

1A Positive Voltage Regulator

General Description

- The TCI LM78xx family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1A.
- The LM78M is available in D-PACK (TO-252) and TO-220 packages.



**D-PACK
(TO-252)**



TO-220



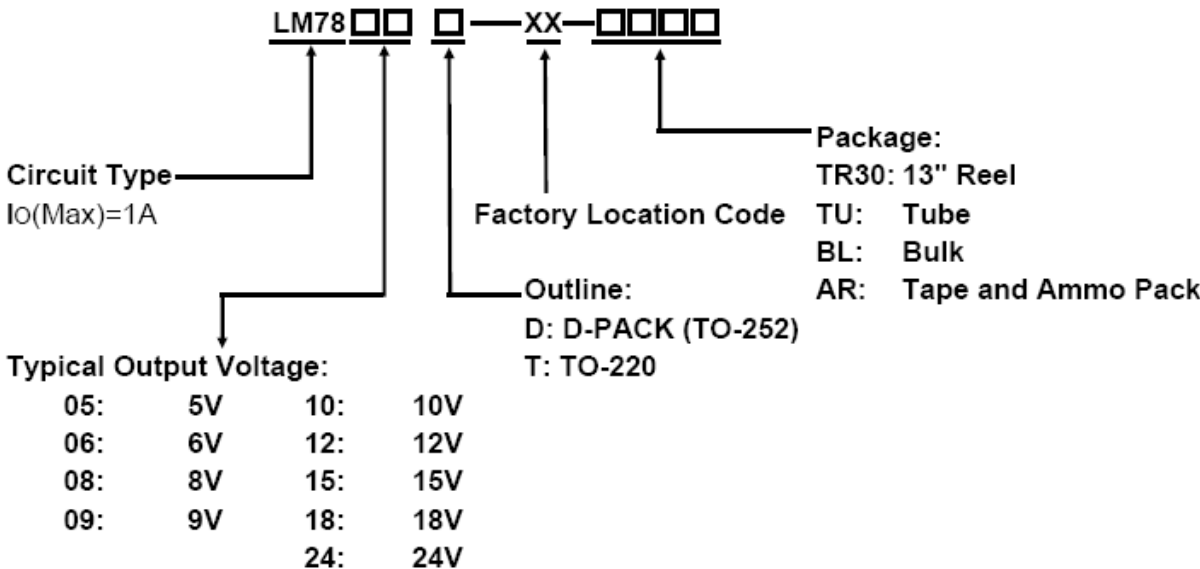
Features

- Output Current up to 1A
- Fixed output voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V available
- Thermal overload shutdown protection
- Short circuit current limiting
- Output transistor SOA protection
- RoHS Compliance

Applications

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

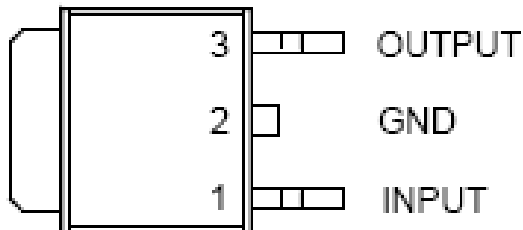
Ordering Information



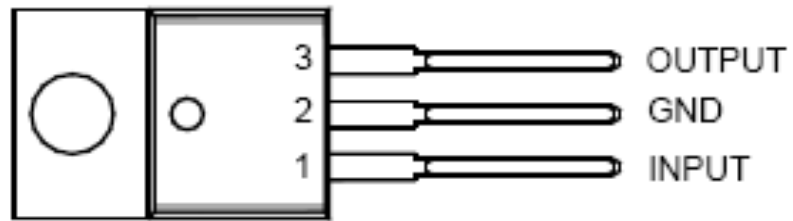
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Pin Configuration

