AMC DOC. #: AMC7628_A
November 2001

ADD MICROTECH CORP.

AMC7628

300mA LOW DROPOUT REGULATOR

DESCRIPTION

The AMC7628 series is a low dropout regulator rated for 300mA output current. AMC7628-5.0 can regulate with as low as 100mV headroom between the input and output voltages at 150mA output current, thus minimizing power dissipation. In addition, it can be used in applications where worst case supplies require a low Input-Output differential to maintain regulation. The AMC7628-3.3/5.0 is a fixed 3.3V/5.0V output voltage version and these features make it ideal for battery powered applications that require low dropout from supply. A reverse battery protection scheme limits the reverse current when the input voltage falls below the output

FEATURES

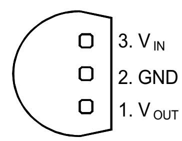
- **1% internally trimmed output**
- **Output current is excess of 300mA**
- **Input-Output differential of typ. 0.3V at 300mA & low quiescent current**
- Reverse battery protection
- Short circuit protection
- Internal thermal overload protection
- Available in 3L plastic TO-92 and surface mount SOT223 packages

APPLICATIONS

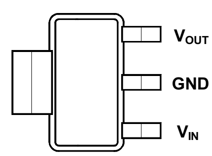
- Computer Monitors
- Battery Powered Circuitry
- Computer Add-On Cards
- USB Power
- DVD Driver
- Digital Camera

AMC7628-3.3 – 3.3V Fixed
AMC7628-5.0 – 5.0V Fixed

PACKAGE PIN OUT



3-Pin Plastic TO-92
(Top View)



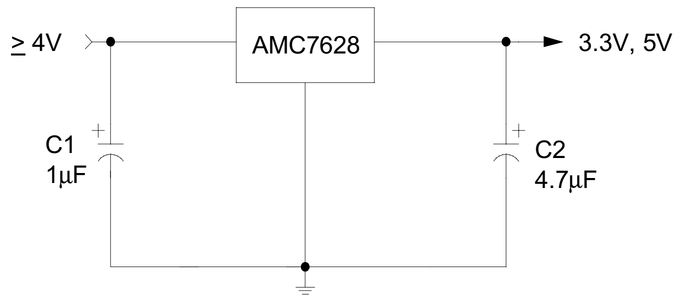
3-Pin Plastic SOT-223
Surface Mount
(Top View)

ORDER INFORMATION

T_A (°C)	**LP** Plastic TO-92 3-pin	**SK** Plastic SOT-223 3-pin
0 to 70	**AMC7628-X.XLP**	**AMC7628-X.XSK**

Note: All surface-mount and TO-92 packages are available in Tape & Reel. Append the letter "T" to part number (i.e. AMC7628-X.XLPT or AMC7628-X.XSKT).

TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS (Note 1)

Input Voltage (V_{IN}) ……..13V
Operating Junction temperature
Plastic (LP, SK Package) ……150 °C
Storage Temperature Range …… -65 °C to 150 °C
Lead temperature (Soldering, 10 seconds) ……....300 °C

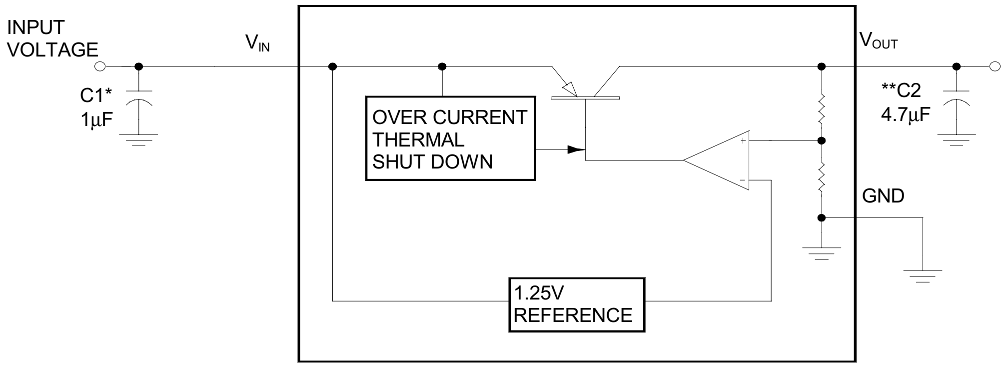
Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

THERMAL DATA

LP PACKAGE:	
Thermal Resistance-Junction to Ambient, θ_{JA}	156 °C/W
SK PACKAGE:	
Thermal Resistance-Junction to Tab, θ_{JT}	15 °C/W
Thermal Resistance-Junction to Ambient, θ_{JA}	136 °C/W

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system.
All of the above assume no ambient airflow.

