

LM7847 ~ LM7824

# **1A Standard Positive Voltage Regulator**

#### **General Description**

- The LM78xx series is three terminal standard positive voltage regulator designed for a wide range of applications that required supply current up to 1A.
- 71.

**TO-220** 

- The LM78xx series is available in 10 fixed output voltage:4.7V,5V,6V,7V,8V,9V,10V, 12V,15V,18V and 24V.
- The LM78xx series provides internal current limiting, thermal shutdown protection and Safe-area operation compensation which make them virtually immune from output load, and the output current could up to 1A if adequate heat sinking provide
- The LM78xx is available in TO-220,TO-220F,DPAK (TO-252) ,D2PAK(TO-263)packages.

# TO-220F



**DPAK** (TO-252)

#### **Features**

- Output Current up to 1A
- Maximum Input voltage up to 36V
- Output Voltage Accuracy of ±4% at 25°C
- Thermal Overload Protection
- Short Circuit Current Limiting
- Output Transistor safe operation area (SOA) Protection
- RoHS Compliance and Halogen Free

# 500

D<sup>2</sup>PAK (TO-263-2)



D<sup>2</sup>PAK (TO-263-3)

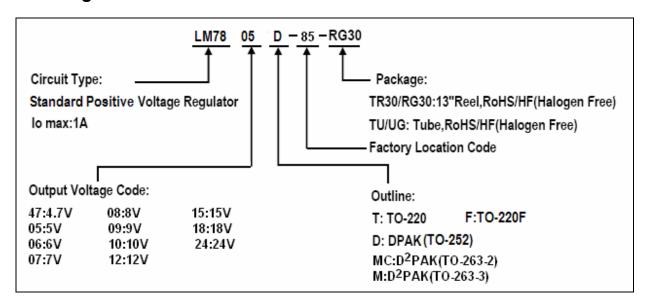
## **Applications**

- High Efficiency Linear Regulator
- Post Regulation for Switching Supply
- Microprocessor Power Supply
- Mother Board

