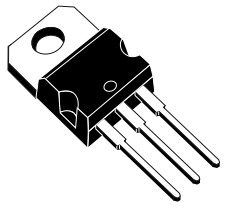
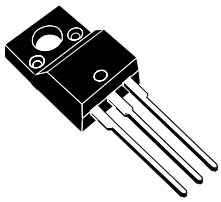
# L7800 SERIES

## POSITIVE VOLTAGE REGULATORS

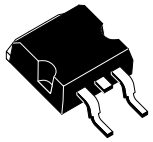
- OUTPUT CURRENT TO 1.5A
- OUTPUT VOLTAGES OF 5; 5.2; 6; 8; 8.5; 9; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION



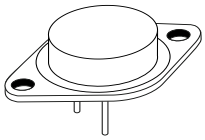
**TO-220**



**TO-220FP**
**TO-220FM**



**D²PAK**

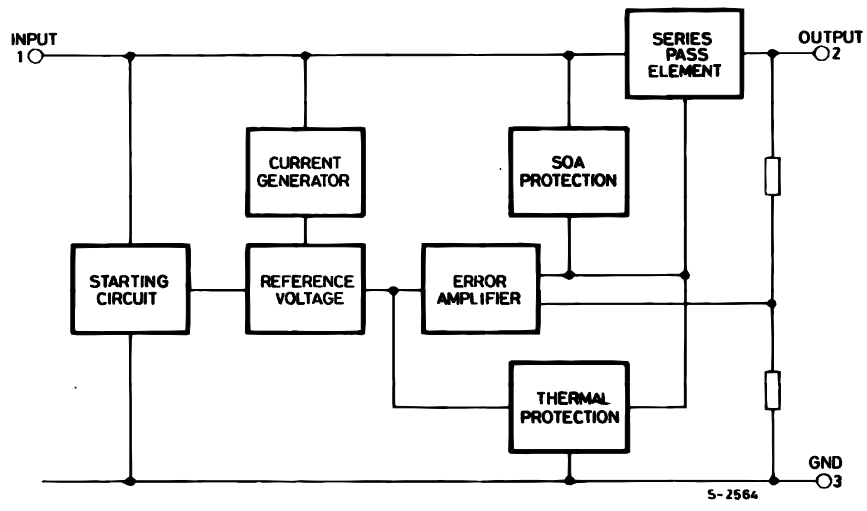


**TO-3**

### DESCRIPTION

The L7800 series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-220FM, TO-3 and $D^2PAK$ 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.

### SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

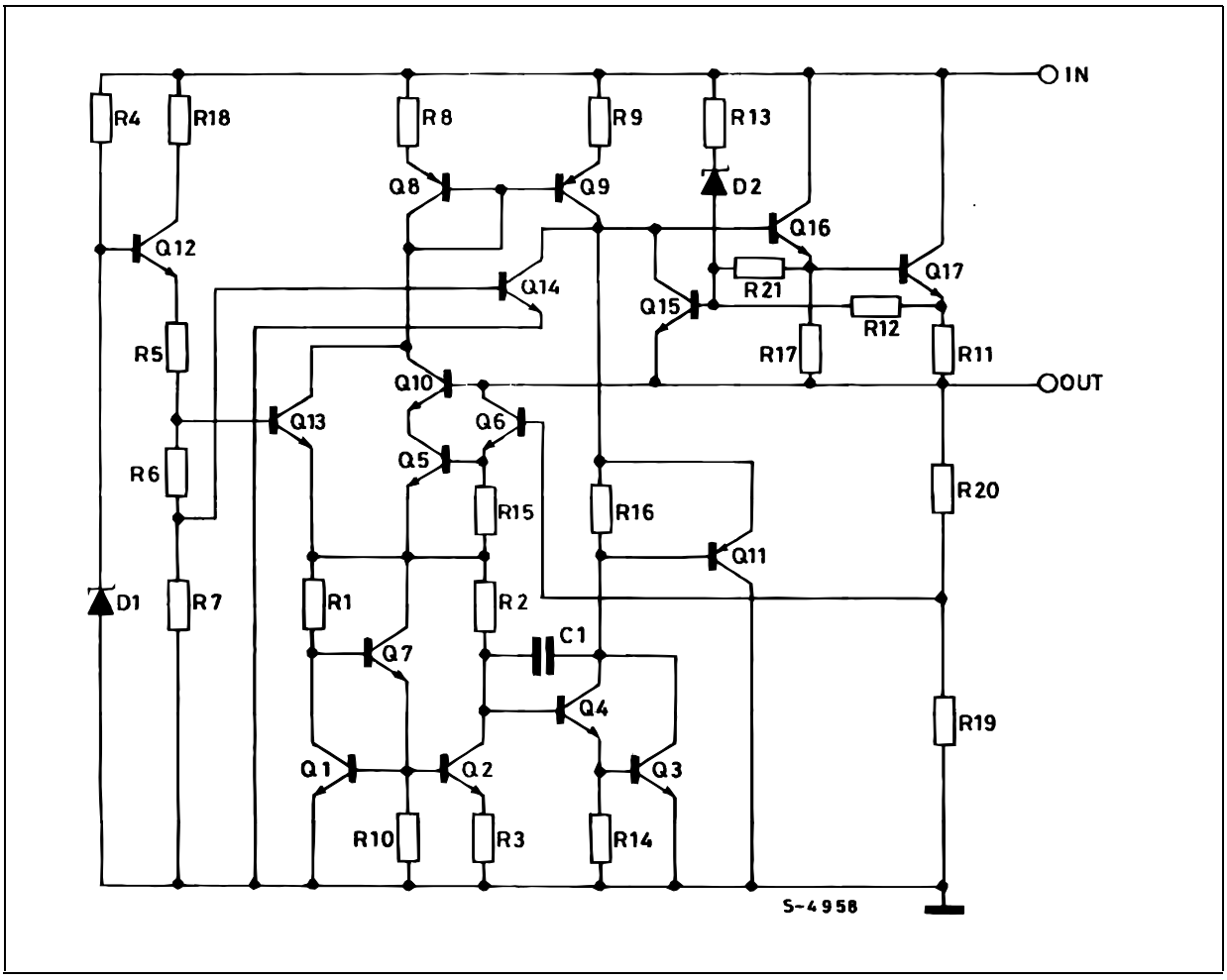
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_I$ | DC Input Voltage | for $V_O$= 5 to 18V | 35 | V |
| | | for $V_O$= 20, 24V | 40 | |
| $I_O$ | Output Current | | Internally Limited | |
| $P_{tot}$ | Power Dissipation | | Internally Limited | |
| $T_{stg}$ | Storage Temperature Range | | -65 to 150 | °C |
| $T_{op}$ | Operating Junction Temperature Range | for L7800 | -55 to 150 | °C |
| | | for L7800C | 0 to 150 | |

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

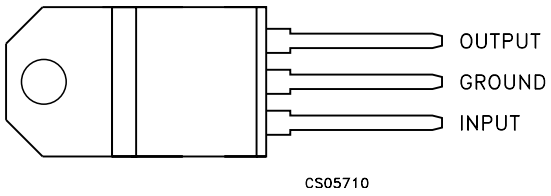
## THERMAL DATA

| Symbol | Parameter | $D^2PAK$ | TO-220 | TO-220FP | TO-220FM | TO-3 | Unit |
|---|---|---|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case Max | 3 | 5 | 5 | 5 | 4 | °C/W |
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-ambient Max | 62.5 | 50 | 60 | 60 | 35 | °C/W |

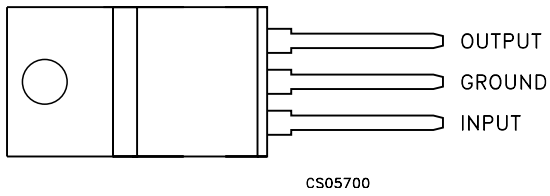
## SCHEMATIC DIAGRAM



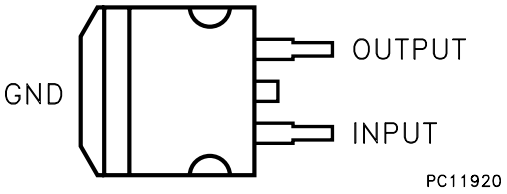
**CONNECTION DIAGRAM** (top view)



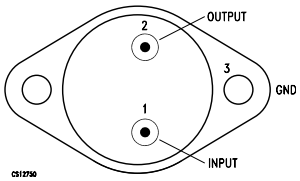

**TO-220 (Any Type)**




**TO-220FP/TO-220FM**




**D²PAK (Any Type)**



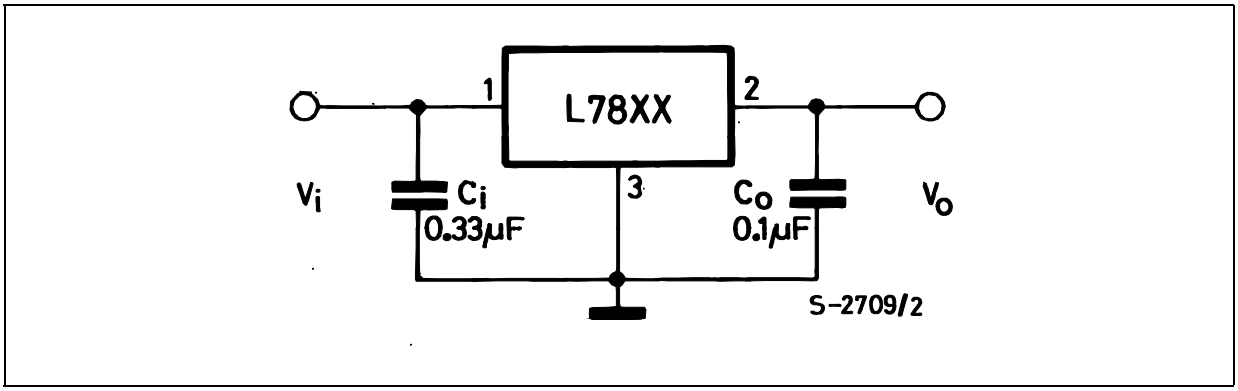

**TO-3**

**ORDERING CODES**

| TYPE | TO-220 (A Type) | TO-220 (C Type) | TO-220 (E Type) | D²PAK (A Type) (*) | D²PAK (C Type) (T & R) | TO-220FP | TO-220FM | TO-3 |
|---|---|---|---|---|---|---|---|---|
| L7805 | | | | | | | | L7805T |
| L7805C | L7805CV | L7805C-V | L7805CV1 | L7805CD2T | L7805C-D2TR | L7805CP | L7805CF | L7805CT |
| L7852C | L7852CV | | | L7852CD2T | | L7852CP | L7852CF | L7852CT |
| L7806 | | | | | | | | L7806T |
| L7806C | L7806CV | L7806C-V | | L7806CD2T | | L7806CP | L7806CF | L7806CT |
| L7808 | | | | | | | | L7808T |
| L7808C | L7808CV | L7808C-V | | L7808CD2T | | L7808CP | L7808CF | L7808CT |
| L7885C | L7885CV | | | L7885CD2T | | L7885CP | L7885CF | L7885CT |
| L7809C | L7809CV | L7809C-V | | L7809CD2T | | L7809CP | L7809CF | L7809CT |
| L7812 | | | | | | | | L7812T |
| L7812C | L7812CV | L7812C-V | | L7812CD2T | | L7812CP | L7812CF | L7812CT |
| L7815 | | | | | | | | L7815T |
| L7815C | L7815CV | L7815C-V | | L7815CD2T | | L7815CP | L7815CF | L7815CT |
| L7818 | | | | | | | | L7818T |
| L7818C | L7818CV | | | L7818CD2T | | L7818CP | L7818CF | L7818CT |
| L7820 | | | | | | | | L7820T |
| L7820C | L7820CV | | | L7820CD2T | | L7820CP | L7820CF | L7820CT |
| L7824 | | | | | | | | L7824T |
| L7824C | L7824CV | | | L7824CD2T | | L7824CP | L7824CF | L7824CT |

(*) Available in Tape & Reel with the suffix "-TR".