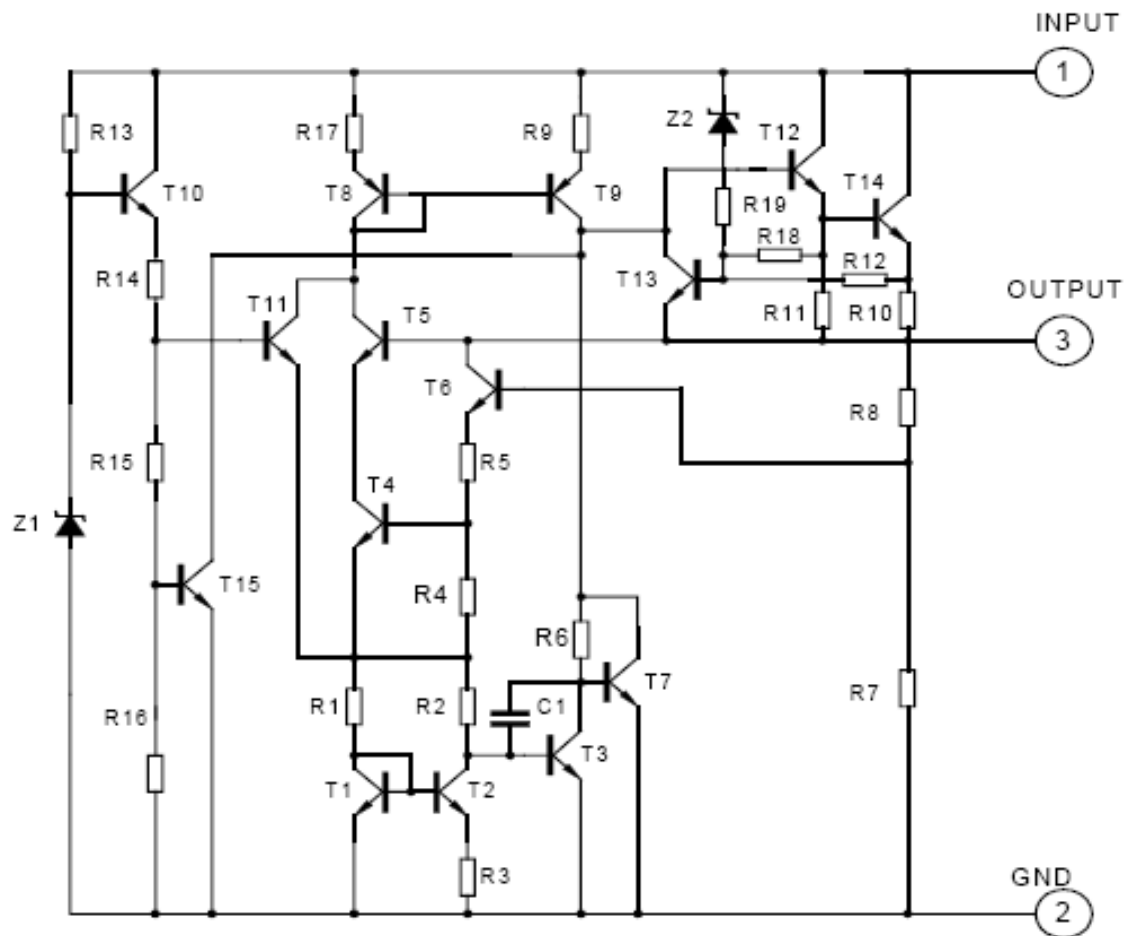


Outline: D
D-PACK
(TO-252)



Outline: T
TO-220

Block Diagram



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Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
V _{IN}	Input Voltage	V _{OUT} =3.3~18V	35
		V _{OUT} =20~24V	40
I _{OUT}	Output Current	1	A
P _D	Power Dissipation	D-PACK (TO-252)	Internally Limited
		TO-220	
T _J	Junction Temperature	150	
T _{OPR}	Operating Temperature Range	-20 ~ 150	° C
T _{STG}	Storage Temperature Range	-55 ~ 150	° C

- Note:** 1. Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.
 2. The maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data are showed as electrical characteristics table represents pulse test conditions with junction temperatures specified at the initiation of test.

Electrical Characteristics (T_J=25° C, P_D ≤ 15W, unless otherwise specified)

For LM7805 (V_{IN}=10V, I_{OUT}=0.5A, C₁=0.33μF, C_o =0.1μF)

Symbol	Description	LM7805			Unit	Test Conditions
		Min.	Typ.	Max.		
V _{OUT}	Output Voltage	4.80	5.0	5.20	V	I _{OUT} =5mA-1.0A
		4.75	-	5.25	V	7.5V ≤ V _{IN} ≤ 20V, I _{OUT} =5mA-1.0A
ΔV _{OUT}	Load Regulation	-	-	50	mV	I _{OUT} =5mA-1.0A
		-	-	25	mV	I _{OUT} =0.25A-0.75A
ΔV _{OUT}	Line Regulation	-	-	50	mV	7V ≤ V _{IN} ≤ 25V
		-	-	50	mV	7.5V ≤ V _{IN} ≤ 20V, I _{OUT} =1.0A
I _q	Quiescent Current	-	-	8.0	mA	I _{OUT} ≤ 1.0A
ΔI _q	Quiescent Current Change	-	-	1.0	mA	7.5V ≤ V _{IN} ≤ 20V
		-	-	0.5	mA	I _{OUT} =5mA-1.0A
e _N	Output Noise Voltage	-	40	-	μV	10Hz ≤ f ≤ 100KHz
ΔV _o /ΔT	Temperature coefficient of V _{OUT}	-	-0.6	-	mV/°C	I _{OUT} =5mA
RR	Ripple Rejection	62	80	-	dB	8V ≤ V _{IN} ≤ 18V, f=120Hz
I _{PEAK}	Peak Output Current	-	1.8	-	A	-
I _{sc}	Short-Circuit Current	-	250	-	mA	V _{IN} =35V
V _D	Dropout Voltage	-	2.0	-	V	-

