

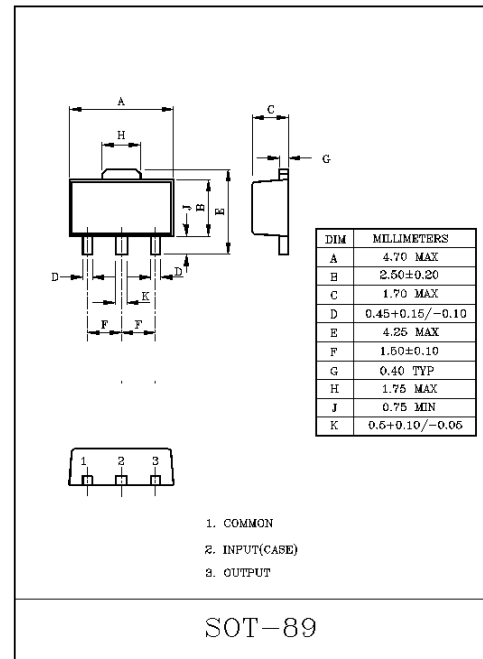
THREE TERMINAL NEGATIVE VOLTAGE REGULATORS  
5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V

#### FEATURES:

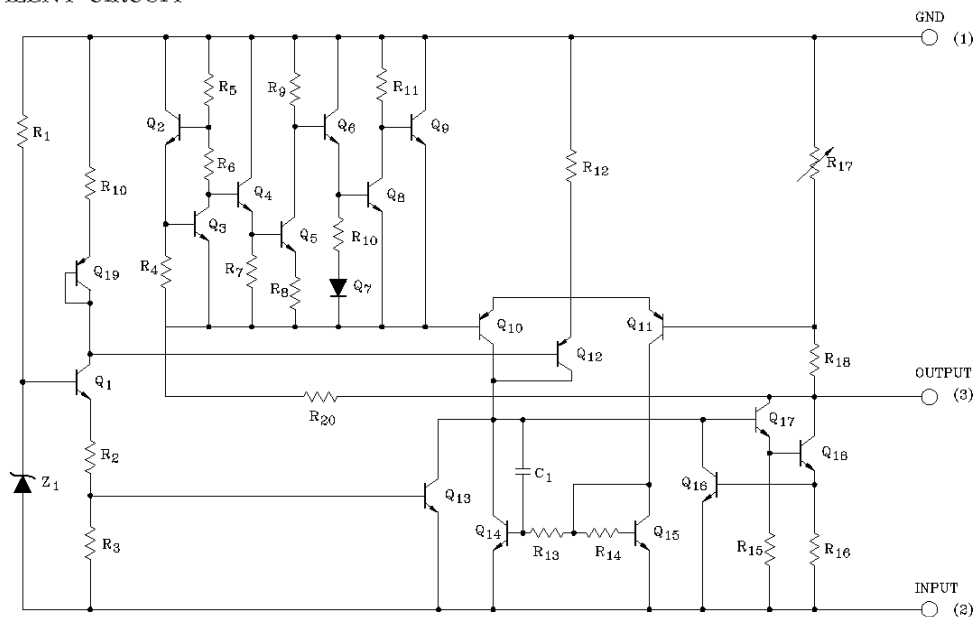
- Best Suited to a Power Supply for TTL and C<sup>2</sup>-MOS.
- Built-in Overcurrent Protective Circuit.
- Built-in Thermal Protective Circuit.
- Max. Output Current 150mA (T<sub>j</sub>=25°C).
- Packaged in Power mini.

#### MAXIMUM RATINGS (T<sub>a</sub>=25°C)

| CHARACTERISTIC                           |            | SYMBOL           | RATING  | UNIT |
|------------------------------------------|------------|------------------|---------|------|
| Input Voltage                            | KIA79L05F~ | V <sub>IN</sub>  | -35     | V    |
|                                          | KIA79L15F  |                  |         |      |
|                                          | KIA79L18F~ |                  | -40     |      |
|                                          | KIA79L24F  |                  |         |      |
| Power Dissipation (T <sub>c</sub> =25°C) |            | P <sub>D</sub>   | 500     | mW   |
| Operating Junction Temperature           |            | T <sub>j</sub>   | -30~150 | °C   |
| Operating Temperature                    |            | T <sub>opr</sub> | -30~75  | °C   |
| Storage temperature                      |            | T <sub>stg</sub> | -55~150 | °C   |



#### EQUIVALENT CIRCUIT



#### Marking

| Type No.  | Marking | Type No.  | Marking | Type No.  | Marking |
|-----------|---------|-----------|---------|-----------|---------|
| KIA79L05F | 9A      | KIA89L10F | 9E      | KIA79L20F | 9I      |
| KIA79L06F | 9B      | KIA79L12F | 9F      | KIA79L24F | 9J      |
| KIA79L08F | 9C      | KIA79L15F | 9G      |           |         |
| KIA79L09F | 9D      | KIA79L18F | 9H      |           |         |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

