

LAMPIRAN

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SEMICONDUCTOR®

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MC78XX/LM78XX/MC78XXA

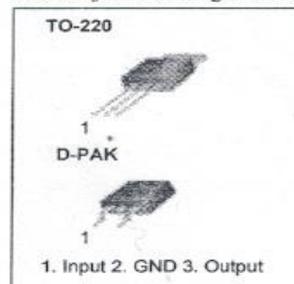
3-Terminal 1A Positive Voltage Regulator

Features

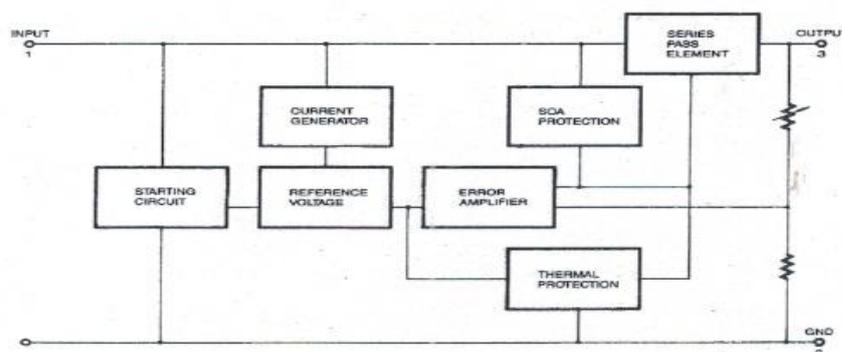
- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

The MC78XX/LM78XX/MC78XXA series of three terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating 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 voltages and currents.



Internal Block Diagram



Rev. 1.0.1

MC78XX/LM78XX/MC78XXA

Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|--|-----------------|------------|---------------|
| Input Voltage (for $V_O = 5V$ to $18V$) (for $V_O = 24V$) | V_I | 35 | V |
| | V_{I1} | 40 | V |
| Thermal Resistance Junction-Cases (TO-220) | $R_{\theta JC}$ | 5 | $^{\circ}C/W$ |
| Thermal Resistance Junction-Air (TO-220) | $R_{\theta JA}$ | 65 | $^{\circ}C/W$ |
| Operating Temperature Range | T_{OPR} | 0 ~ +125 | $^{\circ}C$ |
| Storage Temperature Range | T_{STG} | -65 ~ +150 | $^{\circ}C$ |

Electrical Characteristics (MC7805/LM7805)(Refer to test circuit, $0^{\circ}C < T_J < 125^{\circ}C$, $I_O = 500mA$, $V_I = 10V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

| Parameter | Symbol | Conditions | MC7805/LM7805 | | | Unit | |
|--------------------------|-------------------------|--|--------------------------|------|------|-----------------|----|
| | | | Min. | Typ. | Max. | | |
| Output Voltage | V_O | $T_J = +25^{\circ}C$ | 4.8 | 5.0 | 5.2 | V | |
| | | $5.0mA \leq I_O \leq 1.0A$, $P_O \leq 15W$ $V_I = 7V$ to $20V$ | 4.75 | 5.0 | 5.25 | | |
| Line Regulation (Note1) | Regline | $T_J = +25^{\circ}C$ | $V_O = 7V$ to $25V$ | - | 4.0 | 100 | mV |
| | | | $V_I = 8V$ to $12V$ | - | 1.6 | 50 | |
| Load Regulation (Note1) | Regload | $T_J = +25^{\circ}C$ | $I_O = 5.0mA$ to $1.5A$ | - | 9 | 100 | mV |
| | | | $I_O = 250mA$ to $750mA$ | - | 4 | 50 | |
| Quiescent Current | I_Q | $T_J = +25^{\circ}C$ | - | 5.0 | 8.0 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to $1.0A$ | - | 0.03 | 0.5 | mA | |
| | | $V_I = 7V$ to $25V$ | - | 0.3 | 1.3 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.8 | - | mV/ $^{\circ}C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to $100KHz$, $T_A = +25^{\circ}C$ | - | 42 | - | $\mu V/V_O$ | |
| Ripple Rejection | RR | $f = 120Hz$ $V_O = 8V$ to $18V$ | 62 | 73 | - | dB | |
| Dropout Voltage | V_{Drop} | $I_O = 1A$, $T_J = +25^{\circ}C$ | - | 2 | - | V | |
| Output Resistance | r_O | $f = 1KHz$ | - | 15 | - | m Ω | |
| Short Circuit Current | I_{SC} | $V_I = 35V$, $T_A = +25^{\circ}C$ | - | 230 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^{\circ}C$ | - | 2.2 | - | A | |

