# VOLTAGE REGULATOR WITH ON/OFF SWITCH

## FEATURES

- **Low Dropout Voltage**
- **Electronic ON/OFF Switch**
- **Very Low Standby Current (ON, No Load)**
- **Internal Thermal Shutdown**
- **Short Circuit Protection**
- **Very Low (<100 nA) Current in OFF Mode**
- **Customized Versions Are Available**

## APPLICATIONS

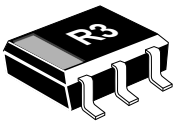
- **Battery Powered Systems**
- **Cellular Telephones**
- **Pagers**
- **Personal Communications Equipment**
- **Portable Instrumentation**
- **Portable Consumer Equipment**
- **Radio Control Systems**
- **Toys**
- **Low Voltage Systems**

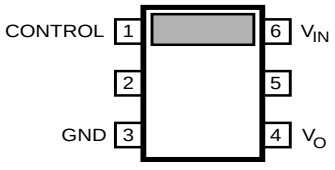
## DESCRIPTION

The TK114xx is a low power, linear regulator with a built-in electronic switch. The internal electronic switch can be controlled by an external pull-up resistor and an open drain or open collector transistor. The device is in the OFF state when the control pin is biased from $V_{IN}$ through the pull-up resistor.

An internal PNP pass-transistor is used in order to achieve low dropout voltage (typically 200 mV at 50 mA load current). The device has very low quiescent current (500 µA) in the ON mode with no load and 2 mA with 30 mA load. The quiescent current is typically 4 mA at 60 mA load. An internal thermal shutdown circuit limits the junction temperature to below 150 °C. The load current is internally monitored and the device will shut down (no load current) in the presence of a short circuit at the output. The device is available in a small SOT-23L surface mount package.

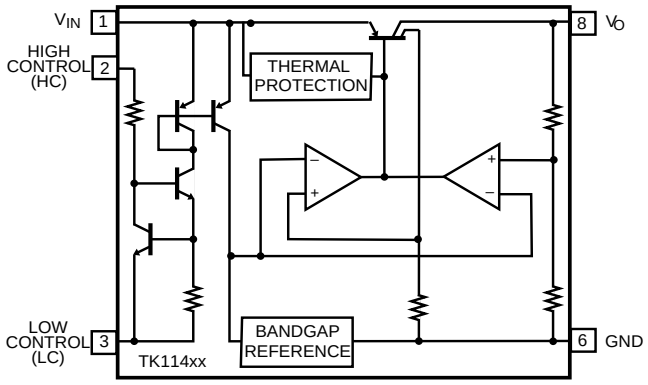
**TK114xxM**






KT114xxM.PO

**BLOCK DIAGRAM**




KT114xx • BD

## ORDERING INFORMATION

**TK114 □□ □□**

**Tape/Reel Code**

**Voltage Code**

| VOLTAGE CODE | |
|---|---|
| 30 = 3.0 V | 47 = 4.75 V |
| 32 = 3.25 V | 50 = 5.0 V |
| 35 = 3.5 V | 55 = 5.5 V |
| 37 = 3.75 V | 57 = 5.75 V |
| 40 = 4.0 V | 60 = 6.0 V |
| 45 = 4.5 V | 80 = 8.0 V |

**TAPE/REEL CODE**
**BX : Bulk/Bag**
**TL : Tape Left**

## ABSOLUTE MAXIMUM RATINGS

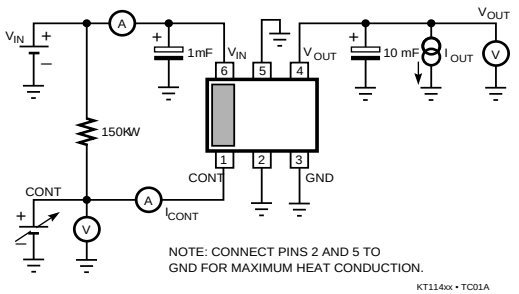
Supply Voltage ..... 16 V
Load Current ..... 180 mA
Power Dissipation (Note 1) ..... 400 mW
Storage Temperature Range ..... -55 to +150 °C
Operating Temperature Range ..... -30 to +80 °C
Lead Soldering Temp. (10 sec.) ..... 240 °C
Junction Temperature ..... 150 °C

## TK11430 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 4 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 2.5 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 4 V, $I_O$ = 30 mA | 2.9 | 3.0 | 3.1 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 4 V → 9 V | | 5 | 30 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 18 | 50 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 36 | 80 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 4.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 4.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.3 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 4.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 1: Power dissipation must be derated at the rate of 1.6 mW/ °C for operation above $T_A$ = 25 °C.

**TEST CIRCUIT 1**



## TK11432 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 4.2 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 2.5 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 4.2 V, $I_O$ = 30 mA | 3.13 | 3.25 | 3.37 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 4.2 V → 9.2 V | | 6 | 30 | mV |
| LoaReg | Load Regulation | $V_{IN}$ = 4.2 V, $I_O$ = 0 mA to 30 mA | | 20 | 50 | mV |
| | | $V_{IN}$ = 4.2 V, $I_O$ = 0 mA to 60 mA | | 40 | 80 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 4.7 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 4.7 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.3 | | mV/°C |
| $V_N$ | Output Noise Voltage | 10 Hz ≤ f ≤ 100 KHz, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11435 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 4.5 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 2.5 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 4.5 V, $I_O$ = 30 mA | 3.38 | 3.5 | 3.62 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 4.5 V → 9.5 V | | 7 | 35 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 20 | 55 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 40 | 95 | **mV** |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 4.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 4.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.3 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 4.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11437 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 4.7 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 2.7 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 4.7 V, $I_O$ = 30 mA | 3.62 | 3.75 | 3.88 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 4.7 V $\rightarrow$ 9.7 V | | 7 | 35 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 20 | 110 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 40 | 100 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 5.2 V, $I_O$ = 10 mA | | 55 | | dB |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN}$ = 5.2 V, $I_O$ = 10 mA<br>-20 °C $\leq T_A \leq$ 75 °C | | ±0.4 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 4.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_o$ (Load Current) is current when $V_o$ drop down 0.3V from $V_o$ at $I_o$ = 30 mA.

## TK11440 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 5 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 3.0 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 5 V, $I_O$ = 30 mA | 3.86 | 4.0 | 3.1 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 5 V → 10 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 24 | 60 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 48 | 100 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 5.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 5.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.4 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 5.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11445 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 5 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 3.5 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 5.5 V, $I_O$ = 30 mA | 4.34 | 4.5 | 4.66 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 5.5 V $\rightarrow$ 10.5 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 25 | 65 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 55 | 110 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 6 V, $I_O$ = 10 mA | | 55 | | dB |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN}$ = 6V, $I_O$ = 10 mA<br>-20 °C $\leq T_A \leq$ 75 °C | | ±0.5 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ =6 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11447 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 5.7 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 3.7 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 5.7 V, $I_O$ = 30 mA | 4.58 | 4.75 | 4.92 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 5.7 V → 10 .7 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 25 | 70 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 50 | 120 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 6.2 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 6.2 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.6 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 6.2 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11450 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 6.0 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 4.0 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 6.0 V, $I_O$ = 30 mA | 4.83 | 5.0 | 5.17 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 6 V → 11 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 25 | 70 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 60 | 120 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 6.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 6.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.6 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 6.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11455 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 6.5 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 4.5 V, $I_O$ = 0 mA | | 1 | 2.5 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 6.5 V, $I_O$ = 30 mA | 5.31 | 5.5 | 5.69 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 6.5 V $\rightarrow$ 11.5 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 30 | 75 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 65 | 130 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 7.0 V, $I_O$ = 10 mA | | 55 | | dB |
| $\Delta V/\Delta T$ | $V_O$ Temperature Coefficient | $V_{IN}$ = 7.0 V, $I_O$ = 10 mA<br>-20 °C $\leq T_A \leq$ 75 °C | | ±0.7 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 7.0 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11460 ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 7.0 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 5.0 V, $I_O$ = 0 mA | | 1 | 3.0 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 7.0 V, $I_O$ = 30 mA | 5.79 | 6.0 | 6.21 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 7.0 V → 12 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 30 | 80 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 65 | 140 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 7.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 7.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.7 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 7.5 V, $I_O$ = 10 mA | | 180 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

## TK11480 ELECTRICAL CHARACTERISTICS

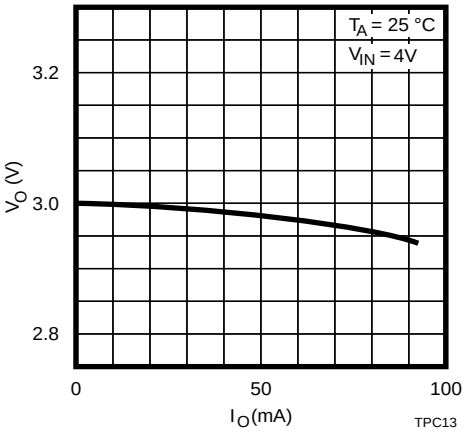
| SYMBOL | PARAMETER | TEST CONDITION | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN1}$ | Supply Current 1 | $V_{IN}$ = 9.0 V, $I_O$ = 0 mA | | 500 | 900 | µA |
| $I_{IN2}$ | Supply Current 2 | $V_{IN}$ = 7.0 V, $I_O$ = 0 mA | | 1 | 3.0 | µA |
| $I_{INS}$ | Standby Current | $V_{IN}$ = 10 V, Output Off | | | 0.1 | µA |
| $V_O$ | Output Voltage Regulation | $V_{IN}$ = 9.0 V, $I_O$ = 30 mA | 7.72 | 8.0 | 8.28 | % |
| $V_{DROP}$ | Dropout Voltage | $I_O$ = 30 mA | | 0.12 | 0.3 | V |
| $I_O$ | Output Current | (Note 2) | 70 | 110 | | mA |
| $I_{OR}$ | Recommended Output Current | | | | 70 | mA |
| LinReg | Line Regulation | $V_{IN}$ = 9 V → 13 V | | 8 | 40 | mV |
| LoaReg | Load Regulation | $I_O$ = 0 mA to 30 mA | | 30 | 100 | mV |
| | | $I_O$ = 0 mA to 60 mA | | 65 | 180 | mV |
| RR | Ripple Rejection | 100 mV(rms), f = 400 Hz<br>$V_{IN}$ = 9.5 V, $I_O$ = 10 mA | | 55 | | dB |
| ΔV/ΔT | $V_O$ Temperature Coefficient | $V_{IN}$ = 9.5 V, $I_O$ = 10 mA<br>-20 °C ≤ $T_A$ ≤ 75 °C | | ±0.7 | | mV/°C |
| $V_N$ | Output Noise Voltage | $V_{IN}$ = 9.5 V, $I_O$ = 10 mA | | 220 | | µV(rms) |
| **Control Pin** | | | | | | |
| $I_{CONT}$ | Control Pin Current | On Mode | | 35 | 120 | µA |
| $V_{Coff}$ | Control Pin Voltage | Off Mode | $V_{IN}$-0.2 | | $V_{IN}$ | V |
| $V_{Con}$ | Control Pin Voltage | On Mode | 0 | | 0.6 | V |

Note 2: $I_O$ (Load Current) is current when $V_O$ drop down 0.3V from $V_O$ at $I_O$ = 30 mA.