### KIA79L05F

(Unless otherwise specified,  $V_{IN}=-10V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                    | TEST<br>CIRCUIT | TEST CONDITION                                                  | MIN.                            | TYP. | MAX.  | UNIT            |
|------------------------------------------------------|---------------------------|-----------------|-----------------------------------------------------------------|---------------------------------|------|-------|-----------------|
| Output Voltage                                       | $V_{OUT}$                 | 1               | $T_j=25^{\circ}C$                                               | -5.2                            | -5.0 | -4.8  | V               |
| Input Regulation                                     | Reg line                  | 1               | $T_j=25^{\circ}C$                                               | -20V $\leq V_{IN} \leq$ -7.0V   | -    | 55    | mV              |
|                                                      |                           |                 |                                                                 | -20V $\leq V_{IN} \leq$ -8.0V   | -    | 45    |                 |
| Load Regulation                                      | Reg load                  | 1               | $T_j=25^{\circ}C$                                               | $1.0mA \leq I_{OUT} \leq 100mA$ | -    | 11    | mV              |
|                                                      |                           |                 |                                                                 | $1.0mA \leq I_{OUT} \leq 40mA$  | -    | 5.0   |                 |
| Output Voltage                                       | $V_{OUT}$                 | 1               | -20V $\leq V_{IN} \leq$ -7.0V<br>$1.0mA \leq I_{OUT} \leq 40mA$ | -5.25                           | -    | -4.75 | V               |
|                                                      |                           |                 | $V_{IN}=-10V$ , $1.0mA \leq I_{OUT} \leq 70mA$                  | -5.25                           | -    | -4.75 |                 |
| Quiescent Current                                    | $I_B$                     | 1               | $T_j=25^{\circ}C$                                               | -                               | 3.1  | 6.0   | mA              |
|                                                      |                           |                 | $T_j=125^{\circ}C$                                              | -                               | -    | 5.5   |                 |
| Quiescent Current Change                             | $\Delta I_{BI}$           | 1               | -20V $\leq V_{IN} \leq$ -8.0V                                   | -                               | -    | 1.5   | mA              |
|                                                      | $\Delta I_{BO}$           |                 | $1.0mA \leq I_{OUT} \leq 40mA$                                  | -                               | -    | 0.1   |                 |
| Output Noise Voltage                                 | $V_{NO}$                  | 3               | $T_a=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$                   | -                               | 40   | -     | $\mu V_{rms}$   |
| Long Term Stability                                  | $\Delta V_{OUT}/\Delta t$ | 1               |                                                                 | -                               | 12   | -     | mV/<br>1.0kHrs  |
| Ripple Rejection Ratio                               | RR                        | 2               | -18V $\leq V_{IN} \leq$ -8.0V,<br>$T_j=25^{\circ}C$ , $f=120Hz$ | 41                              | 49   | -     | dB              |
| Dropout Voltage                                      | $ V_{IN}-V_{OUT} $        | 1               | $T_j=25^{\circ}C$ , $I_{OUT}=40mA$                              | -                               | 1.7  | -     | V               |
| Average Temperature<br>Coefficient of Output Voltage | $TC_{VO}$                 | 1               | $I_{OUT}=5mA$                                                   | -                               | -0.6 | -     | mV/ $^{\circ}C$ |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

KIA79L06F

(Unless otherwise specified,  $V_{IN}=-11V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                    |                                  | MIN.  | TYP. | MAX.  | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|-------------------------------------------------------------------|----------------------------------|-------|------|-------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                               |                                  | -6.24 | -6.0 | -5.76 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                               | -21V ≤ V <sub>IN</sub> ≤ -8.1V   | -     | 50   | 150   | mV                |
|                                                      |                                       |                 |                                                                   | -21V ≤ V <sub>IN</sub> ≤ -9.0V   | -     | 45   | 110   |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                               | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -     | 12   | 70    | mV                |
|                                                      |                                       |                 |                                                                   | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -     | 5.5  | 35    |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -21V ≤ V <sub>IN</sub> ≤ -8.1V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -6.3  | -    | -5.7  | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-11V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA            |                                  | -6.3  | -    | -5.7  |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                               |                                  | -     | 3.1  | 6.0   | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                              |                                  | -     | -    | 5.5   |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -20V ≤ V <sub>IN</sub> ≤ -9.0V                                    |                                  | -     | -    | 1.5   | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                   |                                  | -     | -    | 0.1   |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                            |                                  | -     | 40   | -     | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                   |                                  | -     | 14   | -     | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -19V ≤ V <sub>IN</sub> ≤ -9.0V,<br>T <sub>j</sub> =25℃, f=120Hz   |                                  | 39    | 47   | -     | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                       |                                  | -     | 1.7  | -     | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                             |                                  | -     | -0.7 | -     | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

