

KA317 / LM317

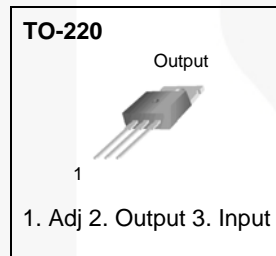
3-Terminal Positive Adjustable Regulator

Features

- Output-Current In Excess of 1.5 A
- Output-Adjustable Between 1.2 V and 37 V
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output-Transistor Safe Operating Area Compensation
- TO-220 Package

Description

This monolithic integrated circuit is an adjustable 3-terminal positive-voltage regulator designed to supply more than 1.5 A of load current with an output voltage adjustable over a 1.2 V to 37 V range. It employs internal current limiting, thermal shutdown, and safe area compensation.



Ordering Information

Product Number	Package	Packing Method	Operating Temperature
LM317T	TO-220 (Single Gauge)	Rail	0°C to +125°C
KA317TU	TO-220 (Dual Gauge)	Rail	0°C to +125°C

Block Diagram

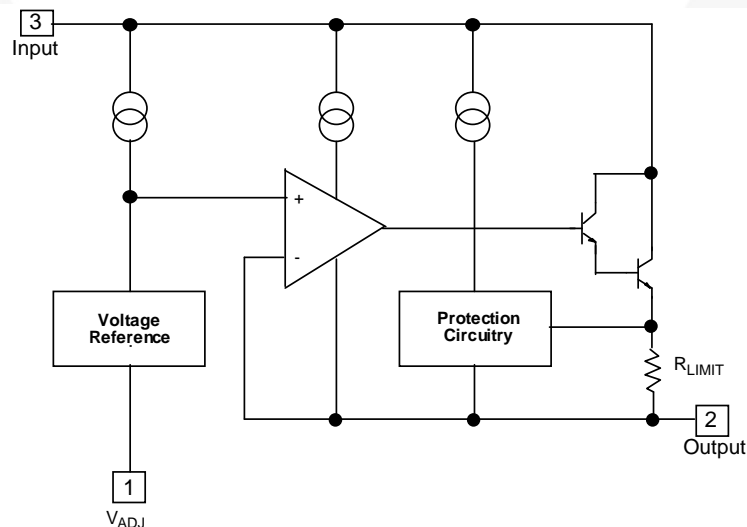


Figure 1. Block Diagram

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 $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Value	Unit
$V_I - V_O$	Input-Output Voltage Differential	40	V
T_{LEAD}	Lead Temperature	230	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	0 to +125	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-65 to +125	$^\circ\text{C}$
$\Delta V_O/\Delta T$	Temperature Coefficient of Output Voltage	± 0.02	$\%/^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
P_D	Power Dissipation	Internally Limited	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	80	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5	$^\circ\text{C}/\text{W}$

