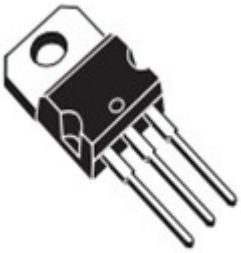
# SP7805

## DESCRIPTION

The SP7800 series of three-terminal positive regulators is available in TO-220 packages and several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

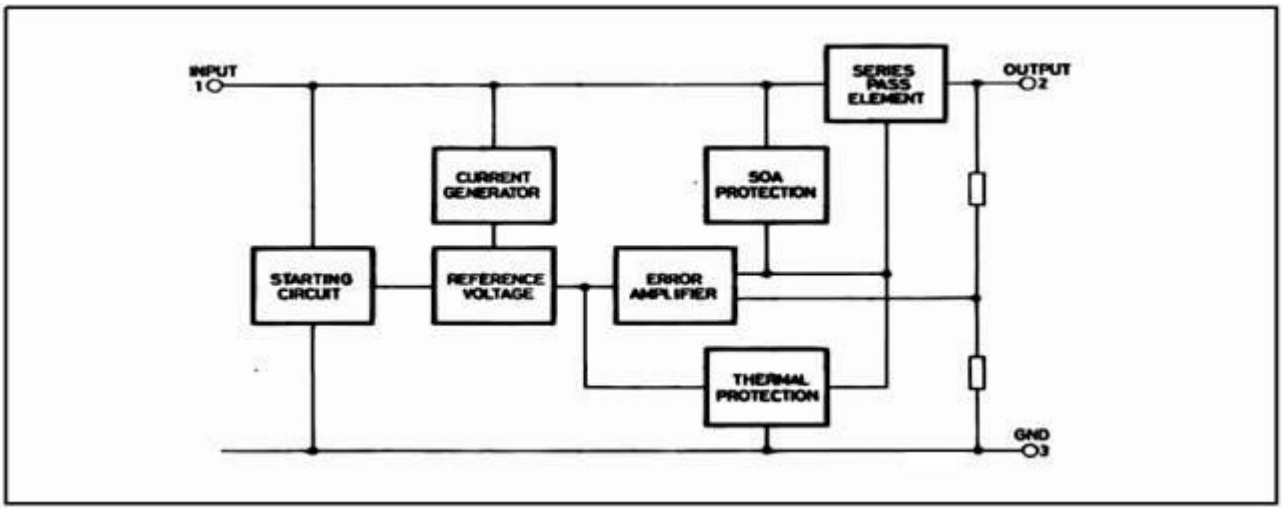
## FEATURES

- Output current to 1.5A
- Output voltages of 5; 8;12V
- Thermal overload protection
- Short circuit protection
- Output transition soa protection



