A103

600mA CMOS
LOW DROPOUT REGULATOR

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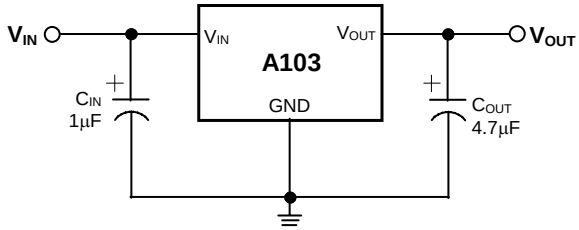
DESCRIPTION

The A103 is a positive, low dropout regulator rated for 600mA output current, making it ideal for battery applications. Low power consumption and high accuracy is achieved through CMOS technology and internal trimmed reference voltage.

The space-saving SOT-89, and SOT-223 packages are attractive for "Pocket" and "Hand Held" applications.

The A103 consists of a high-precision voltage reference, and an error correction circuit. The fast transient response is an outstanding feature for applications with various loads.

TYPICAL APPLICATION CIRCUIT



VOLTAGE OPTIONS

A103LFT-1.5	SOT-223, 1.5V Fixed
A103LFT-1.8	SOT-223, 1.8V Fixed
A103LFT-2.5	SOT-223, 2.5V Fixed
A103LFT-3.3	SOT-223, 3.3V Fixed
A103NFT-1.5	SOT-89, 1.5V Fixed
A103NFT-1.8	SOT-89, 1.8V Fixed
A103NFT-2.5	SOT-89, 2.5V Fixed
A103NFT-3.3	SOT-89, 3.3V Fixed

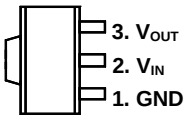
FEATURES

- **±1.5% internally trimmed output.**
- **Guaranteed 600mA Output.**
- **P-MOS output stage with low $R_{DS,\ ON}$.**
- **Internal thermal overload protection.**
- **Enhanced pin-to-pin compatible to the AME8805.**
- **3-Lead SOT-89 and SOT-223 packages.**

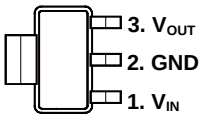
APPLICATIONS

- CD ROM, DVD
- Wireless Communication Systems
- Digital Camera
- Battery Powered Applications
- Instrumentation
- Portable Electronics
- Cordless Phones
- PC Peripherals

PACKAGE PIN OUT



3-Pin Plastic SOT-89
Surface Mount
(Top View)



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

ORDER INFORMATION

	L	Plastic SOT-223 3-pin	N	Plastic SOT-89 3-pin
Lead Free	**A103LFT-X.X**		**A103NFT-X.X**	
Green	**A103LGT-X.X**		**A103NGT-X.X**	

Note: 1. For other output voltage options and pin out, please consult sales or FAEs.

2: **Part Number**: **A103** □ □ □ – □.□

Package Type. PK: SOT-89; SK: SOT-223 → Voltage Options

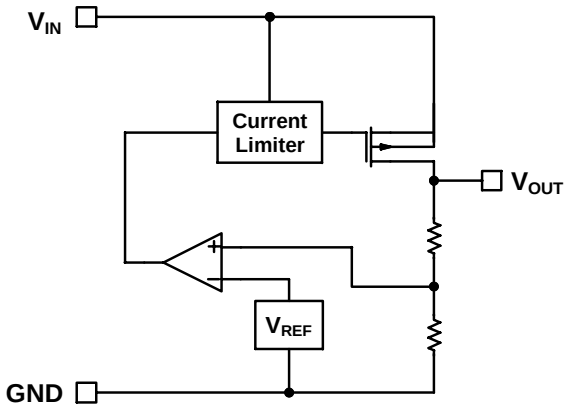
Package Process. F: Lead Free; G: Green → Packing. T: Tape & Reel; N/A: Bulk

ABSOLUTE MAXIMUM RATINGS (Note)

Input Voltage, V_{IN}	13V
Maximum Operating Junction Temperature, T_J	150°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (soldering, 10 seconds)	260°C

Note: 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.