## APPLICATION CIRCUITS




## TEST CIRCUITS

**Figure 1 :** DC Parameter

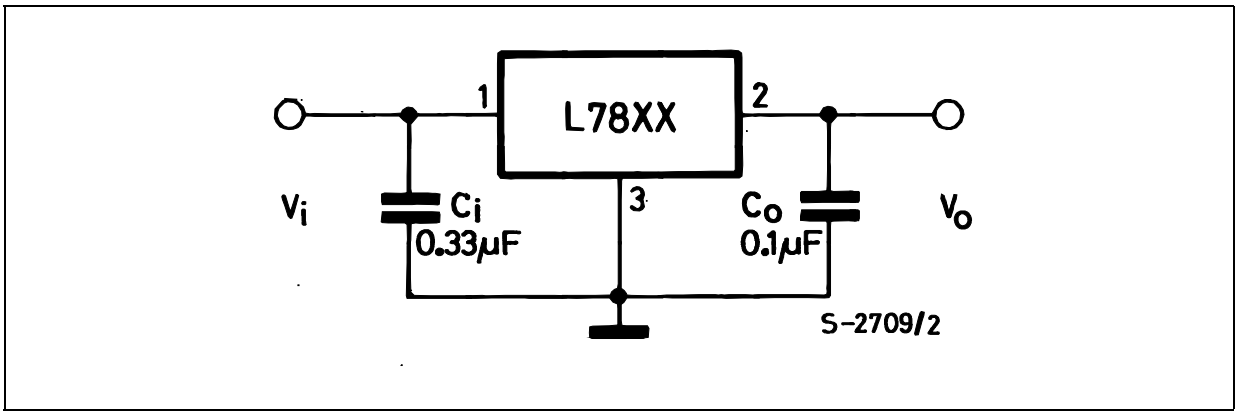



**Figure 2 :** Load Regulation

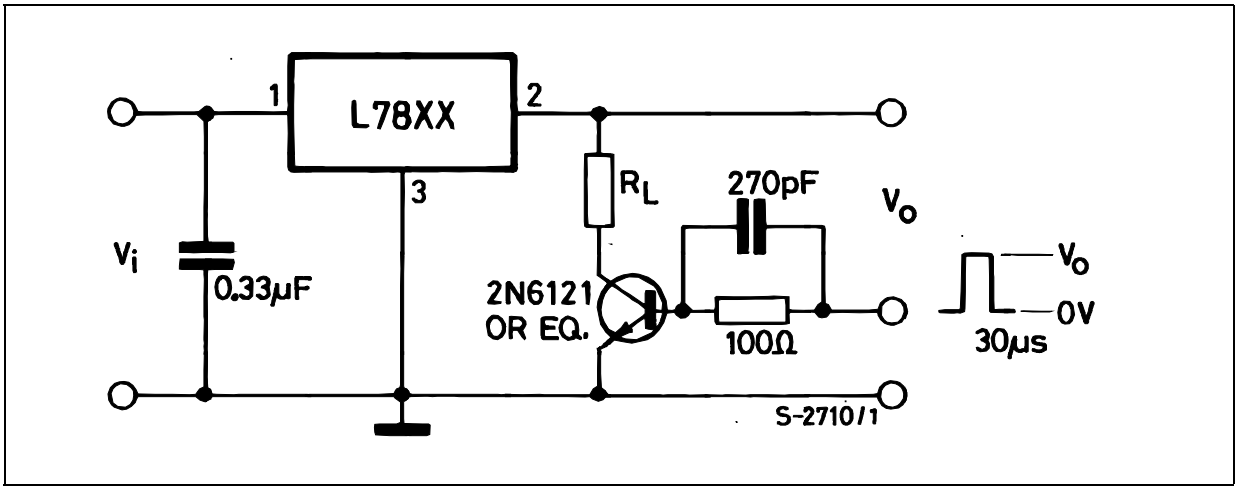
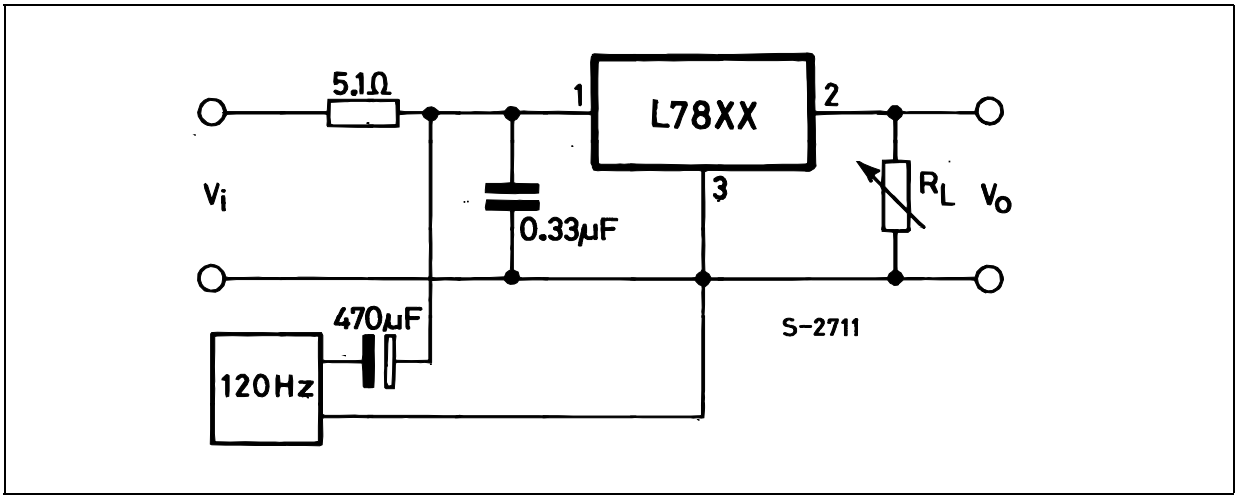


**Figure 3 :** Ripple Rejection




**ELECTRICAL CHARACTERISTICS OF L7805** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 8 to 20 V | 4.65 | 5 | 5.35 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 7 to 25 V $T_J$ = 25°C | | 3 | 50 | mV |
| | | $V_I$ = 8 to 12 V $T_J$ = 25°C | | 1 | 25 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 25 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 8 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 0.6 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 8 to 18 V f = 120Hz | 68 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7806** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 11V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 5.75 | 6 | 6.25 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 9 to 21 V | 5.65 | 6 | 6.35 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 8 to 25 V $T_J$ = 25°C | | | 60 | mV |
| | | $V_I$ = 9 to 13 V $T_J$ = 25°C | | | 30 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 30 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 9 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 0.7 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 9 to 19 V f = 120Hz | 65 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7808** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 14V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 11.5 to 23 V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 10.5 to 25 V $T_J$ = 25°C | | | 80 | mV |
| | | $V_I$ = 11 to 17 V $T_J$ = 25°C | | | 40 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 40 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 11.5 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 1 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 11.5 to 21.5 V f = 120Hz | 62 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7812** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 19V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 15.5 to 27 V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 14.5 to 30 V $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 16 to 22 V $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 15 to 30 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 1.5 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 15 to 25 V f = 120Hz | 61 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 18 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7815** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 23V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 14.4 | 15 | 15.6 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 18.5 to 30 V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 17.5 to 30 V $T_J$ = 25°C | | | 150 | mV |
| | | $V_I$ = 20 to 26 V $T_J$ = 25°C | | | 75 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 150 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 75 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 18.5 to 30 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 1.8 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 18.5 to 28.5 V f = 120Hz | 60 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7818** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 26V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 17.3 | 18 | 18.7 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 22 to 33 V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 21 to 33 V $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 24 to 30 V $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 22 to 33 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 2.3 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 22 to 32 V f = 120Hz | 59 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 22 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7820** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 28V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 19.2 | 20 | 20.8 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 24 to 35 V | 19 | 20 | 21 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 22.5 to 35 V $T_J$ = 25°C | | | 200 | mV |
| | | $V_I$ = 26 to 32 V $T_J$ = 25°C | | | 100 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 200 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 100 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 24 to 35 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 2.5 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 24 to 35 V f = 120Hz | 58 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 24 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7824** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 33V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 23 | 24 | 25 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 28 to 38 V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 27 to 38 V $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$ = 30 to 36 V $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 240 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 120 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 28 to 38 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | 3 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 28 to 38 V f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 28 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | 1.3 | 2.2 | 3.3 | 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 L7805C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 7 to 20 V | 4.75 | 5 | 5.25 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 7 to 25 V $T_J$ = 25°C | | 3 | 100 | mV |
| | | $V_I$ = 8 to 12 V $T_J$ = 25°C | | 1 | 50 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 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 | $I_O$ = 5 mA to 1 A | | | 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 | $V_I$ = 8 to 18 V f = 120Hz | 62 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 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 L7852C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 5.0 | 5.2 | 5.4 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 8 to 20 V | 4.95 | 5.2 | 5.45 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 7 to 25 V $T_J$ = 25°C | | 3 | 105 | mV |
| | | $V_I$ = 8 to 12 V $T_J$ = 25°C | | 1 | 52 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 105 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 52 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 7 to 25 V | | | 1.3 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -1 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 42 | | $\mu V/V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 8 to 18 V f = 120Hz | 61 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 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 L7806C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 11V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 5.75 | 6 | 6.25 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 8 to 21 V | 5.7 | 6 | 6.3 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 8 to 25 V $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 9 to 13 V $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 120 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 8 to 25 V | | | 1.3 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -0.8 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 45 | | $\mu V/V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 9 to 19 V f = 120Hz | 59 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.55 | | 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 L7808C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 14V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 10.5 to 25 V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 10.5 to 25 V $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11 to 17 V $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 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 | $I_O$ = 5 mA to 1 A | | | 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 | $V_I$ = 11.5 to 21.5 V f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 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 L7885C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 14.5V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 8.2 | 8.5 | 8.8 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 11 to 26 V | 8.1 | 8.5 | 8.9 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 11 to 27 V $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11.5 to 17.5 V $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 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 | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 11 to 27 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 | | 55 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 12 to 22 V f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 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 L7809C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 15V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 8.65 | 9 | 9.35 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 11.5 to 26 V | 8.55 | 9 | 9.45 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 11.5 to 26 V $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 12 to 18 V $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 11.5 to 26 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 | | 70 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 12 to 23 V f = 120Hz | 55 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.40 | | 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 L7812C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 19V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 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 | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 14.5 to 27 V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 14.5 to 30 V $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$ = 16 to 22 V $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 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 | $I_O$ = 5 mA to 1 A | | | 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 | $V_I$ = 15 to 25 V f = 120Hz | 55 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 18 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 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.