BLOCK DIAGRAM



* REQUIRED IF REGULATOR IS LOCATED FAR FROM POWER SUPPLY FILTER
** DESIGN C2 AS CLOSE TO V_{OUT} PIN AS POSSIBLE

RECOMMENDED OPERATING CONDITIONS					
Parameter	Symbol	Recommended Operating Conditions			Units
		Min.	Typ.	Max.	
Input Voltage	V_{IN}	4.0		12	V
Load Current (with adequate heatsinking)	I_o	5		300	mA
Input Capacitor (V_{IN} to GND)		0.1			µF
Output Capacitor with ESR of 10Ω max., (V_{OUT} to GND)		4.7			µF
Junction temperature	Tj			125	^oC

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply over the operating ambient temperature of 0^oC to $+70^oC$ for AMC7628; $\mathbf{V_{IN}}$ = 7V, I_O = 100mA, C_{OUT} = 4.7µF, and are for DC characteristics only. (Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

Parameter		Symbol	Test Conditions	AMC7628			Units
				Min.	Typ.	Max.	
Output Voltage	AMC7628-3.3	V_O	I_O = 10mA, T_A = 25 ^oC	3.267	3.3	3.333	V
	AMC7628-5.0			4.950	5.0	5.050	
Line Regulation		ΔV_{OI}	$V_O + 2V \leq V_{IN} \leq 12V$, I_O = 5mA		10	50	mV
Load regulation		ΔV_{OL}	$50mA \leq I_O \leq 300mA$		10	50	mV
Dropout Voltage		ΔV	I_O = 100mA		100	300	mV
			I_O = 300mA		200	400	
Quiescent Current		I_Q	$I_O \leq 5mA$, $4V \leq V_{IN} \leq 12V$		3	10	mA
			I_O = 100mA		6	15	
			I_O = 300mA		20	32	
Current Limit		I_{CL}	V_{IN} = 10V	300	330		mA
Output Noise Voltage (Note 1)		$V_{O\,RMS}$	10HZ – 100kHZ, I_O = 5mA		150		μV_{RMS}
Long Term Stability (Note 1)					20		mV/1000hr
Ripple rejection (Note 1)		R_R	f_O = 120Hz, 1V_{RMS}, I_O = 100mA		66		dB

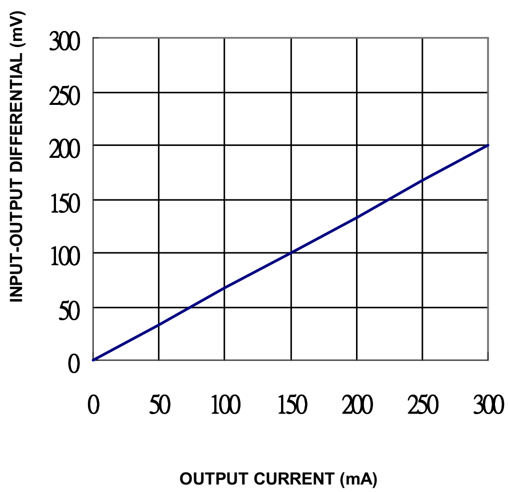
Note 1: These parameters, although guaranteed, are not tested in production.

