

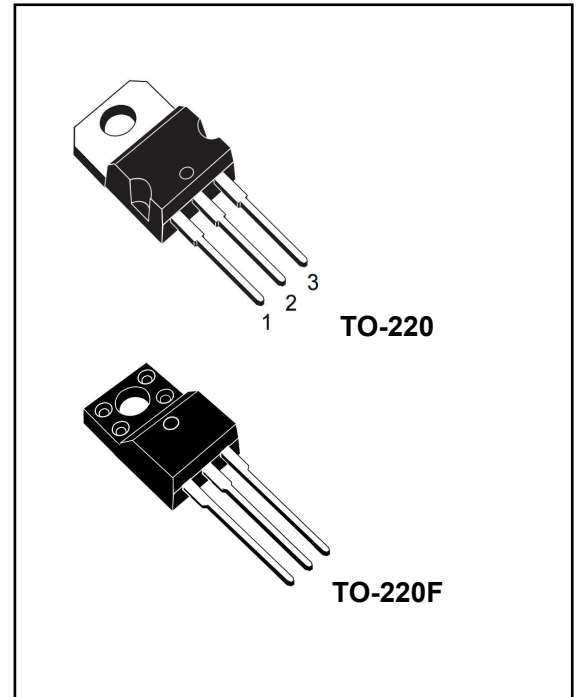
POSITIVE VOLTAGE REGULATORS

1 Description

The L78XX series of three-terminal positive regulators is available in TO-220, TO-220F, 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.

2 Features

- OUTPUT CURRENT TO 1.5A
- OUTPUT VOLTAGES OF 5; 6; 8; 9;10; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION



3 Electrical Characteristics

3.1 Absolute Maximum Ratings (Tc=25°C, unless otherwise noted)

Characteristic		Symbol	Value	Unit
Input Voltage	VO = 5 to 18 V	VI	35	V
	VO = 24 V		40	
Operating Temperature Range		TOPR	0 ~ +125	°C
Storage Temperature Range		TSTG	-55 ~ +150	°C
Output Current		Io	Internally Limited	
Power Dissipation		Ptot	Internally Limited	

3.2 Thermal Characteristics

PARAMETER	SYMBOL	TO-220	TO-220F	UNIT
Thermal Resistance, Junction to Case-sink	R _{thJC}	6.7	6.7	°C/W
Thermal Resistance Junction-ambient	R _{thJa}	87	97	

3.3 Electrical Characteristics

L7805:(refer to the test circuits , $0 < T_j < 125^{\circ}\text{C}$, $I_o = 500\text{mA}$, $V_i = 10\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	L7805			Unit
			Min	Typ	Max	
Output Voltage	V_o^*	$T_j = 25^{\circ}\text{C}$, $V_i = 10\text{V}$	4.9	5.0	5.1	V
Output Voltage	V_o	$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$, $V_i = 7.5\text{V} \sim 20\text{V}$	4.9	5.0	5.1	V
Line Regulation	ΔV_o	$T_j = 25^{\circ}\text{C}$, $I_o = 500\text{mA}$	$V_i = 7.5\text{V} \sim 25\text{V}$		100	mV
			$V_i = 8\text{V} \sim 12\text{V}$		50	
Load Regulation	ΔV_o	$T_j = 25^{\circ}\text{C}$, $V_i = 10\text{V}$	$I_o = 5\text{mA} \sim 1.5\text{A}$		100	mV
			$I_o = 250\text{mA} \sim 750\text{mA}$		50	
Quiescent Current	I_q	$T_j = 25^{\circ}\text{C}$			8	mA
Quiescent Current Change	ΔI_q	$T_j = 25^{\circ}\text{C}$, $V_i = 10\text{V}$, $I_o = 5\text{mA} \sim 1.0\text{A}$			0.5	mA
		$T_j = 25^{\circ}\text{C}$, $I_o = 0.5\text{A}$, $V_i = 8\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$, $T_j = 0 \sim 125^{\circ}\text{C}$		0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_a = 25^{\circ}\text{C}$		42		μV
Supply Voltage Rejection	RR	$f = 120\text{Hz}$, $V_i = 8\text{V} \sim 18\text{V}$	62	73		dB
Dropout Voltage	V_D	$I_o = 1.0\text{A}$, $T_j = 25^{\circ}\text{C}$		2		V
Output Resistance	R_o	$f = 1\text{KHz}$		15		m Ω
Short Circuit Current	I_{SC}	$V_i = 35\text{V}$, $T_a = 25^{\circ}\text{C}$		230		mA
Short Circuit Peak Current	I_{PK}	$T_j = 25^{\circ}\text{C}$		2.2		A

