3A Ultra Low Dropout Linear Regulator

❖ GENERAL DESCRIPTION

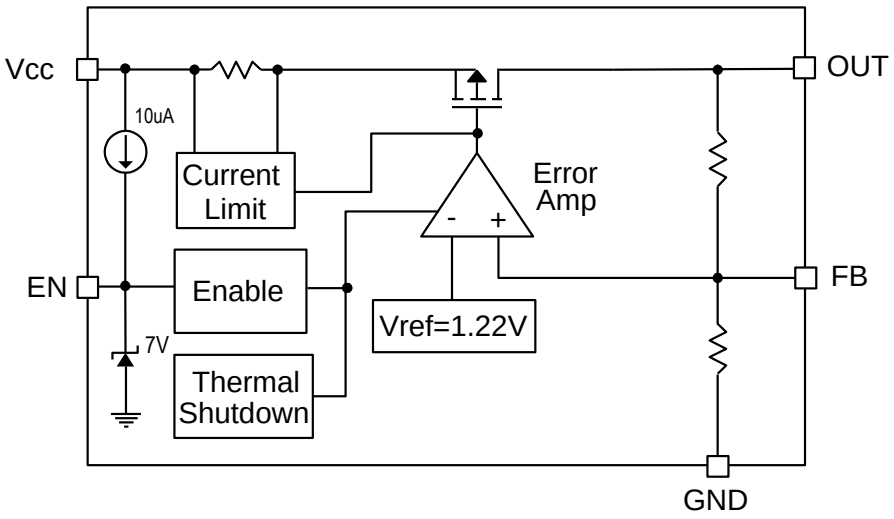
The AX1203 is a low-dropout voltage regulator suitable for various electronic equipments. It provides constant voltage power source. The dropout voltage of AX1203 is below 0.4V in full rated current (3A). This regulator has various functions such as a peak current protection, a thermal shut down, a short circuit protect.

The AX1203 is available in TO220-5L and PDIP-8L power packages which features small size to reduce the junction-to-case resistance, being applicable in 0.5~3W applications.

❖ FEATURES

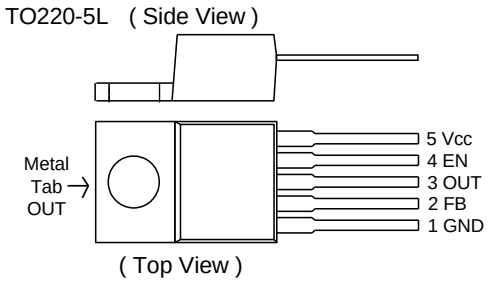
- Ultra Low Dropout - 0.4V(typical) at 3A Output Current
- Adjustable mode: 1.22V Reference Voltage
- Fixed mode:5V, 9V, 12V output voltage
- Operating voltage can be up to 23V.
- Current-Limit and Thermal Shutdown Protection
- Short circuit protection, Enable function.
- Built-in internal SW P-channel MOS
- TO220-5L, TO220-5LR and PDIP-8L Pb-Free Packages.

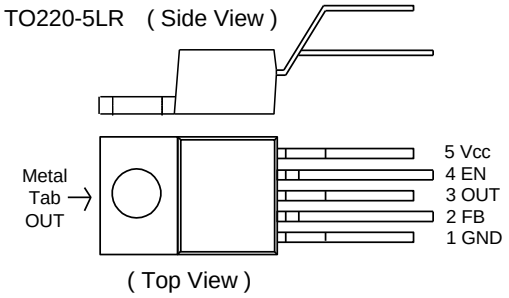
❖ BLOCK DIAGRAM

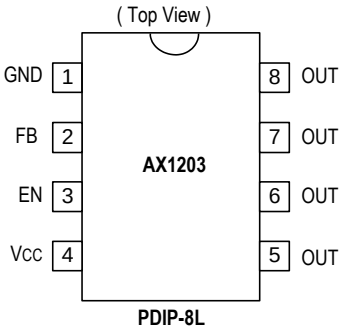


❖ PIN ASSIGNMENT

The packages of AX1203 are TO220-5L, TO220-5LR and PDIP-8L; the pin assignment is given by:







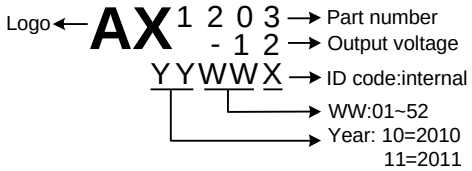
Name	Description
FB	Feedback pin
EN	Enable input, it is pull-high typically. Drive EN high or floating to turn on the regulator, driver it low to turn it off.
V_{CC}	IC power supply pin
OUT	Output Voltage pin
GND	Ground pin

❖ ORDER/MARKING INFORMATION

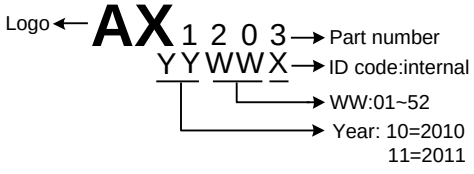
Order Information (FIXED)	Order Information (ADJ)
AX1203 XXX XX X **Package**: N: PDIP-8L; T5 : TO220-5L; T5R: TO220-5LR **Vout**: 50 = 5.0V; 90 = 9.0V; 12 = 12V **Packing**: Blank : Tube; A : Taping	**AX1203NA: PDIP-8L** **AX1203T5: TO220-5L** **AX1203T5R: TO220-5LR**

Top Marking

FIXED Version (V_{OUT}=12V)



ADJ Version



❖ ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristics		Symbol	Rating	Unit
V_{CC} Supply Voltage		V_{CC}	-0.3 to 25	V
EN Pin Voltage		V_{EN}	-0.3 to 7	V
FB Pin Voltage		V_{FB}	-0.3 to Vcc+0.3	V
Output current		I_{OUT}	3.5	A
Power Dissipation		PD	4	W
Storage Temperature Range		T_{ST}	-65 to +150	°C
Junction Temperature Range		T_J	-40 to 125	°C
Operating Temperature Range		T_{OP}	-40 to +85	°C
Thermal Resistance from Junction to case	TO220-5L/TO2205LR	θ_{JC}	3.5	°C/W
	PDIP-8L		15	
Thermal Resistance from Junction to ambient	TO220-5L/TO2205LR	θ_{JA}	25	°C/W
	PDIP-8L		50	

Note: θ_{JA} is measured with the PCB copper area (need connect to OUT pin) of approximately 1.5 in^2 (Multi-layer).

❖ ELECTRICAL CHARACTERISTICS

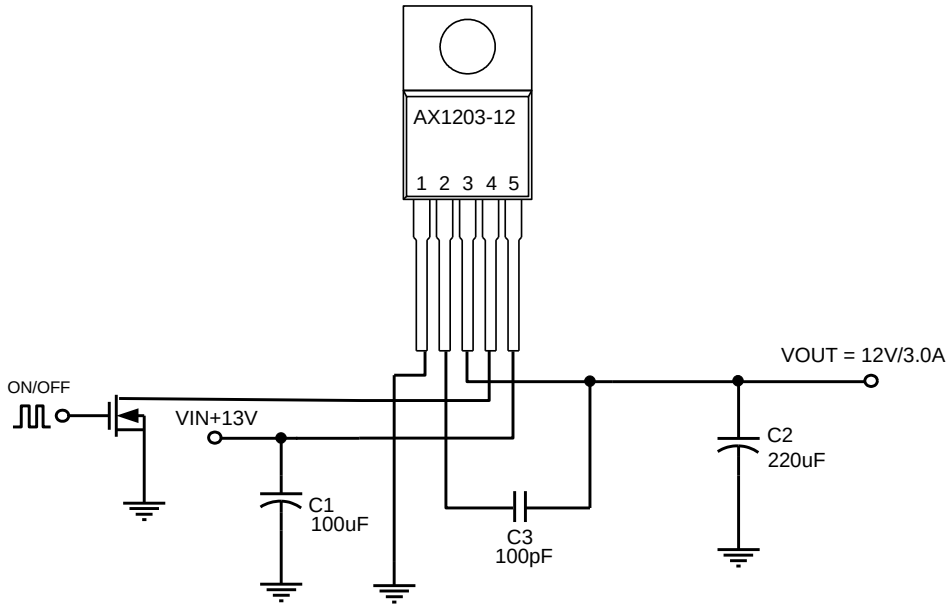
(Unless otherwise specified, T_A=25°C, V_{CC}=12V)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
V_{CC} Supply Voltage	V_{CC}	I_{OUT}=3A	5.1	-	23	V
Feedback Voltage	V_{FB}	I_{OUT}=10mA, V_{CC} =10V	1.196	1.22	1.244	V
Output Voltage	V_{OUT}	I_{OUT}=10mA, V_{CC} =6V	4.90	5.0	5.10	V
		I_{OUT}=10mA, V_{CC} =10V	8.82	9.0	9.18	
		I_{OUT}=10mA, V_{CC} =13V	11.76	12	12.24	
GND Current	I_{GND}	I_{OUT}=0~3A	-	1.2	3	mA
Shutdown Current	I_{SD}	V_{EN} =0V	-	0.15	0.4	mA
Load regulation	V_{Load}	5mA < I_{OUT} < 3A	-	0.5	1.5	%
Line regulation	V_{Line}	I_{OUT}=10mA, V_{OUT}+1.0V<V_{CC}< V_{OUT}+10V	-	0.1	0.5	%
Ripple rejection ratio	PSRR	Note1	-	65	-	dB
Dropout Voltage	V_{DROP}	I_{OUT}=3A, V_{OUT}=5V	-	0.4	0.6	V
		I_{OUT}= 3A , V_{OUT}=9V	-	0.39	0.59	
		I_{OUT}= 3A, V_{OUT}=12V	-	0.27	0.47	
Short circuit protect	I_{SCP}	V_{OUT}<20%	-	0.8	-	A
Current Limit	CL		3.3	-	-	A
EN Pin Logic input threshold voltage	V_{ENH}	High (regulator ON)	2.0	-	-	V
	V_{ENL}	Low (regulator OFF)	-	-	0.8	V
EN Pin Input Current	I_{ENH}	V_{EN}=2.5V (ON)	-	20	-	uA
	I_{ENL}	V_{EN}=0.3V (OFF)	-	-10	-	uA
Internal MOSFET RDSON	R_{DSON}	V_{CC}=5.5V	-	120	150	mΩ
		V_{CC}=12V	-	80	100	
Thermal Shutdown	T_{SD}		-	140	-	°C