AMC7628

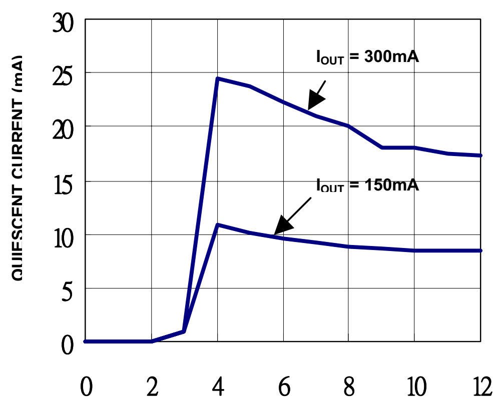
300mA Low Dropout Regulator

CHARACTERISTICS CURVES

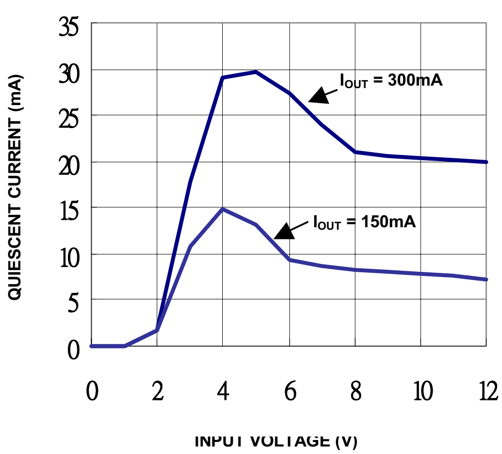
Dropout Voltage (AMC7628-5.0V)



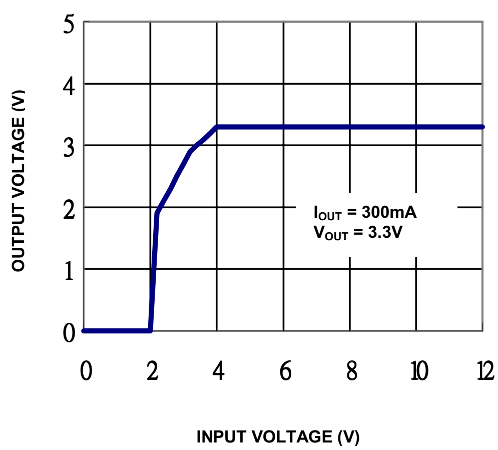
Quiescent Current (AMC7628-3.3)



Quiescent Current (AMC7628-5.0)

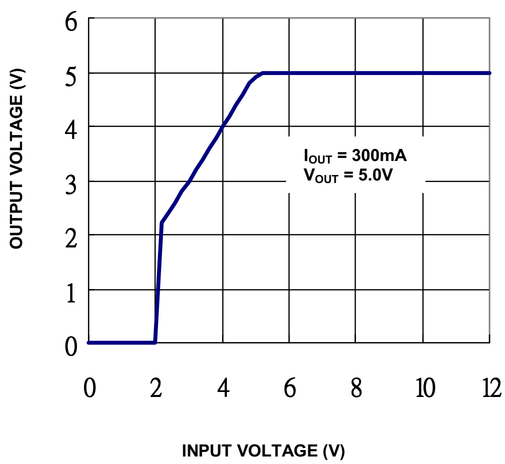


Input Voltage vs. Output Voltage

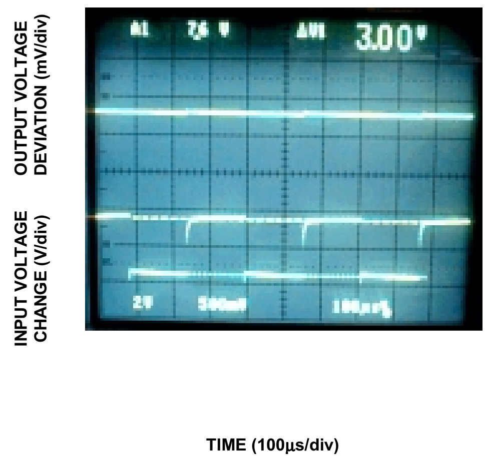


CHARACTERISTICS CURVES

Input Voltage vs. Output voltage



Line Transient Response



Application Note:

Maximum Power Calculation:

$$P_{D(MAX)} = \frac{T_{J(MAX)} - T_{A(MAX)}}{\theta_{JA}}$$

$T_J(^{o}C)$: Maximum recommended junction temperature

$T_A(^{o}C)$: Ambient temperature of the application

$\theta_{JA}(^{o}C/W)$: Junction-to-junction temperature thermal resistance of the package, and other heat dissipating materials.

The maximum power dissipation of a single-output regulator :

$$P_{D(MAX)} = [(V_{IN(MAX)} - V_{OUT(NOM)})] \times I_{OUT(NOM)} + V_{IN(MAX)} \times I_Q$$

Where: $V_{OUT(NOM)}$ = the nominal output voltage
$I_{OUT(NOM)}$ = the nominal output current, and
I_Q = the quiescent current the regulator consumes at $I_{OUT(MAX)}$
$V_{IN(MAX)}$ = the maximum input voltage

Then $\theta_{JA} = (150\,^{o}C - T_A)/P_D$

Thermal consideration:

When power consumption is over about 404 mW (SOT223 package, at T_A=70 ^{o}C), additional heat sink is required to control the junction temperature below 125 ^{o}C.

The junction temperature is: $Tj = P_D\,(\theta_{JT} + \theta_{CS} + \theta_{SA}) + T_A$

P_D ≡ Dissipated power.

θ_{JT} ≡ Thermal resistance from the junction to the mounting tab of the package.

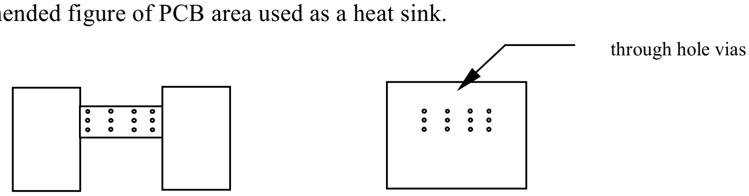
θ_{CS} ≡ Thermal resistance through the interface between the IC and the surface on which it is mounted. (typically, $\theta_{CS} < 1.0°C/W$)

θ_{SA} ≡ Thermal resistance from the mounting surface to ambient (thermal resistance of the heat sink).

If PC Board copper is going to be used as a heat sink, below table can be used to determine the appropriate size of copper foil required. For multi-layered PCB, these layers can also be used as a heat sink. They can be connected with several through hole vias.

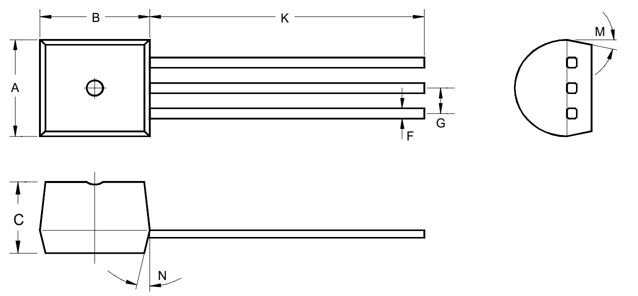
PCB θ_{SA} (^{O}C/W)	59	45	38	33	27	24	21
PCB heat sink size (mm^2)	500	1000	1500	2000	3000	4000	5000

Recommended figure of PCB area used as a heat sink.



(Top View) (Bottom View)

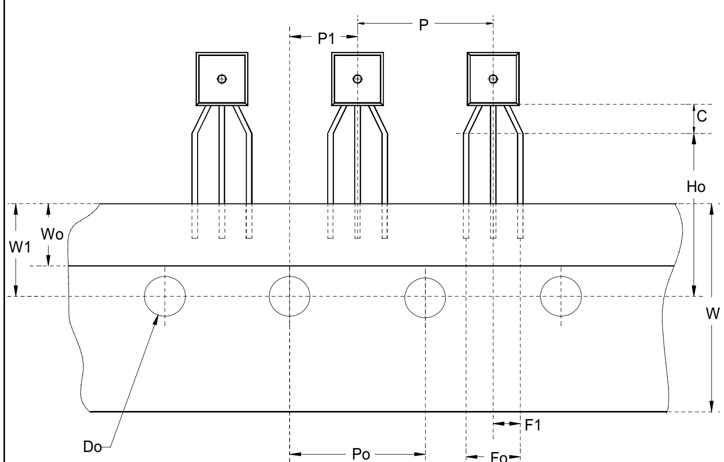
3-Pin Plastic TO-92 (LP)



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.175	0.180	0.205	4.45	4.57	5.21
B	0.170	0.180	0.210	4.32	4.57	5.33
C	0.125	0.142	0.165	3.18	3.62	4.19
F	-	0.015	-	-	0.38	-
G	-	0.050	-	-	1.27	-
J	-	0.150	-	-	3.81	-
K	0.500	0.580	-	12.70	14.73	-
M	-	5º	-	-	5º	-
N	-	5º	-	-	5º	-

Note: For TO-92 in tape and reel, refer to TO-92 package and carrier dimension data for lead dimensions.

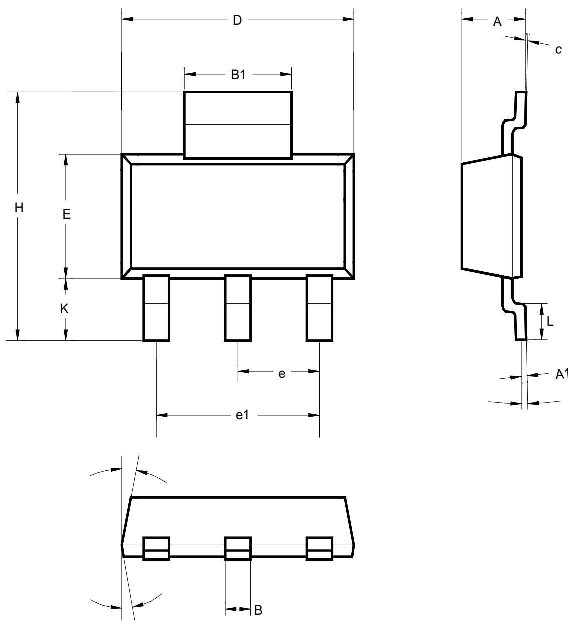
3-Pin Plastic TO-92 Package(Taped and Reeled) Carrier Dimensions



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
C	0.079	-	-	2.00	-	-
P	0.480	0.500	0.520	12.2	12.7	13.2
Po	0.488	0.500	0.512	12.4	12.7	13.0
Do	0.150	0.157	0.165	3.8	4.0	4.2
P1	0.230	0.250	0.256	5.85	6.35	6.85
Fo	0.165	0.197	0.220	4.2	5.0	5.6
W	0.669	0.709	0.748	17.0	18.0	19.0
Ho	0.610	0.630	0.649	15.5	16.0	16.5
Wo	0.224	0.236	0.248	5.7	6.0	6.3
W1	0.335	0.354	0.374	8.5	9.0	9.5

Note: For 3L TO92, 2,000 units per Reel

3-Pin Surface Mount SOT-223 (SK)



	MILLIMETERS		
	MIN	TYP	MAX
A	1.50	1.65	1.80
A1	0.02	0.05	0.08
B	0.60	0.70	0.80
B1	2.90	-	3.15
c	0.28	0.30	0.32
D	6.30	6.50	6.70
E	3.30	3.50	3.70
e	2.3 BSC		
e1	4.6 BSC		
H	6.70	7.00	7.30
L	0.91	1.00	1.10
K	1.50	1.75	2.00
α	0°	5°	10°
β		3°	

IMPORTANT NOTICE

ADD Microtech (ADDM) reserves the right to make changes to its products or to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

A few applications using integrated circuit products may involve potential risks of death, personal injury, or severe property or environmental damage. ADDM integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life-support applications, devices or systems or other critical applications. Use of ADDM products in such applications is understood to be fully at the risk of the customer. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

ADDM assumes to no liability to customer product design or application support. ADDM warrants the performance of its products to the specifications applicable at the time of sale.

U.S.	Asia Pacific region
ADD Microtech Inc.	**ADD Microtech Corp**
492 Altamont Drive	3F, 132, Sec. 4, Chung Hsiao E. Rd.,
Milpitas, CA 95035	Taipei, Taiwan
TEL: (408) 9410420	TEL: 2-27760166
FAX: (408) 9410864	FAX: 2-27764208