Electrical Characteristics

$V_I - V_O = 5\text{ V}$, $I_O = 0.5\text{ A}$, $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$, $I_{\text{MAX}} = 1.5\text{ A}$, $P_{\text{DMAX}} = 20\text{ W}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{LINE}	Line Regulation ⁽¹⁾	$T_A = +25^\circ\text{C}$, $3\text{ V} \leq V_I - V_O \leq 40\text{ V}$		0.01	0.04	%/V
		$3\text{ V} \leq V_I - V_O \leq 40\text{ V}$		0.02	0.07	%/V
R_{LOAD}	Load Regulation ⁽¹⁾	$T_A = +25^\circ\text{C}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$	$V_O < 5\text{ V}$	18	25	mV
			$V_O \geq 5\text{ V}$	0.4	0.5	%/V _O
		$10\text{ mA} \leq I_O \leq I_{\text{MAX}}$	$V_O < 5\text{ V}$	40	70	mV
			$V_O \geq 5\text{ V}$	0.8	1.5	%/V _O
I_{ADJ}	Adjustable Pin Current		46	100	μA	
ΔI_{ADJ}	Adjustable Pin Current Change	$3\text{ V} \leq V_I - V_O \leq 40\text{ V}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$, $P_D \leq P_{\text{MAX}}$		2.0	5.0	μA
V_{REF}	Reference Voltage	$3\text{ V} \leq V_{\text{IN}} - V_O \leq 40\text{ V}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$, $P_D \leq P_{\text{MAX}}$	1.20	1.25	1.30	V
ST_T	Temperature Stability			0.7		%/V _O
$I_{\text{L(MIN)}}$	Minimum Load Current to Maintain Regulation	$V_I - V_O = 40\text{ V}$		3.5	12.0	mA
$I_{\text{O(MAX)}}$	Maximum Output Current	$T_A = 25^\circ\text{C}$	$V_I - V_O \leq 15\text{ V}$, $P_D \leq P_{\text{MAX}}$	1.5	2.2	A
			$V_I - V_O \leq 40\text{ V}$, $P_D \leq P_{\text{MAX}}$		0.3	
e_N	RMS Noise, % of V_{OUT}	$T_A = +25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 10\text{ kHz}$		0.003	0.010	%/V _O
RR	Ripple Rejection	$V_O = 10\text{ V}$, $f = 120\text{ Hz}$ without C_{ADJ}		60		dB
		$C_{\text{ADJ}} = 10\text{ }\mu\text{F}^{(2)}$	66	75		dB
ST	Long-Term Stability, $T_J = T_{\text{HIGH}}$	$T_A = +25^\circ\text{C}$ for End Point Measurements, 1000 HR		0.3	1.0	%

Notes:

- Load and line regulation are specified at constant junction temperature. Change in V_D due to heating effects must be taken into account separately. Pulse testing with low duty is used ($P_{\text{MAX}} = 20\text{ W}$).
- C_{ADJ} , when used, is connected between the adjustment pin and ground.