# TYPICAL PERFORMANCE CHARACTERISTICS

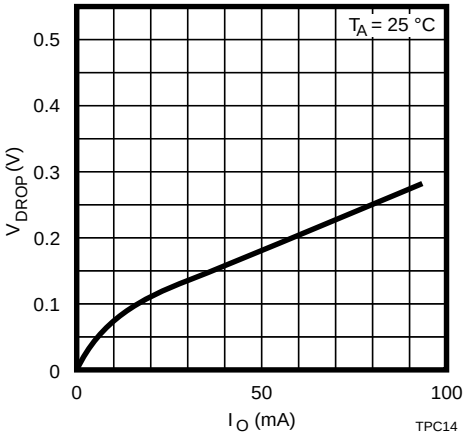
**TK11430**

OUTPUT VOLTAGE vs OUTPUT CURRENT



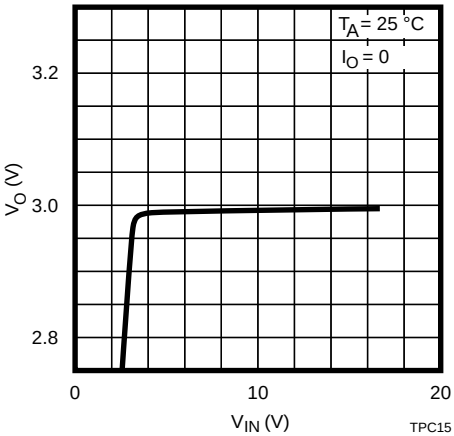

TPC13

DROPOUT VOLTAGE vs LOAD CURRENT



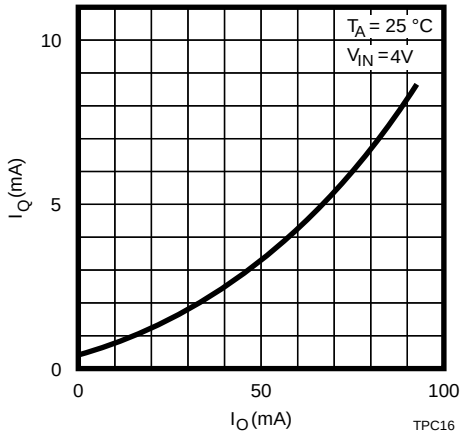

TPC14

OUTPUT VOLTAGE vs INPUT VOLTAGE



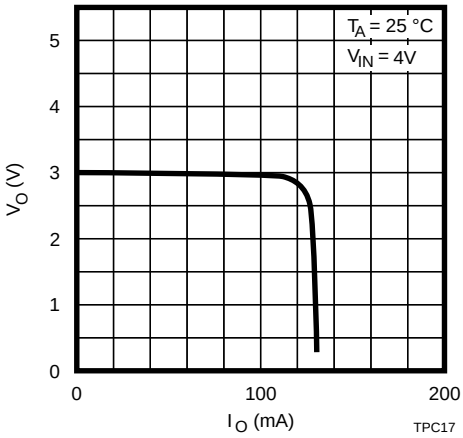

TPC15

QUIESCENT CURRENT vs LOAD CURRENT



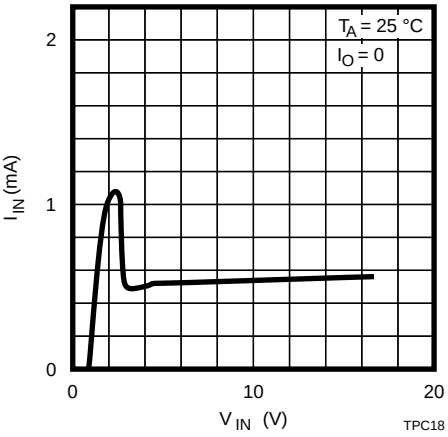

TPC16

SHORT CIRCUIT PROTECTION




TPC17

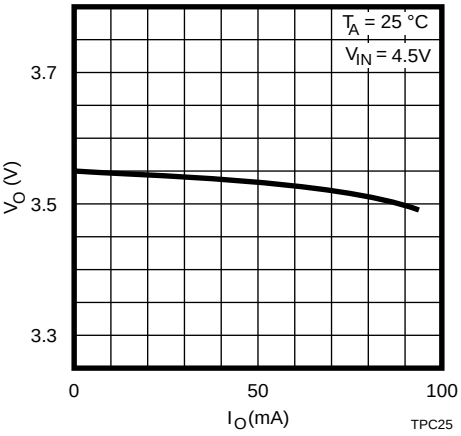
INPUT CURRENT vs INPUT VOLTAGE




TPC18

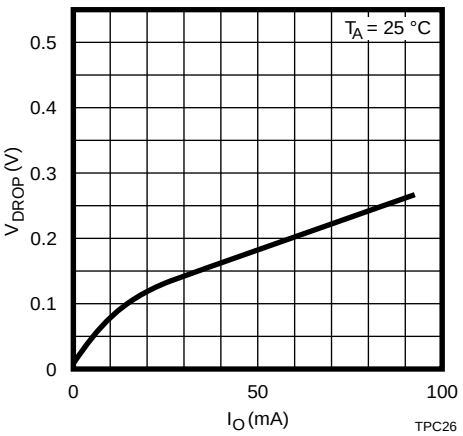
**TK11435**

OUTPUT VOLTAGE vs OUTPUT CURRENT



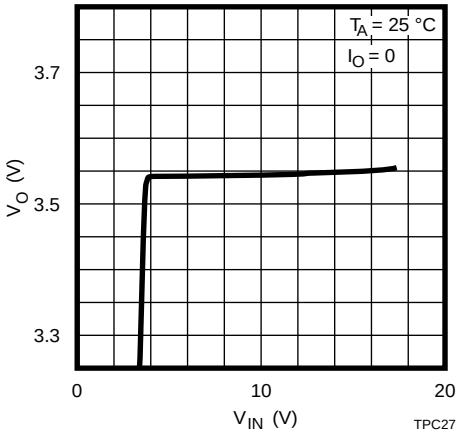

TPC25

DROPOUT VOLTAGE vs LOAD CURRENT




TPC26

OUTPUT VOLTAGE vs INPUT VOLTAGE

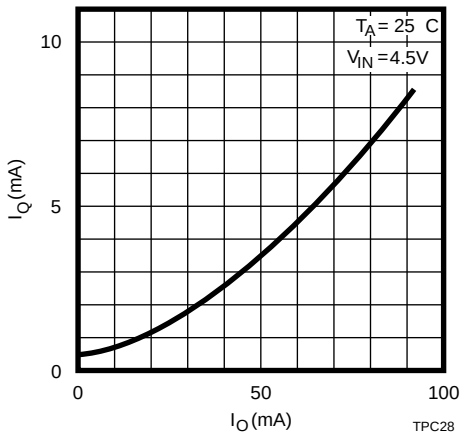



TPC27

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

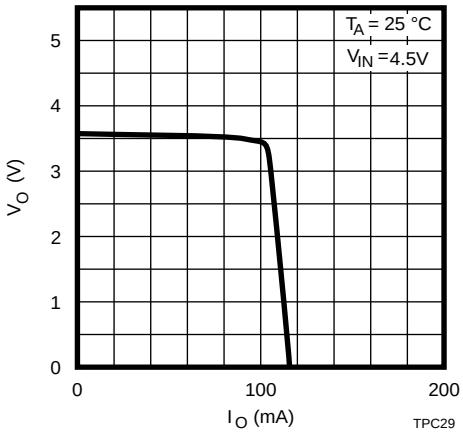
**TK11435 (CONT.)**

QUIESCENT CURRENT vs LOAD CURRENT



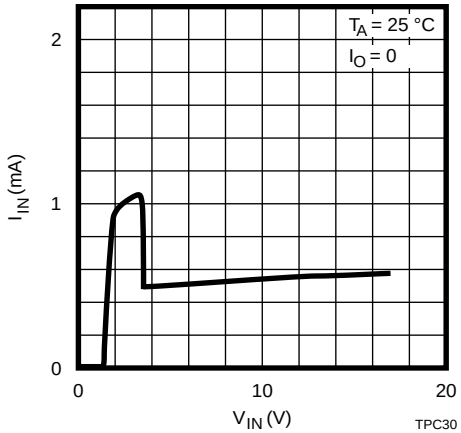

TPC28

SHORT CIRCUIT PROTECTION




TPC29

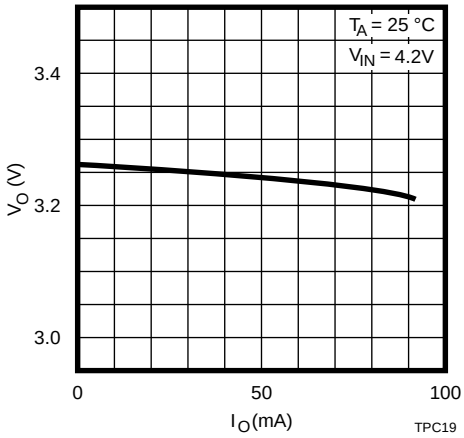
INPUT CURRENT vs INPUT VOLTAGE




TPC30

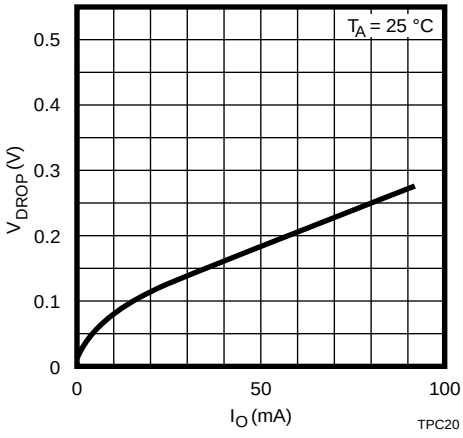
**TK11437**

OUTPUT VOLTAGE vs OUTPUT CURRENT



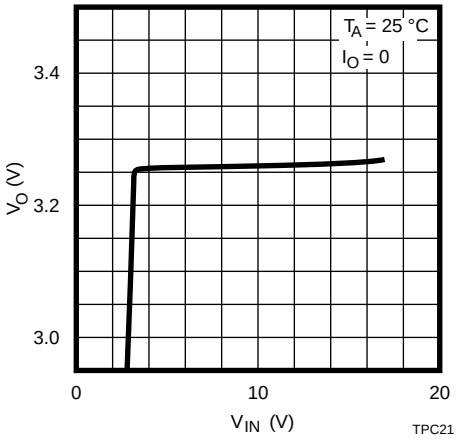

TPC19

DROPOUT VOLTAGE vs LOAD CURRENT



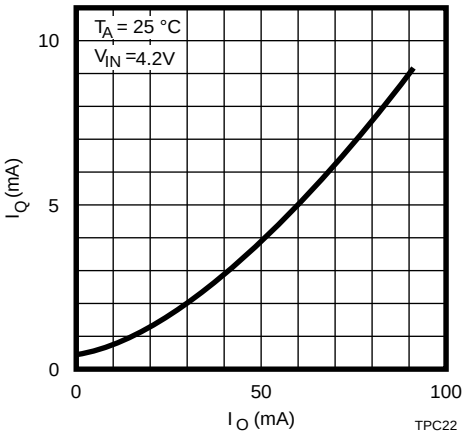

TPC20

OUTPUT VOLTAGE vs INPUT VOLTAGE



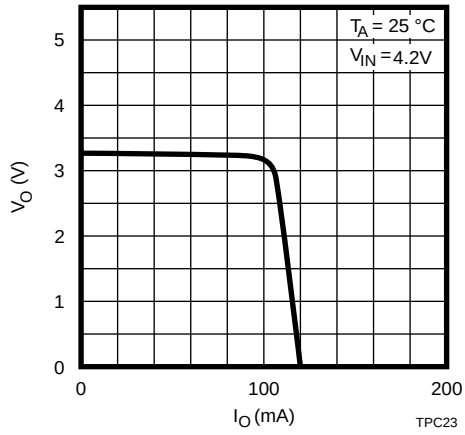