TO-220

## SCHEMATIC DIAGRAM



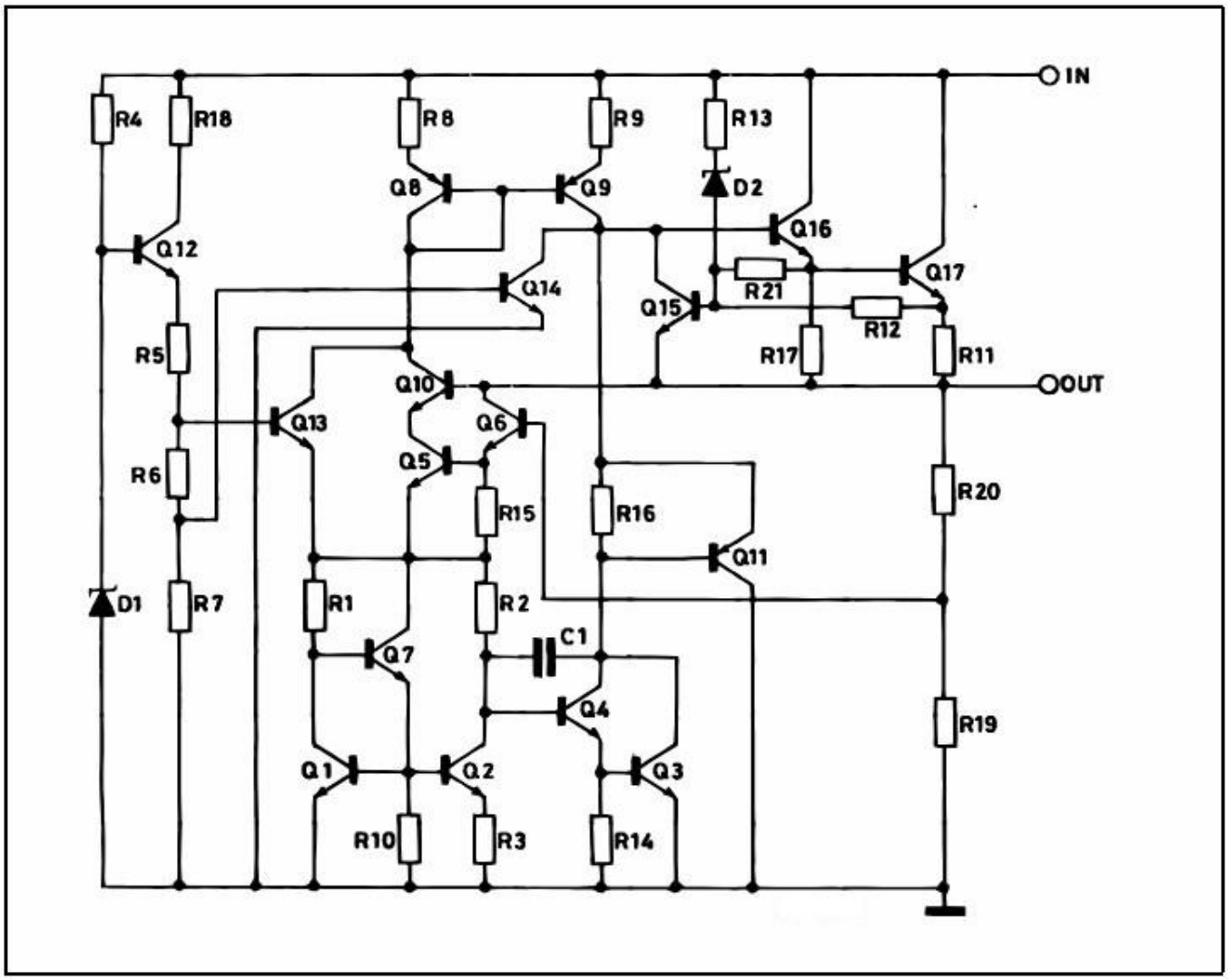

## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter[2] | Value | Unit |
|---|---|---|---|
| $V_I$ | DC Input Voltage | 40 | V |
| $I_O$ | Output Current | Internally Limited | |
| $P_{tot}$ | Power Dissipation | Internally Limited | |
| $T_{stg}$ | Storage Temperature Range | -65 to 150 | ° C |
| $T_{op}$ | Operating Junction Temperature Range | 0 to 150 | ° C |

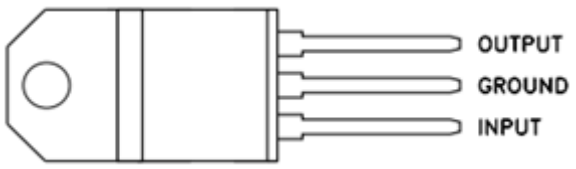
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

## THERMAL DATA

| Symbol | Parameter | TO-220 | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case Max | 5 | ° C/W |
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-ambient Max | 50 | ° C/W |