KIA79L08F

(Unless otherwise specified,  $V_{IN}=-14V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                     |                                  | MIN. | TYP. | MAX. | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------|----------------------------------|------|------|------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>J</sub> =25℃                                                |                                  | -8.3 | -8.0 | -7.7 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>J</sub> =25℃                                                | -23V ≤ V <sub>IN</sub> ≤ -10.5V  | -    | 20   | 175  | mV                |
|                                                      |                                       |                 |                                                                    | -23V ≤ V <sub>IN</sub> ≤ -11V    | -    | 12   | 125  |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>J</sub> =25℃                                                | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -    | 15   | 80   | mV                |
|                                                      |                                       |                 |                                                                    | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -    | 7.0  | 40   |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -23V ≤ V <sub>IN</sub> ≤ -10.5V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -8.4 | -    | -7.6 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-14V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA             |                                  | -8.4 | -    | -7.6 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>J</sub> =25℃                                                |                                  | -    | 3.1  | 6.5  | mA                |
|                                                      |                                       |                 | T <sub>J</sub> =125℃                                               |                                  | -    | -    | 6.0  |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -23V ≤ V <sub>IN</sub> ≤ -11V                                      |                                  | -    | -    | 1.5  | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                    |                                  | -    | -    | 0.1  |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                             |                                  | -    | 60   | -    | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                    |                                  | -    | 20   | -    | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -23V ≤ V <sub>IN</sub> ≤ -12V,<br>T <sub>J</sub> =25℃, f=120Hz     |                                  | 37   | 45   | -    | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>J</sub> =25℃, I <sub>OUT</sub> =40mA                        |                                  | -    | 1.7  | -    | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                              |                                  | -    | -0.8 | -    | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

KIA79L09F

(Unless otherwise specified,  $V_{IN}=-15V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                     |                                  | MIN.  | TYP.  | MAX.  | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------|----------------------------------|-------|-------|-------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                                |                                  | -9.36 | -9.0  | -8.64 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                                | -24V ≤ V <sub>IN</sub> ≤ -11.4V  | -     | 80    | 200   | mV                |
|                                                      |                                       |                 |                                                                    | -24V ≤ V <sub>IN</sub> ≤ -12V    | -     | 20    | 160   |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                                | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -     | 17    | 90    | mV                |
|                                                      |                                       |                 |                                                                    | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -     | 8.0   | 45    |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -24V ≤ V <sub>IN</sub> ≤ -11.4V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -9.45 | -     | -8.55 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-15V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA             |                                  | -9.45 | -     | -8.55 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                                |                                  | -     | 3.2   | 6.5   | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                               |                                  | -     | -     | 6.0   |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -24V ≤ V <sub>IN</sub> ≤ -12V                                      |                                  | -     | -     | 1.5   | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                    |                                  | -     | -     | 0.1   |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                             |                                  | -     | 65    | -     | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                    |                                  | -     | 21    | -     | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -24V ≤ V <sub>IN</sub> ≤ -12V,<br>T <sub>j</sub> =25℃, f=120Hz     |                                  | 36    | 44    | -     | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                        |                                  | -     | 1.7   | -     | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                              |                                  | -     | -0.85 | -     | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

### KIA79L10F

(Unless otherwise specified,  $V_{IN} = -16V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                    | TEST<br>CIRCUIT | TEST CONDITION                                                     | MIN.                            | TYP.  | MAX. | UNIT            |
|------------------------------------------------------|---------------------------|-----------------|--------------------------------------------------------------------|---------------------------------|-------|------|-----------------|
| Output Voltage                                       | $V_{OUT}$                 | 1               | $T_j = 25^{\circ}C$                                                | -10.4                           | -10.0 | -9.6 | V               |
| Input Regulation                                     | Reg line                  | 1               | $T_j = 25^{\circ}C$                                                | -25V $\leq V_{IN} \leq$ -12.5V  | -     | 80   | mV              |
|                                                      |                           |                 | $T_j = 25^{\circ}C$                                                | -25V $\leq V_{IN} \leq$ -13V    | -     | 30   |                 |
| Load Regulation                                      | Reg load                  | 1               | $T_j = 25^{\circ}C$                                                | $1.0mA \leq I_{OUT} \leq 100mA$ | -     | 18   | mV              |
|                                                      |                           |                 | $T_j = 25^{\circ}C$                                                | $1.0mA \leq I_{OUT} \leq 40mA$  | -     | 8.5  |                 |
| Output Voltage                                       | $V_{OUT}$                 | 1               | -25V $\leq V_{IN} \leq$ -12.5V<br>$1.0mA \leq I_{OUT} \leq 40mA$   | -10.5                           | -     | -9.5 | V               |
|                                                      |                           |                 | $V_{IN} = -16V$ , $1.0mA \leq I_{OUT} \leq 70mA$                   | -10.5                           | -     | -9.5 |                 |
| Quiescent Current                                    | $I_B$                     | 1               | $T_j = 25^{\circ}C$                                                | -                               | 3.2   | 6.5  | mA              |
|                                                      |                           |                 | $T_j = 125^{\circ}C$                                               | -                               | -     | 6.0  |                 |
| Quiescent Current Change                             | $\Delta I_{BI}$           | 1               | -25V $\leq V_{IN} \leq$ -13V                                       | -                               | -     | 1.5  | mA              |
|                                                      | $\Delta I_{BO}$           |                 | $1.0mA \leq I_{OUT} \leq 40mA$                                     | -                               | -     | 0.1  |                 |
| Output Noise Voltage                                 | $V_{NO}$                  | 3               | $T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$                    | -                               | 70    | -    | $\mu V_{rms}$   |
| Long Term Stability                                  | $\Delta V_{OUT}/\Delta t$ | 1               |                                                                    | -                               | 22    | -    | mV/<br>1.0kHrs  |
| Ripple Rejection Ratio                               | RR                        | 2               | -24V $\leq V_{IN} \leq$ -13V,<br>$T_j = 25^{\circ}C$ , $f = 120Hz$ | 36                              | 43    | -    | dB              |
| Dropout Voltage                                      | $ V_{IN} - V_{OUT} $      | 1               | $T_j = 25^{\circ}C$ , $I_{OUT} = 40mA$                             | -                               | 1.7   | -    | V               |
| Average Temperature<br>Coefficient of Output Voltage | $TC_{VO}$                 | 1               | $I_{OUT} = 5mA$                                                    | -                               | -0.9  | -    | mV/ $^{\circ}C$ |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

### KIA79L12F

(Unless otherwise specified,  $V_{IN} = -19V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                     |                                  | MIN.  | TYP.  | MAX.  | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------|----------------------------------|-------|-------|-------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                                |                                  | -12.5 | -12.0 | -11.5 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                                | -27V ≤ V <sub>IN</sub> ≤ -14.5V  | -     | 120   | 250   | mV                |
|                                                      |                                       |                 |                                                                    | -27V ≤ V <sub>IN</sub> ≤ -16V    | -     | 100   | 200   |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                                | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -     | 20    | 100   | mV                |
|                                                      |                                       |                 |                                                                    | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -     | 10    | 50    |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -27V ≤ V <sub>IN</sub> ≤ -14.5V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -12.6 | -     | -11.4 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-19V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA             |                                  | -12.6 | -     | -11.4 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                                |                                  | -     | 3.2   | 6.5   | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                               |                                  | -     | -     | 6.0   |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -27V ≤ V <sub>IN</sub> ≤ -16V                                      |                                  | -     | -     | 1.5   | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                    |                                  | -     | -     | 0.1   |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                             |                                  | -     | 80    | -     | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                    |                                  | -     | 24    | -     | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -25V ≤ V <sub>IN</sub> ≤ -15V,<br>T <sub>j</sub> =25℃, f=120Hz     |                                  | 37    | 42    | -     | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                        |                                  | -     | 1.7   | -     | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                              |                                  | -     | -1.0  | -     | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

### KIA79L15F

(Unless otherwise specified,  $V_{IN} = -23V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                     |                                  | MIN.   | TYP.  | MAX.   | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------|----------------------------------|--------|-------|--------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                                |                                  | -15.6  | -15.0 | -14.4  | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                                | -30V ≤ V <sub>IN</sub> ≤ -17.5V  | -      | 130   | 300    | mV                |
|                                                      |                                       |                 |                                                                    | -30V ≤ V <sub>IN</sub> ≤ -20V    | -      | 110   | 250    |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                                | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -      | 25    | 150    | mV                |
|                                                      |                                       |                 |                                                                    | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -      | 12    | 75     |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -30V ≤ V <sub>IN</sub> ≤ -17.5V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -15.75 | -     | -14.25 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-23V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA             |                                  | -15.75 | -     | -14.25 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                                |                                  | -      | 3.3   | 6.5    | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                               |                                  | -      | -     | 6.0    |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -30V ≤ V <sub>IN</sub> ≤ -20V                                      |                                  | -      | -     | 1.5    | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                    |                                  | -      | -     | 0.1    |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                             |                                  | -      | 90    | -      | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                    |                                  | -      | 30    | -      | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -28.5V ≤ V <sub>IN</sub> ≤ -18.5V,<br>T <sub>j</sub> =25℃, f=120Hz |                                  | 34     | 39    | -      | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                        |                                  | -      | 1.7   | -      | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                              |                                  | -      | -1.3  | -      | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