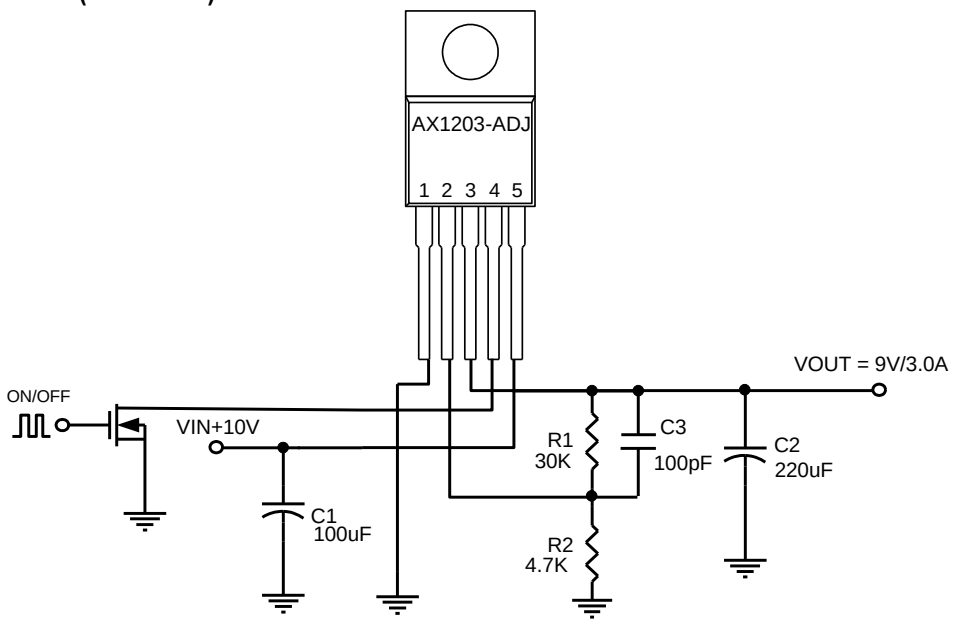
Note: These parameters, although guaranteed, are not 100% tested in production.

❖ APPLICATION CIRCUIT

1. FIXED (TO220-5L)

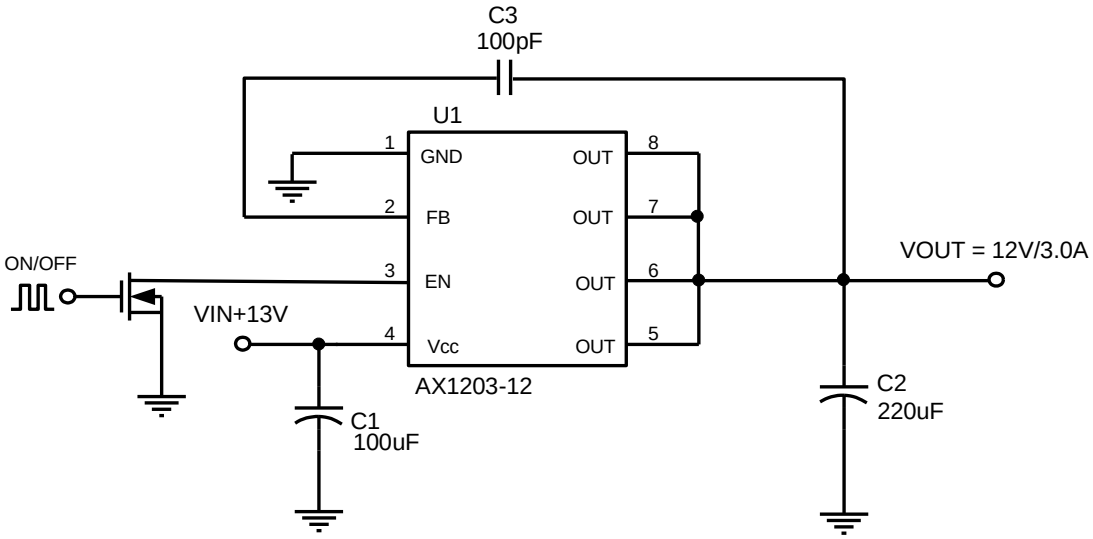


2. ADJ (TO220-5L)

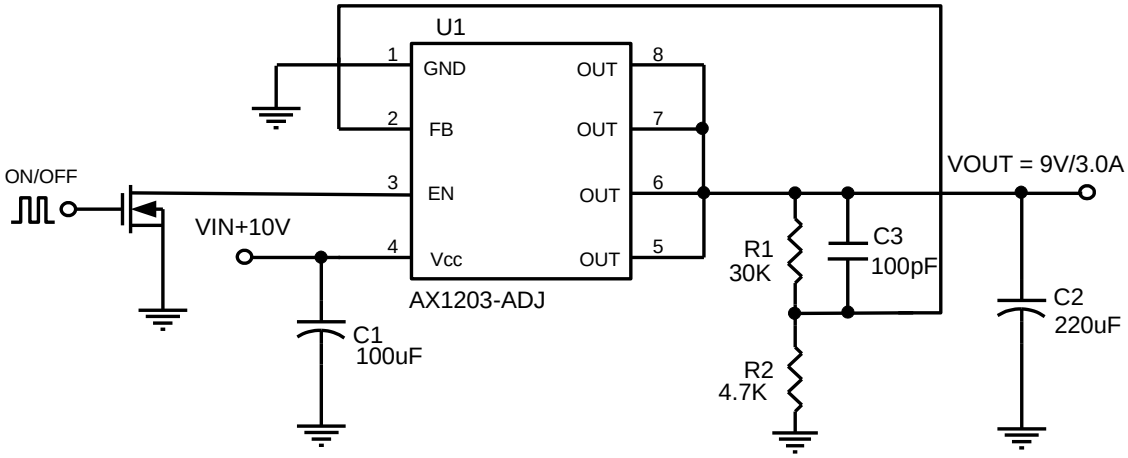


$V_{OUT}=V_{FB}*(1+R1/R2)$
$V_{FB}=1.22V$
R2 suggest 1K ~ 5.6KΩ
C2 Choose Low ESR Capacitor
C3=47pF ~100pF for stability issue

3. FIXED (PDIP-8L)



4. ADJ (PDIP-8L)



$V_{OUT}=V_{FB}*(1+R1/R2)$
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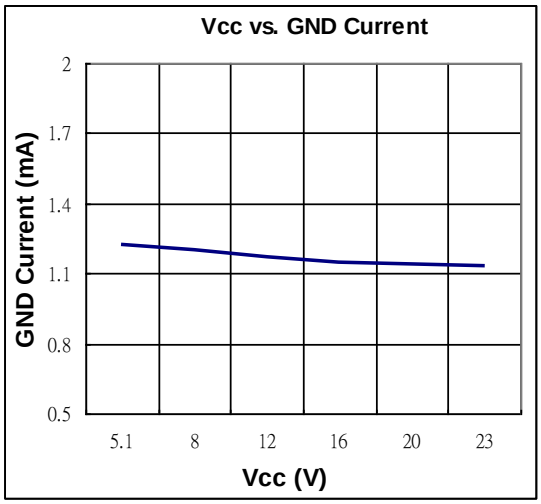
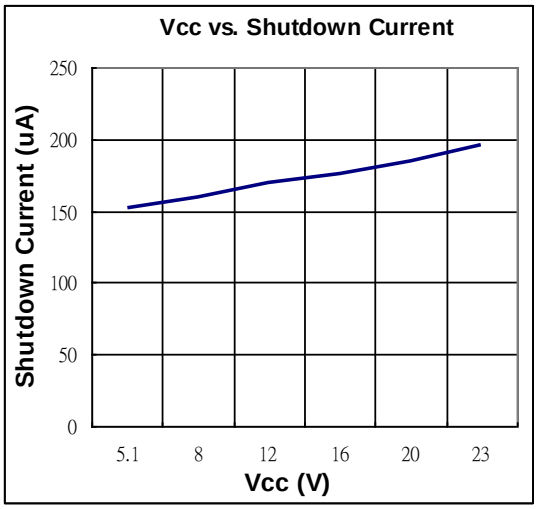
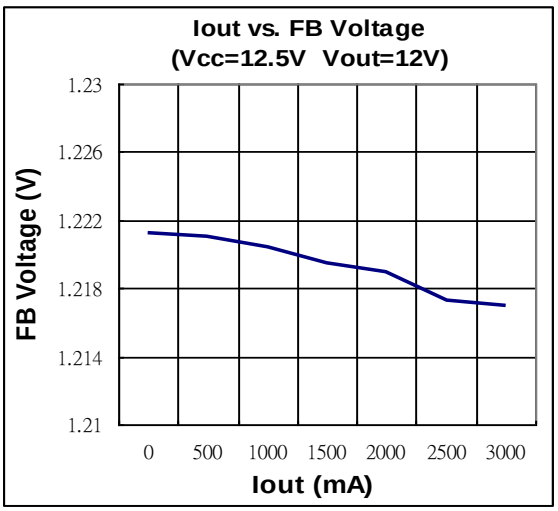
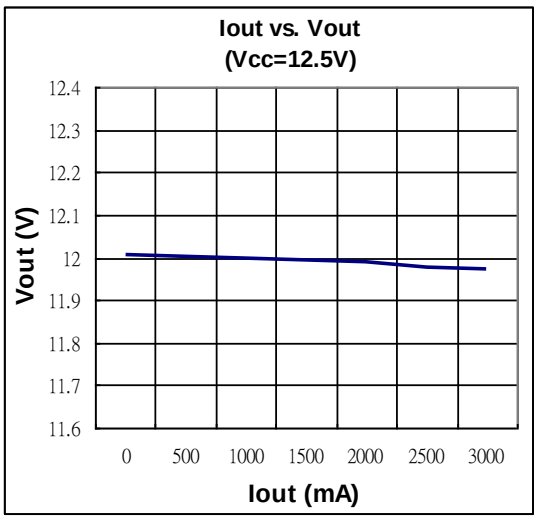
R2 suggest 1K ~ 5.6KΩ
C2 Choose Low ESR Capacitor
C3=47pF ~100pF for stability issue

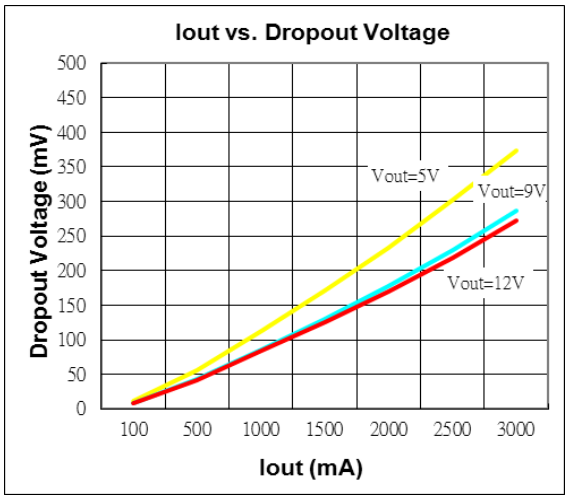
❖ TYPICAL CHARACTERISTICS

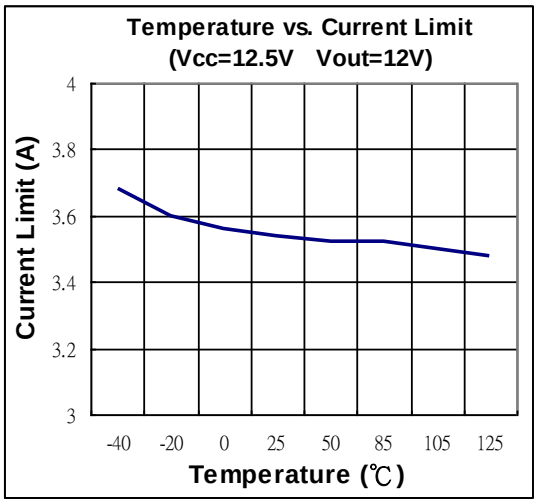




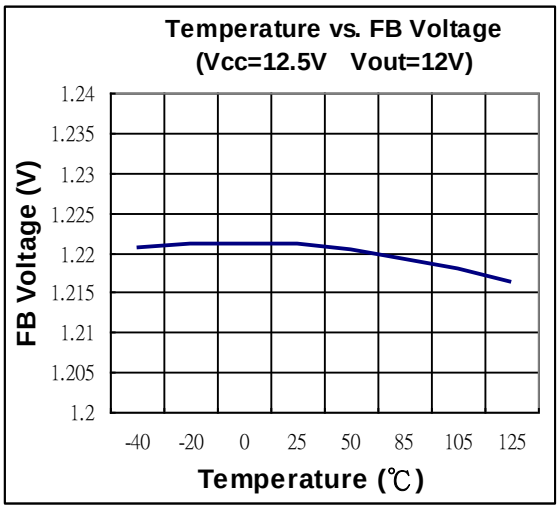


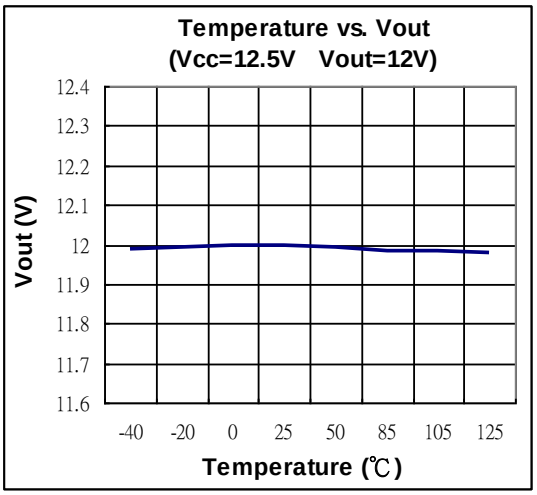


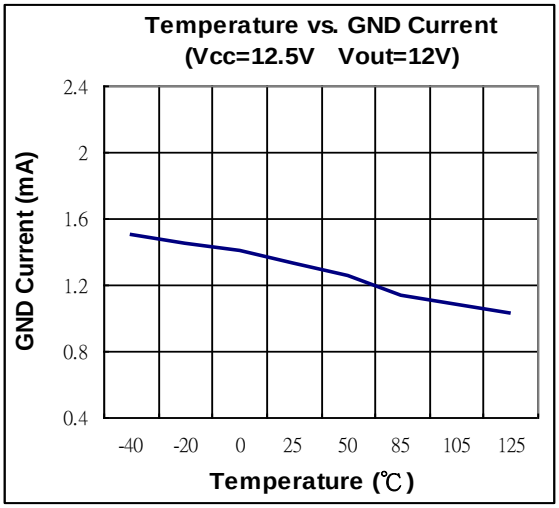


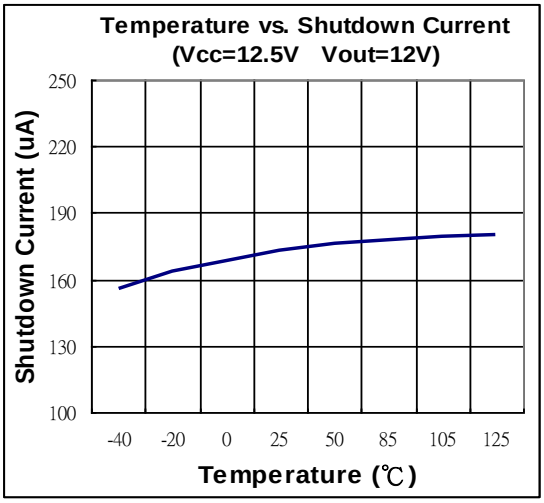


❖ TYPICAL CHARACTERISTICS (CONTINUED)

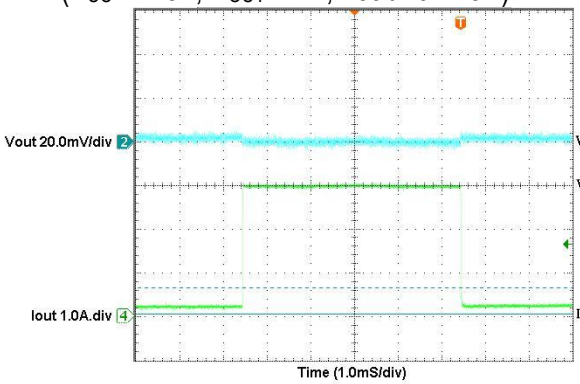




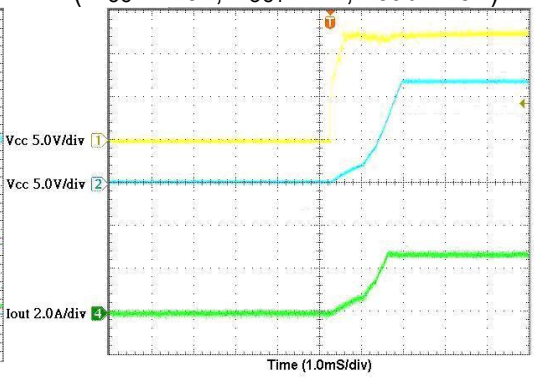




Load Transient
(V_{CC}=12.5V, V_{OUT}=12V, Load=0.1~3A)

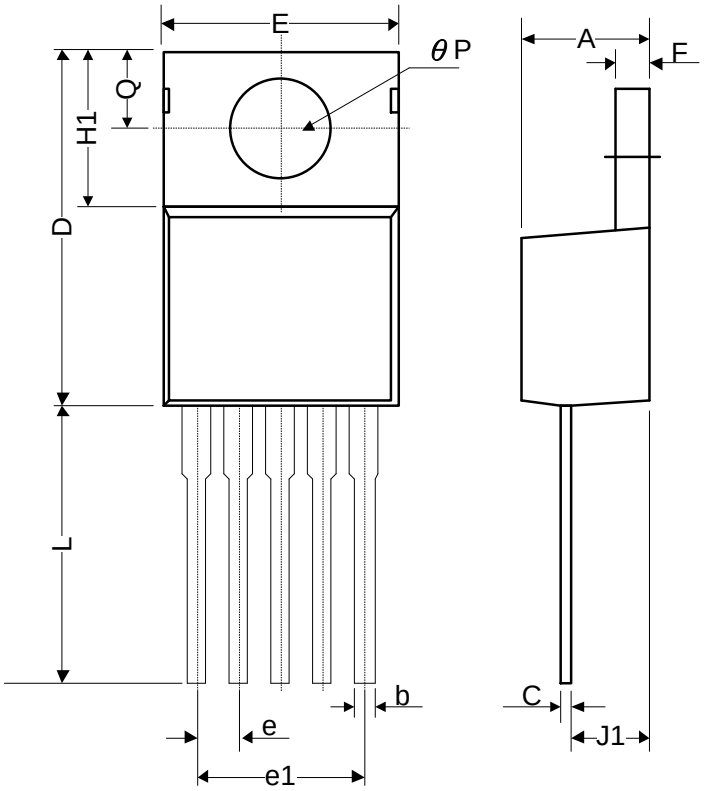


Power-ON
(V_{CC}=12.5V, V_{OUT}=12V, Load=2.5A)



❖ PACKAGE OUTLINES

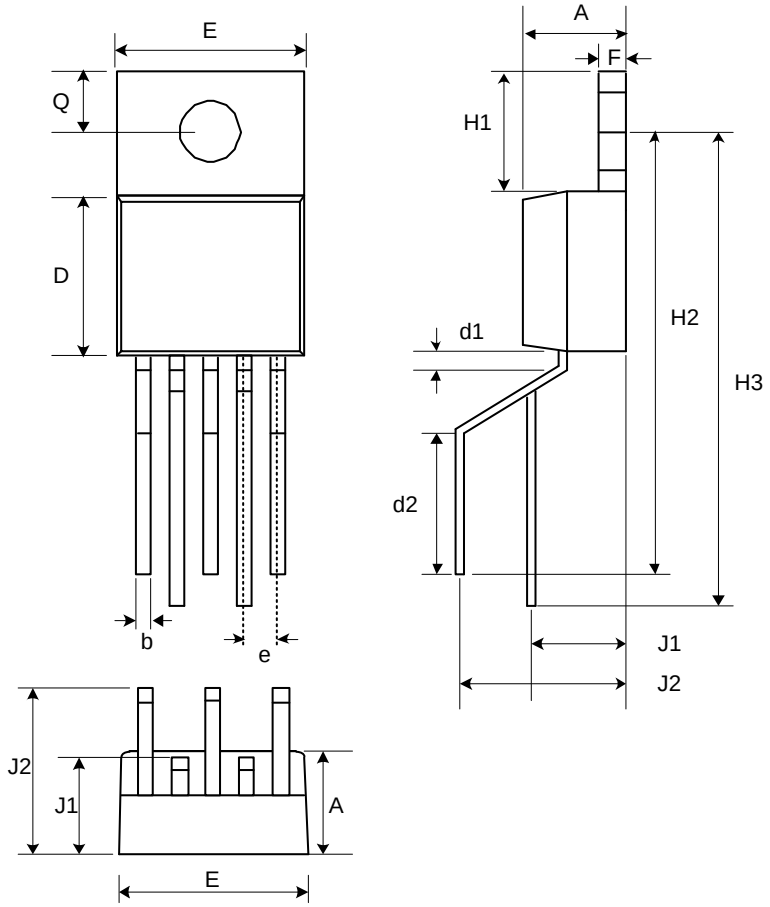
(1) TO220-5L



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.07	4.45	4.82	0.16	0.175	0.19
b	0.76	0.89	1.02	0.03	0.035	0.04
C	0.36	0.5	0.64	0.014	0.02	0.025
D	14.22	14.86	15.5	0.56	0.585	0.61
E	9.78	10.16	10.54	0.385	0.4	0.415
e	1.57	1.71	1.85	0.062	0.067	0.073
e1	6.68	6.81	6.93	0.263	0.268	0.273
F	1.14	1.3	1.45	0.045	0.051	0.057
H1	5.46	6.16	6.86	0.215	0.243	0.27
J1	2.29	2.74	3.18	0.09	0.108	0.125
L	13.21	13.97	14.73	0.52	0.55	0.58
θP	3.68	3.81	3.96	0.145	0.15	0.156
Q	2.54	2.73	2.92	0.1	0.107	0.115