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For LM7806 ($V_{IN}=11V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7806			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	5.76	6.0	6.24	V	$I_{OUT}=5mA-1.0A$
		5.70	-	6.30	V	$8.5V \leq V_{IN} \leq 21V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	60	mV	$I_{OUT}=5mA-1.0A$
		-	-	30	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	60	mV	$8V \leq V_{IN} \leq 25V$
		-	-	60	mV	$8.5V \leq V_{IN} \leq 21V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$8.5V \leq V_{IN} \leq 21V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	45	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.7	-	mV/°C	$I_{OUT}=5mA$
RR	Ripple Rejection	59	75	-	dB	$9V \leq V_{IN} \leq 19V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

For LM7808 ($V_{IN}=14V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7808			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	7.68	8.0	8.32	V	$I_{OUT}=5mA-1.0A$
		7.60	-	8.40	V	$10.5V \leq V_{IN} \leq 23V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	80	mV	$I_{OUT}=5mA-1.0A$
		-	-	40	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	80	mV	$10.5V \leq V_{IN} \leq 25V$
		-	-	80	mV	$10.5V \leq V_{IN} \leq 23V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$10.5V \leq V_{IN} \leq 23V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	58	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.9	-	mV/°C	$I_{OUT}=5mA$
RR	Ripple Rejection	56	72	-	dB	$11.5V \leq V_{IN} \leq 21.5V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

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For LM7809 ($V_{IN}=15V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7809			Unit	Test Conditions
		Min.	Typ.	Max.		
V _{OUT}	Output Voltage	8.64	9.0	9.36	V	I _{OUT} =5mA-1.0A
		8.55	-	9.45	V	11.5V ≤ V _{IN} ≤ 24V, I _{OUT} =5mA-1.0A
ΔV _{OUT}	Load Regulation	-	-	90	mV	I _{OUT} =5mA-1.0A
		-	-	45	mV	I _{OUT} =0.25A-0.75A
ΔV _{OUT}	Line Regulation	-	-	90	mV	11.5V ≤ V _{IN} ≤ 25V
		-	-	90	mV	11.5V ≤ V _{IN} ≤ 24V, I _{OUT} =1.0A
I _Q	Quiescent Current	-	-	8.0	mA	I _{OUT} ≤ 1.0A
ΔI _Q	Quiescent Current Change	-	-	1.0	mA	11.5V ≤ V _{IN} ≤ 24V
		-	-	0.5	mA	I _{OUT} =5mA-1.0A
e _N	Output Noise Voltage	-	58	-	μV	10Hz ≤ f ≤ 100KHz
ΔV _O /ΔT	Temperature coefficient of V _{OUT}	-	-1.1	-	mV/°C	I _{OUT} =5mA
RR	Ripple Rejection	56	72	-	dB	12.5V ≤ V _{IN} ≤ 22.5V, f=120Hz
I _{PEAK}	Peak Output Current	-	1.8	-	A	-
I _{SC}	Short-Circuit Current	-	250	-	mA	V _{IN} =35V
V _D	Dropout Voltage	-	2.0	-	V	-