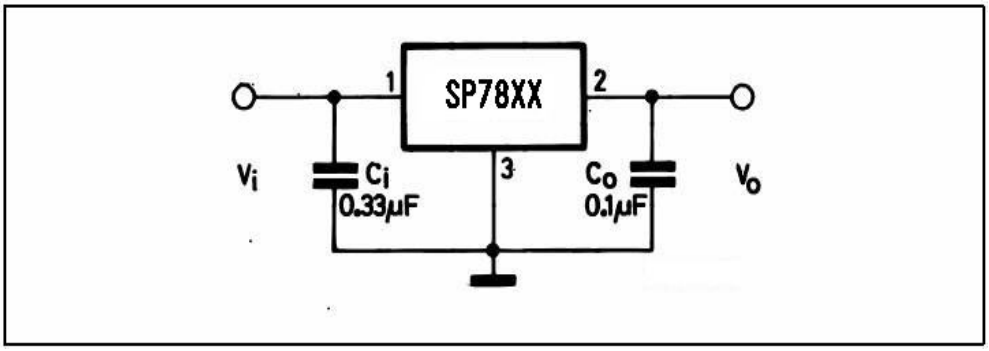

## CONNECTION DIAGRAM (top view)



## ORDERING CODES

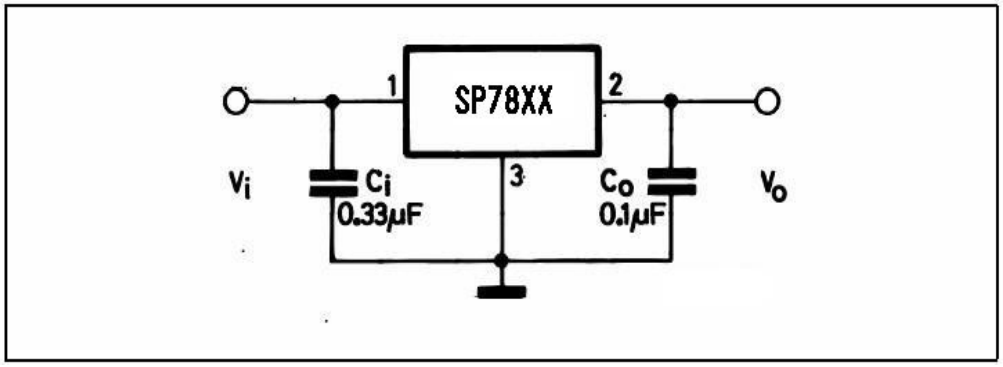
| TYPE | TO-220 | OUTPUT VOLTAGE |
|---|---|---|
| L7805C | L7805CV | 5 V |
| L7808C | L7808CV | 8 V |
| L7812C | L7812CV | 12 V |