**ELECTRICAL CHARACTERISTICS OF L7815C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 23V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 14.5 | 15 | 15.6 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 17.5 to 30 V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 17.5 to 30 V $T_J$ = 25°C | | | 300 | mV |
| | | $V_I$ = 20 to 26 V $T_J$ = 25°C | | | 150 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 300 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 150 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 17.5 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 | | 90 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 18.5 to 28.5 V f = 120Hz | 54 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.23 | | 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 L7818C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 26V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 17.3 | 18 | 18.7 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 21 to 33 V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 21 to 33 V $T_J$ = 25°C | | | 360 | mV |
| | | $V_I$ = 24 to 30 V $T_J$ = 25°C | | | 180 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 360 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 180 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 21 to 33 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 | | 110 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 22 to 32 V f = 120Hz | 53 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 22 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.20 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.1 | | 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 L7820C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 28V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 19.2 | 20 | 20.8 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 23 to 35 V | 19 | 20 | 21 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 22.5 to 35 V $T_J$ = 25°C | | | 400 | mV |
| | | $V_I$ = 26 to 32 V $T_J$ = 25°C | | | 200 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 400 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 200 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 23 to 35 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 | | 150 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 24 to 35 V f = 120Hz | 52 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 24 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.18 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.1 | | 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 L7824C** (refer to the test circuits, $T_J$ = 0 to 125°C, $V_I$ = 33V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified).

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output Voltage | $T_J$ = 25°C | 23 | 24 | 25 | V |
| $V_O$ | Output Voltage | $I_O$ = 5 mA to 1 A $P_O \leq$ 15W<br>$V_I$ = 27 to 38 V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(*) | Line Regulation | $V_I$ = 27 to 38 V $T_J$ = 25°C | | | 480 | mV |
| | | $V_I$ = 30 to 36 V $T_J$ = 25°C | | | 240 | |
| $\Delta V_O$(*) | Load Regulation | $I_O$ = 5 mA to 1.5 A $T_J$ = 25°C | | | 480 | mV |
| | | $I_O$ = 250 to 750 mA $T_J$ = 25°C | | | 240 | |
| $I_d$ | Quiescent Current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent Current Change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 27 to 38 V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift | $I_O$ = 5 mA | | -1.5 | | mV/°C |
| eN | Output Noise Voltage | B =10Hz to 100KHz $T_J$ = 25°C | | 170 | | µV/$V_O$ |
| SVR | Supply Voltage Rejection | $V_I$ = 28 to 38 V f = 120Hz | 50 | | | dB |
| $V_d$ | Dropout Voltage | $I_O$ = 1 A $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output Resistance | f = 1 KHz | | 28 | | mΩ |
| $I_{sc}$ | Short Circuit Current | $V_I$ = 35 V $T_J$ = 25°C | | 0.15 | | A |
| $I_{scp}$ | Short Circuit Peak Current | $T_J$ = 25°C | | 2.1 | | 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 4 :** Dropout Voltage vs Junction Temperature

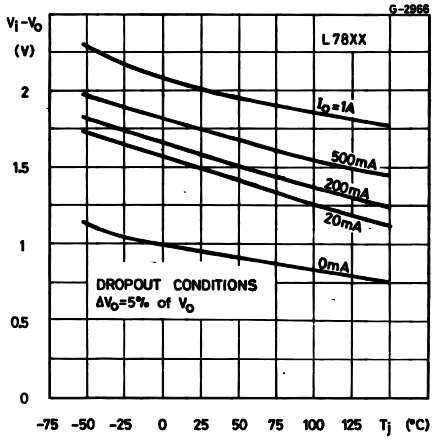



**Figure 5 :** Peak Output Current vs Input/output Differential Voltage

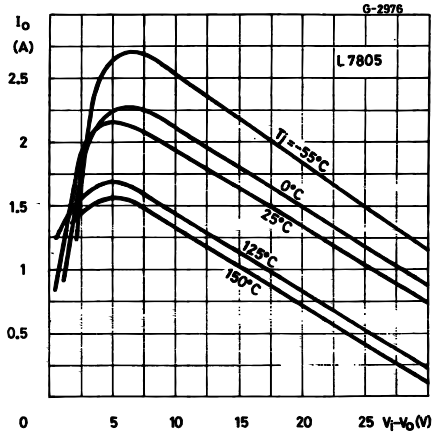



**Figure 6 :** Supply Voltage Rejection vs Frequency

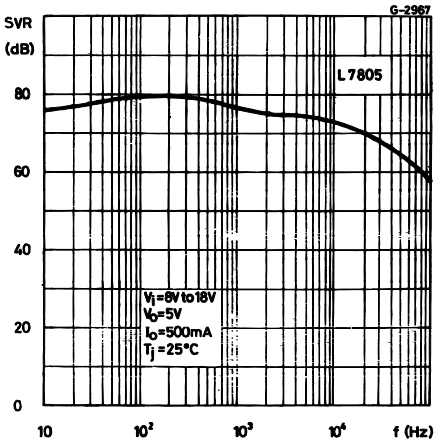



**Figure 7 :** Output Voltage vs Junction Temperature

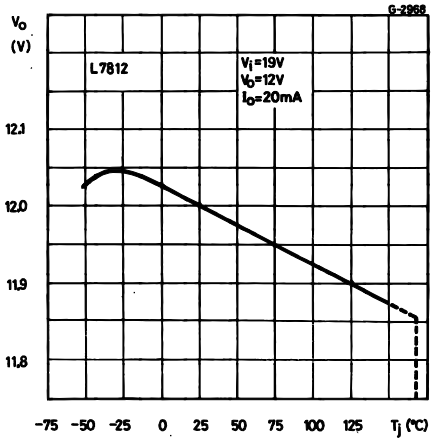



**Figure 8 :** Output Impedance vs Frequency

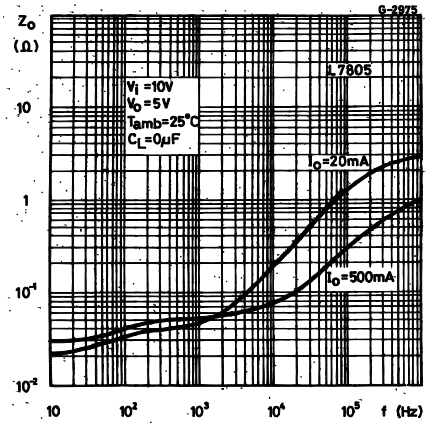



**Figure 9 :** Quiescent Current vs Junction Temperature

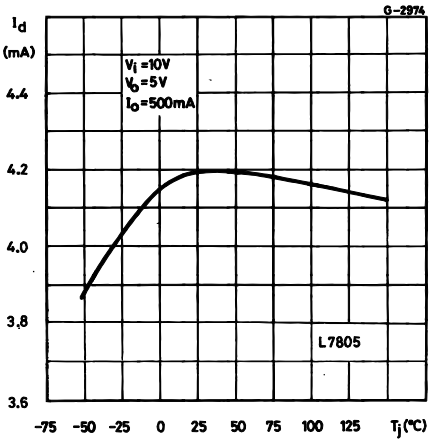


**Figure 10 :** Load Transient Response

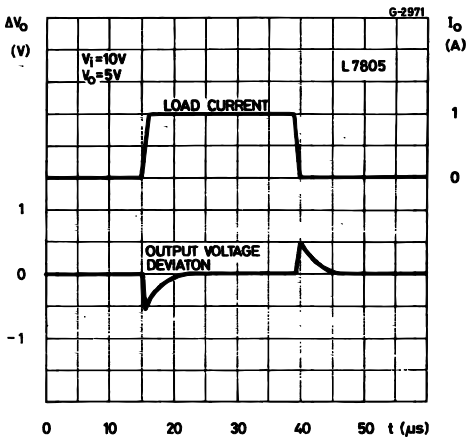



**Figure 11 :** Line Transient Response

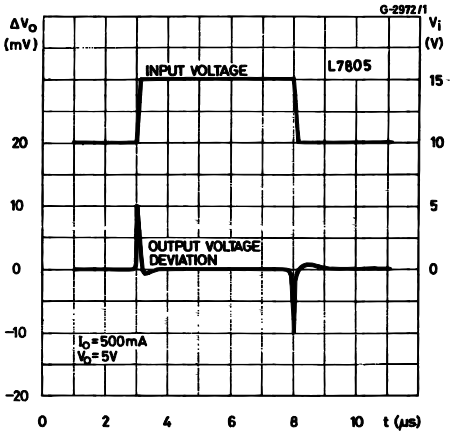



**Figure 12 :** Quiescent Current vs Input Voltage

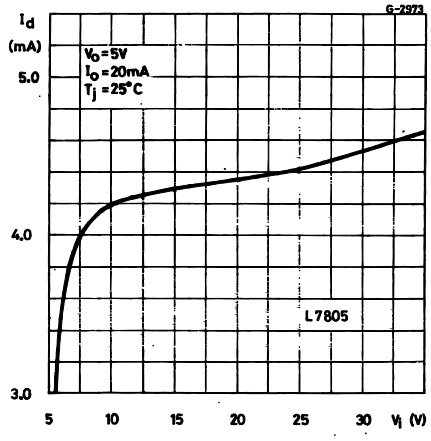
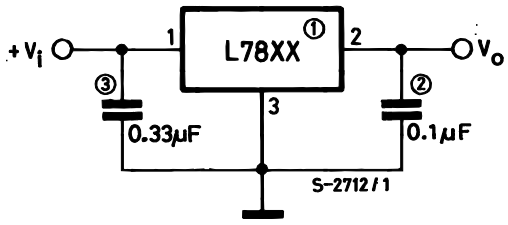



**Figure 13 :** Fixed Output Regulator




NOTE:
1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if regulator is locate an appreciable distance from power supply filter.