For LM7810 ($V_{IN}=16V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7810			Unit	Test Conditions
		Min.	Typ.	Max.		
V _{OUT}	Output Voltage	9.60	10.0	10.40	V	I _{OUT} =5mA-1.0A
		9.50	-	10.50	V	12.5V ≤ V _{IN} ≤ 25V, I _{OUT} =5mA-1.0A
ΔV _{OUT}	Load Regulation	-	-	100	mV	I _{OUT} =5mA-1.0A
		-	-	50	mV	I _{OUT} =0.25A-0.75A
ΔV _{OUT}	Line Regulation	-	-	100	mV	13V ≤ V _{IN} ≤ 25V
		-	-	100	mV	13V ≤ V _{IN} ≤ 25V, I _{OUT} =1.0A
I _Q	Quiescent Current	-	-	8.0	mA	I _{OUT} ≤ 1.0A
ΔI _Q	Quiescent Current Change	-	-	1.0	mA	12.6V ≤ V _{IN} ≤ 25V
		-	-	0.5	mA	I _{OUT} =5mA-1.0A
e _N	Output Noise Voltage	-	58	-	μV	10Hz ≤ f ≤ 100KHz
ΔV _O /ΔT	Temperature coefficient of V _{OUT}	-	-1.1	-	mV/°C	I _{OUT} =5mA
RR	Ripple Rejection	56	72	-	dB	13V ≤ V _{IN} ≤ 23V, f=120Hz
I _{PEAK}	Peak Output Current	-	1.8	-	A	-
I _{SC}	Short-Circuit Current	-	250	-	mA	V _{IN} =35V
V _D	Dropout Voltage	-	2.0	-	V	-

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For LM7812 ($V_{IN}=19V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7812			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	11.52	12.0	12.48	V	$I_{OUT}=5mA-1.0A$
		11.40	-	12.60	V	$14.5V \leq V_{IN} \leq 27V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	120	mV	$I_{OUT}=5mA-1.0A$
		-	-	60	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	120	mV	$14.5V \leq V_{IN} \leq 30V$
		-	-	120	mV	$14.6V \leq V_{IN} \leq 27V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$14.5V \leq V_{IN} \leq 30V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	75	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-1.5	-	$mV/^\circ C$	$I_{OUT}=5mA$
RR	Ripple Rejection	55	72	-	dB	$15V \leq V_{IN} \leq 25V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

For LM7815 ($V_{IN}=23V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7815			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	14.40	15.0	15.60	V	$I_{OUT}=5mA-1.0A$
		14.25	-	15.75	V	$17.5V \leq V_{IN} \leq 30V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	150	mV	$I_{OUT}=5mA-1.0A$
		-	-	75	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	150	mV	$18.5V \leq V_{IN} \leq 30V$
		-	-	150	mV	$17.7V \leq V_{IN} \leq 30V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$17.5V \leq V_{IN} \leq 30V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	90	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-1.8	-	$mV/^\circ C$	$I_{OUT}=5mA$
RR	Ripple Rejection	54	70	-	dB	$18.5V \leq V_{IN} \leq 28.5V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

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For LM7818 ($V_{IN}=27V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7818			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	17.28	18.0	18.72	V	$I_{OUT}=5mA-1.0A$
		17.10	-	18.90	V	$21V \leq V_{IN} \leq 33V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	180	mV	$I_{OUT}=5mA-1.0A$
		-	-	90	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	180	mV	$21V \leq V_{IN} \leq 33V$
		-	-	180	mV	$21V \leq V_{IN} \leq 33V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$21.5V \leq V_{IN} \leq 33V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	110	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-2.2	-	$mV/^\circ C$	$I_{OUT}=5mA$
RR	Ripple Rejection	53	69	-	dB	$22V \leq V_{IN} \leq 32V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

For LM7824 ($V_{IN}=33V$, $I_{OUT}=0.5A$, $C1=0.33\mu F$, $C_o=0.1\mu F$)

Symbol	Description	LM7824			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{OUT}	Output Voltage	23.04	24.0	24.96	V	$I_{OUT}=5mA-1.0A$
		22.80	-	25.20	V	$27V \leq V_{IN} \leq 38V$, $I_{OUT}=5mA-1.0A$
ΔV_{OUT}	Load Regulation	-	-	240	mV	$I_{OUT}=5mA-1.0A$
		-	-	120	mV	$I_{OUT}=0.25A-0.75A$
ΔV_{OUT}	Line Regulation	-	-	240	mV	$27V \leq V_{IN} \leq 38V$
		-	-	240	mV	$27V \leq V_{IN} \leq 38V$, $I_{OUT}=1.0A$
I_q	Quiescent Current	-	-	8.0	mA	$I_{OUT} \leq 1.0A$
ΔI_q	Quiescent Current Change	-	-	1.0	mA	$28V \leq V_{IN} \leq 38V$
		-	-	0.5	mA	$I_{OUT}=5mA-1.0A$
e_N	Output Noise Voltage	-	170	-	μV	$10Hz \leq f \leq 100KHz$
$\Delta V_o/\Delta T$	Temperature coefficient of V_{OUT}	-	-2.8	-	$mV/^\circ C$	$I_{OUT}=5mA$
RR	Ripple Rejection	50	66	-	dB	$28V \leq V_{IN} \leq 38V$, $f=120Hz$
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{sc}	Short-Circuit Current	-	250	-	mA	$V_{IN}=35V$
V_D	Dropout Voltage	-	2.0	-	V	-

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Typical Characteristics Curves

Fig.1- Peak Output Current vs. Input/Output Differential Voltage

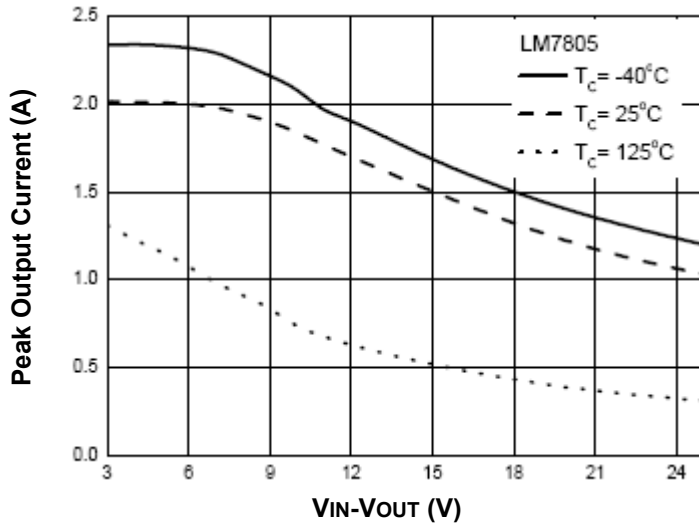


Fig.2- Output Voltage vs. Junction Temperature

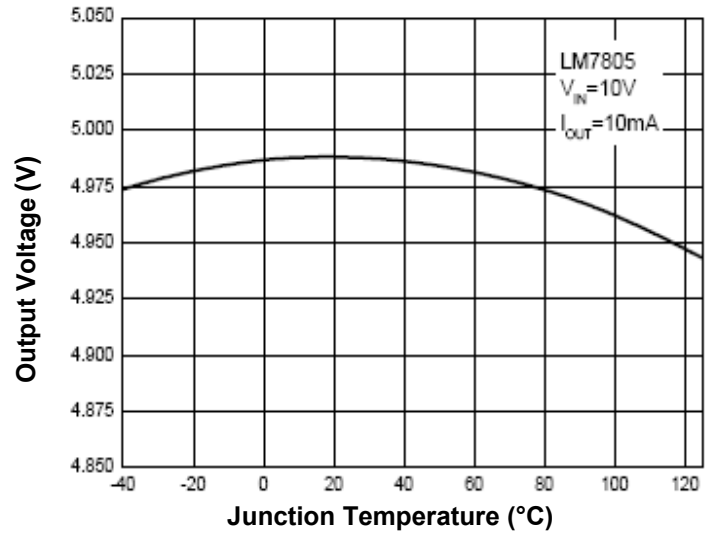


Fig.3- Quiescent Current vs. Junction Temperature

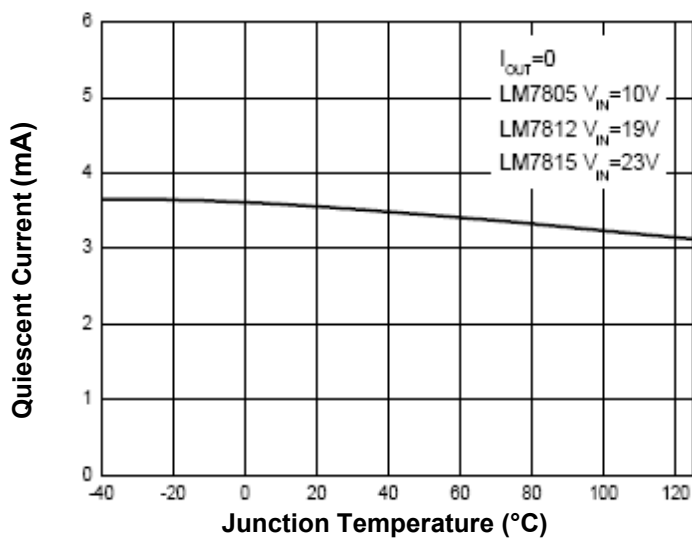
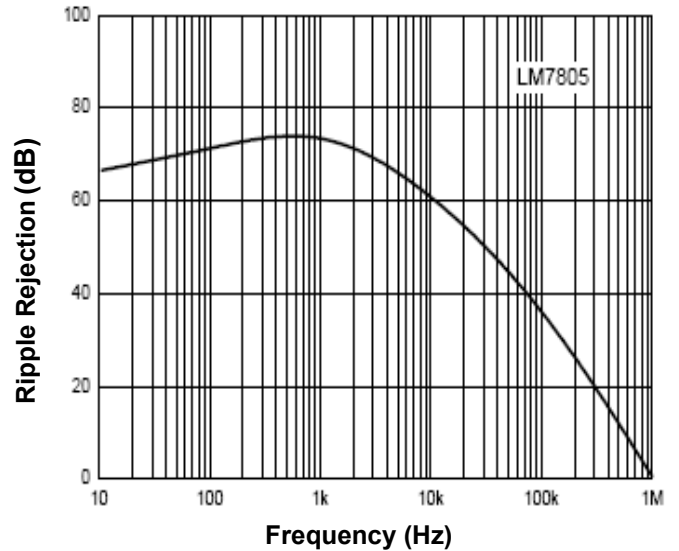