*** V_o : $\pm 1\%$ 、 $\pm 2\%$**

DHD7806:(refer to the test circuits, $0 < T_j < 125^{\circ}\text{C}$, $I_o = 500\text{mA}$, $V_i = 11\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	L7806			Unit
			Min	Typ	Max	
Output Voltage	V_o^*	$T_j = 25^{\circ}\text{C}$, $V_i = 11\text{V}$	5.88	6.0	6.12	V
Output Voltage	V_o	$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$, $V_i = 8.5\text{V} \sim 21\text{V}$	5.88	6.0	6.12	V
Line Regulation	ΔV_o	$T_j = 25^{\circ}\text{C}$, $I_o = 500\text{mA}$	$V_i = 8.5\text{V} \sim 25\text{V}$		120	mV
			$V_i = 9\text{V} \sim 13\text{V}$		60	
Load Regulation	ΔV_o	$T_j = 25^{\circ}\text{C}$, $V_i = 11\text{V}$	$I_o = 5\text{mA} \sim 1.5\text{A}$		120	mV
			$I_o = 250\text{mA} \sim 750\text{mA}$		60	
Quiescent Current	I_q	$T_j = 25^{\circ}\text{C}$			8	mA
Quiescent Current Change	ΔI_q	$T_j = 25^{\circ}\text{C}$, $V_i = 11\text{V}$, $I_o = 5\text{mA} \sim 1.0\text{A}$			0.5	mA
		$T_j = 25^{\circ}\text{C}$, $I_o = 0.5\text{A}$, $V_i = 9\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$, $T_j = 0 \sim 125^{\circ}\text{C}$		0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_a = 25^{\circ}\text{C}$		45		μV
Supply Voltage Rejection	RR	$f = 120\text{Hz}$, $V_i = 9\text{V} \sim 19\text{V}$	59	75		dB
Dropout Voltage	V_D	$I_o = 1.0\text{A}$, $T_j = 25^{\circ}\text{C}$		2		V
Output Resistance	R_o	$f = 1\text{KHz}$		19		m Ω
Short Circuit Current	I_{SC}	$V_i = 35\text{V}$, $T_a = 25^{\circ}\text{C}$		230		mA
Short Circuit Peak Current	I_{PK}	$T_j = 25^{\circ}\text{C}$		2.2		A

*** V_o : $\pm 1\%$ 、 $\pm 2\%$**

L7808:(refer to the test circuits,0<T_j<125°C,I_o=500mA,V_i=14V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7808			Unit	
			Min	Typ	Max		
Output Voltage	V _o *	T _j =25°C, V _i =14V	7.84	8.0	8.16	V	
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =11V~23V	7.84	8.0	8.16	V	
Line Regulation	ΔV _o	T _j =25°C, I _o =500mA	V _i =10.5V~25V		160	mV	
			V _i =11V~17V		80		
Load Regulation	ΔV _o	T _j =25°C, V _i =14V	I _o =5mA~1.5A		160	mV	
			I _o =250mA~750mA		80		
Quiescent Current	I _q	T _j =25°C			8	mA	
Quiescent Current Change	ΔI _q	T _j =25°C,V _i =14V,I _o =5mA~1.0A			0.5	mA	
		T _j =25°C,I _o =0.5A,V _i =11V~25V			0.8		
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _j =0~125°C			0.8	mV/°C	
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C			52	μV	
Supply Voltage Rejection	RR	f=120Hz, V _i =11.5V~21.5V			56	73	dB
Dropout Voltage	V _D	I _o =1.0A, T _j =25°C			2	V	
Output Resistance	R _o	f=1KHz			17	mΩ	
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C			230	mA	
Short Circuit Peak Current	I _{PK}	T _j =25°C			2.2	A	