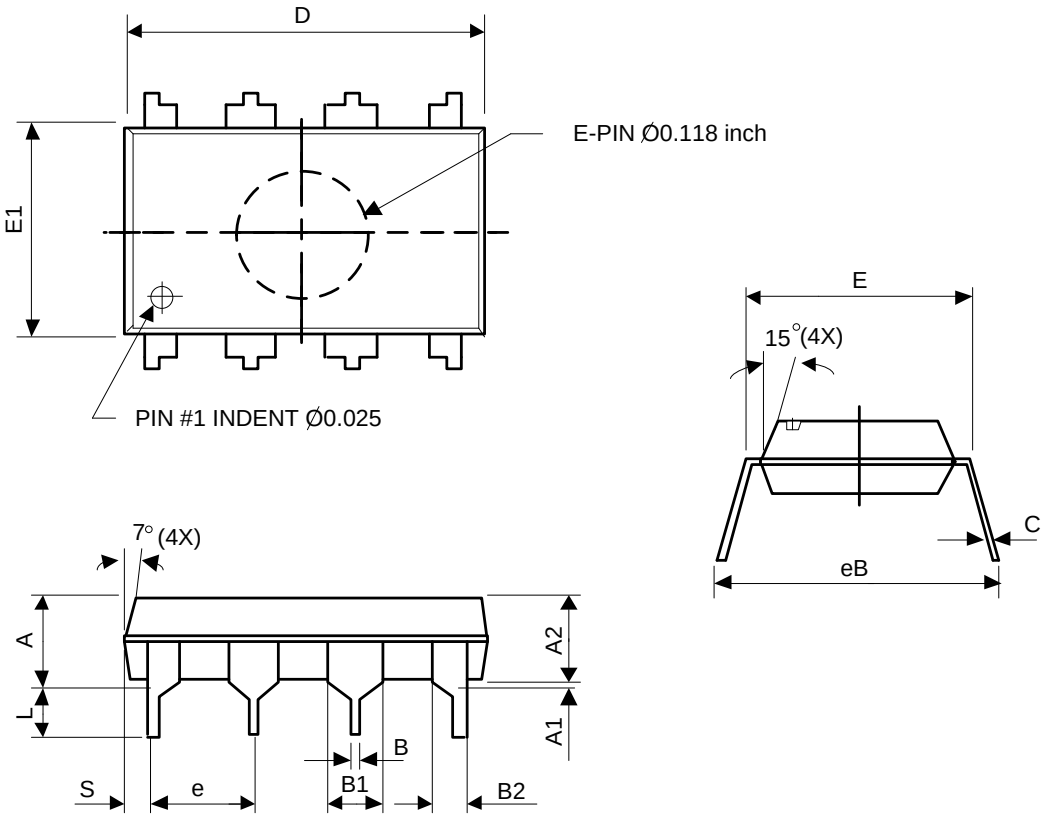
Mold flash shall not exceed 0.005inch per side
JEDEC outline: NA

(2) TO220-5LR



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.4	4.6	4.7	0.175	0.18	0.185
b	0.7	0.8	0.9	0.027	0.032	0.037
D	8.4	8.7	8.9	0.33	0.34	0.35
d1		1			0.039	
d2		6.3			0.248	
E	9.91	10.16	10.41	0.39	0.4	0.41
e	1.6	1.7	1.8	0.062	0.067	0.072
F	1.2	1.25	1.3	0.048	0.05	0.052
H1		6.4			0.25	
H2	20.8	21.6	22.4	0.82	0.85	0.88
H3	23.9	24.7	25.5	0.942	0.972	1.002
J1	3.7	4.5	5.3	0.147	0.177	0.207
J2		8.4			0.331	
Q	2.5	2.8	3	0.1	0.11	0.12

(3) PDIP-8L



Symbol	Dimensions in millimeters			Dimensions in inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	5.33	-	-	0.21
A1	0.38			0.015	-	-
A2	2.92	3.3	4.95	0.115	0.13	0.195
B	0.36	0.46	0.51	0.014	0.018	0.02
B1	1.14	1.52	1.78	0.045	0.06	0.07
B2	0.76	0.99	1.14	0.03	0.039	0.045
C	0.2	0.25	0.36	0.008	0.01	0.014
D	9.02	9.27	10.16	0.355	0.365	0.4
E	7.62	7.87	8.26	0.3	0.31	0.325
E1	6.1	6.35	7.11	0.24	0.25	0.28
e	2.54 BSC			0.100 BSC		
L	2.92	3	3.81	0.115	0.13	0.15
eB	-	-	10.92	-	-	0.43
S	0.13	-	-	0.005	-	-

JEDEC outline: MO-100 BA