Fig.4- Ripple Rejection vs. Frequency



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Typical Characteristics Curves (Continued)

Fig.5- Dropout Voltage vs. Junction Temperature

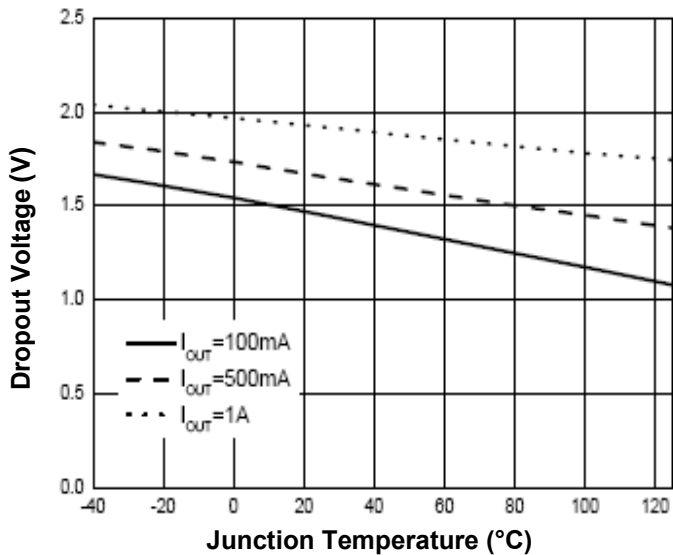


Fig.6- Power Dissipation vs. Case Temperature

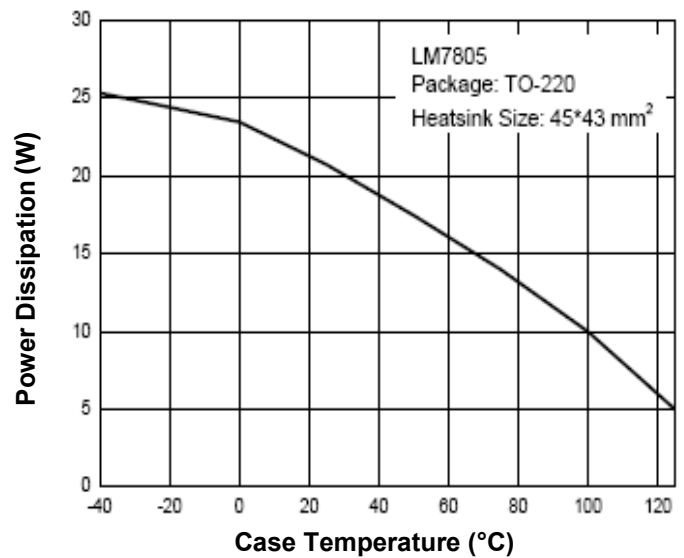


Fig.7- Power Dissipation vs. Case Temperature

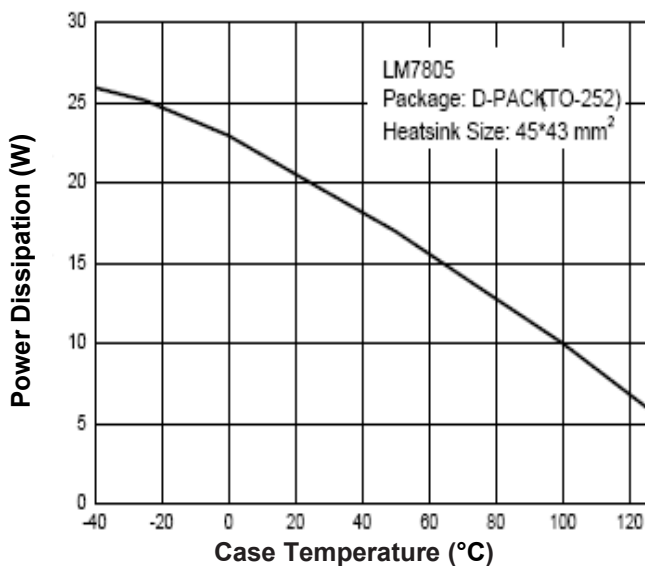