TPC21

QUIESCENT CURRENT vs LOAD CURRENT



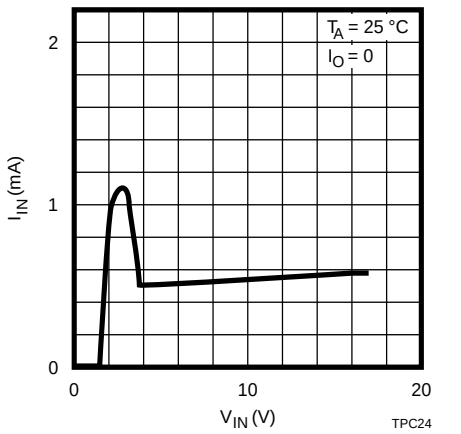

TPC22

SHORT CIRCUIT PROTECTION




TPC23

INPUT CURRENT vs INPUT VOLTAGE

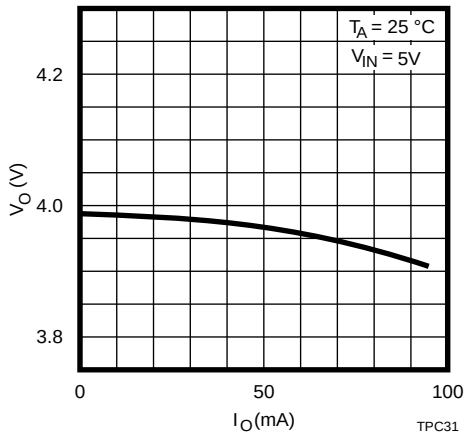



TPC24

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

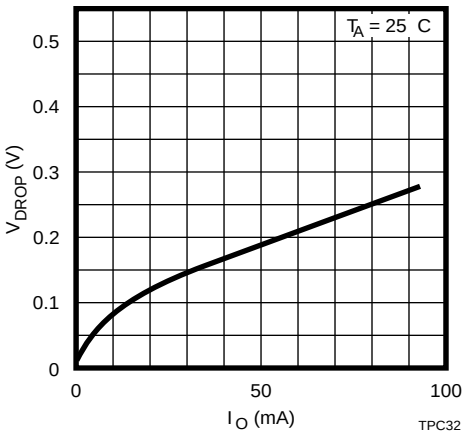
**TK11440**

OUTPUT VOLTAGE vs OUTPUT CURRENT



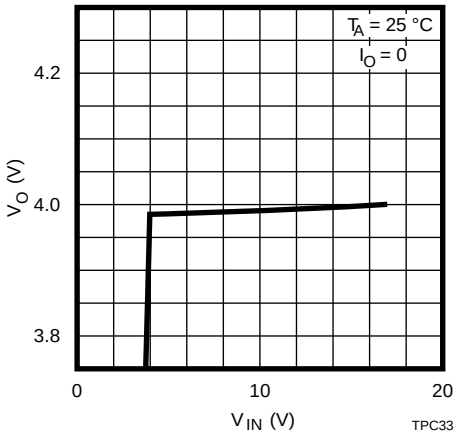

TPC31

DROPOUT VOLTAGE vs LOAD CURRENT



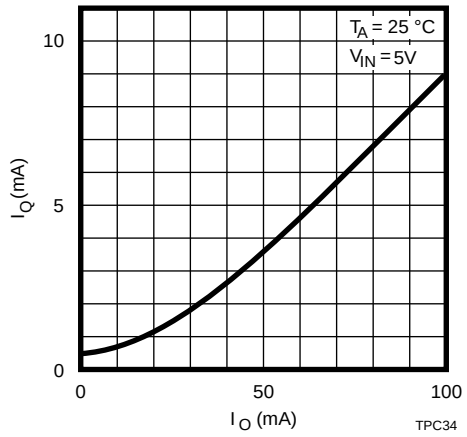

TPC32

OUTPUT VOLTAGE vs INPUT VOLTAGE



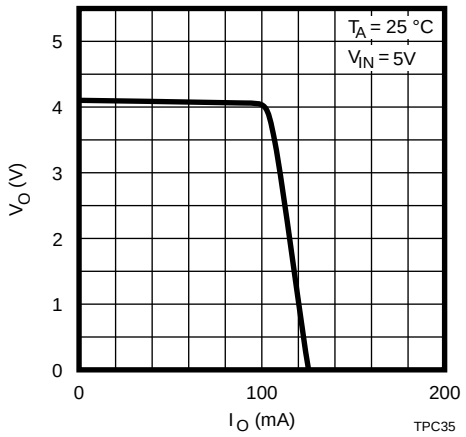

TPC33

QUIESCENT CURRENT vs LOAD CURRENT



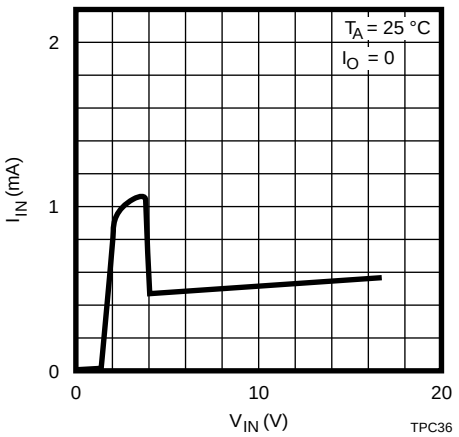

TPC34

SHORT CIRCUIT PROTECTION




TPC35

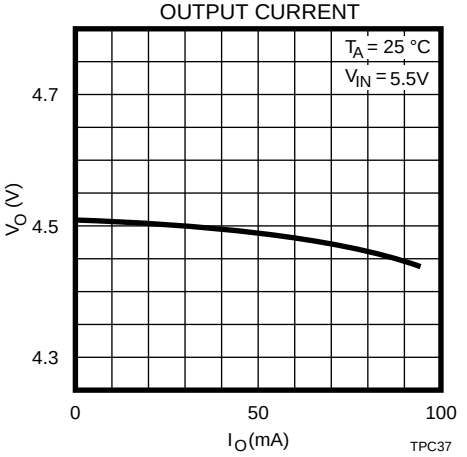
INPUT CURRENT vs INPUT VOLTAGE




TPC36

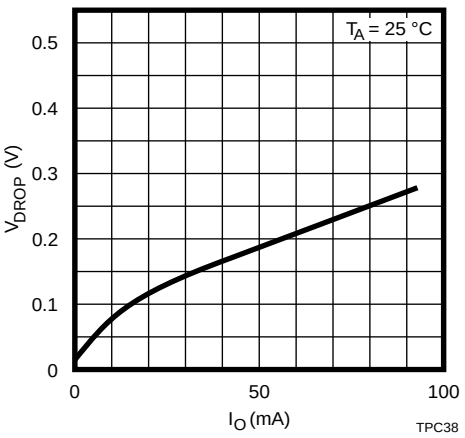
**TK11445**

OUTPUT VOLTAGE vs OUTPUT CURRENT



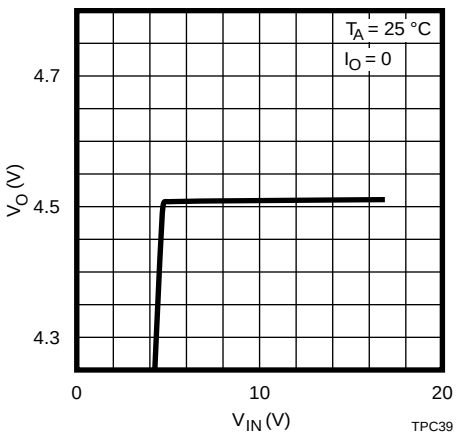

TPC37

DROPOUT VOLTAGE vs LOAD CURRENT




TPC38

OUTPUT VOLTAGE vs INPUT VOLTAGE

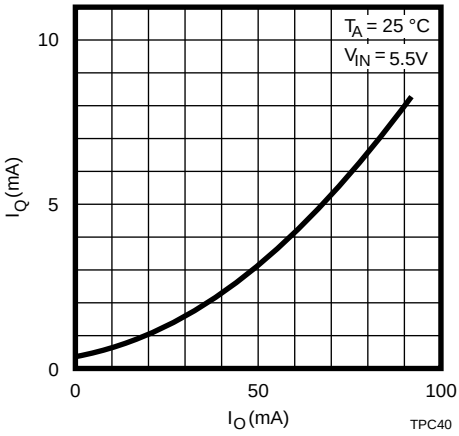



TPC39

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

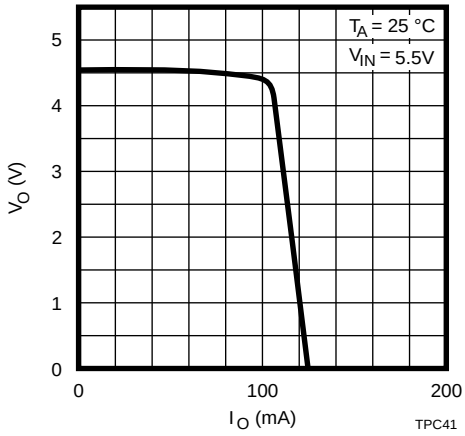
**TK11445 (CONT.)**

QUIESCENT CURRENT vs LOAD CURRENT



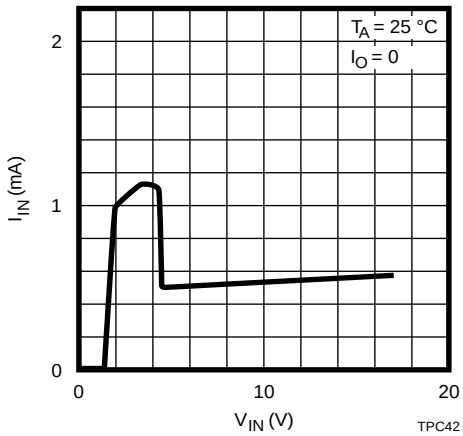

TPC40

SHORT CIRCUIT PROTECTION



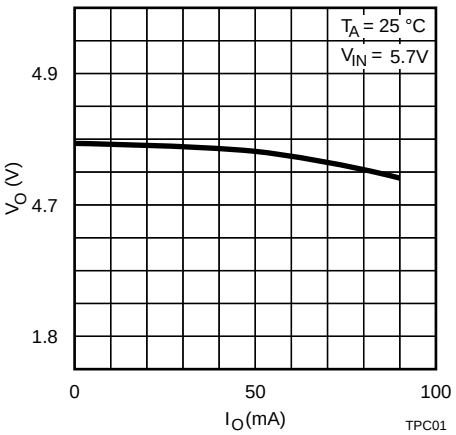

TPC41

INPUT CURRENT vs INPUT VOLTAGE



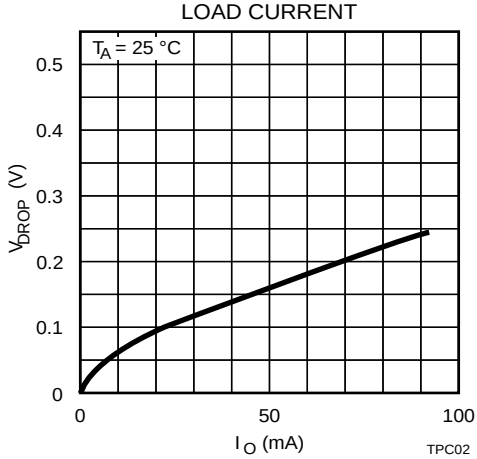