**Figure 14 :** Current Regulator

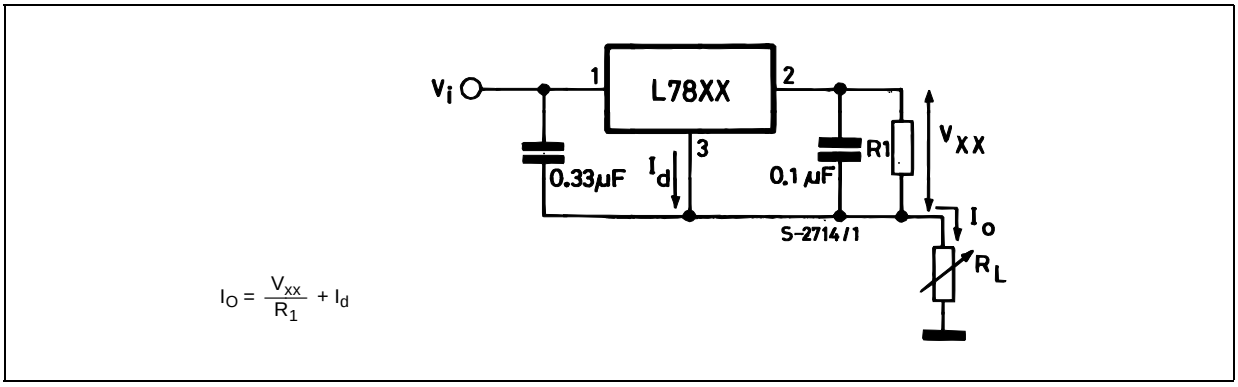



**Figure 15 :** Circuit for Increasing Output Voltage

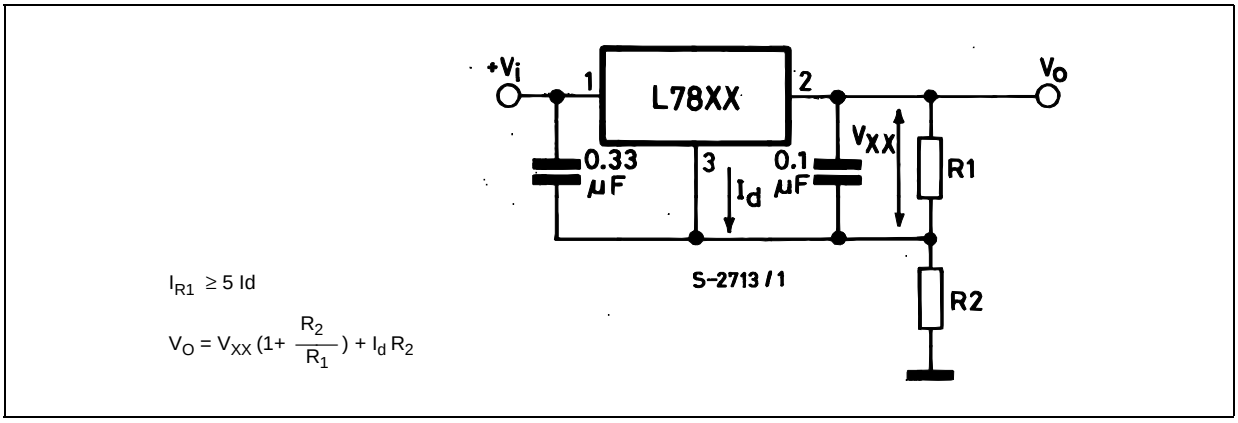



**Figure 16 :** Adjustable Output Regulator (7 to 30V)

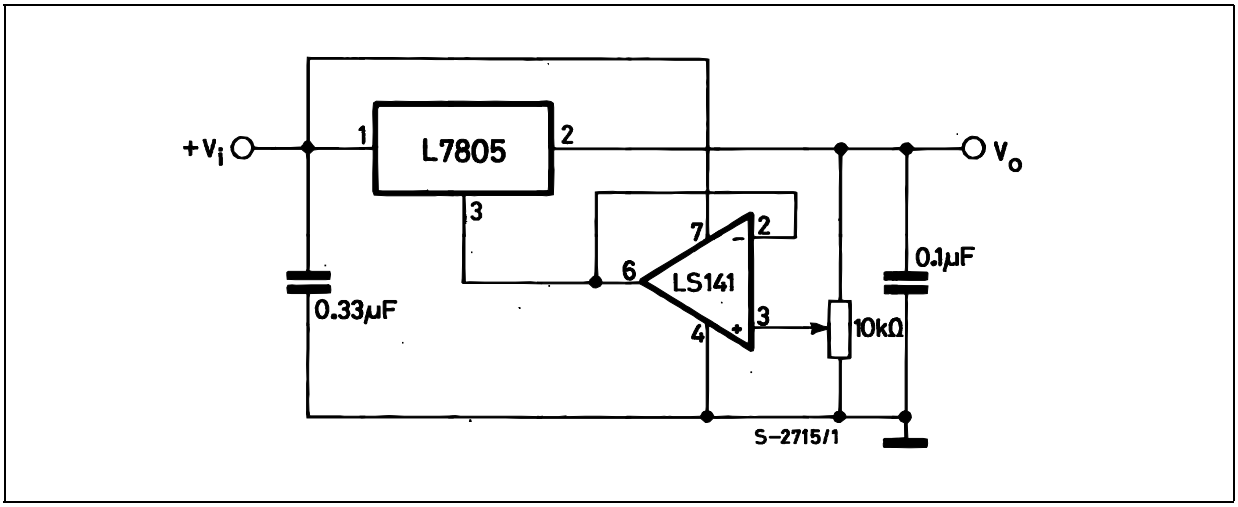


**Figure 17 :** 0.5 to 10V Regulator

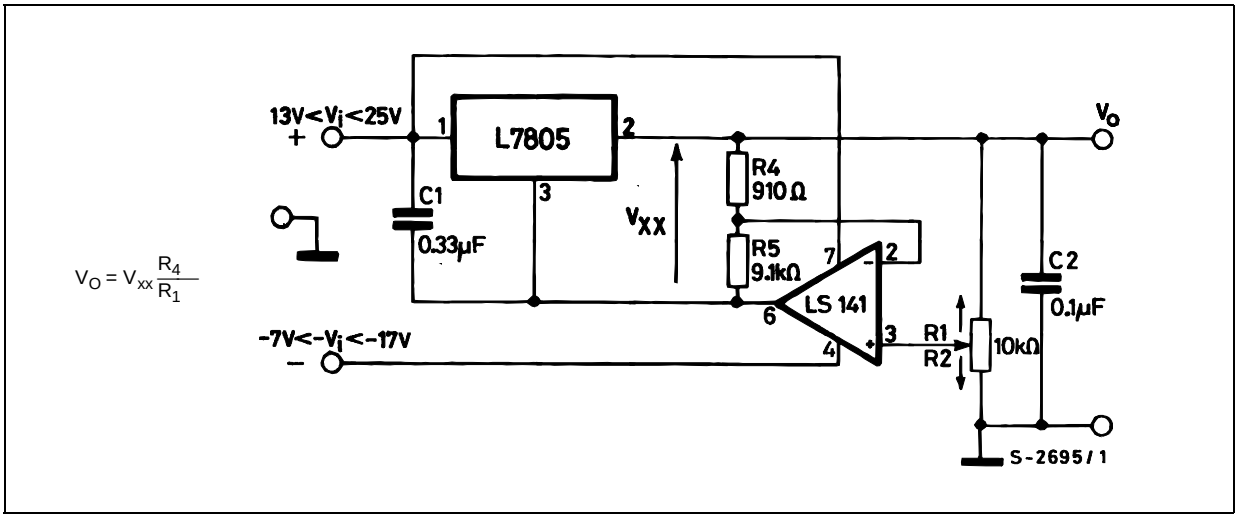



**Figure 18 :** High Current Voltage Regulator

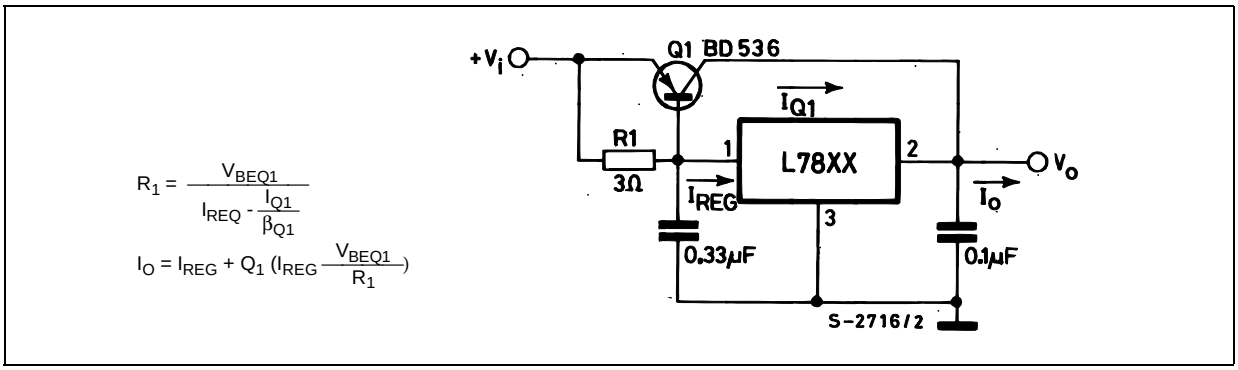



**Figure 19 :** High Output Current with Short Circuit Protection

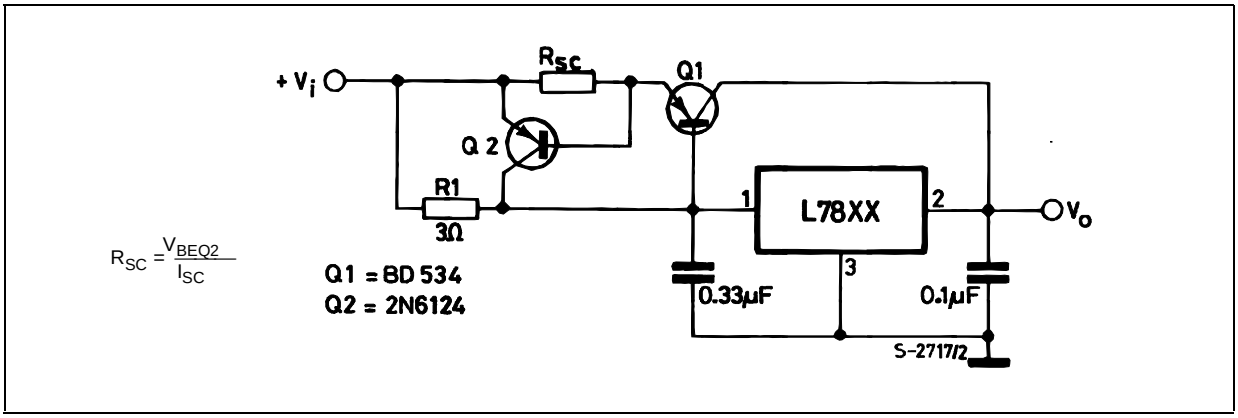


**Figure 20 :** Tracking Voltage Regulator

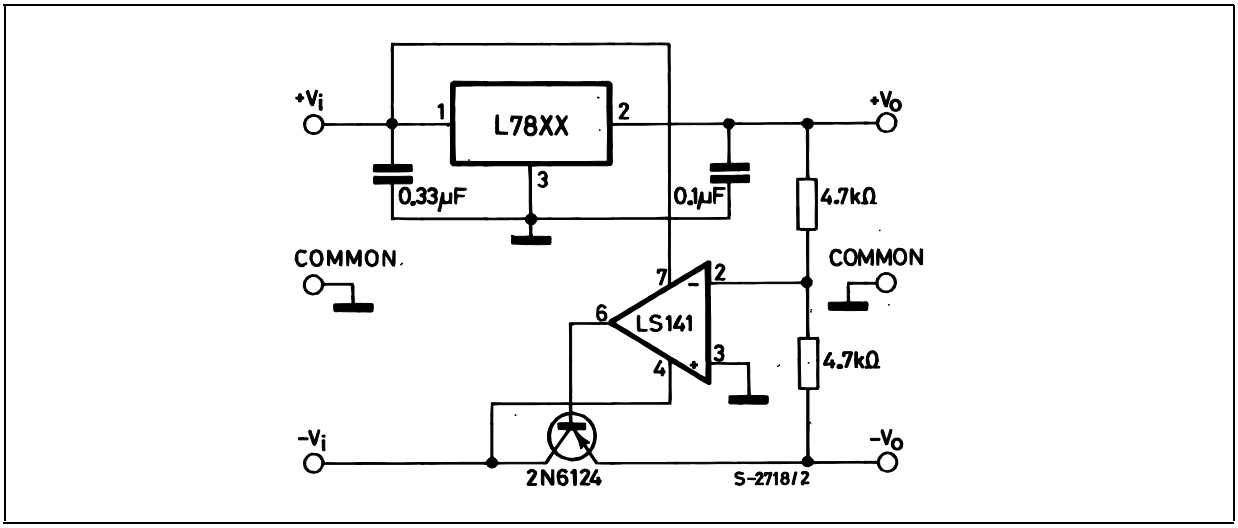
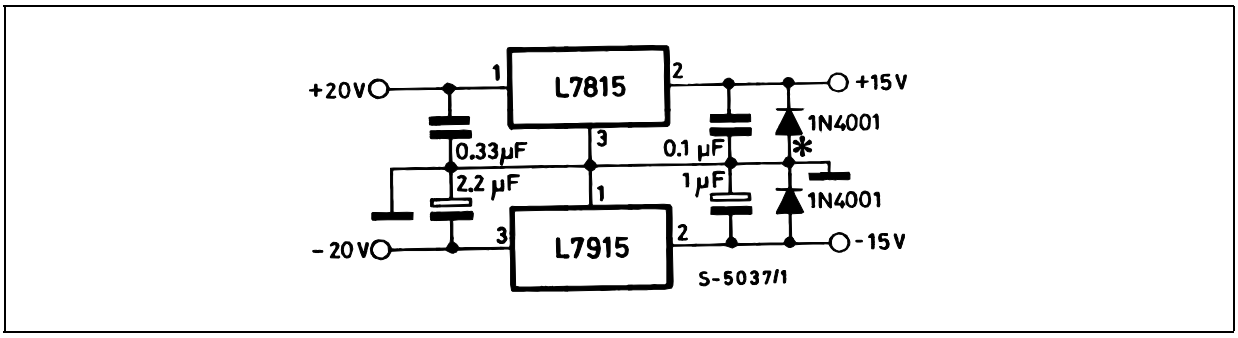