## APPLICATION CIRCUITS

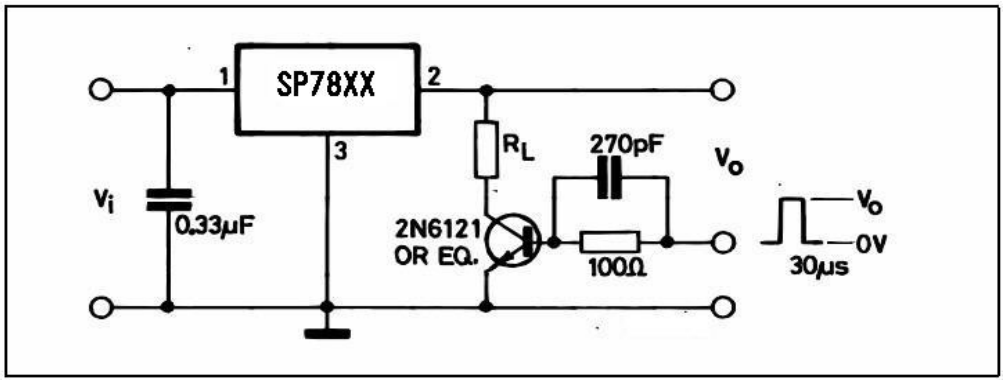



## TEST CIRCUITS

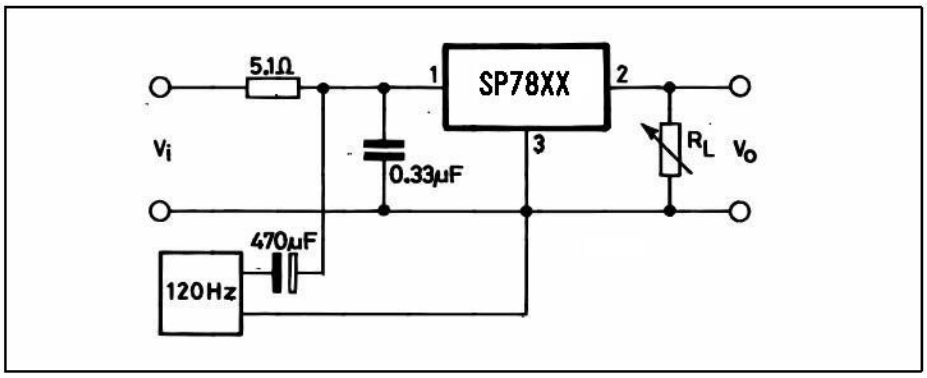
### Figure 1 : DC Parameter




### Figure 2 : Load Regulation



## Figure 3 : Ripple Rejection




## ELECTRICAL CHARACTERISTICS OF SP7805C (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$= 10V,$I_O$ =500mA,$C_I$=0.33μF,$C_O$ = 0.1 μF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 4.8 | 5 | 5.2 | V |
| $V_O$ | Output Voltage | $I_O$ =5mAto1A $P_O \leqslant$ 15W<br>$V_I$= 7 to 20 V | 4.75 | 5 | 5.25 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$=7to25V $T_J$ = 25°C | | 3 | 100 | mV |
| | | $V_I$=8to12V $T_J$ = 25°C | | 1 | 50 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ =5mAto1.5A $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 50 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ =5mAto1A | | | 0.5 | mA |
| | | $V_I$= 7 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -1.1 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 40 | | μV/$V_O$ |
| SVR | Supply Voltage Rejection | VI= 8 to 18 V f = 120Hz | 62 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ =1A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$=35V $T_J$ = 25°C | | 0.75 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.2 | | A |

(*) Load and line regulation are specified at constant junction temperature. Changes in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## ELECTRICAL CHARACTERISTICS OF SP7808C (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$= 14V,$I_O$ =500mA,$C_I$=0.33μF,$C_O$ = 0.1 μF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 7.7 | 8 | 8.3 | V |
| $V_O$ | Output Voltage | $I_O$ =5mAto1A $P_O \leqslant$ 15W<br>$V_I$= 10.5 to 25 V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$=10.5to25V $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$=11to17V $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ =5mAto1.5A $T_J$ = 25°C | | | 160 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 80 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ =5mAto1A | | | 0.5 | mA |
| | | $V_I$= 10.5 to 25 V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -0.8 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 52 | | μV/$V_O$ |
| SVR | Supply Voltage Rejection | VI= 11.5 to 21.5 V f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ =1A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$=35V $T_J$ = 25°C | | 0.45 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.2 | | A |

(*) Load and line regulation are specified at constant junction temperature. Changes in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## ELECTRICAL CHARACTERISTICS OF SP7812C (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$= 19V,$I_O$ =500mA,$C_I$=0.33μF,$C_O$ = 0.1 μF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 11.5 | 12 | 12.5 | V |
| $V_O$ | Output Voltage | $I_O$ =5mAto1A $P_O \leqslant$ 15W<br>$V_I$= 14.5 to 27 V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$=14.5to30V $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$=16to22V $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ =5mAto1.5A $T_J$ = 25°C | | | 240 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 120 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ =5mAto1A | | | 0.5 | mA |
| | | $V_I$= 14.5 to 30 V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -1 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 75 | | μV/$V_O$ |
| SVR | Supply Voltage Rejection | VI= 15 to 25 V f = 120Hz | 55 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ =1A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 18 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$=35V $T_J$ = 25°C | | 0.35 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.2 | | A |

(*) Load and line regulation are specified at constant junction temperature. Changes in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