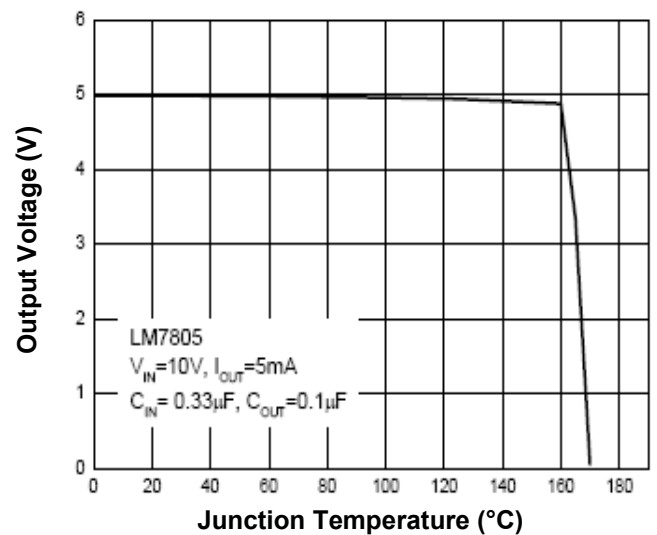


Fig.8- Thermal Shutdown Protection



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Typical Characteristics Curves (Continued)

Fig.9- Line Transient
(Conditions: $I_{OUT}=500mA$, $C_{OUT}=0.1\mu F$)

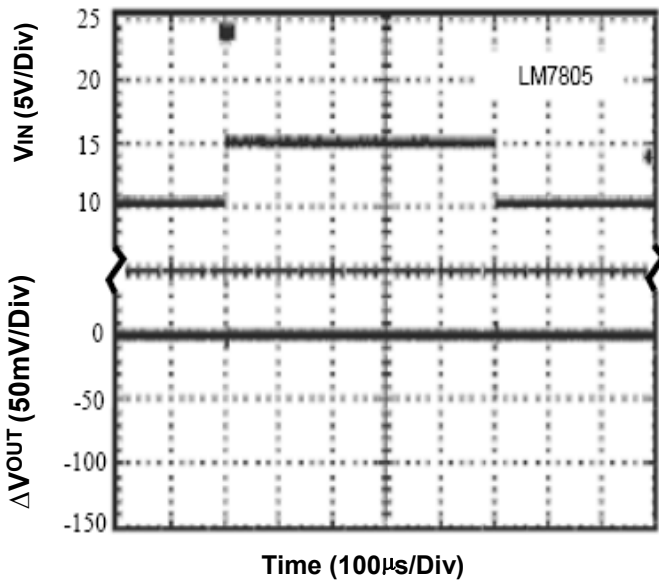
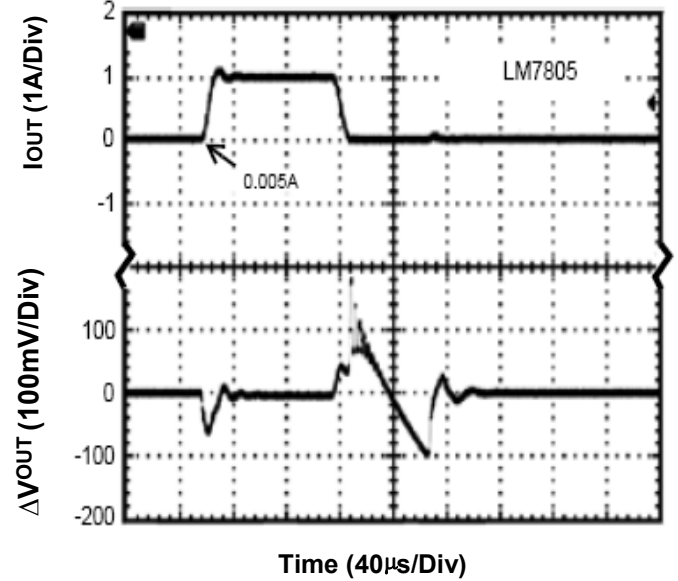
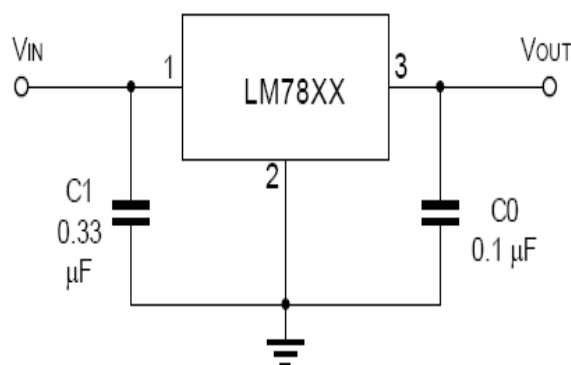