BLOCK DIAGRAM



POWER DISSIPATION TABLE

Package Types	SOT-223	SOT-89
Thermal Resistance from Junction to Ambient, θ_{JA}, (°C/ W)	116	173
Thermal Resistance from Junction to Tab, θ_{JT}, (°C/ W)	21	25

Note: $T_J = T_A + (P_D \times \theta_{JA})$
P_D: Power dissipation.
θ_{JA}: Thermal resistance from Junction to Ambient.

For SOT-89 package, $\theta_{JT} = 25$°C / W.
$T_J = T_{TAB} + (P_D \times \theta_{JT})$
T_{TAB}: Tab temperature.
θ_{JT}: Thermal resistance from junction to tab of the package.

The θ_{JA} numbers are guidelines for the thermal performance of the device/PC-board system.
All of the above assume no ambient airflow.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Voltage	V_{IN}	3.0		10	V
Load Current (with adequate heat sinking)	I_o	5	300	600	mA
Input Capacitor (V_{IN} to GND)		0.1			µF
Output Capacitor with ESR of 10Ω max., (V_{OUT} to GND)		1.0			µF
Operating ambient temperature range	T_A	-40		85	°C
Operating junction temperature	T_J			125	°C

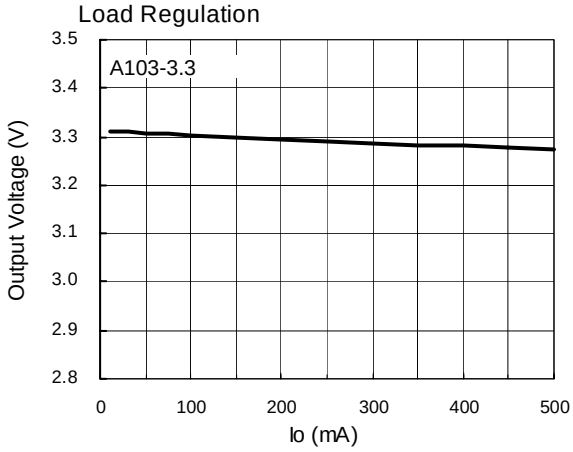
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $V_{IN} = V_{OUT(TYP)} + 1V$, $I_O = 10mA$, $C_{OUT} = 4.7\mu F$, $T_A = 25$ °C. (Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

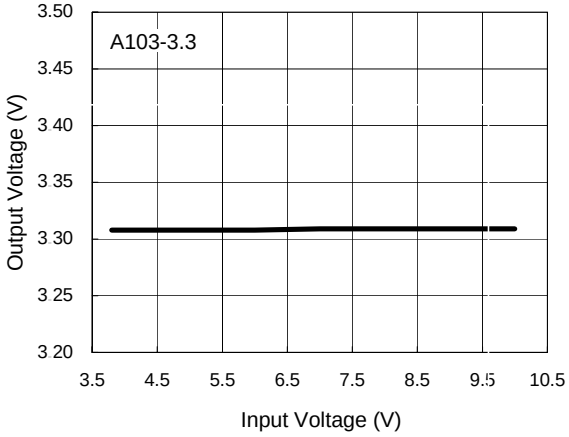
Parameter	Symbol	Test Conditions		Min	Typ	Max	Units
Output Voltage Accuracy	V_O	$I_O = 10mA$		-1.5		+1.5	%
Line Regulation	ΔV_{OI}	$V_{IN} = (V_{OUT} + 1V)$ to 6V $I_O = 10mA$			0.2	0.4	%/V
Load regulation	ΔV_{OL}	$V_{IN} = 5V$, $10mA \le I_O \le 600mA$			60	120	mV
Dropout Voltage	ΔV	$V_O > 2.5V$	$I_O = 300mA$		300	500	mV
			$I_O = 600mA$		600	900	
		$2.0V < V_O \le 2.5V$	$I_O = 300mA$		450	750	
			$I_O = 600mA$		900	1400	
		$V_O \le 2.0V$	$I_O = 300mA$		600	1000	
			$I_O = 600mA$		1200	1800	
Ground Pin Current	I_Q	$I_O = 10mA \sim 300mA$			8	30	µA
Current Limit	I_{CL}	$V_{IN} = V_{OUT} + 0.5V$		600			mA
Output Voltage Temperature Coefficient		$I_O = 100mA$, $-40^oC \le T_J \le 125^oC$			±100		ppm/°C

CHARACTERISTIC CURVES

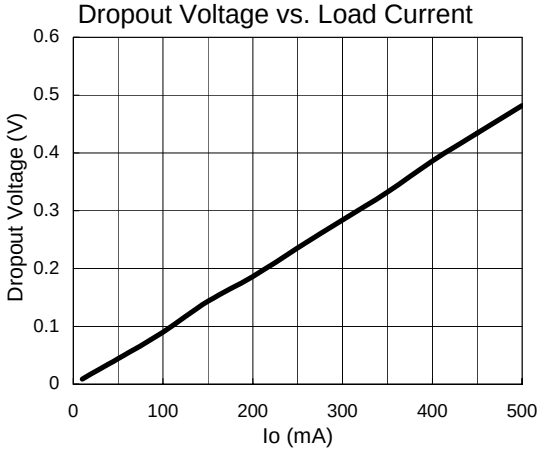
Load Regulation



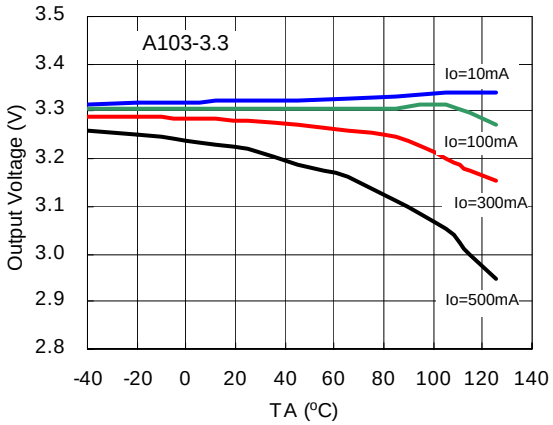
Line Regulation



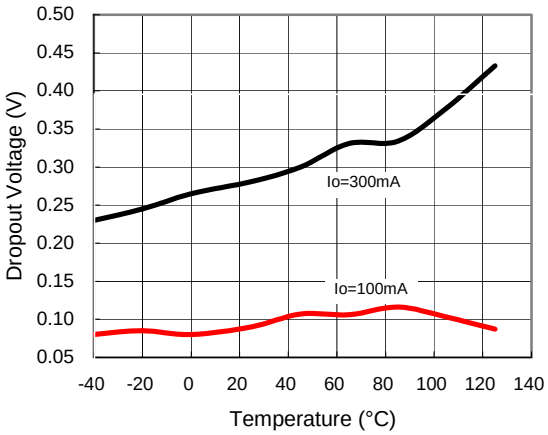
Dropout Voltage vs. Load Current



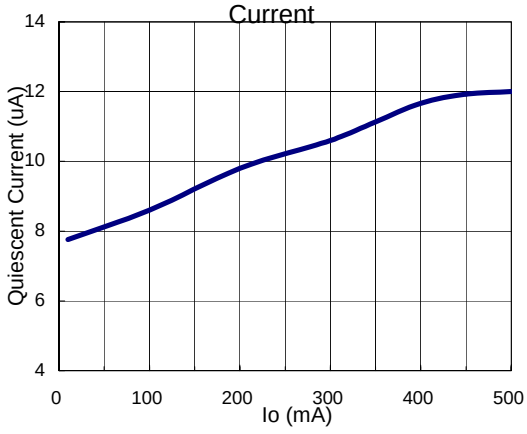
Output Voltage vs. Temperature



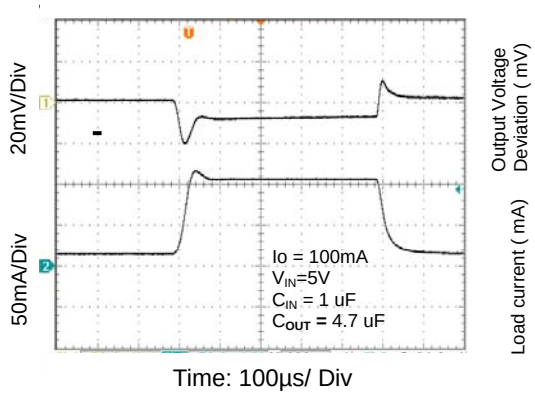
Dropout Voltage vs. Temperature



Quiescent Current vs. Output Current

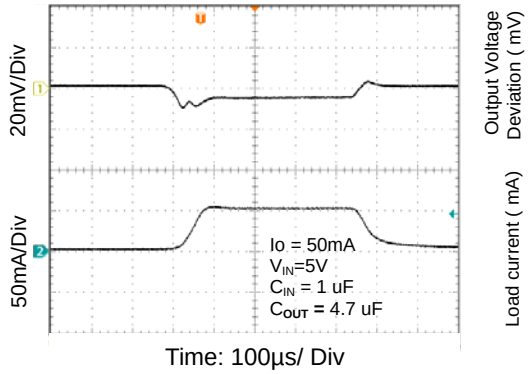


Load Transient Response



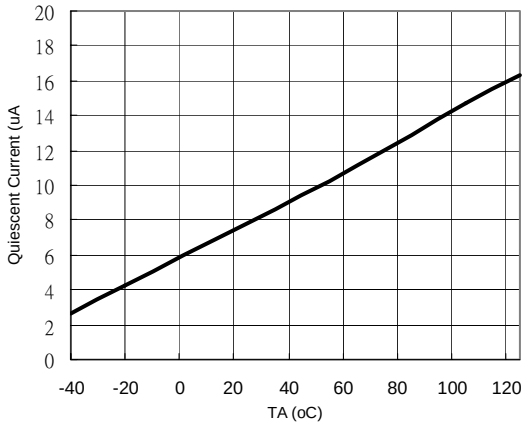
Time: 100µs/ Div

Load Transient Response



Time: 100µs/ Div

Quiescent Current vs. Temperature



APPLICATION INFORMATION

The maximum power dissipation of a single-output regulator

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

$V_{OUT(NOM)}$ = 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

Thermal consideration

The A103 series have internal power and thermal limiting circuitry designed to protect the device under overload conditions. However maximum junction temperature ratings should not be exceeded under continuous normal load conditions. The thermal protection circuit of A103 series will prevent the device from damage due to excessive power dissipation. When the device temperature rises to approximately 150°C, the regulator will be turned off.

When power consumption is over about 318mW (SOT-89 package, at T_A=70°C) or 474mW (SOT-223 package, at T_A=70°C), additional heat sink is required to control the junction temperature below 125°C.

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

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.

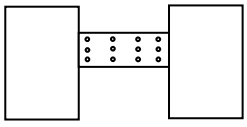
(Typically, θ_{CS} < 1.0°C /W)

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

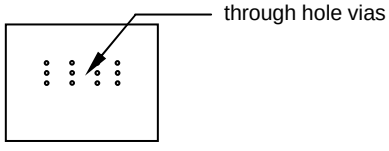
If PC Board copper is going to be used as a heat sink, below table can be used to determine the appropriate size of copper foil required. For multi-layered PCB, these layers can also be used as a heat sink. They can be connected with several through hole vias.

PCB θ_{SA} (°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.



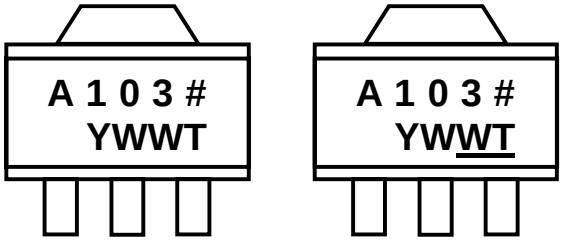
(Top View)



(Bottom View)

PACKAGE

Top Marking for SOT-89



 # : Output Voltage Options

E = 1.5V; H = 1.8V; R = 2.5V; 1 = 3.3V

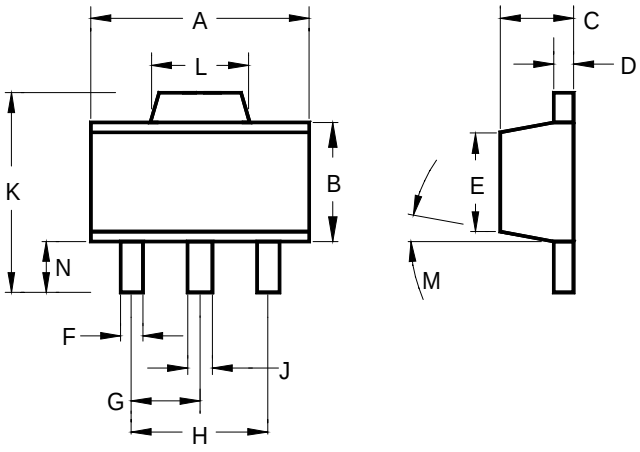
Y : Year Code

WW : Week Code

T : Trace Code

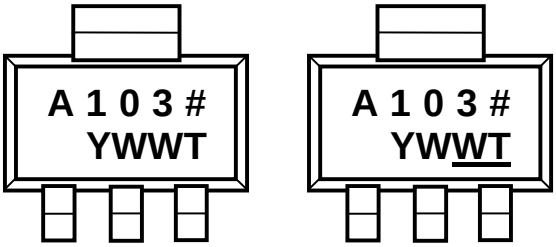
__ : Green Part

3-Pin Surface Mount SOT-89



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.173	-	0.181	4.39	-	4.59
B	0.090	-	0.102	2.28	-	2.59
C	0.055	-	0.063	1.39	-	1.60
D	0.015	-	0.017	0.38	-	0.43
E	0.084	-	0.090	2.13	-	2.28
F	0.016	-	0.019	0.33	-	0.48
G	0.059 BSC			1.49 BSC		
H	0.118 BSC			2.99 BSC		
J	0.018	-	0.022	0.45	-	0.55
K	0.155	-	0.167	3.94	-	4.24
L	0.067	-	0.072	1.70	-	1.82
M	0°	-	8°	0°	-	8°
N	0.035	-	0.047	0.89	-	1.19

Top Marking for SOT-223



 # : Output Voltage Options

E = 1.5V; H = 1.8V; R = 2.5V; 1 = 3.3V

Y : Year Code

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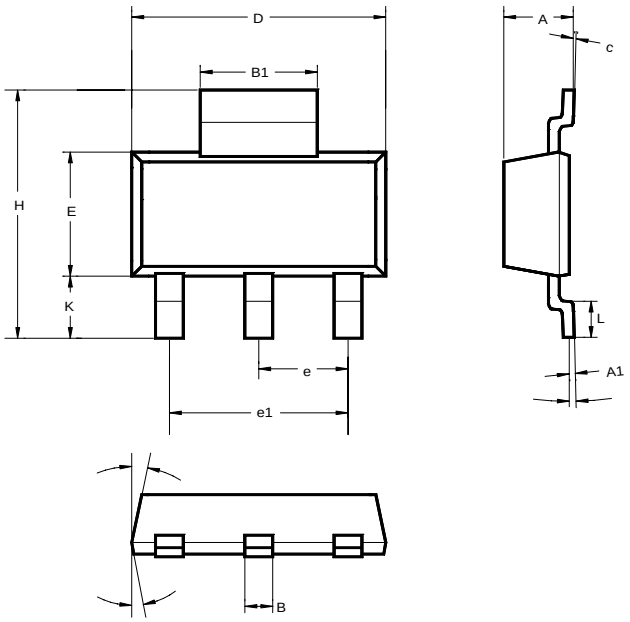
3-Pin Surface Mount SOT-223



	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°	

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