KIA79L18F

(Unless otherwise specified,  $V_{IN} = -27V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                    | TEST<br>CIRCUIT | TEST CONDITION                                                     | MIN.                            | TYP.  | MAX.  | UNIT            |
|------------------------------------------------------|---------------------------|-----------------|--------------------------------------------------------------------|---------------------------------|-------|-------|-----------------|
| Output Voltage                                       | $V_{OUT}$                 | 1               | $T_j = 25^{\circ}C$                                                | -18.7                           | -18.0 | -17.3 | V               |
| Input Regulation                                     | Reg line                  | 1               | $T_j = 25^{\circ}C$                                                | -33V $\leq V_{IN} \leq$ -20.7V  | -     | 32    | mV              |
|                                                      |                           |                 | $T_j = 25^{\circ}C$                                                | -33V $\leq V_{IN} \leq$ -21V    | -     | 27    |                 |
| Load Regulation                                      | Reg load                  | 1               | $T_j = 25^{\circ}C$                                                | 1.0mA $\leq I_{OUT} \leq$ 100mA | -     | 30    | mV              |
|                                                      |                           |                 | $T_j = 25^{\circ}C$                                                | 1.0mA $\leq I_{OUT} \leq$ 40mA  | -     | 15    |                 |
| Output Voltage                                       | $V_{OUT}$                 | 1               | -33V $\leq V_{IN} \leq$ -20.9V<br>1.0mA $\leq I_{OUT} \leq$ 40mA   | -18.9                           | -     | -17.1 | V               |
|                                                      |                           |                 | $V_{IN} = -27V$ , 1.0mA $\leq I_{OUT} \leq$ 70mA                   | -18.9                           | -     | -17.1 |                 |
| Quiescent Current                                    | $I_B$                     | 1               | $T_j = 25^{\circ}C$                                                | -                               | 3.3   | 6.5   | mA              |
|                                                      |                           |                 | $T_j = 125^{\circ}C$                                               | -                               | -     | 6.0   |                 |
| Quiescent Current Change                             | $\Delta I_{BI}$           | 1               | -33V $\leq V_{IN} \leq$ -21V                                       | -                               | -     | 1.5   | mA              |
|                                                      | $\Delta I_{BO}$           |                 | 1.0mA $\leq I_{OUT} \leq$ 40mA                                     | -                               | -     | 0.1   |                 |
| Output Noise Voltage                                 | $V_{NO}$                  | 3               | $T_a = 25^{\circ}C$ , 10Hz $\leq f \leq$ 100kHz                    | -                               | 150   | -     | $\mu V_{rms}$   |
| Long Term Stability                                  | $\Delta V_{OUT}/\Delta t$ | 1               |                                                                    | -                               | 45    | -     | mV/<br>1.0kHrs  |
| Ripple Rejection Ratio                               | RR                        | 2               | -33V $\leq V_{IN} \leq$ -23V,<br>$T_j = 25^{\circ}C$ , $f = 120Hz$ | 33                              | 48    | -     | dB              |
| Dropout Voltage                                      | $ V_{IN} - V_{OUT} $      | 1               | $T_j = 25^{\circ}C$ , $I_{OUT} = 40mA$                             | -                               | 1.7   | -     | V               |
| Average Temperature<br>Coefficient of Output Voltage | $TC_{VO}$                 | 1               | $I_{OUT} = 5mA$                                                    | -                               | -1.5  | -     | mV/ $^{\circ}C$ |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

KIA79L20F

(Unless otherwise specified,  $V_{IN} = -29V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                     |                                  | MIN.  | TYP.  | MAX.  | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------|----------------------------------|-------|-------|-------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                                |                                  | -20.8 | -20.0 | -19.2 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                                | -35V ≤ V <sub>IN</sub> ≤ -23.5V  | -     | 33    | 330   | mV                |
|                                                      |                                       |                 |                                                                    | -35V ≤ V <sub>IN</sub> ≤ -24V    | -     | 28    | 285   |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                                | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -     | 33    | 180   | mV                |
|                                                      |                                       |                 |                                                                    | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -     | 17    | 90    |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -35V ≤ V <sub>IN</sub> ≤ -23.5V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -21.0 | -     | -19.0 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-29V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA             |                                  | -21.0 | -     | -19.0 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                                |                                  | -     | 3.3   | 6.5   | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                               |                                  | -     | -     | 6.0   |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -35V ≤ V <sub>IN</sub> ≤ -24V                                      |                                  | -     | -     | 1.5   | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                    |                                  | -     | -     | 0.1   |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                             |                                  | -     | 170   | -     | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                    |                                  | -     | 49    | -     | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -35V ≤ V <sub>IN</sub> ≤ -27V,<br>T <sub>j</sub> =25℃, f=120Hz     |                                  | 31    | 37    | -     | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                        |                                  | -     | 1.7   | -     | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                              |                                  | -     | -1.7  | -     | mV/℃              |