TPC42

**TK11447** OUTPUT VOLTAGE vs OUTPUT CURRENT



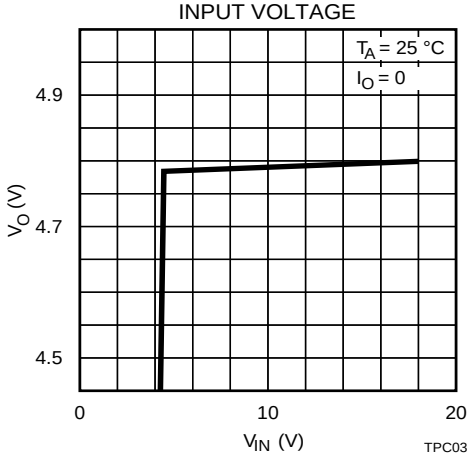

TPC01

DROPOUT VOLTAGE vs LOAD CURRENT



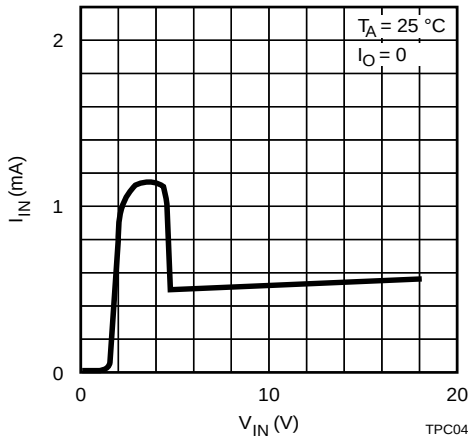

TPC02

OUTPUT VOLTAGE vs INPUT VOLTAGE



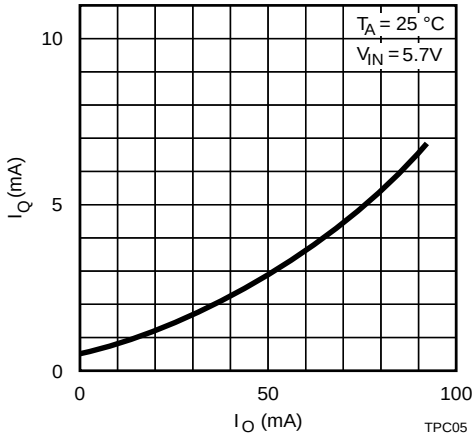

TPC03

INPUT CURRENT vs INPUT VOLTAGE



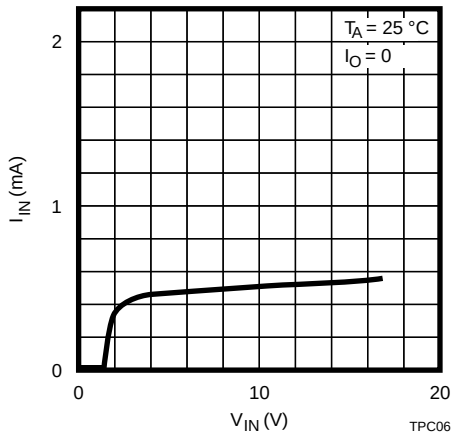

TPC04

QUIESCENT CURRENT vs LOAD CURRENT




TPC05

INPUT CURRENT vs INPUT VOLTAGE

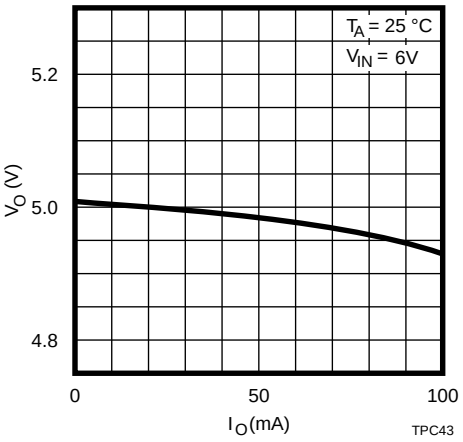



TPC06

## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

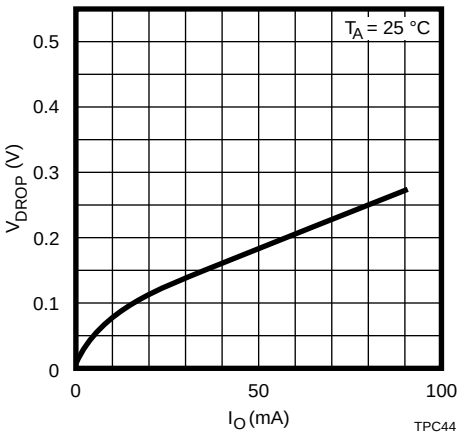
**TK11450**

OUTPUT VOLTAGE vs OUTPUT CURRENT



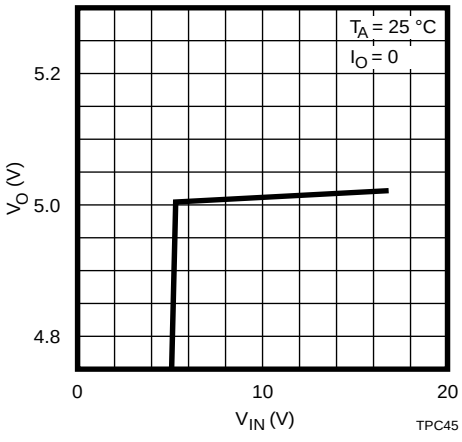

TPC43

DROPOUT VOLTAGE vs LOAD CURRENT



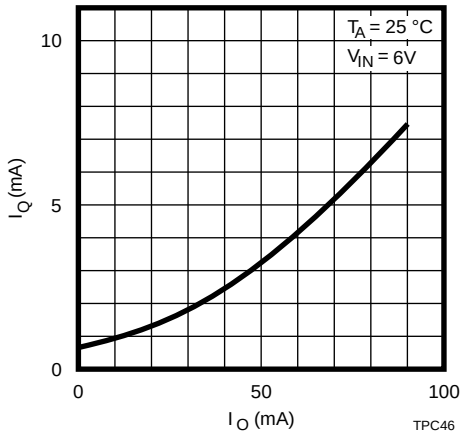

TPC44

OUTPUT VOLTAGE vs INPUT VOLTAGE



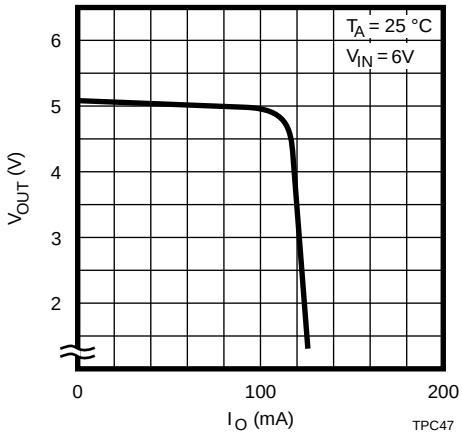

TPC45

QUIESCENT CURRENT vs LOAD CURRENT



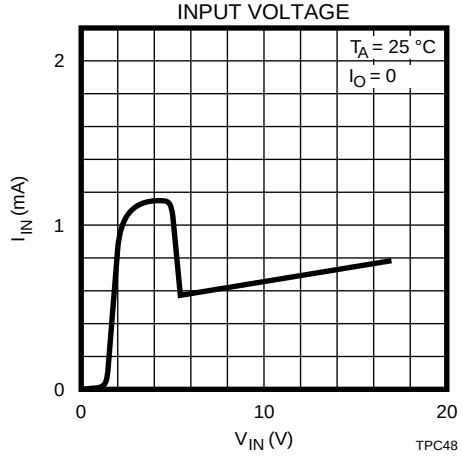

TPC46

SHORT CIRCUIT PROTECTION




TPC47

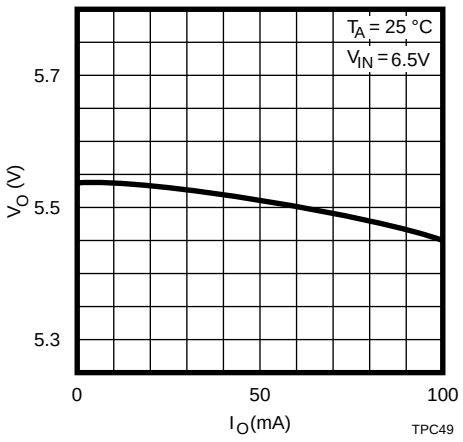
INPUT CURRENT vs INPUT VOLTAGE




TPC48

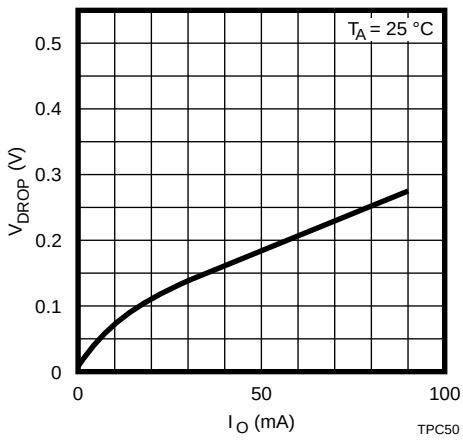
**TK11455**

OUTPUT VOLTAGE vs OUTPUT CURRENT



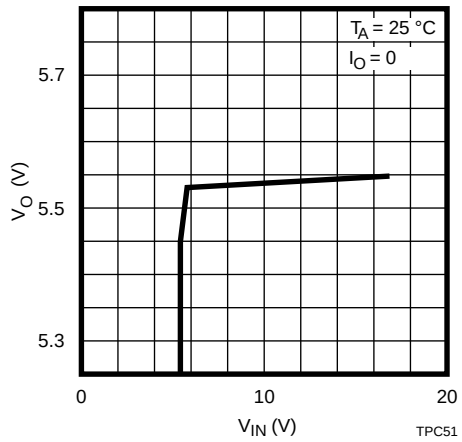

TPC49

DROPOUT VOLTAGE vs LOAD CURRENT




TPC50

OUTPUT VOLTAGE vs INPUT VOLTAGE

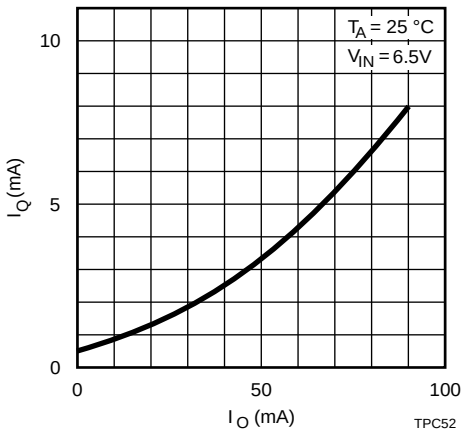



TPC51

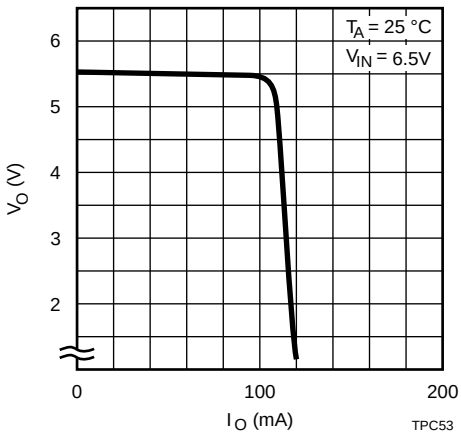
## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