Fig.10- Load Transient
(Conditions: $V_{IN}=10V$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$)



Typical Application

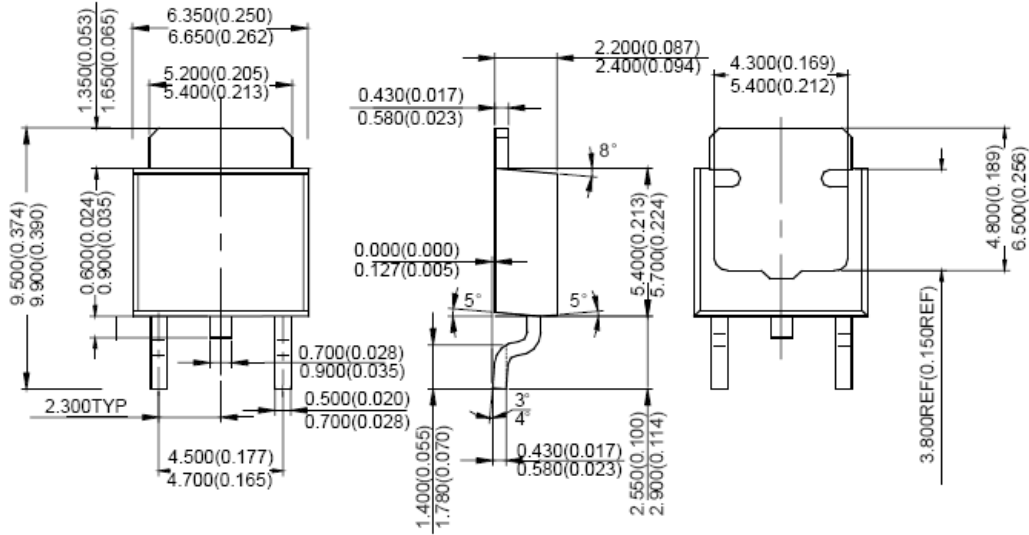


Note: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

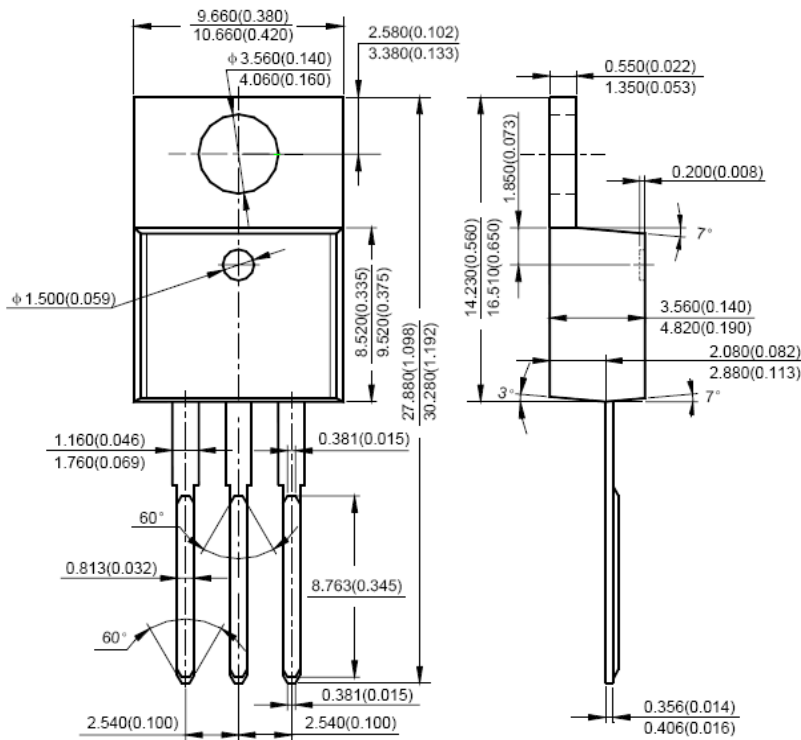
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Dimensions in mm (inches)



D-PACK (TO-252)



TO-220



Rev. A/DX 2007-06-04

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