***V_o: ±1%、±2%**
L7809:(refer to the test circuits,0<T_j<125°C,I_o=500mA,V_i=15V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7809			Unit	
			Min	Typ	Max		
Output Voltage	V _o *	T _j =25°C, V _i =15V	8.82	9.0	9.18	V	
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =11.5V~24V	8.82	9.0	9.18	V	
Line Regulation	ΔV _o	T _j =25°C, I _o =500mA	V _i =11.5V~25V		180	mV	
			V _i =12V~18V		90		
Load Regulation	ΔV _o	T _j =25°C, V _i =15V	I _o =5mA~1.5A		180	mV	
			I _o =250mA~750mA		90		
Quiescent Current	I _q	T _j =25°C			8	mA	
Quiescent Current Change	ΔI _q	T _j =25°C,V _i =15V,I _o =5mA~1.0A			0.5	mA	
		T _j =25°C,I _o =0.5A,V _i =12V~26V			0.8		
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _j =0~125°C			1.0	mV/°C	
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C			58	μV	
Supply Voltage Rejection	RR	f=120Hz, V _i =13V~23V			56	71	dB
Dropout Voltage	V _D	I _o =1.0A, T _j =25°C			2	V	
Output Resistance	R _o	f=1KHz			15	mΩ	
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C			230	mA	
Short Circuit Peak Current	I _{PK}	T _j =25°C			2.2	A	

***V_o: ±1%、±2%**

L7810:(refer to the test circuits,0<T_J<125°C,I_o=500mA,V_i=16V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7810			Unit
			Min	Typ	Max	
Output Voltage	V _o *	T _J =25°C, V _i =16V	9.8	10	10.2	V
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =12.5V~25V	9.8	10	10.2	V
Line Regulation	ΔV _o	T _J =25°C, I _o =500mA	V _i =12.5V~25V		200	mV
			V _i =13V~20V		100	
Load Regulation	ΔV _o	T _J =25°C, V _i =16V	I _o =5mA~1.5A		200	mV
			I _o =250mA~750mA		100	
Quiescent Current	I _q	T _J =25°C			8	mA
Quiescent Current Change	ΔI _q	T _J =25°C,V _i =16V,I _o =5mA~1.0A			0.5	mA
		T _J =25°C,I _o =0.5A,V _i =13V~29V			0.8	
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _J =0~125°C		1.0		mV/°C
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C		58		μV
Supply Voltage Rejection	RR	f=120Hz, V _i =14V~24V	56	71		dB
Dropout Voltage	V _D	I _o =1.0A, T _J =25°C		2		V
Output Resistance	R _o	f=1KHz		17		mΩ
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C		230		mA
Short Circuit Peak Current	I _{PK}	T _J =25°C		2.2		A

***V_o: ±1%、±2%**
L7812:(refer to the test circuits,0<T_J<125°C,I_o=500mA,V_i=19V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7812			Unit
			Min	Typ	Max	
Output Voltage	V _o *	T _J =25°C, V _i =19V	11.76	12	12.24	V
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =14.5~27V	11.76	12	12.24	V
Line Regulation	ΔV _o	T _J =25°C, I _o =500mA	V _i =14.5V~30V		240	mV
			V _i =16V~22V		120	
Load Regulation	ΔV _o	T _J =25°C, V _i =19V	I _o =5mA~1.5A		240	mV
			I _o =250mA~750mA		120	
Quiescent Current	I _q	T _J =25°C			8	mA
Quiescent Current Change	ΔI _q	T _J =25°C,V _i =19V,I _o =5mA~1.0A			0.5	mA
		T _J =25°C,I _o =0.5A,V _i =15V~30V			0.8	
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _J =0~125°C		1.0		mV/°C
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C		76		μV
Supply Voltage Rejection	RR	f=120Hz, V _i =15V~25V	55	71		dB
Dropout Voltage	V _D	I _o =1.0A, T _J =25°C		2		V
Output Resistance	R _o	f=1KHz		18		mΩ
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C		230		mA
Short Circuit Peak Current	I _{PK}	T _J =25°C		2.2		A

***V_o: ±1%、±2%**

L7815:(refer to the test circuits,0<T_J<125°C,I_o=500mA,V_i=23V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7815			Unit	
			Min	Typ	Max		
Output Voltage	V _o *	T _J =25°C, V _i =23V	14.7	15	15.3	V	
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =17.5V~30V	14.7	15	15.3	V	
Line Regulation	ΔV _o	T _J =25°C, I _o =500mA	V _i =17.5V~30V		300	mV	
			V _i =20V~26V		150		
Load Regulation	ΔV _o	T _J =25°C, V _i =23V	I _o =5mA~1.5A		300	mV	
			I _o =250mA~750mA		150		
Quiescent Current	I _q	T _J =25°C			8	mA	
Quiescent Current Change	ΔI _q	T _J =25°C,V _i =23V,I _o =5mA~1.0A			0.5	mA	
		T _J =25°C,I _o =0.5A,V _i =18.5V~30V			0.8		
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _J =0~125°C			1.0	mV/°C	
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C			90	μV	
Supply Voltage Rejection	RR	f=120Hz, V _i =18.5V~28.5V			54	70	dB
Dropout Voltage	V _D	I _o =1.0A, T _J =25°C			2	V	
Output Resistance	R _o	f=1KHz			19	mΩ	
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C			230	mA	
Short Circuit Peak Current	I _{PK}	T _J =25°C			2.2	A	

***V_o: ±1%、±2%**
L7818:(refer to the test circuits,0<T_J<125°C,I_o=500mA,V_i=26V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7818			Unit	
			Min	Typ	Max		
Output Voltage	V _o *	T _J =25°C, V _i =26V	18.64	18	18.36	V	
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =21V~33V	18.64	18	18.36	V	
Line Regulation	ΔV _o	T _J =25°C, I _o =500mA	V _i =21V~33V		360	mV	
			V _i =24V~30V		180		
Load Regulation	ΔV _o	T _J =25°C, V _i =26V	I _o =5mA~1.5A		360	mV	
			I _o =250mA~750mA		180		
Quiescent Current	I _q	T _J =25°C			8	mA	
Quiescent Current Change	ΔI _q	T _J =25°C,V _i =26V,I _o =5mA~1.0A			0.5	mA	
		T _J =25°C,I _o =0.5A,V _i =21V~32V			0.8		
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _J =0~125°C			1.2	mV/°C	
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C			110	μV	
Supply Voltage Rejection	RR	f=120Hz, V _i =22V~32V			53	69	dB
Dropout Voltage	V _D	I _o =1.0A, T _J =25°C			2	V	
Output Resistance	R _o	f=1KHz			22	mΩ	
Short Circuit Current	I _{sc}	V _i =35V, T _a =25°C			230	mA	
Short Circuit Peak Current	I _{PK}	T _J =25°C			2.2	A	

***V_o: ±1%、±2%**

L7824:(refer to the test circuits,0<T_j<125°C,I_o=500mA,V_i=33V,C_i=0.33μF, C_o=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	L7824			Unit	
			Min	Typ	Max		
Output Voltage	V _o *	T _j =25°C, V _i =33V	23.52	24	24.48	V	
Output Voltage	V _o	5.0mA<I _o <1.0A,P _o <15W,V _i =27V~38V	23.52	24	24.48	V	
Line Regulation	ΔV _o	T _j =25°C, I _o =500mA	V _i =27V~38V		480	mV	
			V _i =30V~36V		240		
Load Regulation	ΔV _o	T _j =25°C, V _i =33V	I _o =5mA~1.5A		480	mV	
			I _o =250mA~750mA		240		
Quiescent Current	I _q	T _j =25°C			8	mA	
Quiescent Current Change	ΔI _q	T _j =25°C,V _i =33V,I _o =5mA~1.0A			0.5	mA	
		T _j =25°C,I _o =0.5A,V _i =27V~38V			0.8		
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _j =0~125°C			1.5	mV/°C	
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C			160	μV	
Supply Voltage Rejection	RR	f=120Hz, V _i =28V~38V			50	67	dB
Dropout Voltage	V _D	I _o =1.0A, T _j =25°C			2	V	
Output Resistance	R _o	f=1KHz			28	mΩ	
Short Circuit Current	I _{sc}	V _i =40V, T _a =25°C			230	mA	
Short Circuit Peak Current	I _{PK}	T _j =25°C			2.2	A	

 *V_o: ±1%、±2%

4、TEST CIRCUITS

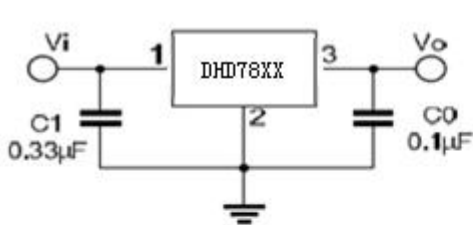


FIG.1 DC PARAMETERS

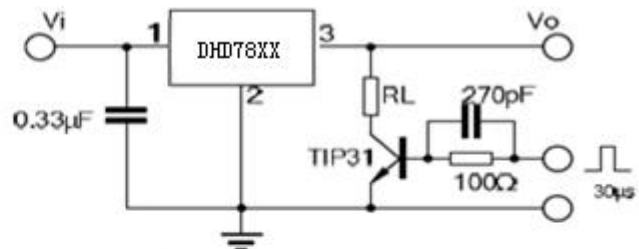


FIG.2 LOAD REGULATION

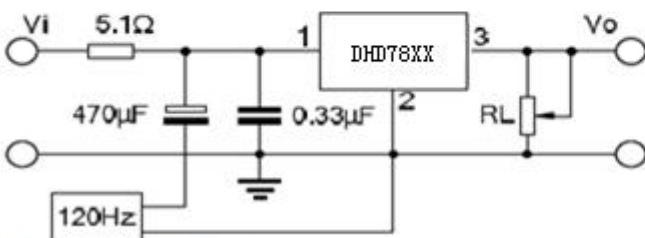


FIG.3 RIPPLE REJECTION

5. Application Circuits

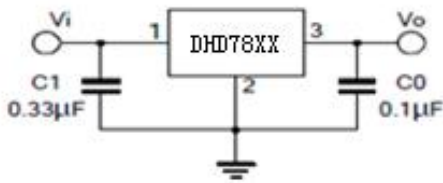


Fig.4 Fixed output regulator

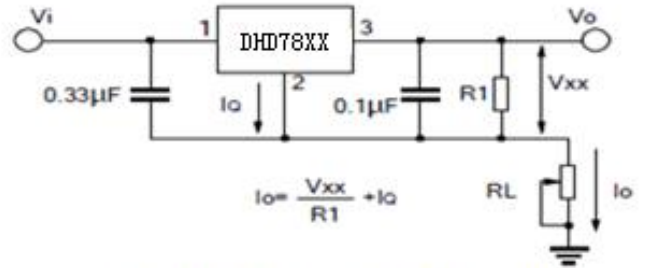


Fig.5 Constant current regulator

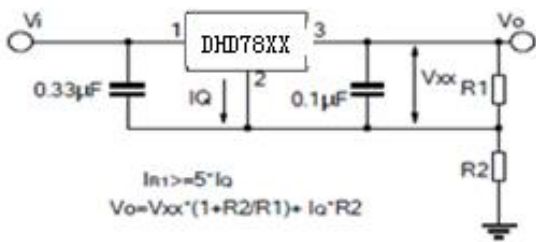


Fig.6 Circuit for increasing Regulator output voltage

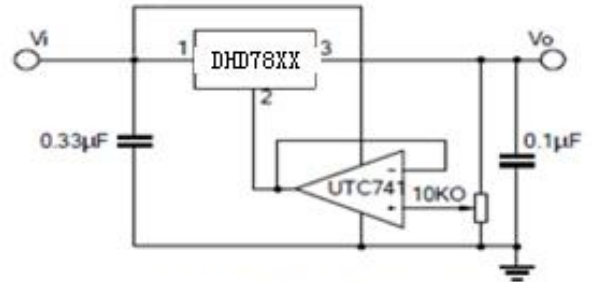


Fig.7 Adjustable output

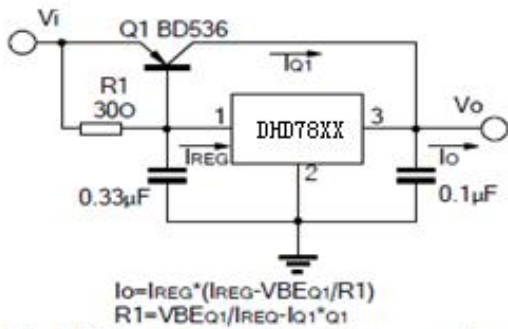


Fig.8 High current with voltage regulator

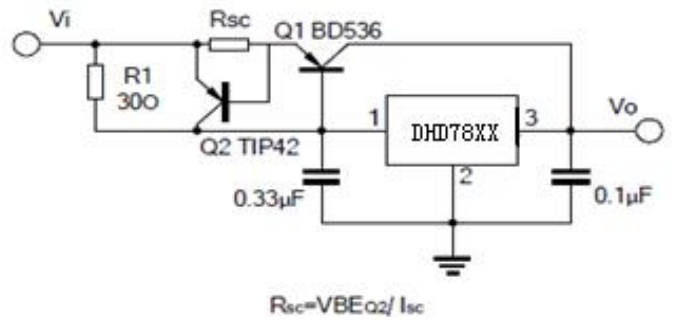


Fig.9 High output current short circuit protection

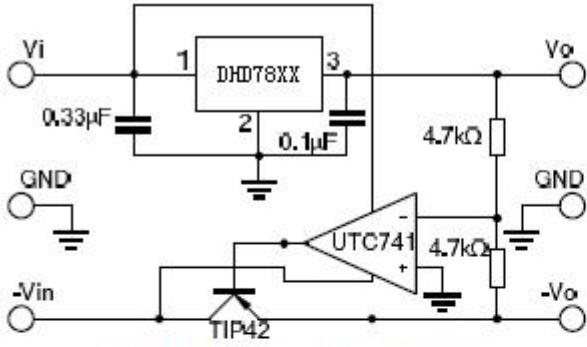


Fig.10 Tracking voltage regulator

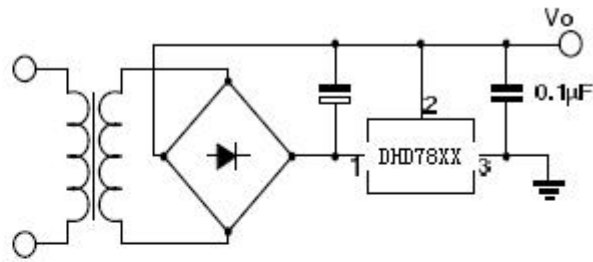


Fig.11 Negative output voltage circuit

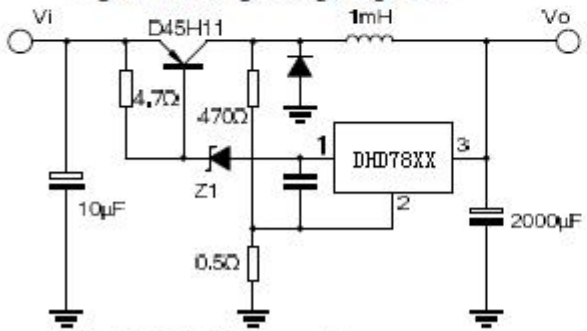


Fig.12 Switching regulator

6. Typical characteristics diagrams

Fig. 1 Quiescent current

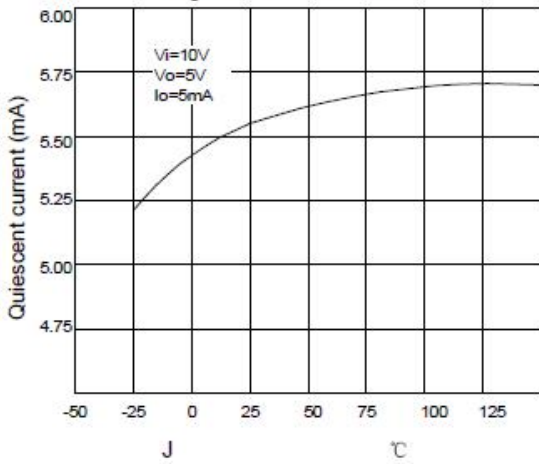


Fig. 2 Output voltage

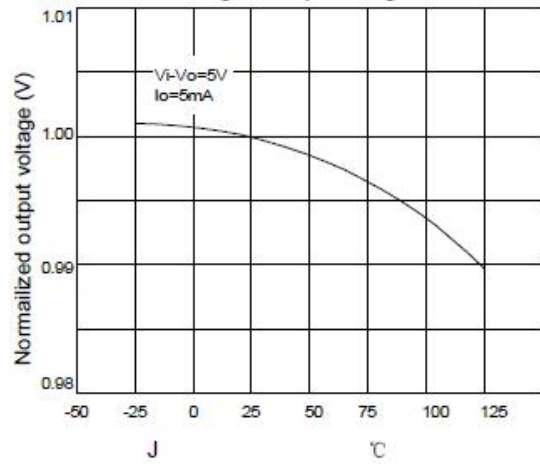


Fig. 3 Peak output current

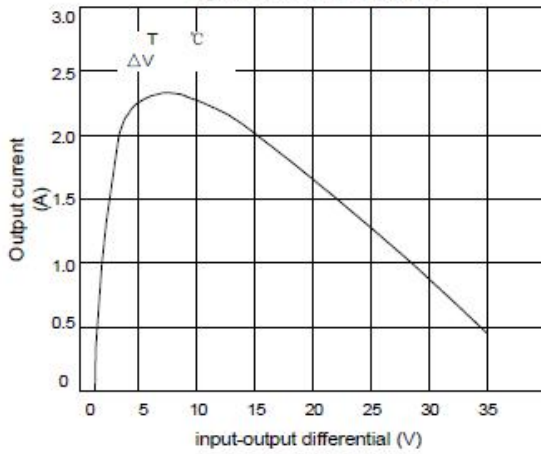
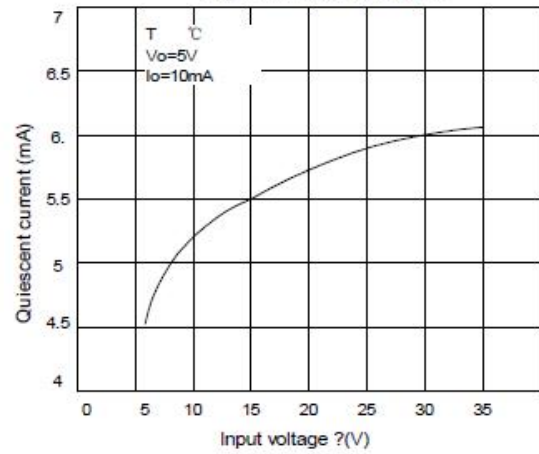