**TK11455 (CONT.)**

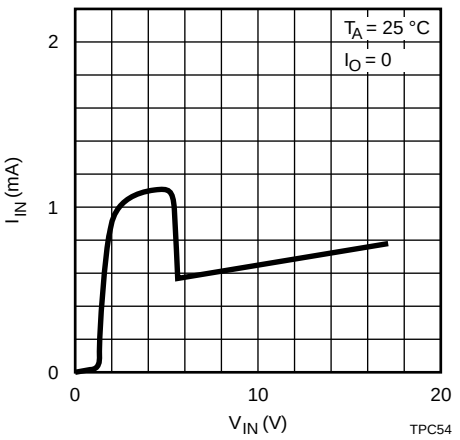
QUIESCENT CURRENT vs LOAD CURRENT




SHORT CIRCUIT PROTECTION

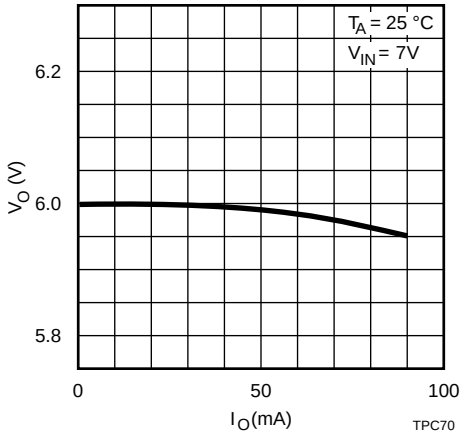



INPUT CURRENT vs INPUT VOLTAGE

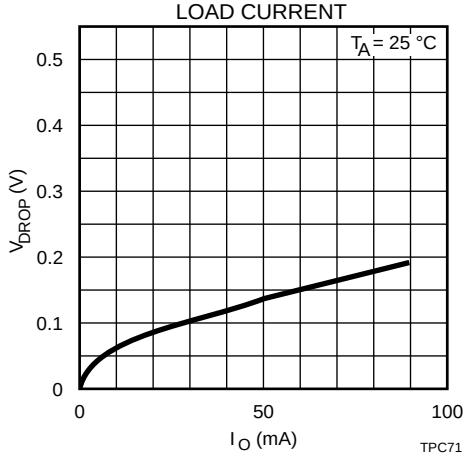



**TK11460**

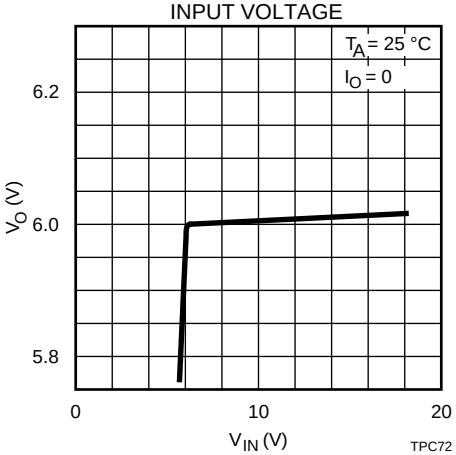
OUTPUT VOLTAGE vs OUTPUT CURRENT



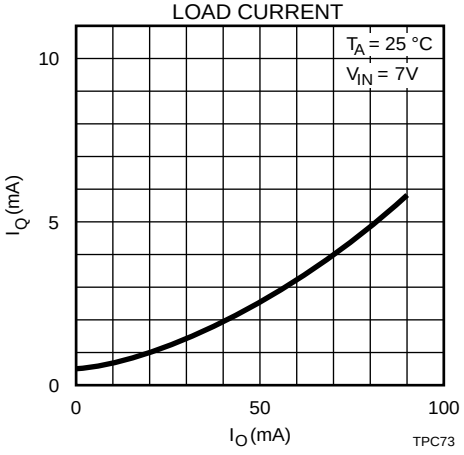

DROPOUT VOLTAGE vs LOAD CURRENT



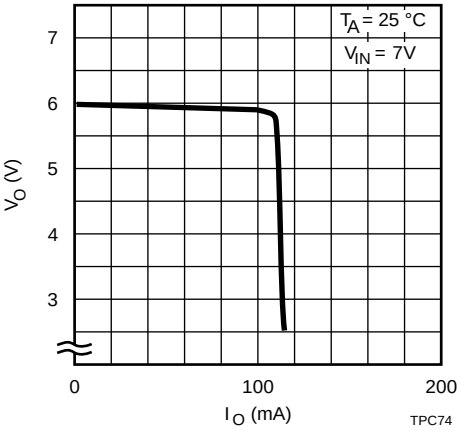

OUTPUT VOLTAGE vs INPUT VOLTAGE



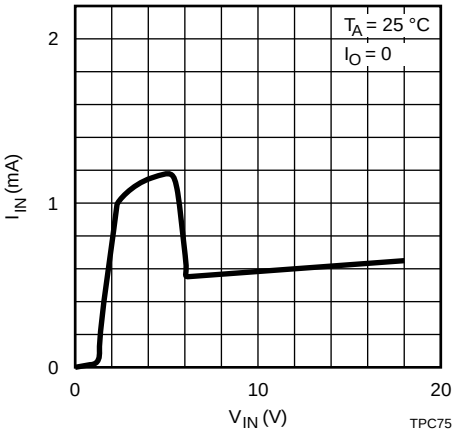

QUIESCENT CURRENT vs LOAD CURRENT




SHORT CIRCUIT PROTECTION



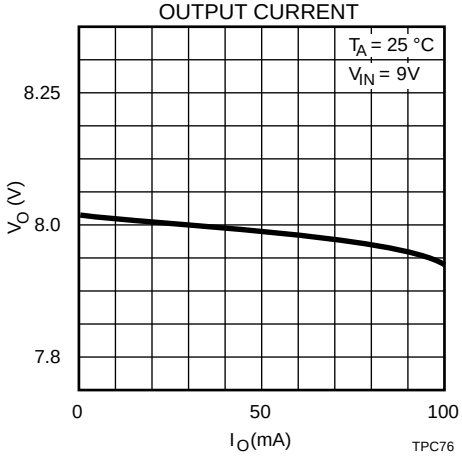

INPUT CURRENT vs INPUT VOLTAGE



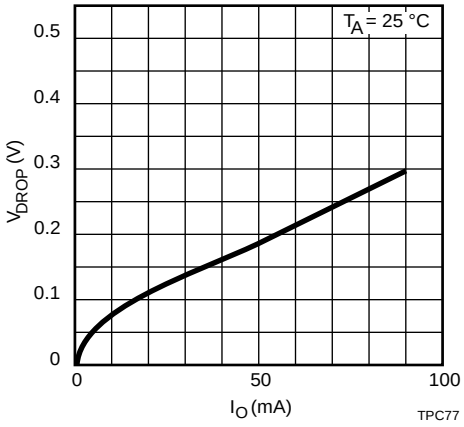
## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