**Figure 21 :** Split Power Supply (± 15V - 1 A)




* Against potential latch-up problems.

**Figure 22 :** Negative Output Voltage Circuit

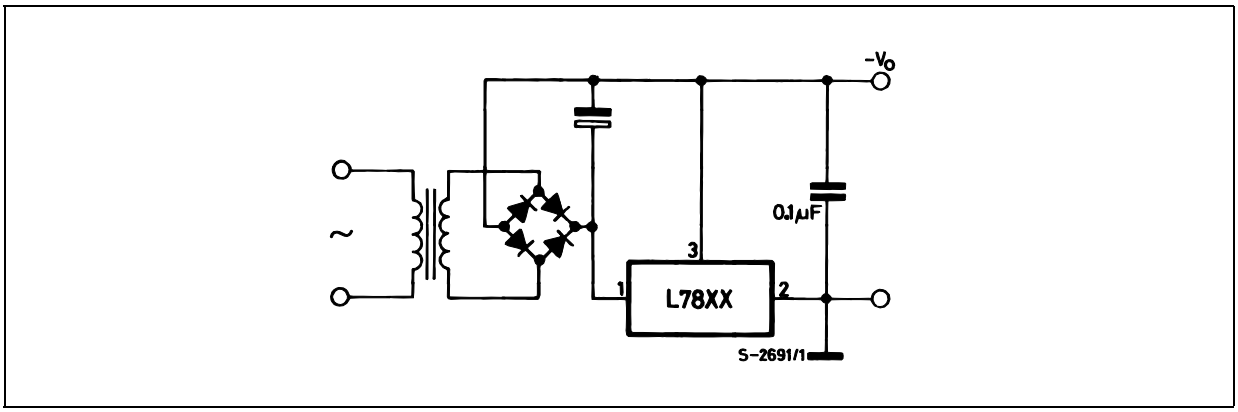


**Figure 23 :** Switching Regulator

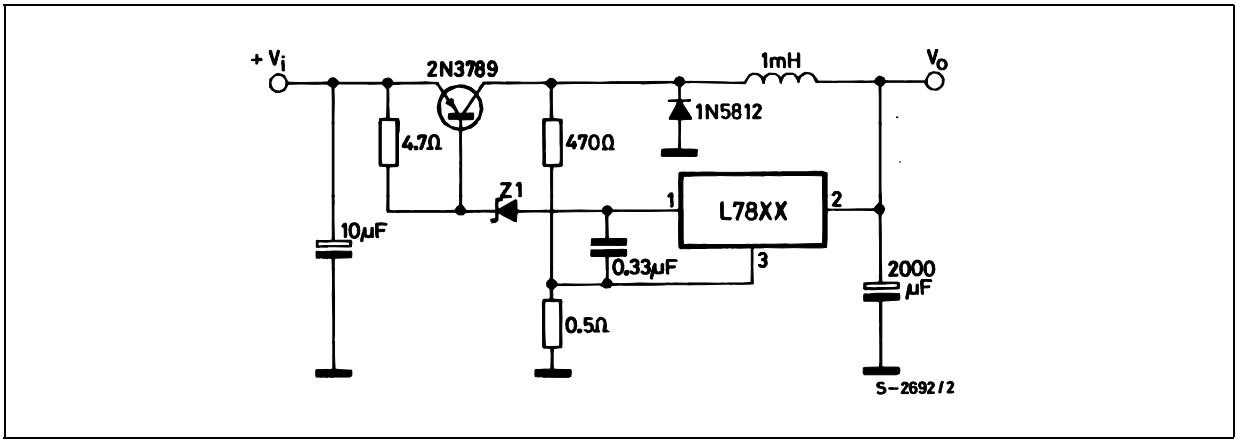



**Figure 24 :** High Input Voltage Circuit

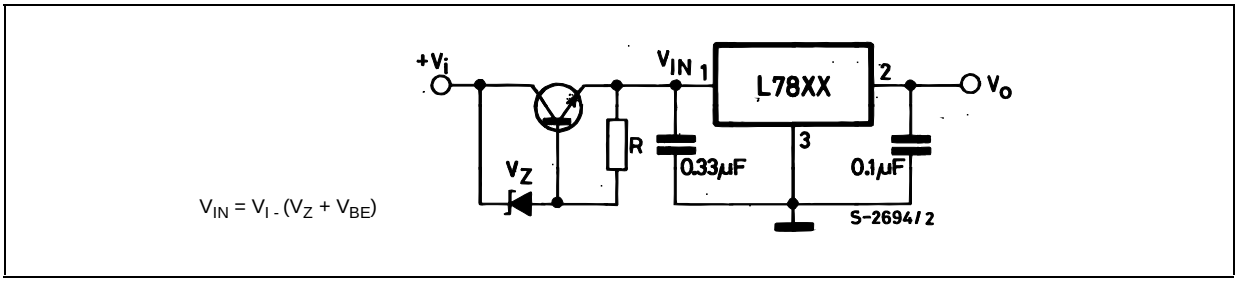



**Figure 25 :** High Input Voltage Circuit

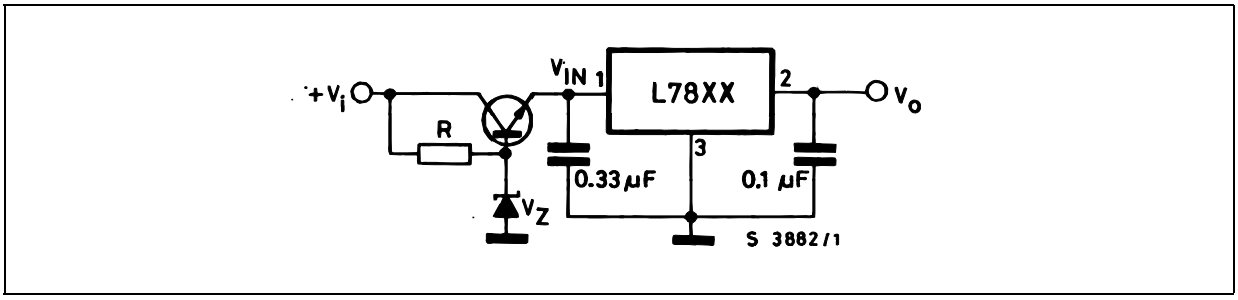



**Figure 26 :** High Output Voltage Regulator

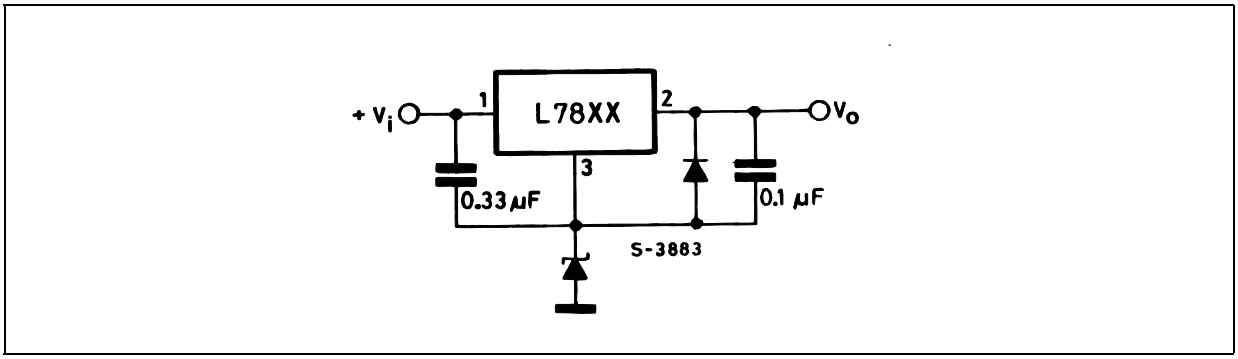
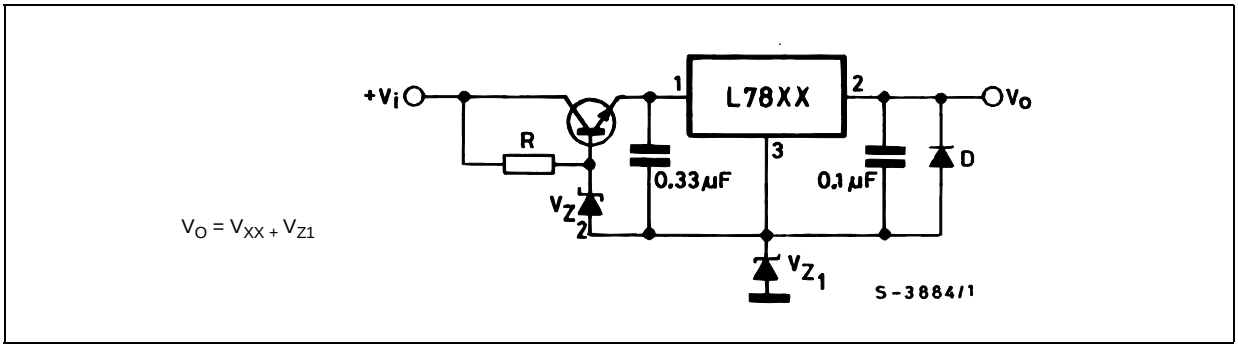
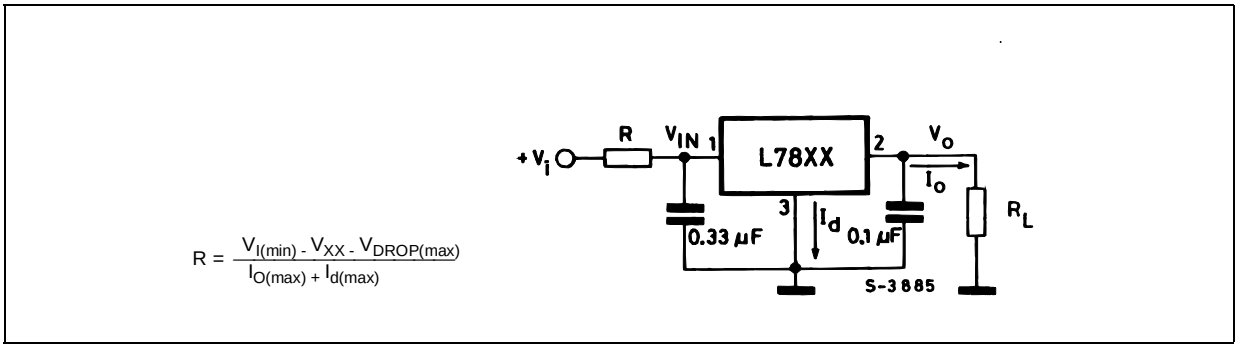


