG DESIG | PACKAGE DESCRIPTION | PIN COUNT | PARTS PER TUBE | PARTS PER REEL | T & R Orientation |
|-----------|---------------------|-----------|----------------|----------------|-------------------|
| D | TO-252, (D-Pak) | 2 | 75 | 2500 | Fig A |
| M | TO-263 | 3 | 50 | 750 | Fig B |
| P | Ultra Thin-Pak™ | 2 | 75 | 2500 | Fig C |
| T | TO-220 | 3 | 50 | --- | --- |