**TK11480**

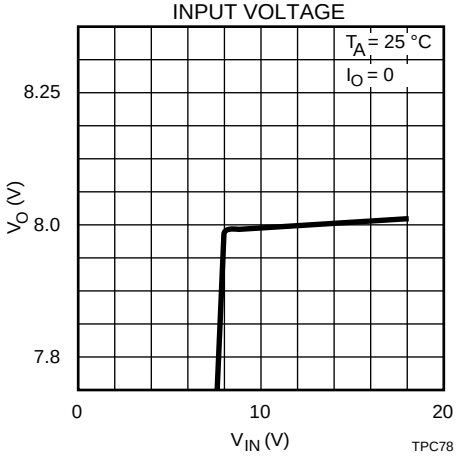
OUTPUT VOLTAGE vs OUTPUT CURRENT



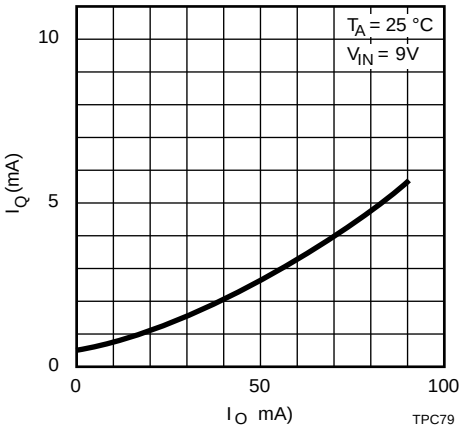

DROPOUT VOLTAGE vs LOAD CURRENT



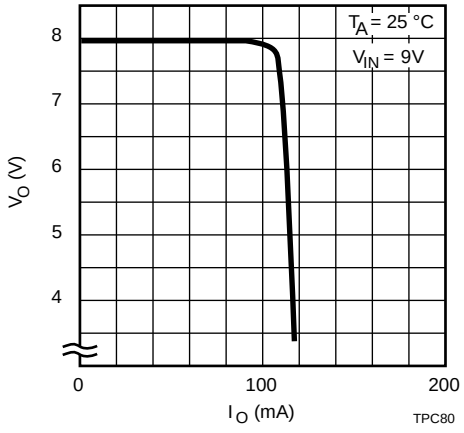

OUTPUT VOLTAGE vs INPUT VOLTAGE



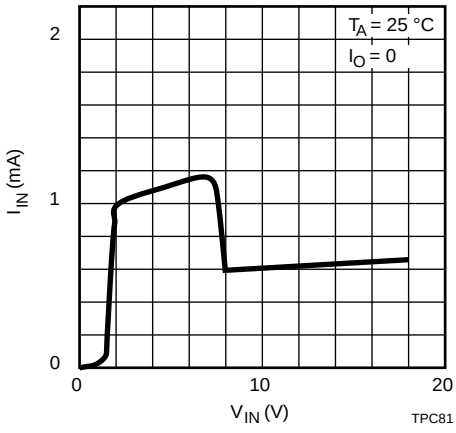

QUIESCENT CURRENT vs LOAD CURRENT




SHORT CIRCUIT PROTECTION

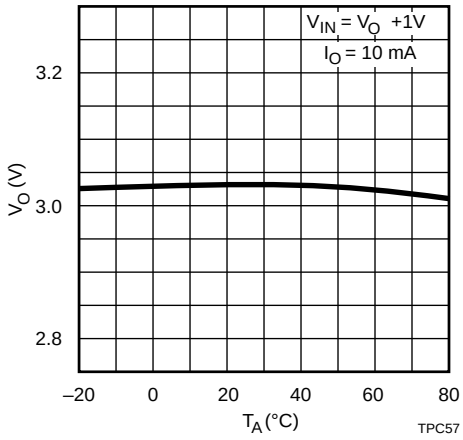



INPUT CURRENT vs INPUT VOLTAGE



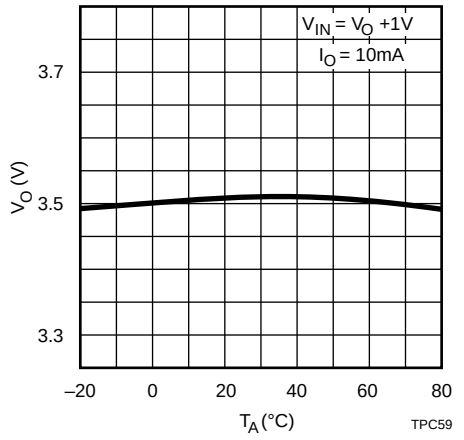

**TK11430**

OUTPUT VOLTAGE vs TEMPERATURE



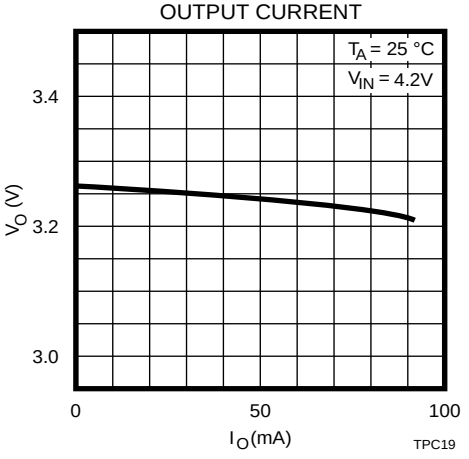

**TK11435**

OUTPUT VOLTAGE vs TEMPERATURE




**TK11437**

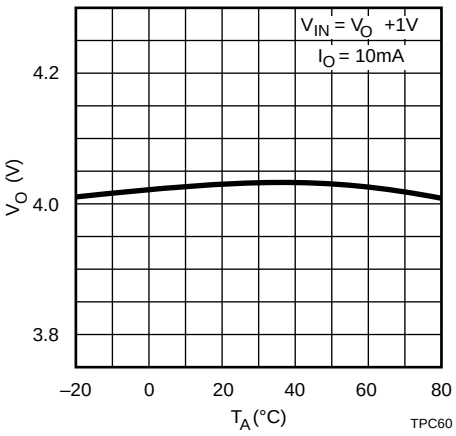
OUTPUT VOLTAGE vs OUTPUT CURRENT



## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

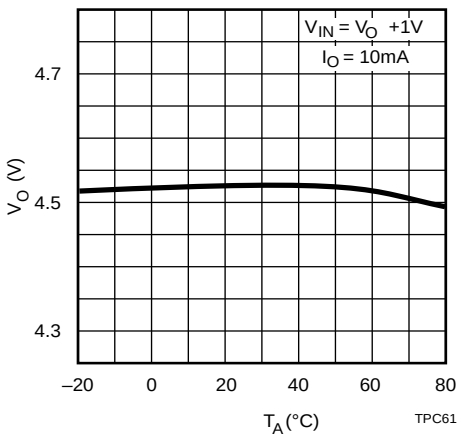
**TK11440**

OUTPUT VOLTAGE vs TEMPERATURE



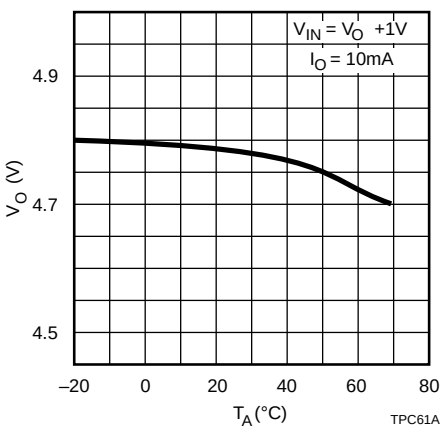

**TK11445**

OUTPUT VOLTAGE vs TEMPERATURE



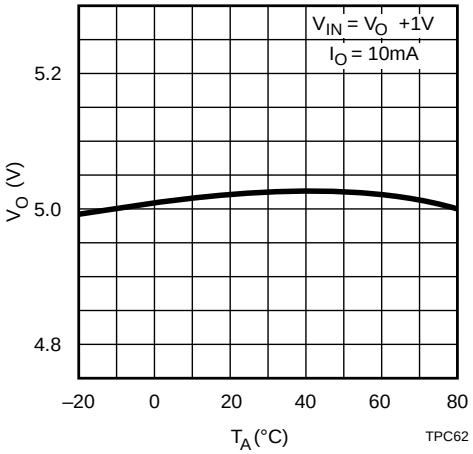

**TK11447**

OUTPUT VOLTAGE vs TEMPERATURE



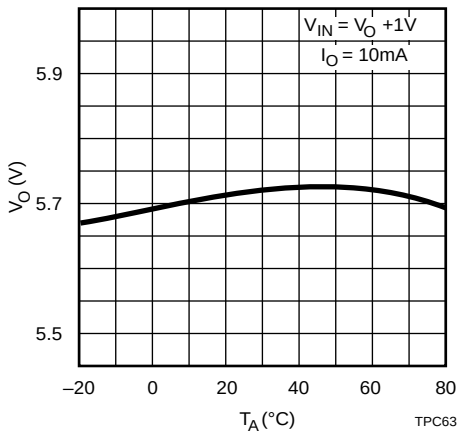

**TK11450**

OUTPUT VOLTAGE vs TEMPERATURE



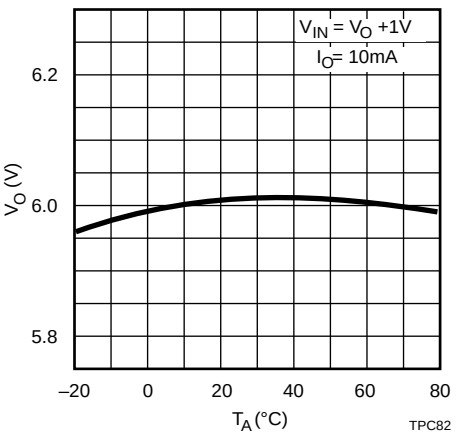

**TK11457**

OUTPUT VOLTAGE vs TEMPERATURE



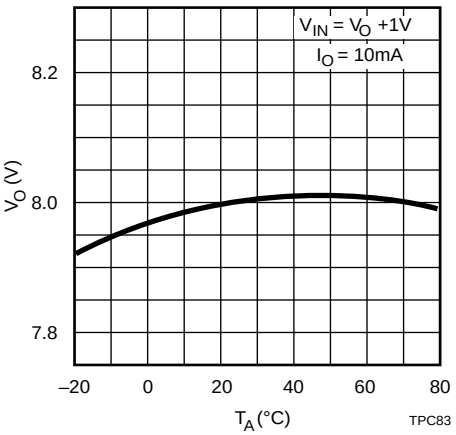

**TK11460**

OUTPUT VOLTAGE vs TEMPERATURE




**TK11480**

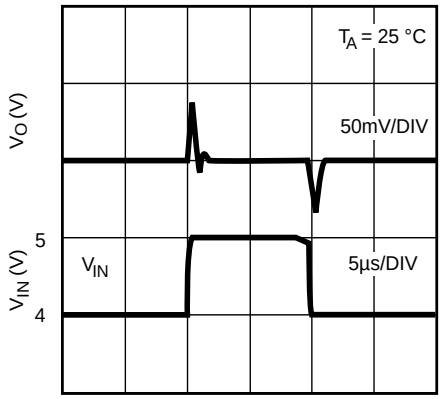
OUTPUT VOLTAGE vs TEMPERATURE



## TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

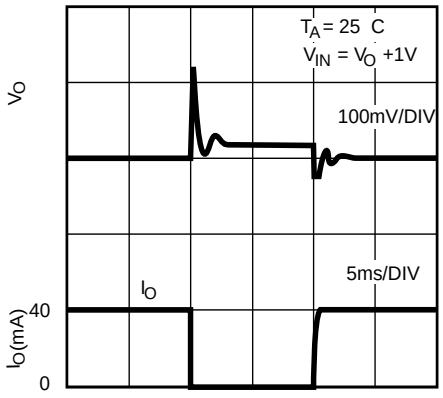
### COMMON CHARACTERISTICS

LINE TRANSIENT RESPONSE



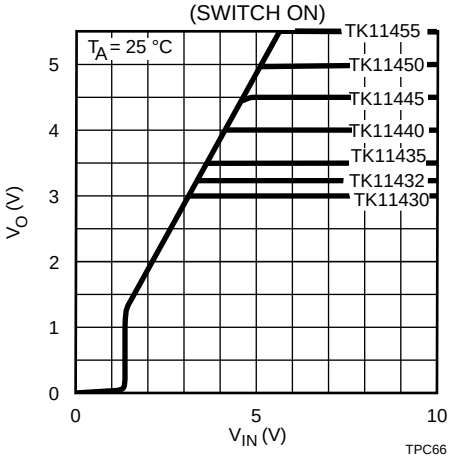

TPC64

LOAD TRANSIENT RESPONSE



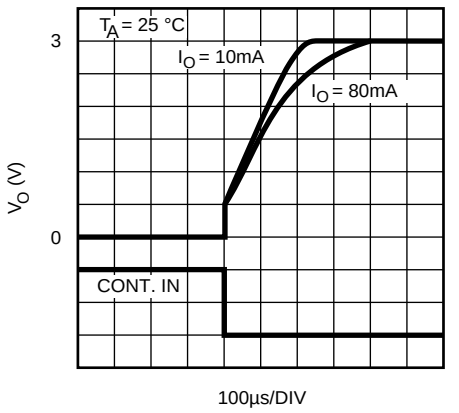

TPC65

INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



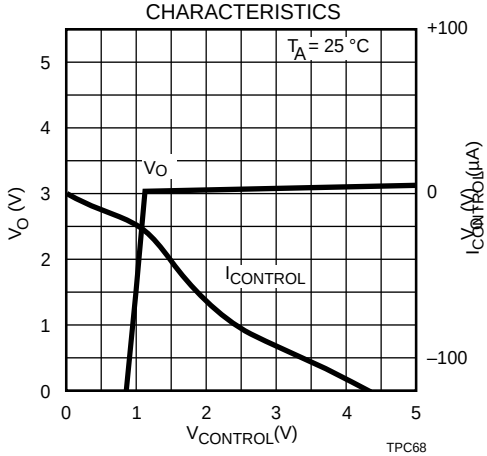

TPC66

TURN ON TRANSIENT RESPONSE



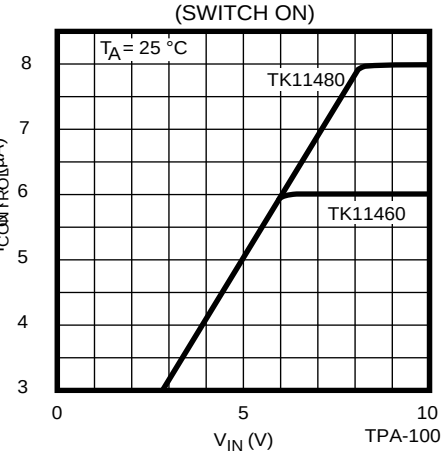

TPC67

CONTROL PIN CHARACTERISTICS



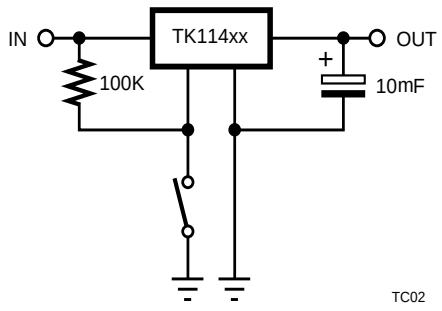

TPC68

INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



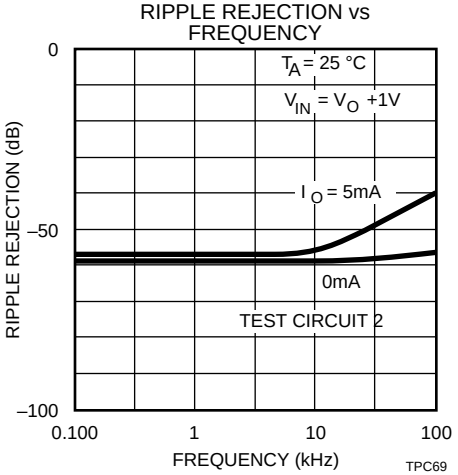

TPA-100

**TEST CIRCUIT 2**



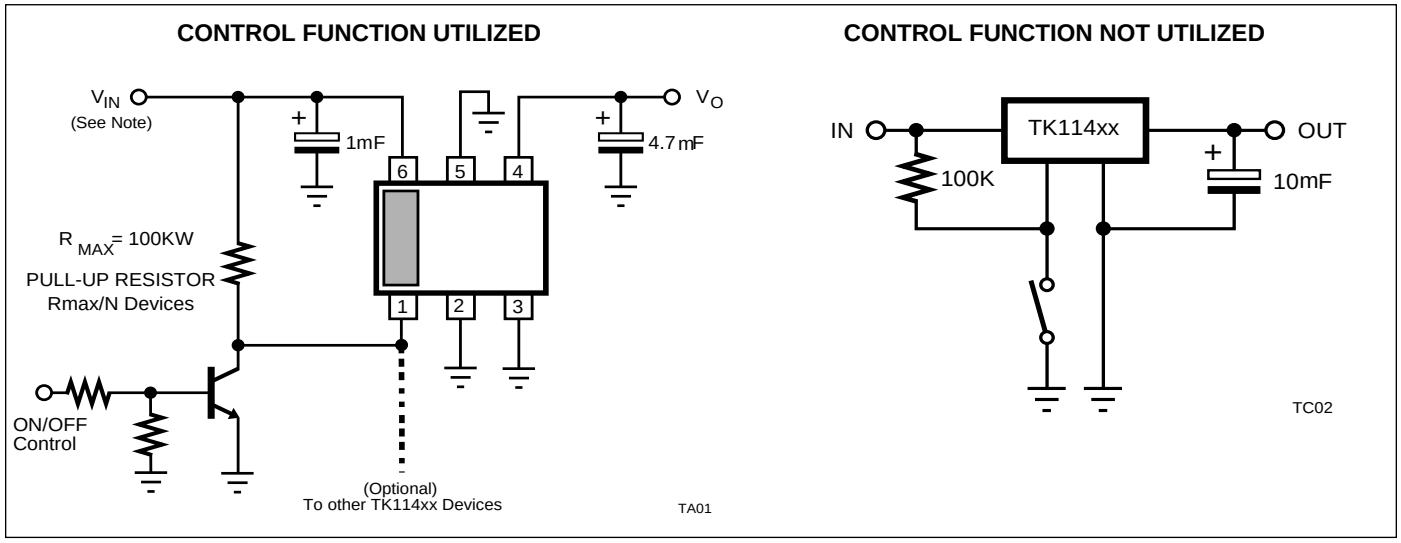

**RIPPLE REJECTION TEST CIRCUIT**

RIPPLE REJECTION vs FREQUENCY

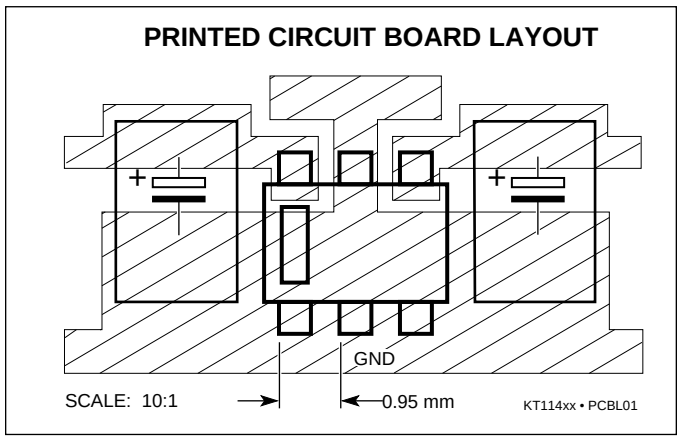



TPC69

## TYPICAL APPLICATIONS




Note: Parallel connection of control pins is allowed if all devices use identical input voltage.




**Application Hints**

Maximize copper foil area connecting to all IC pins for optimum performance. Place input and output bypass capacitors close to the GND pin. For best transient behavior and lowest output impedance, use as large a capacitor value as possible. The temperature coefficient of the capacitance and Equivalent Series Resistance (ESR) should be taken into account. These parameters can influence power supply noise and ripple rejection. In extreme cases, oscillation may occur. In order to maintain stability, the output bypass capacitor value should be minimum 2.2 µF for a Tantalum electrolytic or 4.7 µF for an Aluminum electrolytic.