**Figure 27 :** High Input and Output Voltage




$V_O = V_{XX} + V_{Z1}$

**Figure 28 :** Reducing Power Dissipation with Dropping Resistor




$$R = \frac{V_{I(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

**Figure 29 :** Remote Shutdown

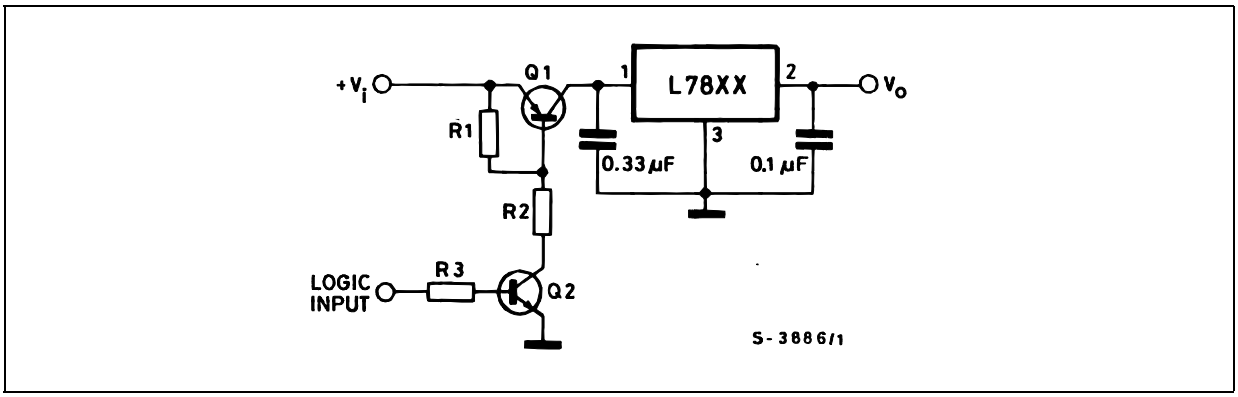
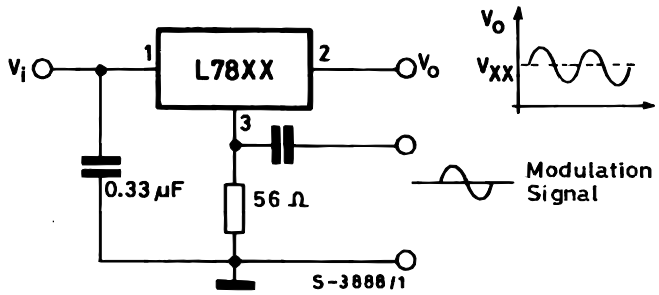
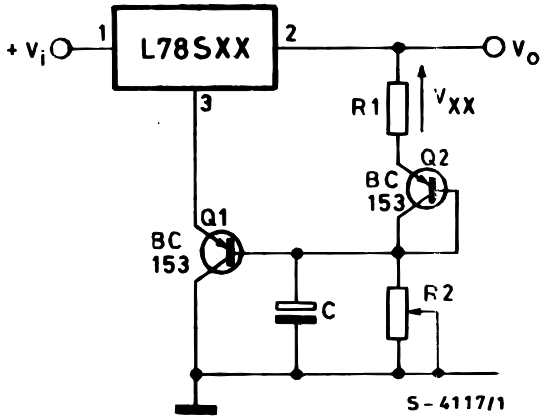


**Figure 30 :** Power AM Modulator (unity voltage gain, $I_O \leq 0.5$)




NOTE: The circuit performs well up to 100 KHz.

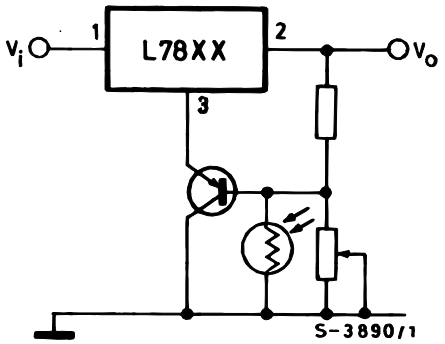
**Figure 31 :** Adjustable Output Voltage with Temperature Compensation



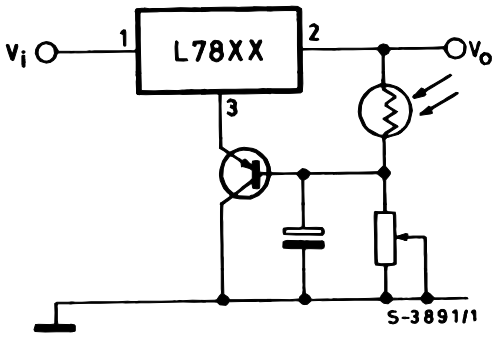

$$V_O = V_{XX}\left(1+\frac{R_2}{R_1}\right) + V_{BE}$$

NOTE: $Q_2$ is connected as a diode in order to compensate the variation of the $Q_1$ $V_{BE}$ with the temperature. C allows a slow rise time of the $V_O$.

**Figure 32 :** Light Controllers ($V_{Omin} = V_{XX} + V_{BE}$)

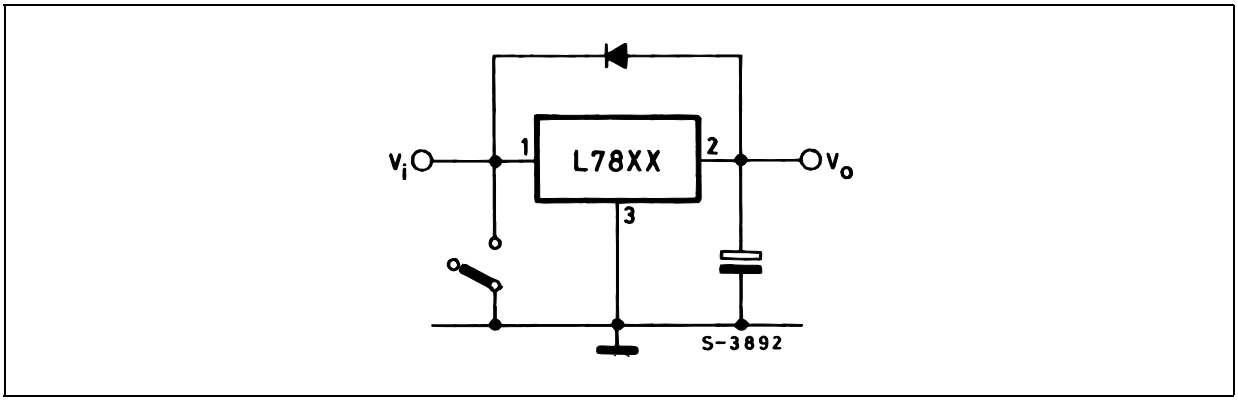



$V_O$ falls when the light goes up




$V_O$ rises when the light goes up

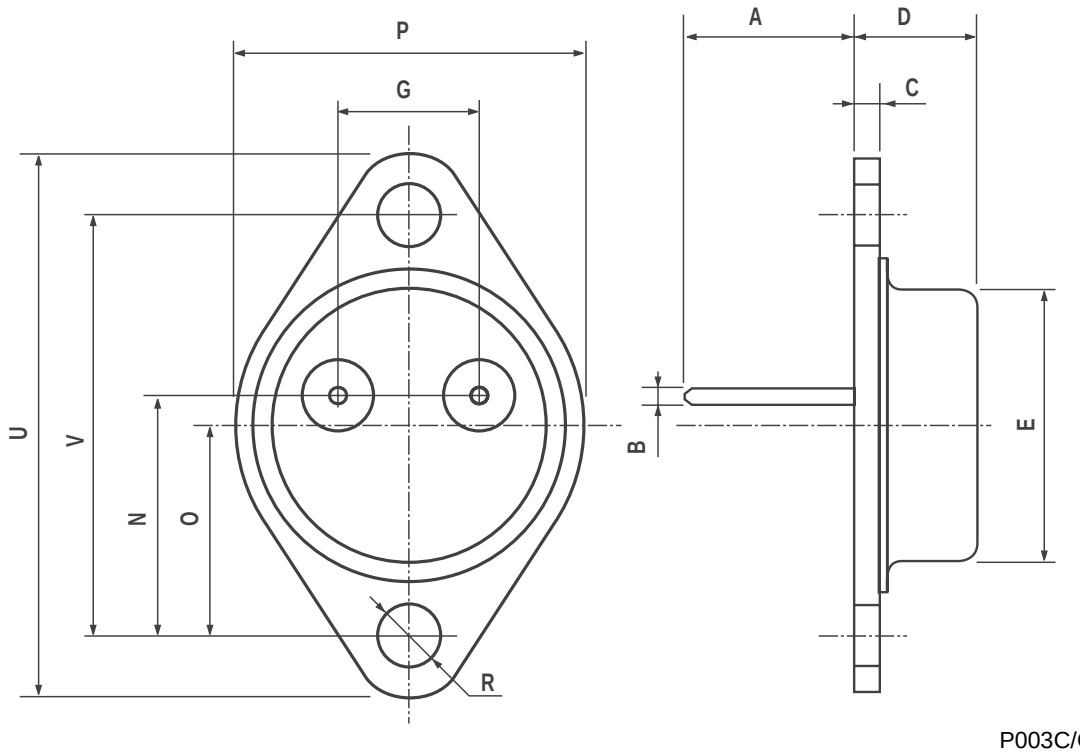
**Figure 33 :** Protection against Input Short-Circuit with High Capacitance Loads




Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 33) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