# KIA79L05F ~ KIA79L24F

## ELECTRICAL CHARACTERISTICS

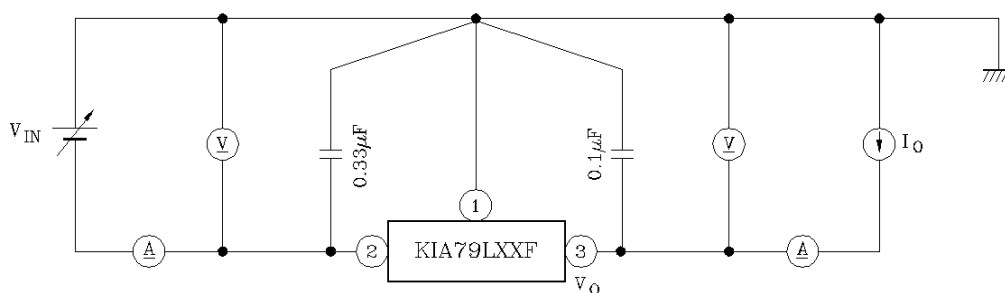
### KIA79L24F

(Unless otherwise specified,  $V_{IN} = -33V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

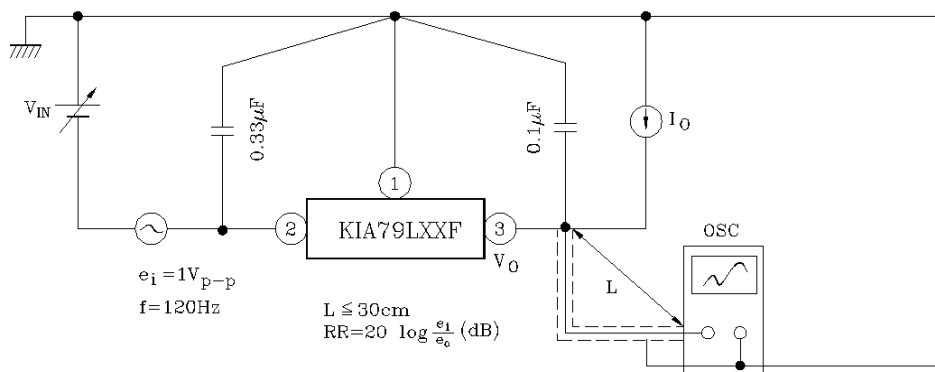
| CHARACTERISTIC                                       | SYMBOL                                | TEST<br>CIRCUIT | TEST CONDITION                                                   |                                  | MIN.  | TYP.  | MAX.  | UNIT              |
|------------------------------------------------------|---------------------------------------|-----------------|------------------------------------------------------------------|----------------------------------|-------|-------|-------|-------------------|
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | T <sub>j</sub> =25℃                                              |                                  | -25.0 | -24.0 | -23.0 | V                 |
| Input Regulation                                     | Reg line                              | 1               | T <sub>j</sub> =25℃                                              | -38V ≤ V <sub>IN</sub> ≤ -27V    | -     | 35    | 350   | mV                |
|                                                      |                                       |                 |                                                                  | -38V ≤ V <sub>IN</sub> ≤ -28V    | -     | 30    | 300   |                   |
| Load Regulation                                      | Reg load                              | 1               | T <sub>j</sub> =25℃                                              | 1.0mA ≤ I <sub>OUT</sub> ≤ 100mA | -     | 40    | 200   | mV                |
|                                                      |                                       |                 |                                                                  | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA  | -     | 20    | 100   |                   |
| Output Voltage                                       | V <sub>OUT</sub>                      | 1               | -38V ≤ V <sub>IN</sub> ≤ -27V<br>1.0mA ≤ I <sub>OUT</sub> ≤ 40mA |                                  | -25.2 | -     | -22.8 | V                 |
|                                                      |                                       |                 | V <sub>IN</sub> =-33V, 1.0mA ≤ I <sub>OUT</sub> ≤ 70mA           |                                  | -25.2 | -     | -22.8 |                   |
| Quiescent Current                                    | I <sub>B</sub>                        | 1               | T <sub>j</sub> =25℃                                              |                                  | -     | 3.5   | 6.5   | mA                |
|                                                      |                                       |                 | T <sub>j</sub> =125℃                                             |                                  | -     | -     | 6.0   |                   |
| Quiescent Current Change                             | ΔI <sub>BI</sub>                      | 1               | -38V ≤ V <sub>IN</sub> ≤ -28V                                    |                                  | -     | -     | 1.5   | mA                |
|                                                      | ΔI <sub>BO</sub>                      |                 | 1.0mA ≤ I <sub>OUT</sub> ≤ 40mA                                  |                                  | -     | -     | 0.1   |                   |
| Output Noise Voltage                                 | V <sub>NO</sub>                       | 3               | T <sub>a</sub> =25℃, 10Hz ≤ f ≤ 100kHz                           |                                  | -     | 200   | -     | μV <sub>rms</sub> |
| Long Term Stability                                  | ΔV <sub>OUT</sub> /Δt                 | 1               |                                                                  |                                  | -     | 56    | -     | mV/<br>1.0kHrs    |
| Ripple Rejection Ratio                               | RR                                    | 2               | -35V ≤ V <sub>IN</sub> ≤ -29V,<br>T <sub>j</sub> =25℃, f=120Hz   |                                  | 31    | 47    | -     | dB                |
| Dropout Voltage                                      | V <sub>IN</sub> -<br>V <sub>OUT</sub> | 1               | T <sub>j</sub> =25℃, I <sub>OUT</sub> =40mA                      |                                  | -     | 1.7   | -     | V                 |
| Average Temperature<br>Coefficient of Output Voltage | TC <sub>VO</sub>                      | 1               | I <sub>OUT</sub> =5mA                                            |                                  | -     | -2.0  | -     | mV/℃              |