Typical Performance Characteristics

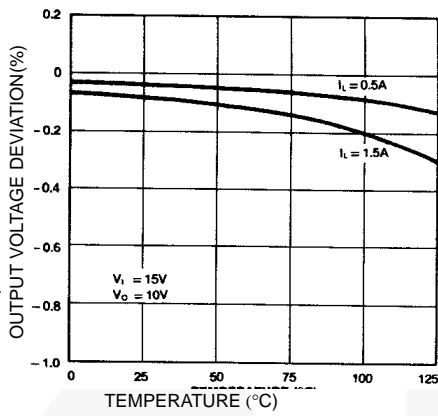


Figure 2. Load Regulation

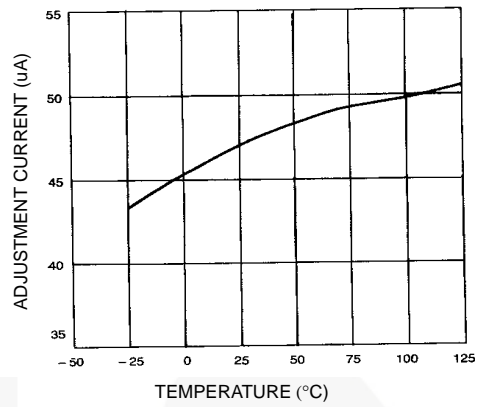


Figure 3. Adjustment Current

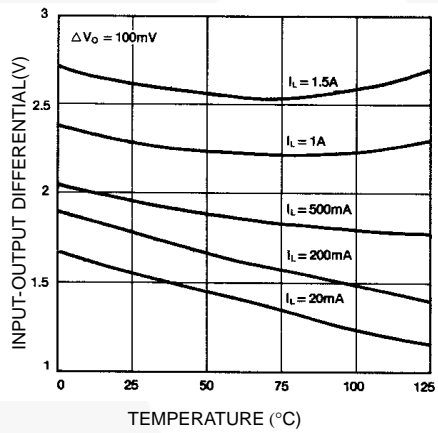


Figure 4. Drop out Voltage

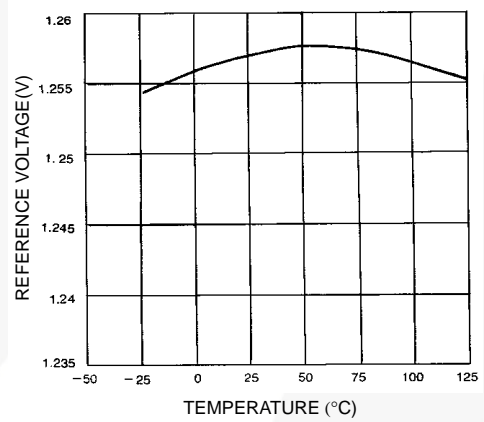


Figure 5. Reference Voltage

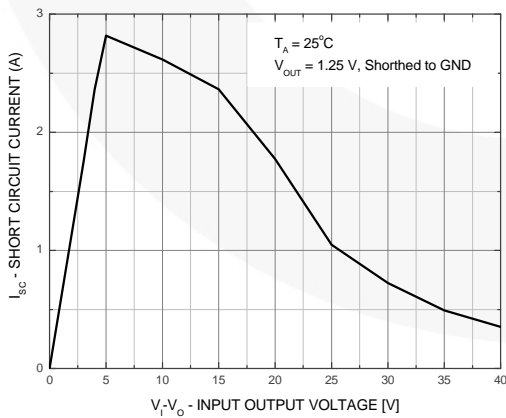
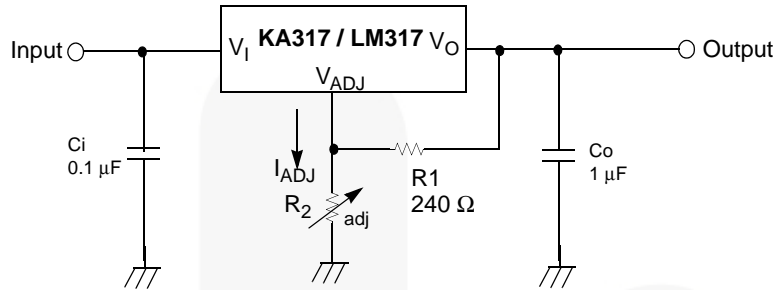


Figure 6. Short Circuit vs. Input-Output Voltage

Typical Application⁽³⁾



$$V_O = 1.25 \text{ V} \left(1 + \frac{R_2}{R_1} \right) + I_{ADJ} R_2$$

Figure 7. Typical Application

Note:

3. C_I is required when the regulator is located an appreciable distance from power supply filter. C_O is not needed for stability; however, it does improve transient response. Since I_{ADJ} is controlled to less than 100 μA , the error associated with this term is negligible in most applications.



Physical Dimensions (continued)

TO-220 [DUAL GAUGE]