## TO-3 MECHANICAL DATA

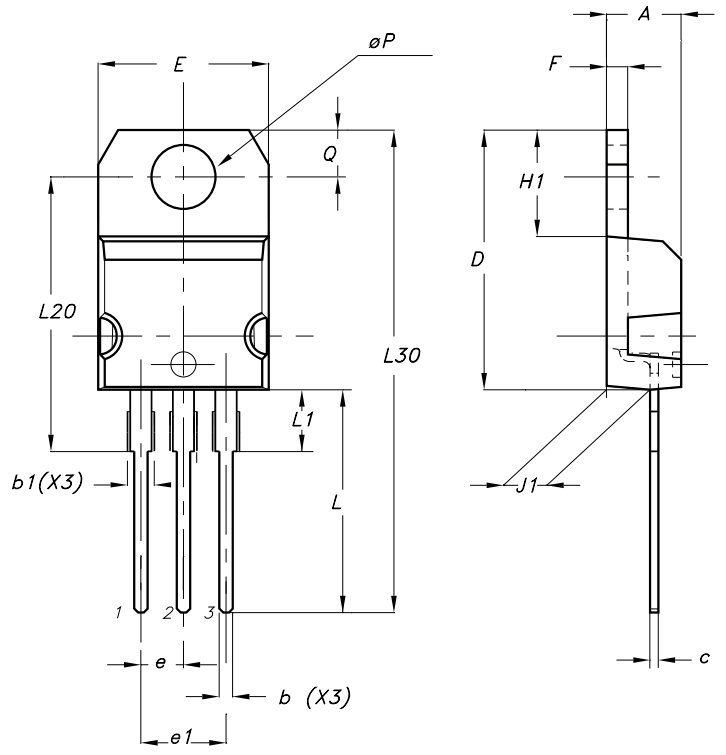
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | 11.85 | | | 0.466 | |
| B | 0.96 | 1.05 | 1.10 | 0.037 | 0.041 | 0.043 |
| C | | | 1.70 | | | 0.066 |
| D | | | 8.7 | | | 0.342 |
| E | | | 20.0 | | | 0.787 |
| G | | 10.9 | | | 0.429 | |
| N | | 16.9 | | | 0.665 | |
| P | | | 26.2 | | | 1.031 |
| R | 3.88 | | 4.09 | 0.152 | | 0.161 |
| U | | | 39.5 | | | 1.555 |
| V | | 30.10 | | | 1.185 | |




P003C/C

## TO-220 (A TYPE) MECHANICAL DATA

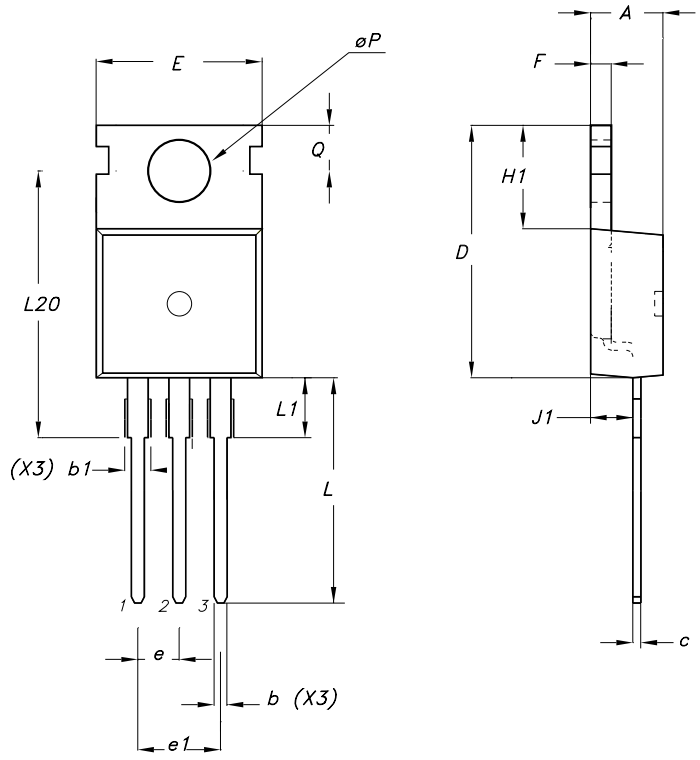
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.15 | | 1.70 | 0.045 | | 0.067 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.600 | | 0.620 |
| E | 10.0 | | 10.40 | 0.393 | | 0.409 |
| e | 2.4 | | 2.7 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.203 |
| F | 1.23 | | 1.32 | 0.048 | | 0.051 |
| H1 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L1 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.4 | | | 0.645 | |
| L30 | | 28.9 | | | 1.138 | |
| ϕP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |




0015988/M

## TO-220 (C TYPE) MECHANICAL DATA

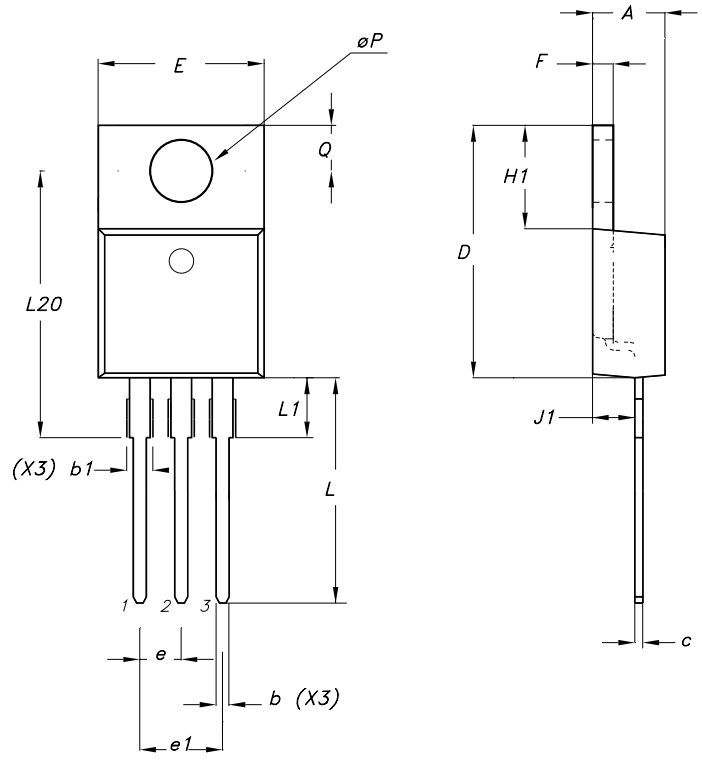
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.30 | | 4.70 | 0.169 | | 0.185 |
| b | 0.70 | | 0.90 | 0.028 | | 0.035 |
| b1 | 1.42 | | 1.62 | 0.056 | | 0.064 |
| c | 0.45 | | 0.60 | 0.018 | | 0.024 |
| D | | 15.70 | | | 0.618 | |
| E | 9.80 | | 10.20 | 0.386 | | 0.402 |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| F | 1.25 | | 1.39 | 0.049 | | 0.055 |
| H1 | | 6.5 | | | 0.256 | |
| J1 | 2.20 | | 2.60 | 0.087 | | 0.202 |
| L | 12.88 | | 13.28 | 0.507 | | 0.523 |
| L1 | | 3 | | | 0.118 | |
| L20 | 15.70 | | 16.1 | 0.618 | | 0.634 |
| L30 | | 28.9 | | | 1.138 | |
| ϕP | 3.50 | | 3.70 | 0.138 | | 0.146 |
| Q | 2.70 | | 2.90 | 0.106 | | 0.114 |




0015988/M

## TO-220 (E TYPE) MECHANICAL DATA

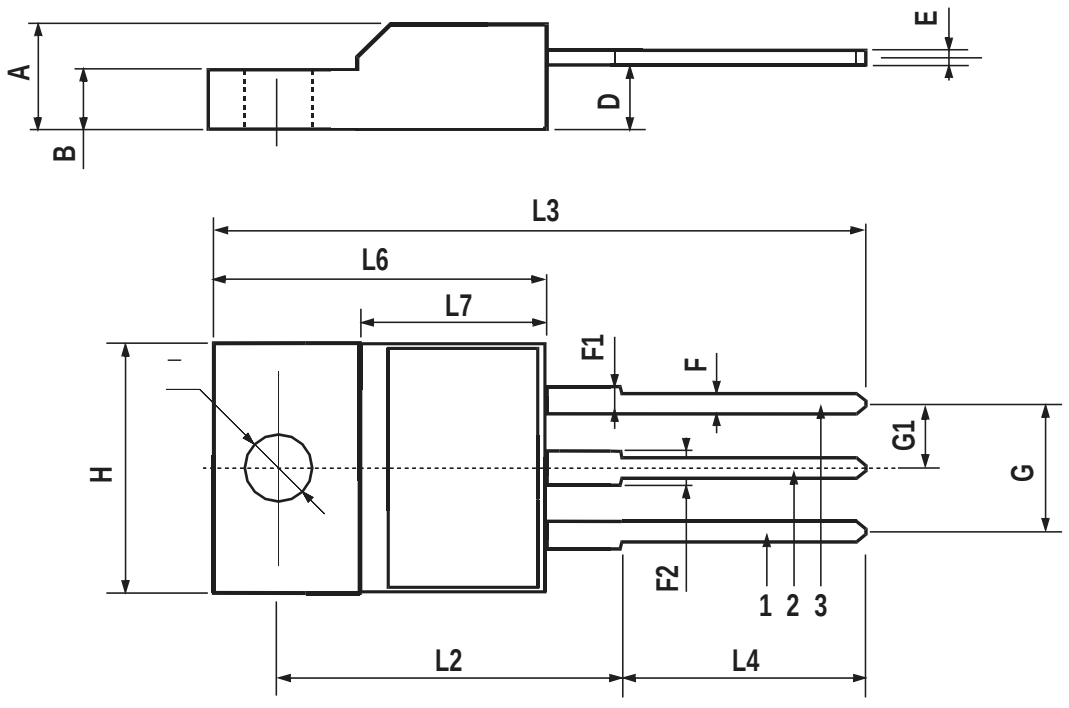
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.47 | | 4.67 | 0.176 | | 0.184 |
| b | 0.70 | | 0.91 | 0.028 | | 0.036 |
| b1 | 1.17 | | 1.37 | 0.046 | | 0.054 |
| c | 0.31 | | 0.53 | 0.012 | | 0.021 |
| D | 14.60 | | 15.70 | 0.575 | | 0.618 |
| E | 9.96 | | 10.36 | 0.392 | | 0.408 |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| F | 1.17 | | 1.37 | 0.046 | | 0.054 |
| H1 | 6.1 | | 6.8 | 0.240 | | 0.268 |
| J1 | 2.52 | | 2.82 | 0.099 | | 0.111 |
| L | 12.70 | | 13.80 | 0.500 | | 0.543 |
| L1 | 3.20 | | 3.96 | 0.126 | | 0.156 |
| L20 | 15.21 | | 16.77 | 0.599 | | 0.660 |
| ϕP | 3.73 | | 3.94 | 0.147 | | 0.155 |
| Q | 2.59 | | 2.89 | 0.102 | | 0.114 |




7655923/A

## TO-220FP MECHANICAL DATA

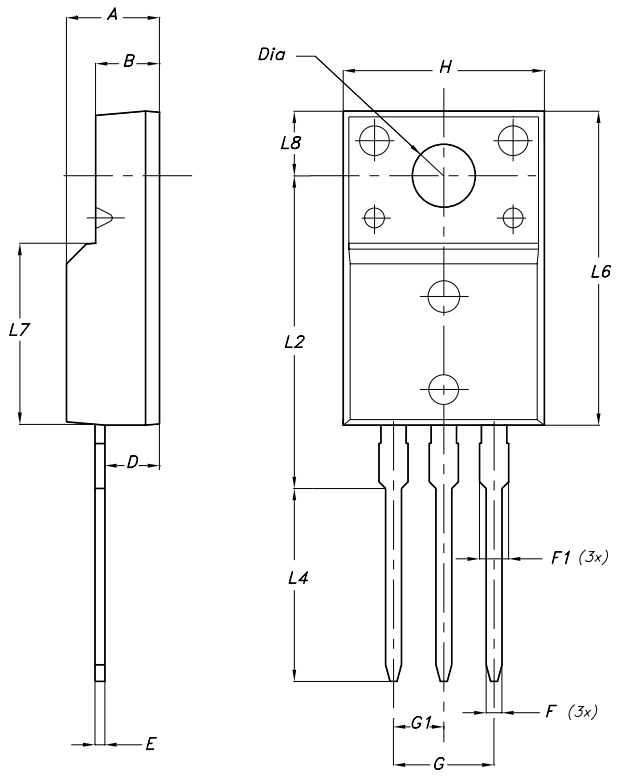
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| B | 2.5 | | 2.7 | 0.098 | | 0.106 |
| D | 2.5 | | 2.75 | 0.098 | | 0.108 |
| E | 0.45 | | 0.70 | 0.017 | | 0.027 |
| F | 0.75 | | 1 | 0.030 | | 0.039 |
| F1 | 1.15 | | 1.50 | 0.045 | | 0.059 |
| F2 | 1.15 | | 1.50 | 0.045 | | 0.059 |
| G | 4.95 | | 5.2 | 0.194 | | 0.204 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16 | | | 0.630 | |
| L3 | 28.6 | | 30.6 | 1.126 | | 1.204 |
| L4 | 9.8 | | 10.6 | 0.385 | | 0.417 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| DIA. | 3 | | 3.2 | 0.118 | | 0.126 |