# KIA79L05F ~ KIA79L24F

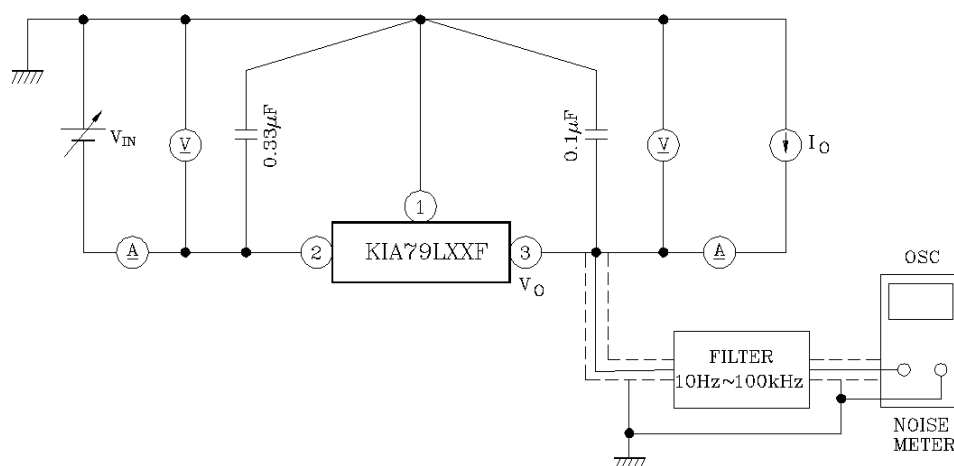
TEST CIRCUIT 1



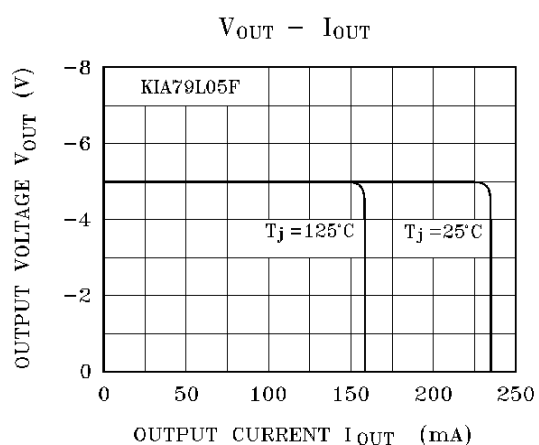
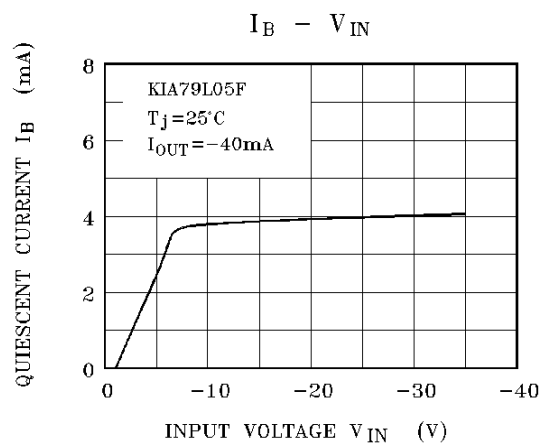
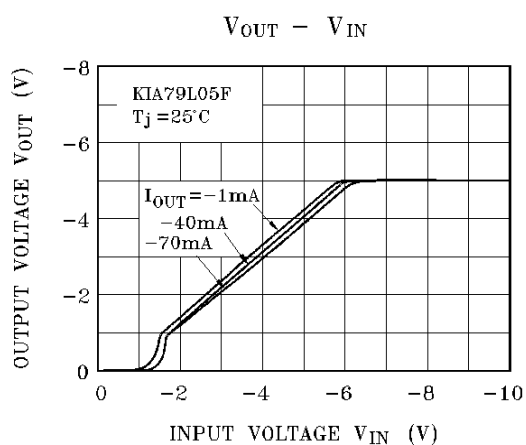
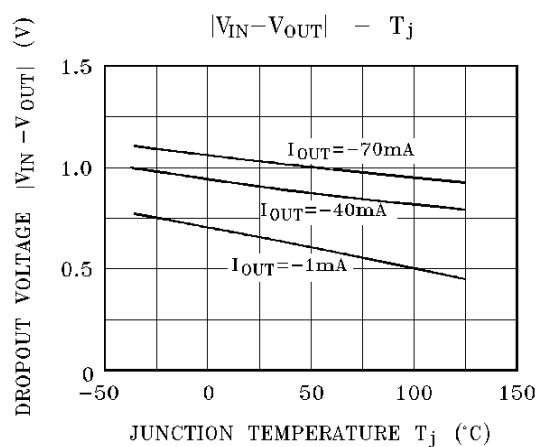
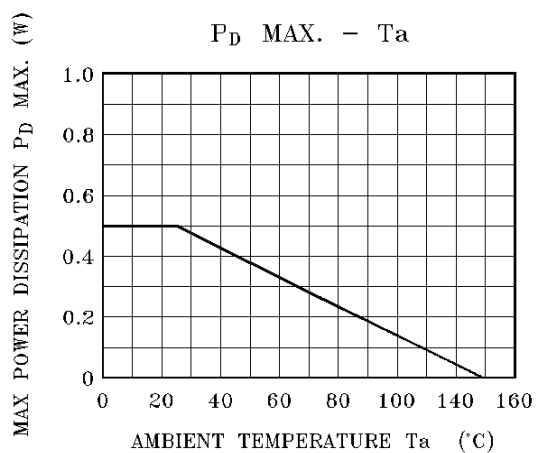
TEST CIRCUIT 2



TEST CIRCUIT 3



# KIA79L05F ~ KIA79L24F



# KIA79L05F ~ KIA79L24F

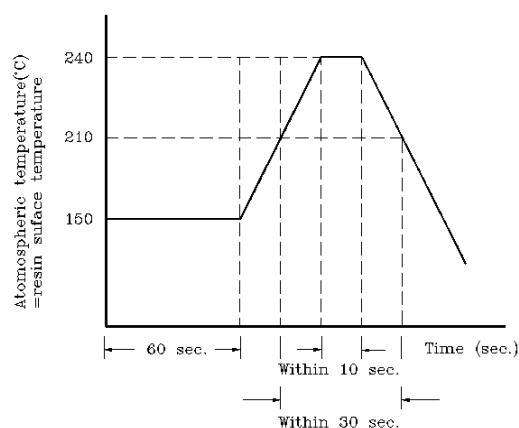
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## PRECAUTIONS FOR USE

### SOLDERING

#### Flat Package (SOT-89 Package)

Elements mounting styles of electronic devices are gaining in further diversification over recent years, and needs for components are all the more expanding in varieties. Especially, surface mounting is steadily penetrating into industrial segments as a world-wide popular technical trend. Although exposure to high temperature is inevitable during soldering we recommend limiting the soldering temperature to low levels as shown in figure for the sake of retaining inherent excellent reliability.



#### (a) When employing solder reflow method

- ① Atmospheric temperature around resin surfaces must be less than 240°C, not exceeding the time length of 10 sec.
- ② Recommend temperature profile
- ③ Precautions on heating method

When resin is kept exposed to high temperature for a long time, device reliability may be marred. Therefore, it is essential to complete soldering in the shortest time possible to prevent temperature of resin from rising.

#### (b) When employing halogen lamps or infrared-ray heaters

When halogen lamps or infrared-ray heaters are used, avoid direct irradiation onto resin surfaces ; such devices cause extensive localized temperature rise.

※ Please keep a reflow solder operating when SOT-89 package's soldering.