Fig. 4 Quiescent current

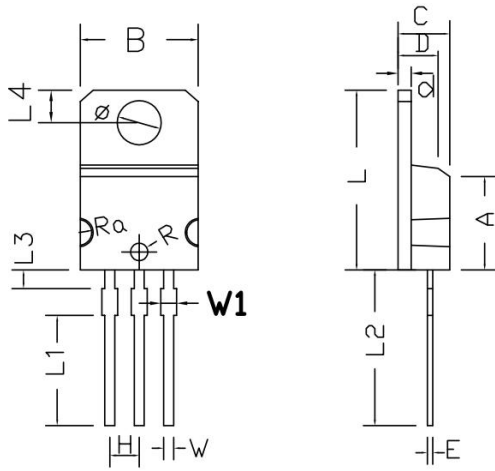


7、 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
LF78XXCV	TO-220F	LF78XXCV	Pb-free	Tube	1000/box
L78XXCV	TO-220	L78XXCV	Pb-free	Tube	1000/box

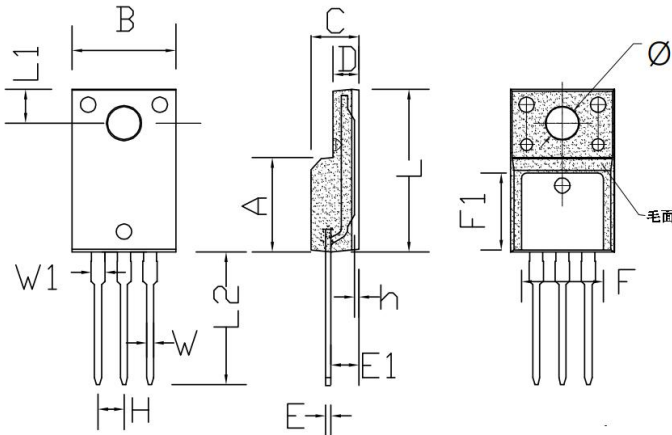
8、 Dimensions

TO-220M PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
	MIN	MAX	MIN	MAX
A	7.55	8.05	0.297	0.317
B	9.85	10.25	0.388	0.404
C	4.20	4.80	0.165	0.189
D	3.20	3.60	0.126	0.142
E	0.42	0.47	0.017	0.019
L	15.20	15.60	0.598	0.614
H	2.52	2.56	0.099	0.101
W	0.78	0.88	0.031	0.035
Φ	3.60	3.90	0.142	0.154
R	0.72	0.78	0.028	0.031
Ra	9.00	10.5	0.354	0.413
d	1.10	1.40	0.043	0.055
L1	9.3	9.7	0.366	0.382
L2	13.00	13.60	0.512	0.535
L3	1.20	1.70	0.047	0.067
L4	2.60	3.0	0.102	0.118
W1	1.10	1.50	0.043	0.059

TO-220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	10.00	10.50	0.394	0.413
C	4.30	4.90	0.169	0.193
D	2.30	2.70	0.091	0.106
L	15.55	16.15	0.612	0.636
h	0.40	0.60	0.016	0.024
L1	3.15	3.55	0.124	0.140
L2	12.65	13.35	0.498	0.526
W	0.70	0.90	0.028	0.035
W1	1.15	1.55	0.045	0.061
H	2.54 TYP		0.100 TYP	
E	0.48	0.53	0.019	0.021
Φ	2.90	3.40	0.114	0.134
E1	2.40	2.90	0.094	0.114
F	7.75	8.25	0.305	0.325
F1	7.35	7.85	0.289	0.309

9、 Attentions

- Jiangsu Donghai Semiconductor Technology Co., Ltd. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of WXDH products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

11 Appendix

Revision history:

Date	REV.	Description	Page
2017.05.8	1.0	Original	