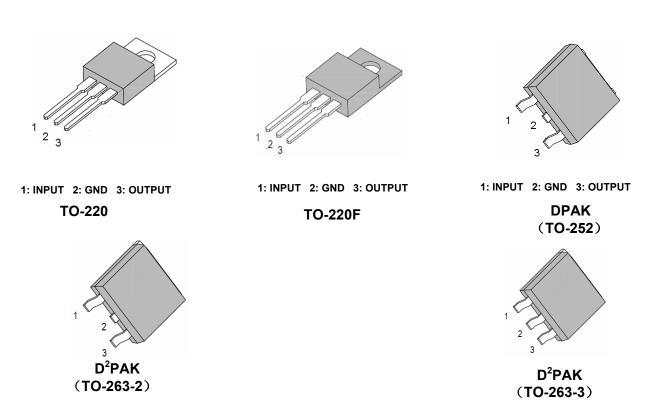




#### **Ordering Information**



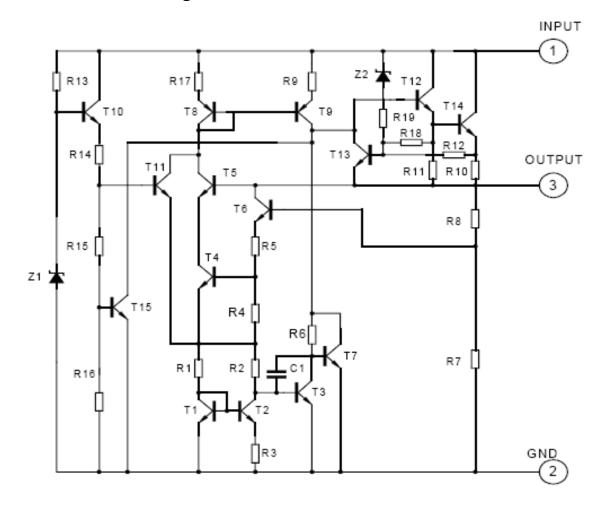
## **Pin Configuration**





Rev. B/LX

## **Functional Block Diagram**





#### **Absolute Maximum Ratings** (Note 1)

Symbol	Descr	Ratings	Unit		
VIN	Input Voltage	Vo=4.7~18V	35	V	
VIIN	input voltage	Vo=20~24V	40	V	
lo	Output	Current	1	Α	
Po	Power Di	issipation	Internally Limited	W	
TLEAD	Lead Temperature	260			
TJ	Operating Junction	D <sup>2</sup> PAK	0 to 125	00	
13	Temperature	Temperature others		°C	
Тѕтс	Storage Temperature	D <sup>2</sup> PAK	-40 to 150		
1516	Range	others	-55 to 150		
	Thermal Resistance	TO-220	65		
θJA	(Junction to Ambient)	TO-220F	05		
	(Sufficient to Ambient)	DPAK (TO-252)	61.54	°C/W	
	Thermal Resistance	TO-220	5	C/ VV	
θις		TO-220F	<u> </u>		
	(Junction to Case)	DPAK (TO-252)	7.48		

Note1: Absolute maximum ratings indicate limits beyond which damage to the device may occur. For guarantee specification and test conditions, see the Electrical Characteristics. the guarantee specification apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.



**Electrical Characteristics** (Io=0.5A,Tj=0~125°C, CIN=0.33μF, CO =0.1μF,unless otherwise specified,Note2)

For LM7847 (Vin=9.7V, T<sub>J</sub> = 25°C)

	Description	L	_M7847	7	Unit	Toot Conditions
Symbol	Description	Min.	Тур.	Max.	Unit	Test Conditions
Vo	Output Voltage	4.512	4.70	4.888	V	5mA≤ lo≤1.0A
<b>V</b> 0	Output voitage	4.465	-	4.935	V	7.2V≤VIN≤19.7V, 5mA ≤lo ≤1.0A
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	47	mV	5mA ≤lo ≤1.0A
∆VLOAD	Load Regulation	-	-	24	mV	0.25A≤lo≤0.75A
$\Delta oldsymbol{V}$ LINE	Line Regulation	-	-	47	mV	7.2V≤VIN≤19.7V
ΔVLINE	NE Line Regulation	-	-	47	mV	7.2V≤VIN≤19.7V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	loυτ≤1.0A
		_	_	1.0	mA	7.2V≤VIN≤19.7V
$\Delta$ lQ	Quiescent Current Change	_	_	1.0	111/1	5.8V≤VIN≤18.3V
		-	-	0.5	mA	5mA≤ Io≤1.0A
eN	Output Noise Voltage	-	40	-	μV	10Hz≤f≤100KHz
Δ <b>V</b> ο/Δ <b>T</b>	Temperature coefficient of Vout	-	-0.6	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	62	80	-	dB	7.7V≤Vin≤17.7V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V

For LM7805 (Vin=10V, TJ = 25°C)

Symbol	Description	L	M7805	5	Unit	Test Conditions
Syllibol	Description	Min.	Тур.	Max.	Offic	rest conditions
Vo	Output Voltage	4.80	5.0	5.20	V	5mA ≤lo≤1.0A
VO	Odiput Voltage	4.75	-	5.25	V	7.5V≤VIN≤20V, 5mA ≤lo≤1.0A
$\Delta \mathbf{V}$ LOAD	Load Regulation	1	-	50	mV	5mA ≤lo≤1.0A
△VLOAD	Load Negulation	1	-	25	mV	0.25A≤ lo ≤0.75A
$\Delta V$ LINE	Line Regulation	1	-	50	mV	7.0V≤VIN≤25V
ΔVLINE	Line Regulation	ı	-	50	mV	7.5V≤VIN≤20V,Io=1.0A
<b>V</b> D	Dropout Voltage	1	2.0	ı	V	1
lq	Quiescent Current	1	-	8.0	mA	lo≤1.0A
Δ <b>l</b> Q	Quiescent Current Change	1	-	1.0	mA	7.5V≤VIN≤20V
ΔIQ	Quiescent Current Change	1	-	0.5	mA	5mA ≤lo≤1.0A
eN	Output Noise Voltage		40	ı	μV	10Hz≤f≤100KHz
$\Delta$ Vo/ $\Delta$ T	Temperature coefficient of Vout	-	-0.6	-	mV/℃	Iouт= <b>5mA</b>



# LM7847 ~ LM7824

PSRR	Power Supply Ripple Rejection Ratio	62	80	-	dB	8V≤Vin≤18V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	Vin=35V

For LM7806 (Vin=11V, T<sub>J</sub> = 25°C)

	Description	L	M7806	6	Unit	Test Conditions	
Symbol	Description	Min.	Тур.	Max.	Unit	rest conditions	
Vo	Output Voltage	5.76	6.0	6.24	V	5mA ≤lo≤1.0A	
VO	Output Voltage	5.7	-	6.3	V	8.5V≤VIN≤21V, 5mA ≤lo≤1.0A	
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	60	mV	5mA ≤lo≤1.0A	
AVLOAD	Load Regulation	-	-	30	mV	0.25A≤ lo ≤0.75A	
$\Delta  extsf{V}$ LINE	Line Degulation	-	-	60	mV	8.0V≤VIN≤25V	
AVLINE	Line Regulation	-	-	60	mV	8.5V≤VIN≤21V,Io=1.0A	
lq	Quiescent Current	-	-	8.0	mA	Ioυτ≤1.0A	
ΔIO	Quicacent Current Change	-	-	1.0	mA	7.5V≤VIN≤20V	
Δ <b>l</b> Q	Quiescent Current Change	-	-	0.5	mA	Io=5mA-1.0A	
eN	Output Noise Voltage	-	40	-	μV	10Hz≤f≤100KHz	
$\Delta$ Vo/ $\Delta$ T	Temperature coefficient of Vout	-	-0.7	-	mV/℃	lo=5mA	
PSRR	Power Supply Ripple Rejection Ratio	62	80	1	dB	9V≤Vın≤19V, f=120Hz	
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-	
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V	
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-	

For LM7807 (Vin=13V, T<sub>J</sub> = 25°C)

Symbol	Description	L	M7807	7	Unit	Test Conditions
Symbol	Description	Min.	Тур.	Max.	Ullit	rest Conditions
Vo	Output Voltage	6.72	7.0	7.28	V	5mA ≤lo≤1.0A
VO	Output Voltage	6.65	-	7.35	V	9.5V≤VIN≤22V, 5mA ≤lo≤1.0A
$\Delta \mathbf{V}$ LOAD	Load Regulation	ı	-	70	mV	5mA ≤lo≤1.0A
∆VLOAD	Load Negulation	ı	-	35	mV	0.25A≤ lo ≤0.75A
$\Delta  extsf{V}$ LINE	Line Regulation	ı	-	70	mV	9.0V≤VIN≤25V
AVLINE		-	1	70	mV	9.5V≤VIN≤22V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
Δ <b>l</b> Q	Quicacent Current Change	-	-	1.0	mA	9.5V≤VIN≤22V
ΔIQ	Quiescent Current Change	-	-	0.5	mA	Io=5mA-1.0A
eN	Output Noise Voltage	-	50	-	μV	10Hz≤f≤100KHz
$\Delta$ Vo/ $\Delta$ T	Temperature coefficient of Vout	-	-0.8	-	mV/℃	lo=5mA



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PSRR	Power Supply Ripple Rejection Ratio	59	75	-	dB	9V≤Vın≤19V, f=120Hz
IPEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	Vin=35V

For LM7808 (Vin=14V, TJ = 25°C)

	Description	L	M7808	3	Unit	Test Conditions	
Symbol	Description	Min.	Тур.	Max.	Unit	rest conditions	
Vo	Output Voltage	7.68	8.0	8.32	V	5mA ≤lo≤1.0A	
<b>V</b> O	Output voltage	7.6	-	8.4	V	10.5V≤ViN≤23V, 5mA ≤lo≤1.0A	
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	80	mV	5mA ≤lo≤1.0A	
AVLOAD	Load Regulation	-	-	40	mV	0.25A≤ lo ≤0.75A	
$\Delta V$ LINE	Line Degulation	-	-	80	mV	10.5V≤Vın≤25V	
AVLINE	Line Regulation	-	-	80	mV	10.5V≤VIN≤23V,Io=1.0A	
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-	
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A	
Δ <b>l</b> Q	Quicacent Current Change	-	-	1.0	mA	9.5V≤VIN≤22V	
ΔΙΟ	Quiescent Current Change	-	-	0.5	mA	5mA ≤lo≤1.0A	
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz	
$\Delta$ Vo/ $\Delta$ T	Temperature coefficient of Vout	-	-0.9	-	mV/℃	lo=5mA	
PSRR	Power Supply Ripple Rejection Ratio	56	72	-	dB	11.5V≤Vin≤21.5V, f=120Hz	
IPEAK	Peak Output Current	-	1.8	-	Α	-	
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V	

For LM7809 (Vin=15V, T<sub>J</sub> = 25°C)

Cumbal	Description	L	M7809	•	Unit	Test Conditions
Symbol	Description	Min.	Тур.	Max.	Ullit	rest Conditions
Vo	Output Voltage	8.64	9.0	9.36	V	5mA ≤lo≤1.0A
VO	Output voltage	8.55	-	9.45	V	10.5V≤VIN≤23V, 5mA ≤Io≤1.0A
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	90	mV	5mA ≤lo≤1.0A
∆VLOAD	Load Negulation	-	-	45	mV	0.25A≤ lo ≤0.75A
$\Delta  extsf{V}$ LINE	Line Regulation	-	-	90	mV	11.5V≤VıN≤25V
AVLINE		-	-	90	mV	11.5V≤VIN≤24V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
Δ <b>l</b> Q	Quioscont Current Change	-	-	1.0	mA	11.5V≤Vın≤24V
ΔIQ	Quiescent Current Change	-	-	0.5	mA	5mA ≤lo≤1.0A
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz
Δ <b>V</b> ο/Δ <b>T</b>	Temperature coefficient of Vout	-	-1.1	-	mV/℃	Io=5mA



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PSRR	Power Supply Ripple Rejection Ratio	56	72	ı	dB	12.5V≤VIN≤22.5V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	Vin=35V

For LM7810 (Vin=16V, T<sub>J</sub> = 25°C)

	Description	L	M7810	)	Unit	Test Conditions
Symbol	Description	Min.	Тур.	Max.	Ullit	rest Conditions
<b>V</b> o	Output Voltage	9.60	10.0	10.4 0	V	5mA ≤lo≤1.0A
	-	9.5	-	10.5	V	12.5V≤VıN≤25V, Io=5mA-1.0A
$\Delta$ <b>V</b> LOAD	Load Bogulation	-	-	100	mV	5mA ≤lo≤1.0A
AVLOAD	Load Regulation	-	-	50	mV	0.25A≤ lo ≤0.75A
$\Delta oldsymbol{V}$ LINE	AM Line Denvilation	-	-	100	mV	13V≤Vın≤25V
AVLINE	Line Regulation	-	-	100	mV	13V≤VIN≤25V,Io=1.0A
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
ΔIO	Quippont Current Change	-	-	1.0	mA	12.6V≤Vın≤25V
∆lQ	Quiescent Current Change	-	-	0.5	mA	5mA ≤lo≤1.0A
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz
Δ <b>V</b> o/Δ <b>T</b>	Temperature coefficient of Vout	-	-1.1	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	56	72	1	dB	12.5V≤VIN≤22.5V, f=120Hz
<b>I</b> PEAK	Peak Output Current	ı	1.8	ı	Α	-
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V
<b>V</b> D	Dropout Voltage	1	2.0	-	V	-

For LM7812 (Vin=19V, T<sub>J</sub> = 25°C)

Symbol	Description	L	_M7812	2	Unit	Test Conditions
Syllibol	Description	Min.	Тур.	Max.		rest conditions
Vo	Output Voltage	11.52	12.0	12.48	V	5mA ≤lo≤1.0A
VO	Output voltage	11.4	-	12.6	V	14.5V≤VıN≤27V, 5mA ≤lo≤1.0A
$\Delta \mathbf{V}$ LOAD	Load Decidation	-	-	120	mV	5mA ≤lo≤1.0A
AVLOAD	Load Regulation	-	-	60	mV	0.25A≤ lo ≤0.75A
$\Delta$ <b>V</b> LINE	Line Regulation	-	-	120	mV	14.5V≤Vın≤30V
ΔVLINE		-	-	120	mV	14.5V≤VIN≤27V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
Δ <b>l</b> Q	Quiescent Current Change	-	-	1.0	mA	14.5V≤VIN≤30V
ΔIQ		-	-	0.5	mA	5mA ≤lo≤1.0A



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eN	Output Noise Voltage	-	75	-	μV	10Hz≤f≤100KHz
Δ <b>V</b> ο/Δ <b>T</b>	Temperature coefficient of Vout	-	-1.5	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	56	72	1	dB	15V≤Vin≤25V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	Vin=35V

For LM7815 (Vin=23V, Tj= 25°C)

Symbol	Description	LM7815			l lmit	Toot Conditions
		Min.	Тур.	Max.	Unit	Test Conditions
<b>V</b> o	Output Voltage	14.40	15.0	15.60	V	5mA ≤lo≤1.0A
VO		14.25	-	15.75	<b>V</b>	17.5V≤VIN≤30V, 5mA ≤lo≤1.0A
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	150	mV	5mA ≤lo≤1.0A
△VLOAD		-	-	75	mV	0.25A≤ lo ≤0.75A
$\Delta  extsf{V}$ LINE	Line Regulation	-	-	150	mV	18.5V≤Vın≤30V
AVLINE		-	-	150	mV	17.8V≤VIN≤30V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
Ale	Quiescent Current Change	-	-	1.0	mA	17.5V≤VIN≤30V
∆lq		-	-	0.5	mA	5mA ≤lo≤1.0A
eN	Output Noise Voltage	-	90	-	μV	10Hz≤f≤100KHz
$\Delta$ <b>V</b> o/ $\Delta$ <b>T</b>	Temperature coefficient of Vout	-	-1.8	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	54	70	-	dB	15V≤Vin≤25V, f=120Hz
İPEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V

For LM7818 (Vin=27V, Tj= 25°C)

Symbol	Description	LM7818			Unit	Test Conditions
		Min.	Тур.	Max.	Offic	Test Conditions
Vo	Output Voltage	17.28	18.0	18.72	V	5mA ≤lo≤1.0A
VO		17.1	-	18.9	V	21V≤VIN≤33V, 5mA ≤lo≤1.0A
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	180	mV	5mA ≤lo≤1.0A
AVLOAD		-	-	90	mV	0.25A≤ lo ≤0.75A
$\Delta V$ LINE	Line Regulation	-	-	180	mV	21V≤Vın≤33V
ΔVLINE		-	-	180	mV	21V≤VIN≤33V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
Δ <b>l</b> Q	Quiescent Current Change	-	-	1.0	mA	21.5V≤Vıν≤33V
		-	-	0.5	mA	5mA ≤lo≤1.0A



# LM7847 ~ LM7824

eN	Output Noise Voltage	-	110	-	μV	10Hz≤f≤100KHz
$\Delta$ <b>V</b> o/ $\Delta$ <b>T</b>	Temperature coefficient of Vout	-	-2.2	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	53	69	ı	dB	22V≤ViN≤32V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	Vin=35V

For LM7824 (Vin=33V, Tj= 25°C)

Symbol	Description	LM7824			Unit	Test Conditions
		Min.	Тур.	Max.	Unit	rest conditions
Vo	Output Voltage	23.04	24.0	24.9 6	V	5mA ≤lo≤1.0A
VO		22.80	-	25.2 0	V	27V≤ViN≤38V, 5mA ≤lo≤1.0A
$\Delta$ <b>V</b> LOAD	Load Regulation	-	-	240	mV	5mA ≤lo≤1.0A
ΔVLOAD		-	-	120	mV	0.25A≤ lo ≤0.75A
$\Delta  extsf{V}$ LINE	Line Regulation	-	-	240	mV	21V≤Vın≤33V
AVLINE		-	-	240	mV	27V≤VIN≤38V,Io=1.0A
<b>V</b> D	Dropout Voltage	-	2.0	-	V	-
lq	Quiescent Current	-	-	8.0	mA	lo≤1.0A
ΔlQ	Quiescent Current Change	-	-	1.0	mA	28V≤Vın≤38V
ΔIQ		-	-	0.5	mA	5mA ≤lo≤1.0A
eN	Output Noise Voltage	-	170	-	μV	10Hz≤f≤100KHz
Δ <b>V</b> o/Δ <b>T</b>	Temperature coefficient of Vout	-	-2.8	-	mV/℃	Io=5mA
PSRR	Power Supply Ripple Rejection Ratio	50	66	1	dB	28V≤Vin≤38V, f=120Hz
<b>I</b> PEAK	Peak Output Current	-	1.8	-	Α	-
Isc	Short-Circuit Current	-	250	-	mA	VIN=35V

Note2: The Maximum steady state usable output current are dependent on the input voltage, heat sinking, lead length of the package and the copper pattern of the PCB. The data above represents pulse test conditions with junction temperature specified at the initiation of test.