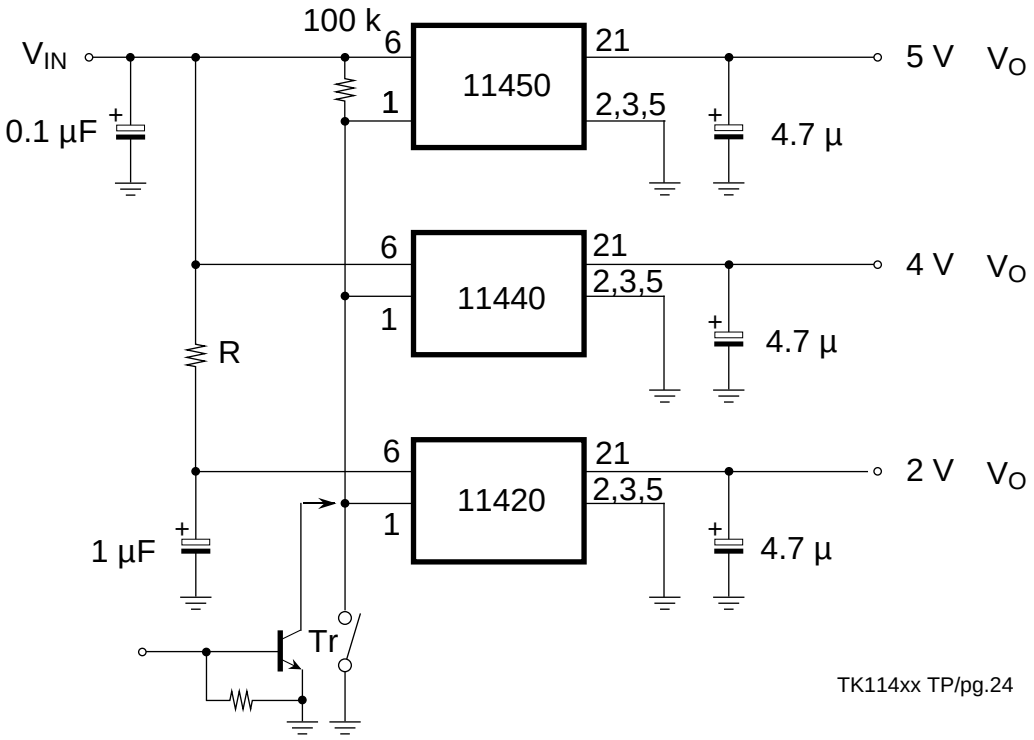
**Handling Molded Resin Packages**

All plastic molded packages absorb some moisture from the air. If moisture absorption occurs prior to soldering the device into the printed circuit board, increased separation of the lead from the plastic molding may occur, degrading the moisture barrier characteristics of the device.

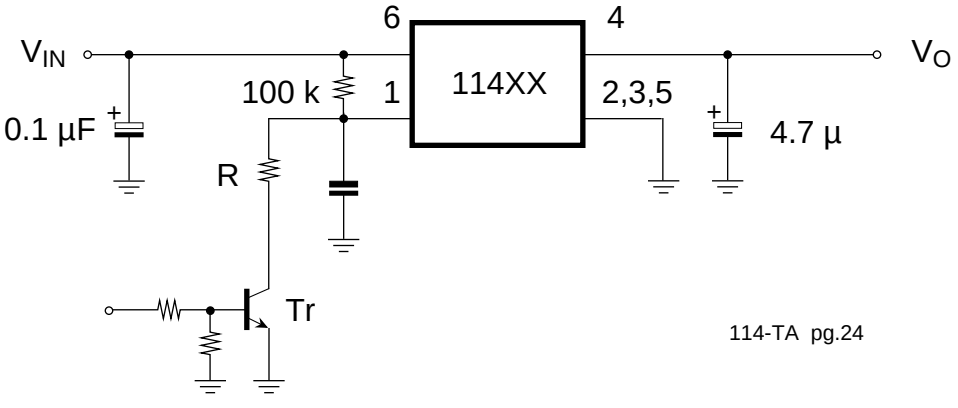
This property of plastic molding compounds should not be overlooked, particularly in the case of very small packages, where the plastic is very thin.

In order to preserve the original moisture barrier properties of the package, devices are stored and shipped in moisture proof bags, filled with dry air. The bags should not be opened or damaged prior to the actual use of the devices. If this is unavoidable, the devices should be stored in a low relative humidity environment (40 to 65%) or in an enclosed environment with desiccant.

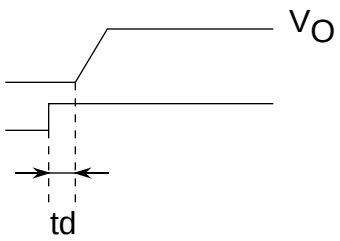
## TYPICAL APPLICATIONS (CONT.)




TK114xx TP/pg.24

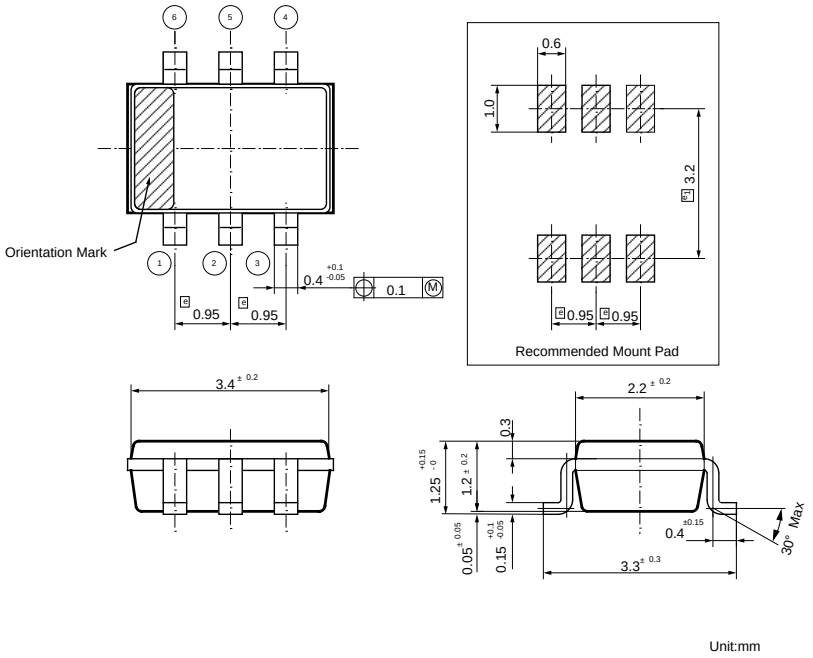



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## PACKAGE OUTLINE

### SOT-23L




Unit:mm

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