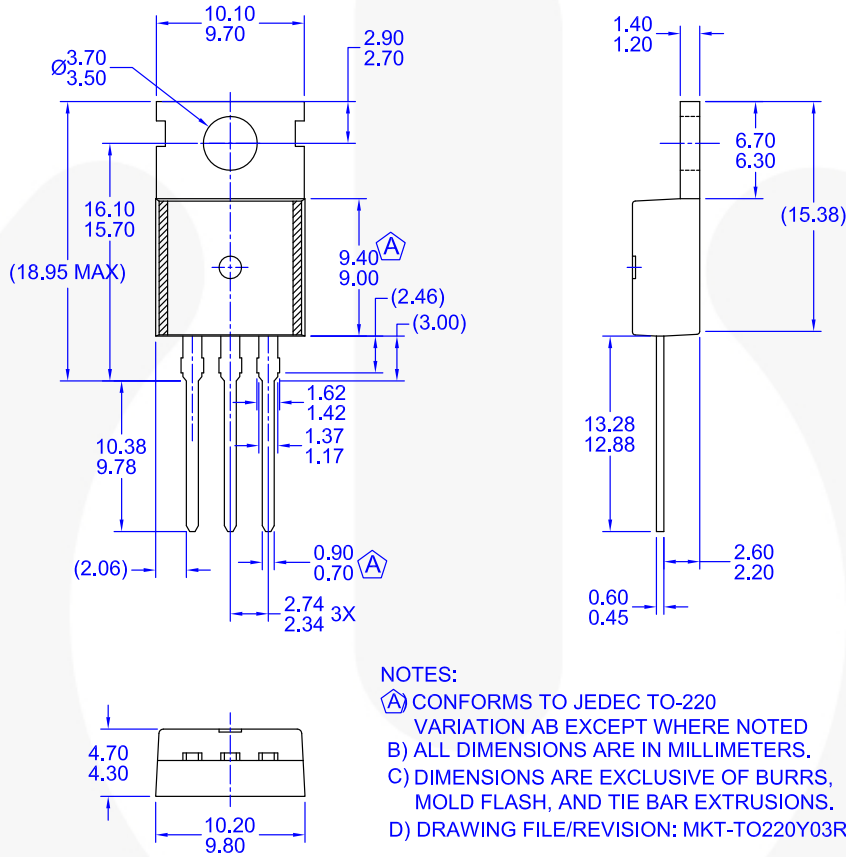


Figure 9. TO220, MOLDED, 3-LEAD, NON-JEDEC, VARIATION AB

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/dwg/TO/TO220Y03.pdf>






For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area:

http://www.fairchildsemi.com/packaging_dwg/PKG-TO220Y03.pdf



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|-----------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 2Cool™ | FPS™ |  | Sync-Lock™ |
| AccuPower™ | F-PFS™ | PowerTrench® |  |
| AX-CAP®* | FRFET® | PowerXS™ | TinyBoost™ |
| BitSiC™ | Global Power Resource SM | Programmable Active Droop™ | TinyBuck™ |
| Build it Now™ | GreenBridge™ | QFET® | TinyCalc™ |
| CorePLUS™ | Green FPS™ | QS™ | TinyLogic® |
| CorePOWER™ | Green FPS™ e-Series™ | Quiet Series™ | TINYOPTO™ |
| CROSSVOLT™ | Gmax™ | RapidConfigure™ | TinyPower™ |
| CTL™ | GTO™ |  | TinyPWM™ |
| Current Transfer Logic™ | IntelliMAX™ | Saving our world, 1mW/W/kW at a time™ | TinyWire™ |
| DEUXPEED® | ISOPLANAR™ | SignalWise™ | TranSiC™ |
| Dual Cool™ | Making Small Speakers Sound Louder and Better™ | SmartMax™ | TriFault Detect™ |
| EcoSPARK® | MegaBuck™ | SMART START™ | TRUECURRENT®* |
| EfficientMax™ | MICROCOUPLER™ | Solutions for Your Success™ | μSerDes™ |
| ESBC™ | MicroFET™ | SPM® |  |
|  | MicroPak™ | STEALTH™ | UHC® |
| Fairchild® | MicroPak2™ | SuperFET® | Ultra FRFET™ |
| Fairchild Semiconductor® | MillerDrive™ | SuperSOT™-3 | UniFET™ |
| FACT Quiet Series™ | MotionMax™ | SuperSOT™-6 | VXC™ |
| FACT® | mWSaver™ | SuperSOT™-8 | VisualMax™ |
| FAST® | OptoHi™ | SupreMOS® | VoltagePlus™ |
| FastvCore™ | OPTOLOGIC® | SyncFET™ | XS™ |
| FETBench™ | OPTOPLANAR® | | |

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.