#### **Typical Characteristics Curves**

Fig.1- Dropout Voltage vs. Junction Temperature

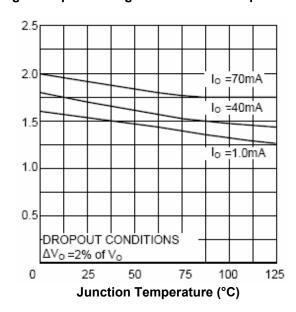


Fig.2- Output Voltage vs. Junction Temperature

5.2

5.1

5.0

4.9

4.8

-50

50

50

Junction Temperature (°C)

Fig.3- Power Dissipation vs. Junction Temperature

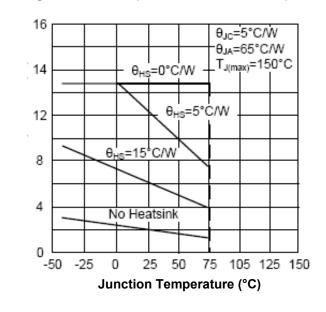
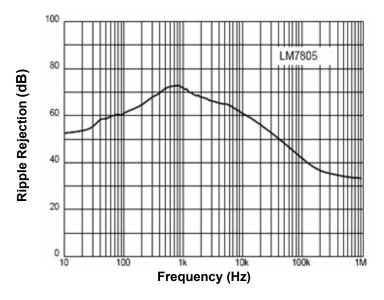
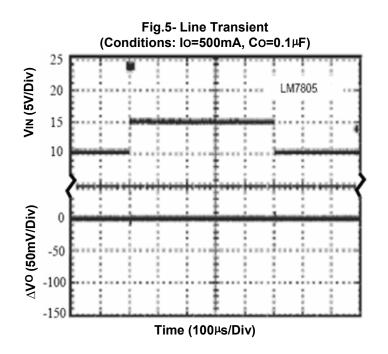


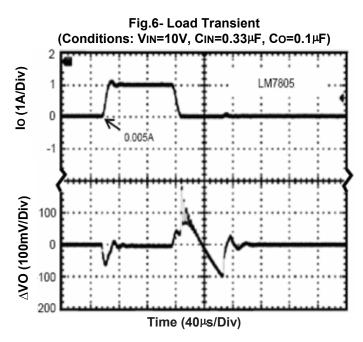
Fig.4- Ripple Rejection vs. Frequency



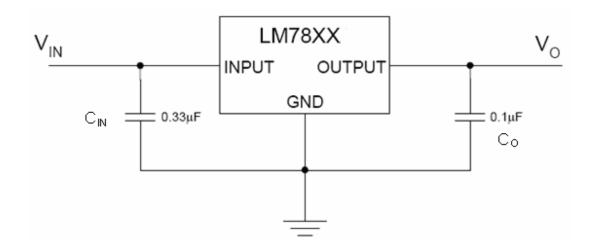
Output Voltage (V)

## **Typical Characteristics Curves (Continued)**



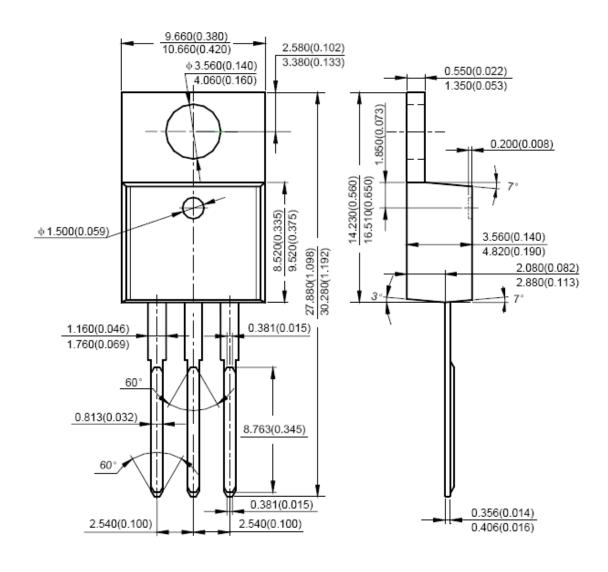


# **Typical Application**



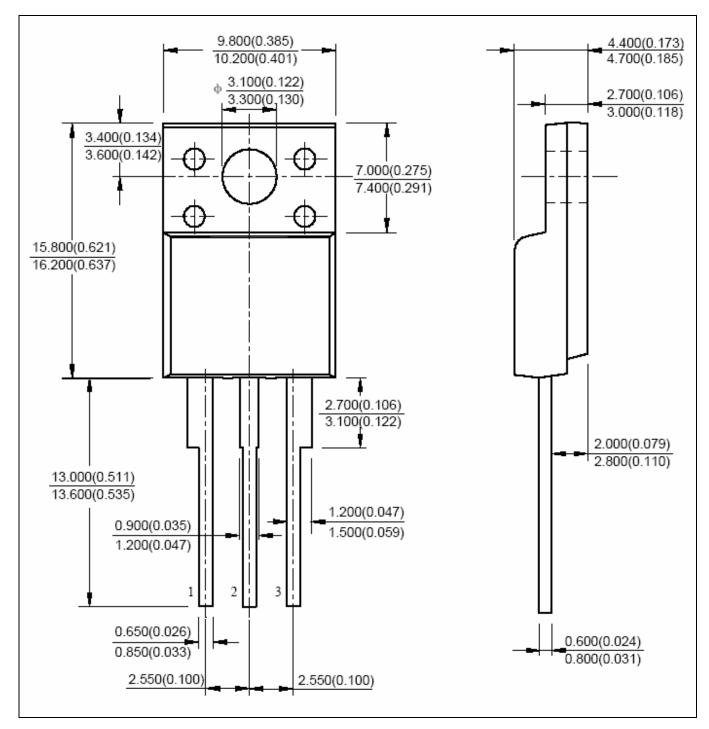


### **Dimensions in mm (inches)**



TO-220

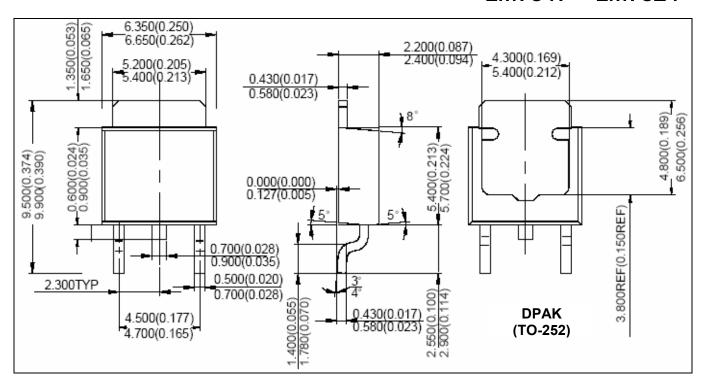


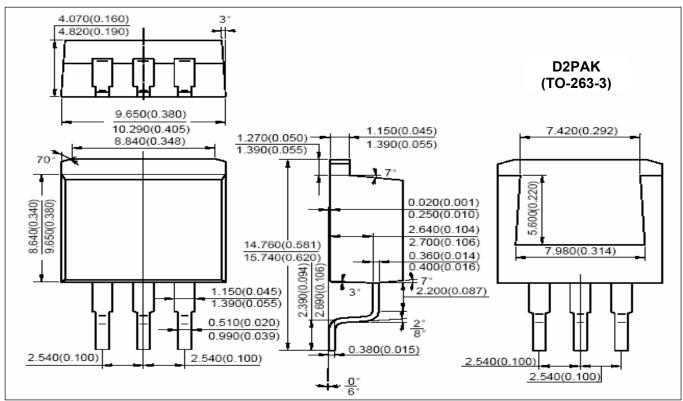


**TO-220F** 



#### LM7847 ~ LM7824







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