Note:

1. 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 is used.

MC78XX/LM78XX/MC78XXA

Typical Performance Characteristics

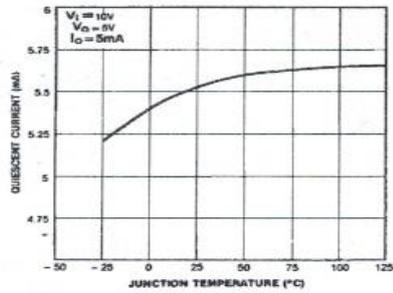


Figure 1. Quiescent Current

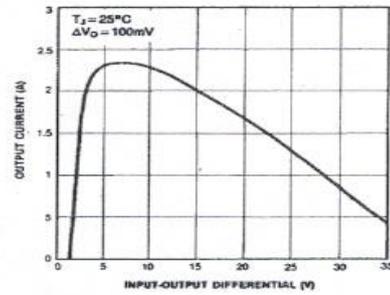


Figure 2. Peak Output Current

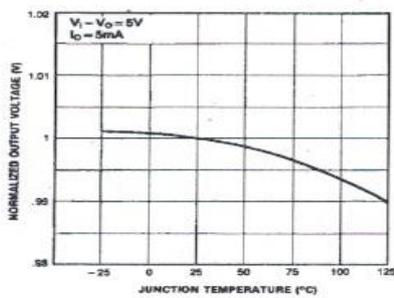


Figure 3. Output Voltage

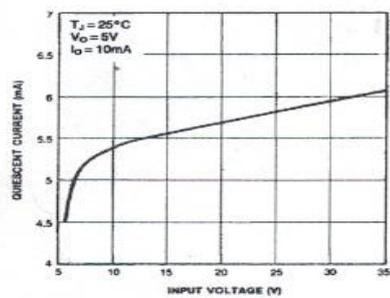


Figure 4. Quiescent Current



ON Semiconductor®

TIP41A / TIP41B / TIP41C

NPN Epitaxial Silicon Transistor

Features

- Medium Power Linear Switching Applications
- Complement to TIP42 Series



TO-220
1.Base 2.Collector 3.Emmitter

Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|--------------------------|----------------|
| TIP41A | TIP41A | TO-220 3L (Single Gauge) | Bulk |
| TIP41B | TIP41B | TO-220 3L (Single Gauge) | Bulk |
| TIP41C | TIP41C | TO-220 3L (Single Gauge) | Bulk |
| TIP41CTU | TIP41C | TO-220 3L (Single Gauge) | Rail |

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|-----------|---------------------------|------------|------------------|
| V_{CBO} | Collector-Base Voltage | TIP41A | 60 |
| | | TIP41B | 80 |
| | | TIP41C | 100 |
| V_{CEO} | Collector-Emitter Voltage | TIP41A | 60 |
| | | TIP41B | 80 |
| | | TIP41C | 100 |
| V_{EBO} | Emitter-Base Voltage | 5 | V |
| I_C | Collector Current (DC) | 6 | A |
| I_{CP} | Collector Current (Pulse) | 10 | A |
| I_B | Base Current | 2 | A |
| T_J | Junction Temperature | 150 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | -65 to 150 | $^\circ\text{C}$ |