**Figure 5 :** Peak Output Current vs Input/output Differential Voltage

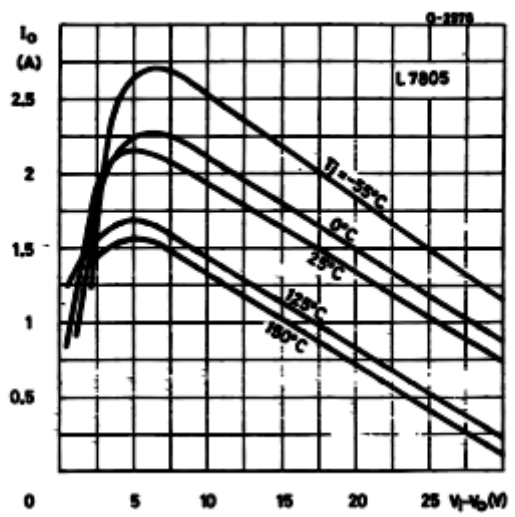



**Figure 6 :** Supply Voltage Rejection vs Frequency

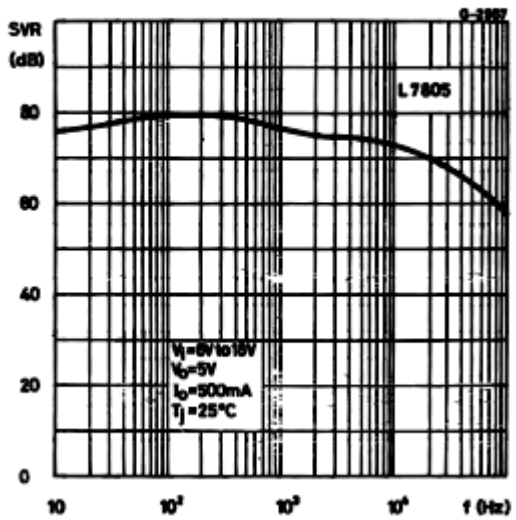


**Figure 7 :** Output Voltage vs Junction Temperature

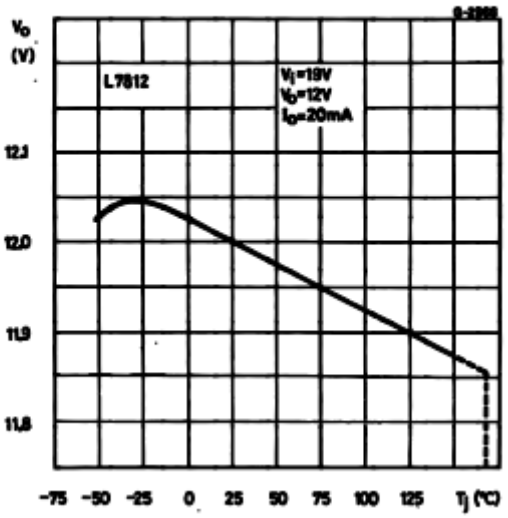