7012510/G

## TO-220FM MECHANICAL DATA

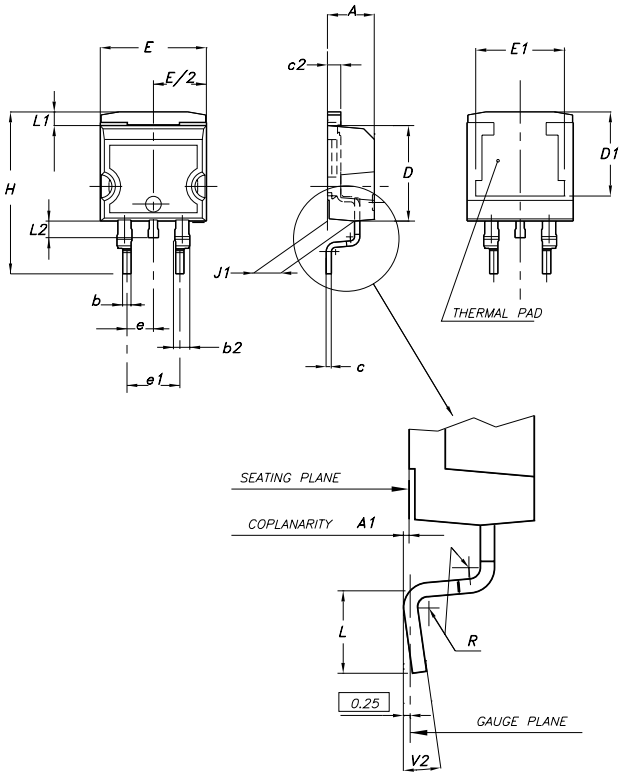
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.50 | | 4.90 | 0.177 | | 0.193 |
| B | 3.04 | | 3.44 | 0.120 | | 0.135 |
| D | 2.56 | | 2.96 | 0.101 | | 0.117 |
| E | 0.45 | 0.50 | 0.60 | 0.018 | 0.020 | 0.024 |
| F | 0.70 | | 0.90 | 0.028 | | 0.035 |
| F1 | | | 1.47 | | | 0.058 |
| G | | 5.08 | | | 0.200 | |
| G1 | 2.34 | 2.54 | 2.74 | 0.092 | 0.100 | 0.108 |
| H | 9.96 | | 10.36 | 0.392 | | 0.408 |
| L2 | | 15.8 | | | 0.622 | |
| L4 | 9.45 | | 10.05 | 0.372 | | 0.396 |
| L6 | 15.67 | | 16.07 | 0.617 | | 0.633 |
| L7 | 8.99 | | 9.39 | 0.354 | | 0.370 |
| L8 | | 3.30 | | | 0.130 | |
| DIA. | 3.08 | | 3.28 | 0.121 | | 0.129 |




7012510C/G

## $D^2PAK$ (A TYPE) MECHANICAL DATA

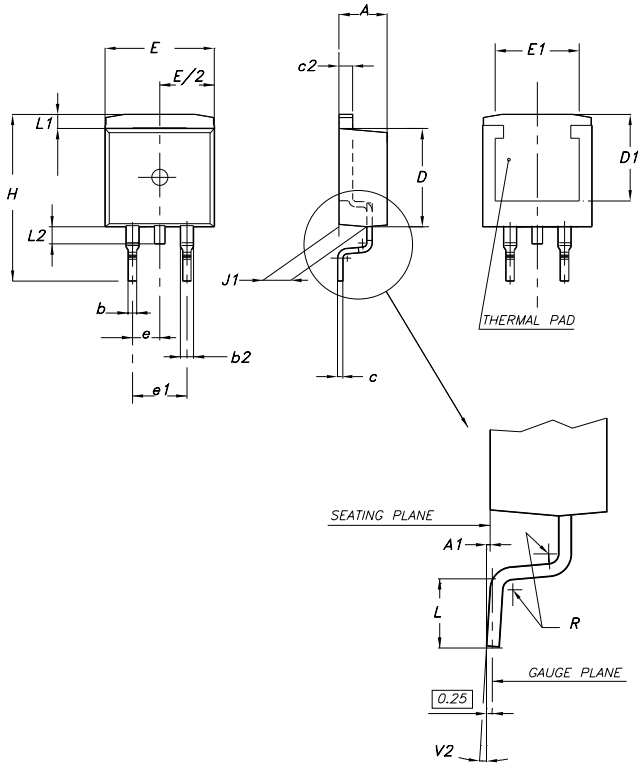
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| b | 0.7 | | 0.93 | 0.027 | | 0.036 |
| b2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| c | 0.45 | | 0.6 | 0.017 | | 0.023 |
| c2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | 8 | | | 0.315 | | |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| E1 | 8.5 | | | 0.335 | | |
| e | | 2.54 | | | 0.100 | |
| e1 | 4.88 | | 5.28 | 0.192 | | 0.208 |
| H | 15 | | 15.85 | 0.590 | | 0.624 |
| J1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| L | 2.29 | | 2.79 | 0.090 | | 0.110 |
| L1 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L2 | 1.3 | | 1.75 | 0.051 | | 0.069 |
| R | | 0.4 | | | 0.016 | |
| V2 | 0° | | 8° | 0° | | 8° |




0079457/J

# $D^2PAK$ (C TYPE) MECHANICAL DATA

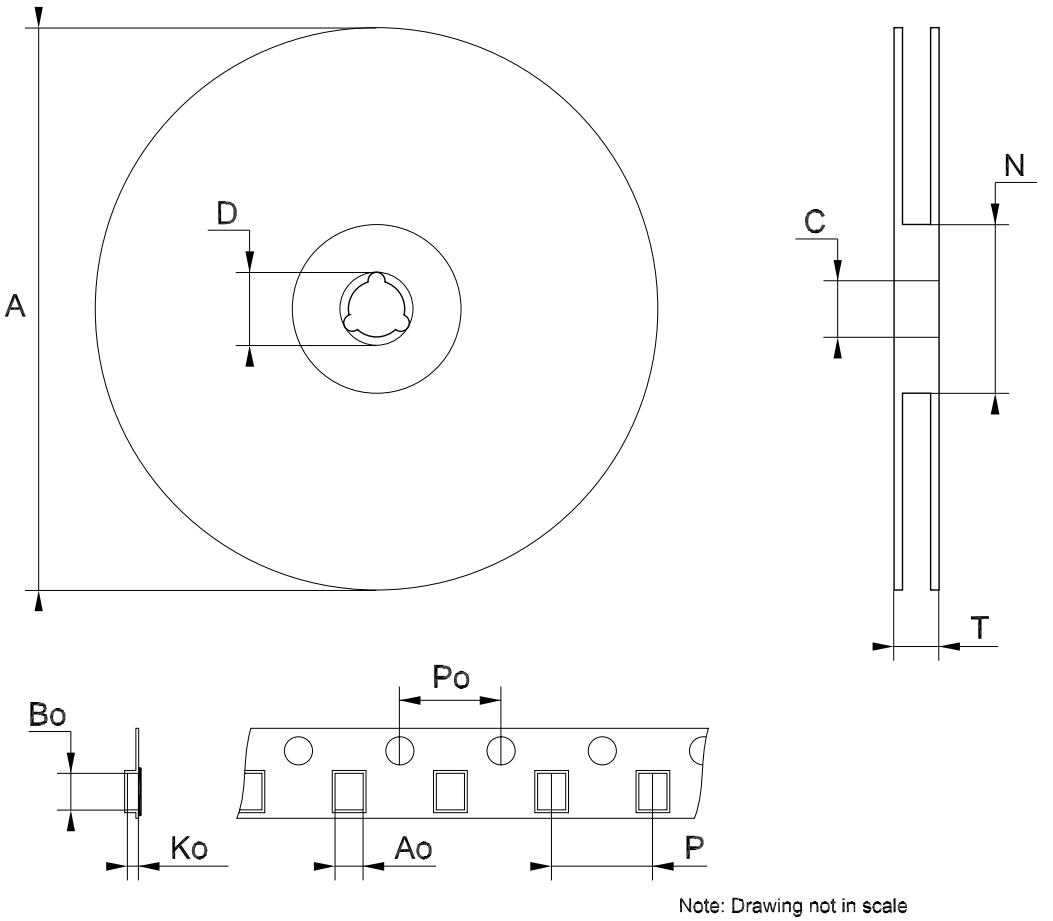
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.3 | | 4.7 | 0.169 | | 0.185 |
| A1 | 0 | | 0.20 | 0.000 | | 0.008 |
| b | 0.70 | | 0.90 | 0.028 | | 0.035 |
| b2 | 1.17 | | 1.37 | 0.046 | | 0.054 |
| c | 0.45 | 0.50 | 0.6 | 0.018 | 0.020 | 0.024 |
| c2 | 1.25 | 1.30 | 1.40 | 0.049 | 0.051 | 0.055 |
| D | 9.0 | 9.2 | 9.4 | 0.354 | 0.362 | 0.370 |
| D1 | 7.5 | | | 0.295 | | |
| E | 9.8 | | 10.2 | 0.386 | | 0.402 |
| E1 | 7.5 | | | 0.295 | | |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| H | 15 | 15.30 | 15.60 | 0.591 | 0.602 | 0.614 |
| J1 | 2.20 | | 2.60 | 0.087 | | 0.102 |
| L | 1.79 | | 2.79 | 0.070 | | 0.110 |
| L1 | 1.0 | | 1.4 | 0.039 | | 0.055 |
| L2 | 1.2 | | 1.6 | 0.047 | | 0.063 |
| R | | 0.3 | | | 0.012 | |
| V2 | 0° | | 3° | 0° | | 3° |




0079457/J

## Tape & Reel $D^2PAK$-$P^2PAK$-$D^2PAK/A$-$P^2PAK/A$ MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 180 | | | 7.086 |
| C | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 14.4 | | | 0.567 |
| Ao | 10.50 | 10.6 | 10.70 | 0.413 | 0.417 | 0.421 |
| Bo | 15.70 | 15.80 | 15.90 | 0.618 | 0.622 | 0.626 |
| Ko | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| Po | 3.9 | 4.0 | 4.1 | 0.153 | 0.157 | 0.161 |
| P | 11.9 | 12.0 | 12.1 | 0.468 | 0.472 | 0.476 |




Note: Drawing not in scale