Thermal CharacteristicsValues are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|--------|--|-------|------|
| P_C | Collector Dissipation ($T_C = 25^\circ\text{C}$) | 65 | W |
| | Collector Dissipation ($T_A = 25^\circ\text{C}$) | 2 | |

Electrical CharacteristicsValues are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Max. | Unit |
|----------------|---|-----------------|---|------|---------------|
| $V_{CEO(sus)}$ | Collector-Emitter Sustaining Voltage ⁽¹⁾ | TIP41A | $I_C = 30\text{ mA}, I_B = 0$ | 60 | V |
| | | TIP41B | | 80 | |
| | | TIP41C | | 100 | |
| I_{CEO} | Collector Cut-Off Current | TIP41A | $V_{CE} = 30\text{ V}, I_B = 0$ | 0.7 | mA |
| | | TIP41B / TIP41C | $V_{CE} = 60\text{ V}, I_B = 0$ | 0.7 | |
| I_{CES} | Collector Cut-Off Current | TIP41A | $V_{CE} = 60\text{ V}, V_{EB} = 0$ | 400 | μA |
| | | TIP41B | $V_{CE} = 80\text{ V}, V_{EB} = 0$ | 400 | |
| | | TIP41C | $V_{CE} = 100\text{ V}, V_{EB} = 0$ | 400 | |
| I_{EBO} | Emitter Cut-Off Current | | $V_{EB} = 5\text{ V}, I_C = 0$ | 1 | mA |
| h_{FE} | DC Current Gain ⁽¹⁾ | | $V_{CE} = 4\text{ V}, I_C = 0.3\text{ A}$ | 30 | |
| | | | $V_{CE} = 4\text{ V}, I_C = 3\text{ A}$ | 15 | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage ⁽¹⁾ | | $I_C = 6\text{ A}, I_B = 600\text{ mA}$ | 1.5 | V |
| $V_{BE(on)}$ | Base-Emitter On Voltage ⁽¹⁾ | | $V_{CE} = 4\text{ V}, I_C = 6\text{ A}$ | 2.0 | V |
| f_T | Current Gain Bandwidth Product | | $V_{CE} = 10\text{ V}, I_C = 500\text{ mA}, f = 1\text{ MHz}$ | 3.0 | MHz |

Note:1. Pulse test: $p_w \leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

Typical Performance Characteristics

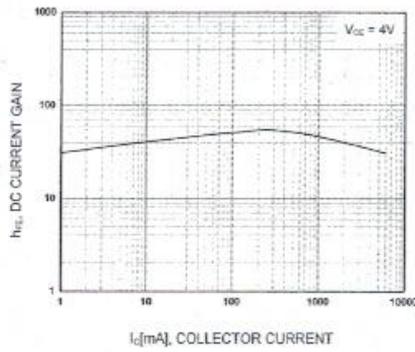


Figure 1. DC Current Gain

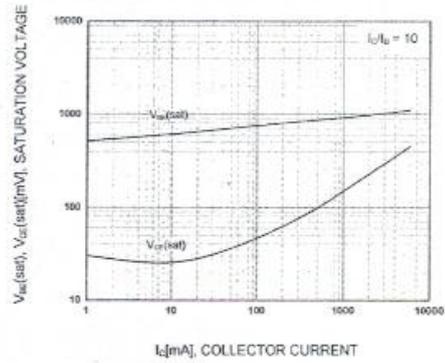


Figure 2. Base-Emitter Saturation Voltage and Collector-Emitter Saturation Voltage