**Figure 8 :** Output Impedance vs Frequency

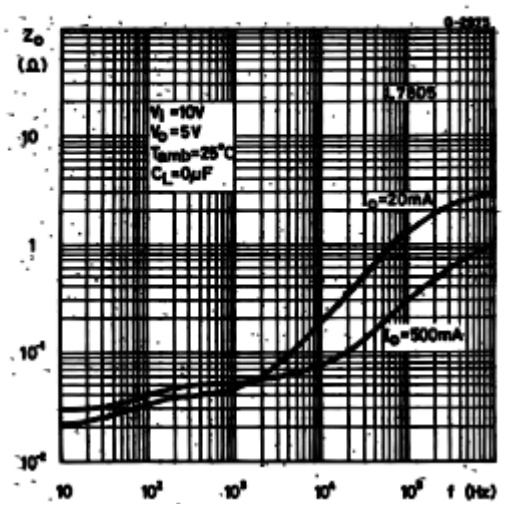



**Figure 9 :** Quiescent Current vs Junction Temperature

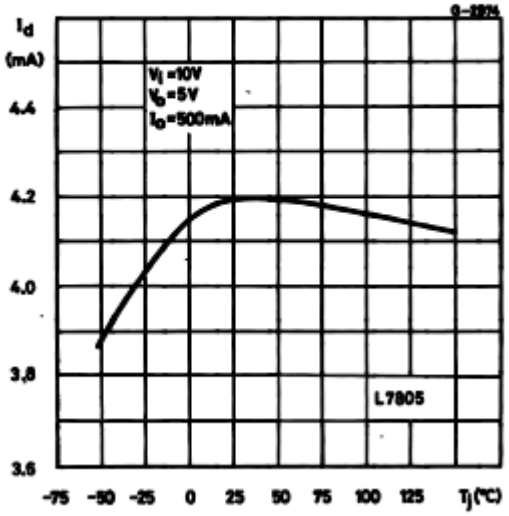



**Figure 10 :** Load Transient Response

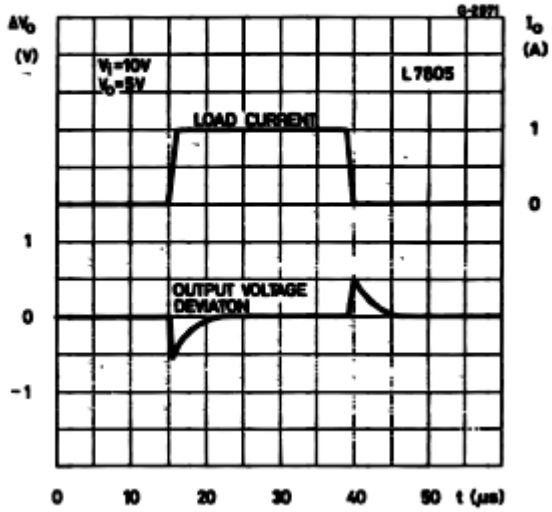