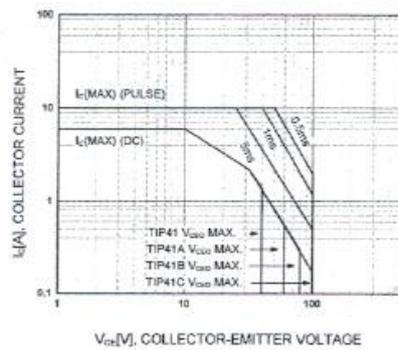


Figure 3. Safe Operating Area

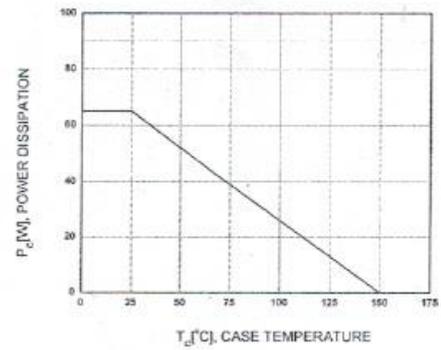


Figure 4. Power Derating

Physical Dimensions

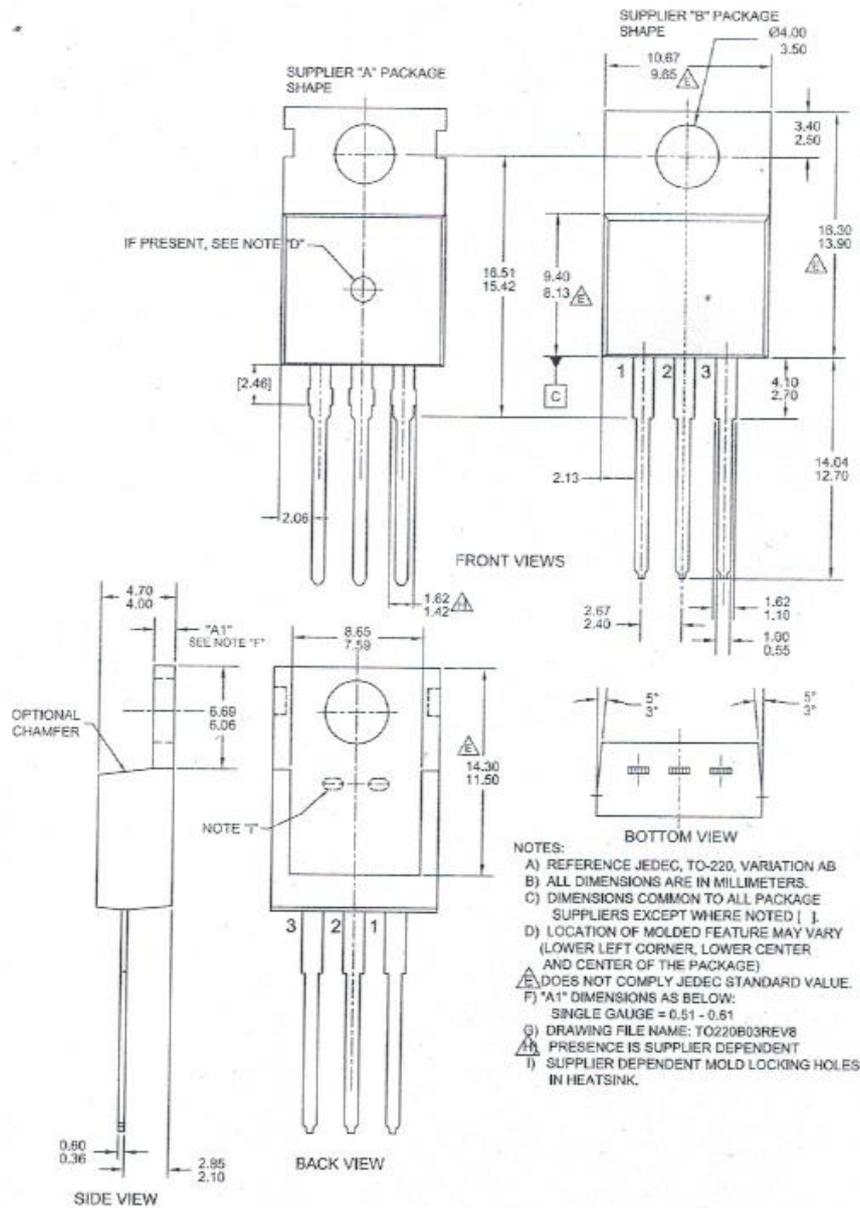


Figure 5. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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