**Figure 11 :** Line Transient Response

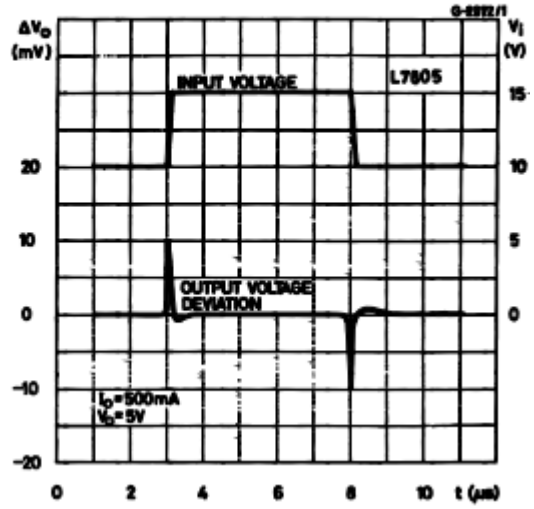
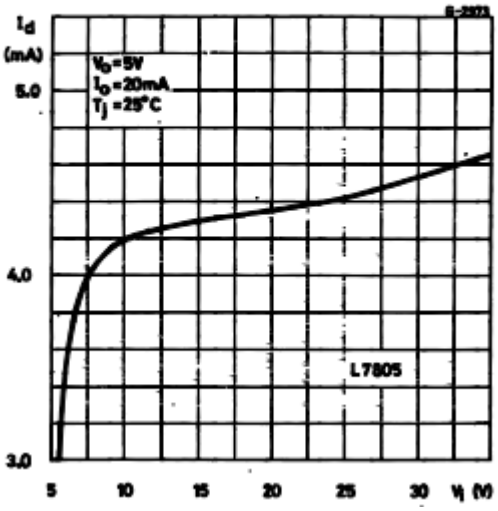
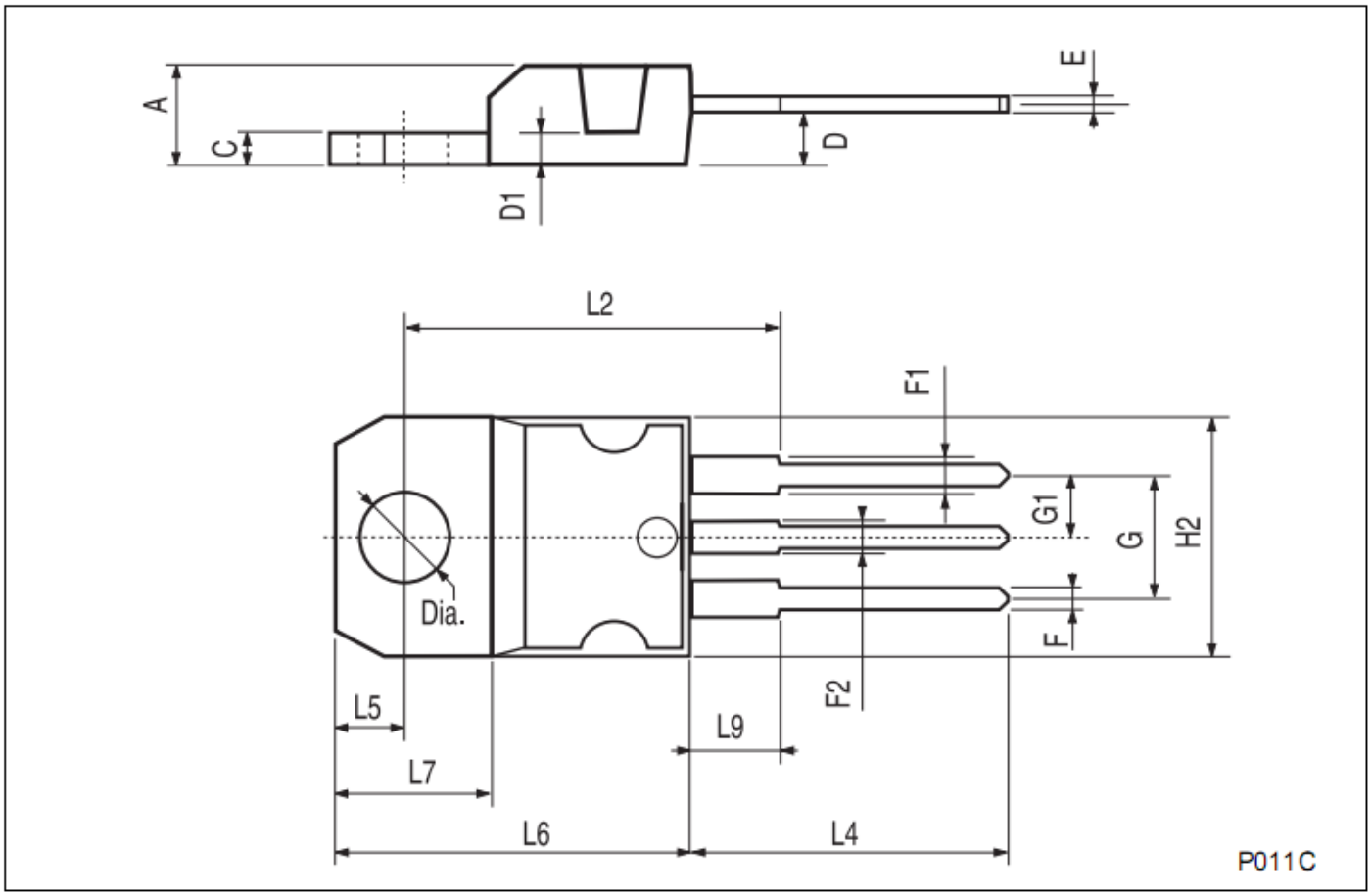



**Figure 12 :** Quiescent Current vs Input Voltage



## PACKAGE DESCRIPTION

### TO-220 PACKAGE OUTLINE DIMENSIONS



| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |