

## 450mA LOW DROP OUT REGULATOR

### DESCRIPTION

The AMC7638 series is a low dropout regulator rated for 450mA output current. Low power consumption and high accuracy is achieved through CMOS technology and internal trimmed reference voltage.

The AMC7638 series consists of a high-precision voltage reference, error correction circuit, and a current limit output driver. The fast transient response is an outstanding feature for applications with various loads

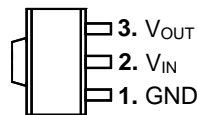
### FEATURES

- **2% internally trimmed output**
- **Input-Output differential of typ. 360mV at 300mA & low quiescent current of 10 $\mu$ A in typical**
- **P-MOS output stage with low  $R_{DS, ON}$**
- **Short circuit protection**
- **Internal thermal overload protection**
- **Enhanced pin-to-pin compatible to the XC62FP series, RT9261/A.**
- **3-Lead SOT-89 and SOT-223 packages.**
- **Lead (Pb) free process**

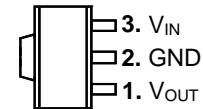
### APPLICATIONS

- CD ROM, DVD
- Wireless Communication Systems
- Digital Camera
- Battery Powered Applications

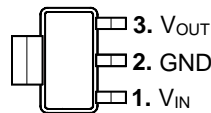
### PACKAGE PIN OUT



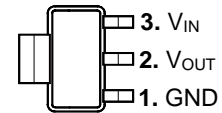
**AMC76381-X.XPKF**  
3-Pin Plastic SOT-89  
Surface Mount  
(Top View)



**AMC76382-X.XPKF**  
3-Pin Plastic SOT-89  
Surface Mount  
(Top View)



**AMC76383-X.XSKF**  
3-Pin Plastic SOT-223  
Surface Mount  
(Top View)



**AMC76385-X.XSKF**  
3-Pin Plastic SOT-223  
Surface Mount  
(Top View)

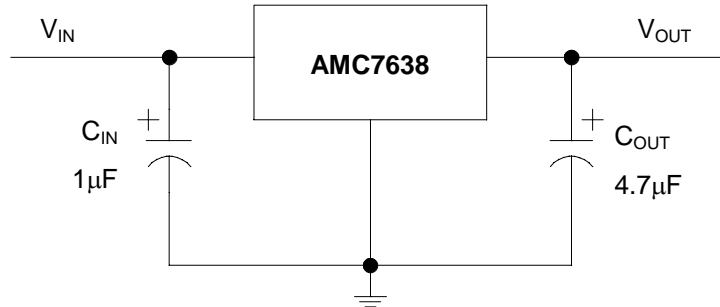
### VOLTAGE OPTIONS

AMC76381-1.5 – 1.5V Fixed  
 AMC76381-1.8 – 1.8V Fixed  
 AMC76381-2.5 – 2.5V Fixed  
 AMC76381-3.3 – 3.3V Fixed  
 AMC76382-1.5 – 1.5V Fixed  
 AMC76382-2.5 – 2.5V Fixed  
 AMC76382-3.3 – 3.3V Fixed  
 AMC76383-1.5 – 1.5V Fixed  
 AMC76383-2.5 – 2.5V Fixed  
 AMC76383-3.3 – 3.3V Fixed  
 AMC76385-2.5 – 2.5V Fixed  
 AMC76385-3.3 – 3.3V Fixed

### ORDER INFORMATION

T <sub>A</sub> (°C)	PK	Plastic SOT-89	SK	Plastic SOT-223
		3-pin		3-pin
-40 to 85		<b>AMC76381-X.XPKF</b>		
		<b>AMC76382-X.XPKF</b>		
			<b>AMC76383-X.XSKF</b>	
			<b>AMC76385-X.XSKF</b>	

Note: 1. All surface-mount packages are available in Tape & Reel.  
 Append the letter "T" to part number (i.e. AMC76381-X.XPKFT, AMC76383-X.XSKFT).  
 2. The letter "F" is marked for Lead Free process.

**TYPICAL APPLICATION**

**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.

**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	500	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

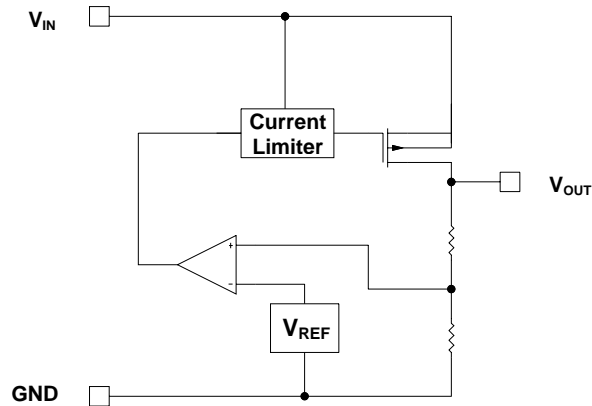
**POWER DISSIPATION TABLE**

Package	$\theta_{JA}$ (°C/W)	Derating factor (mW/°C) $T_A \geq 25^\circ\text{C}$	$T_A \leq 25^\circ\text{C}$ Power rating (mW)	$T_A = 70^\circ\text{C}$ Power rating (mW)	$T_A = 85^\circ\text{C}$ Power rating (mW)
PK	71(Note)	14.1	1763	1128	916

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

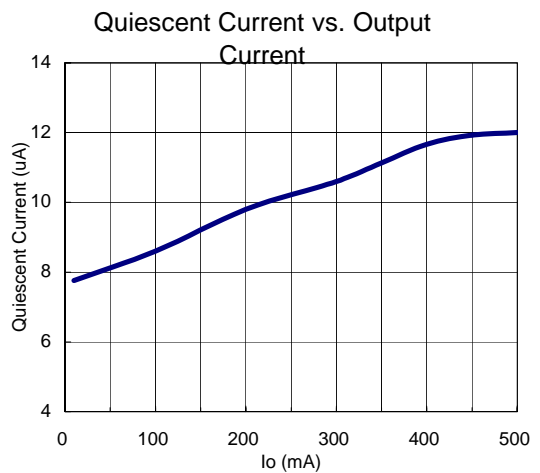
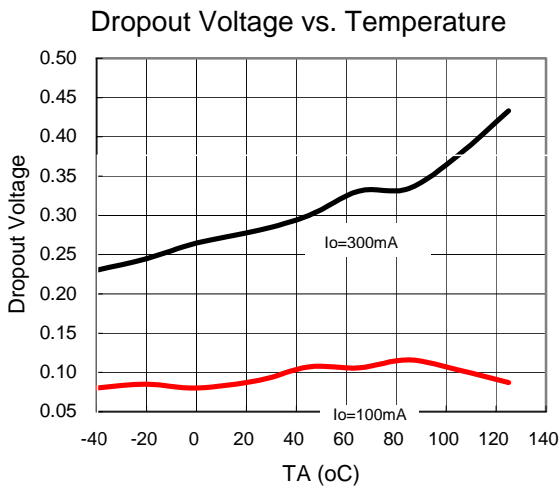
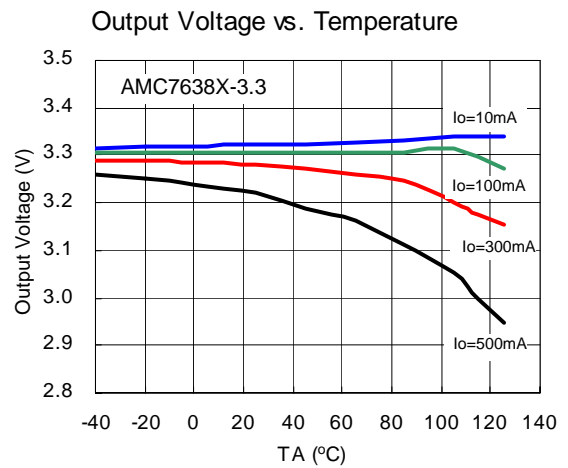
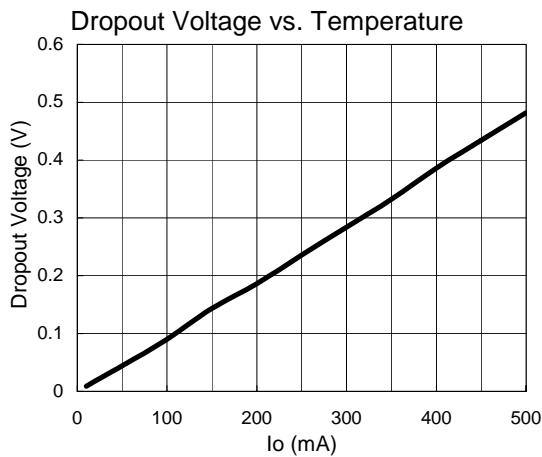
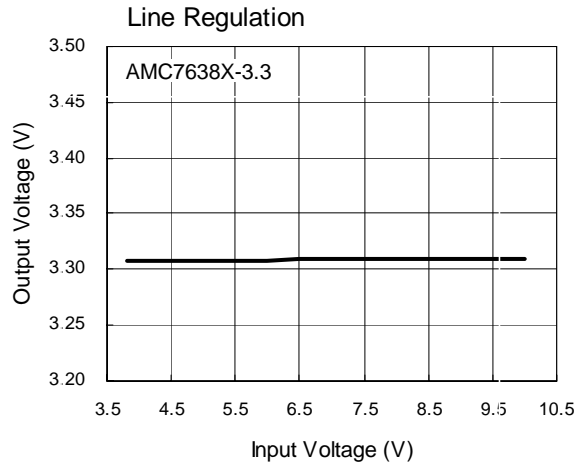
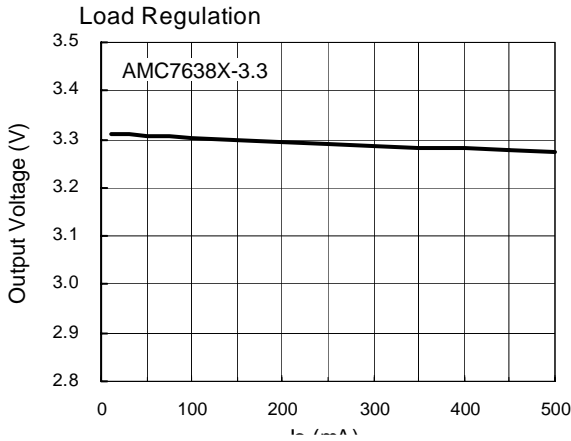
For PK package,  $\theta_{JT} = 35^\circ\text{C/W}$ .  
 $T_J = T_{TAB} + (P_D \times \theta_{JT})$   
 $T_{TAB}$ : Tab temperature.  
 $\theta_{JT}$ : Thermal resistance from junction to tab of the package.

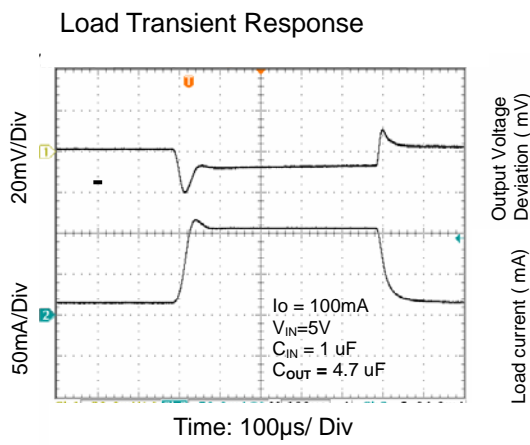
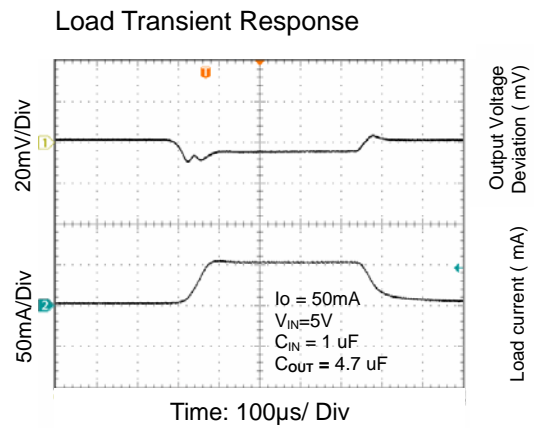
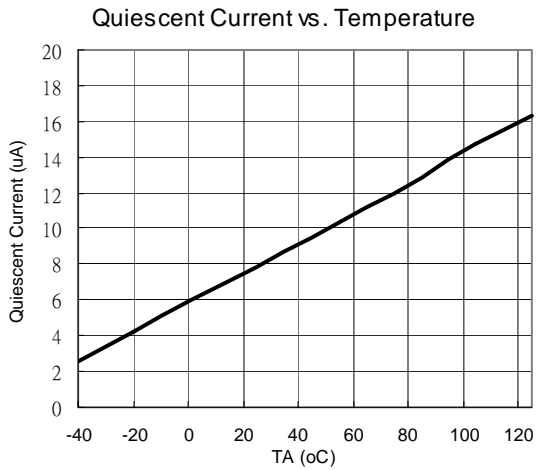
The  $\theta_{JA}$  numbers are guidelines for the thermal performance of the device/PC-board system.  
 All of the above assume no ambient airflow.

**BLOCK DIAGRAM**

**ELECTRICAL CHARACTERISTICS**

Unless otherwise specified,  $V_{IN} = V_{OUT(TYP)} + 1V$ ,  $I_O = 10mA$ ,  $C_{OUT} = 4.7\mu F$ ,  $T_A = 25^\circ C$ . (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	AMC7638X-1.5	$I_O = 10mA$	1.470	1.500	1.530	V	
	AMC7638X-1.8		1.764	1.800	1.836		
	AMC7638X-2.5		2.450	2.500	2.550		
	AMC7638X-3.3		3.234	3.300	3.366		
Line Regulation	$\Delta V_{OI}$	$V_{IN} = (V_{OUT} + 0.5V)$ to 10V		0.2	0.4	%/V	
Load regulation	$\Delta V_{OL}$	$10mA \leq I_O \leq 100mA$		15	30	mV	
		$10mA \leq I_O \leq 300mA$		45	80		
Dropout Voltage	$\Delta V$	$V_O > 2.5V$	$I_O = 100mA$		100	180	mV
			$I_O = 300mA$		300	550	
		$2.0V < V_O \leq 2.5V$	$I_O = 100mA$		150	300	
			$I_O = 300mA$		450	800	
		$V_O \leq 2.0V$	$I_O = 100mA$		200	400	
			$I_O = 300mA$		600	1100	
Ground Pin Current	$I_Q$	$I_O = 10mA \sim 300mA$		8	20	$\mu A$	
Current Limit	$I_{CL}$	$V_{IN} = V_{OUT} + 0.5V$	400			mA	
Output Voltage Temperature Coefficient		$I_O = 100mA$ , $-40^\circ C \leq T_J \leq 125^\circ C$		$\pm 100$		ppm/ $^\circ C$	

**CHARACTERISTIC CURVES**


**CHARACTERIZATION CURVES (Continued)**


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 AMC7638 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 AMC7638 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 775mW (SOT89 package, at  $T_A=70^\circ\text{C}$ ), 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.

$\theta_{JT}$ : Thermal resistance from the junction to the mounting tab of the package.

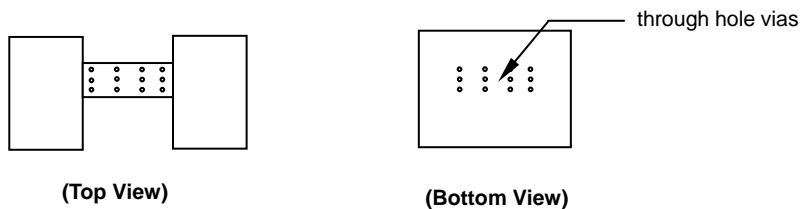
$\theta_{CS}$ : Thermal resistance through the interface between the IC and the surface on which it is mounted.  
 (typically,  $\theta_{CS} < 1.0^\circ\text{C/W}$ )

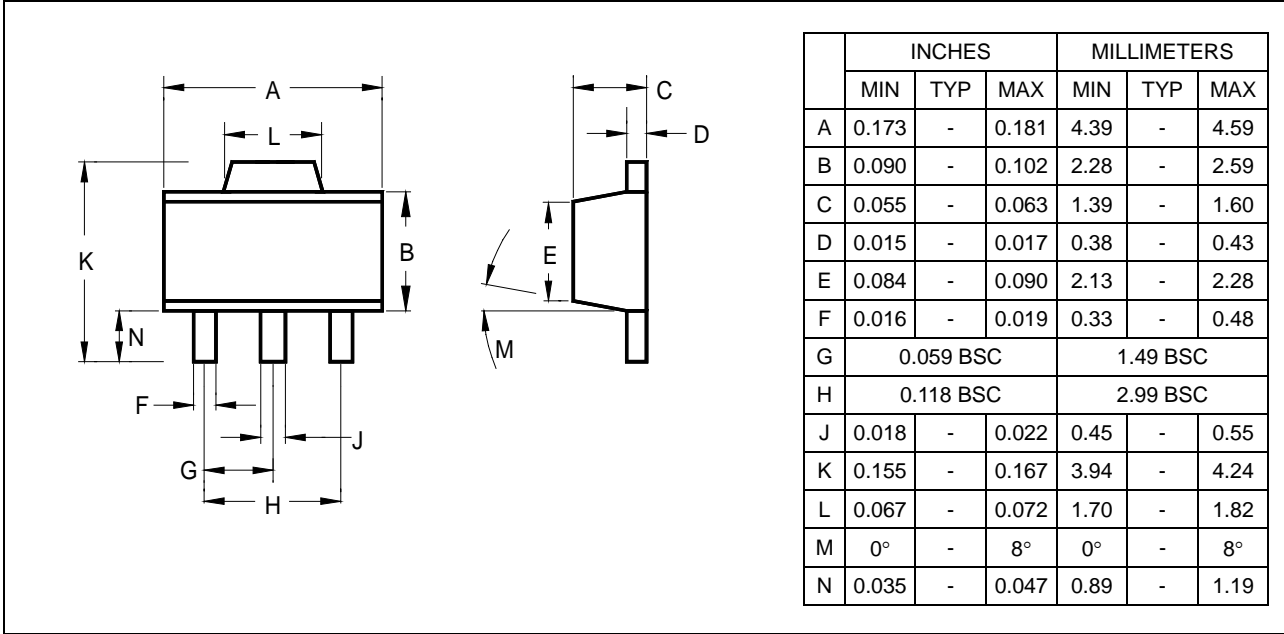
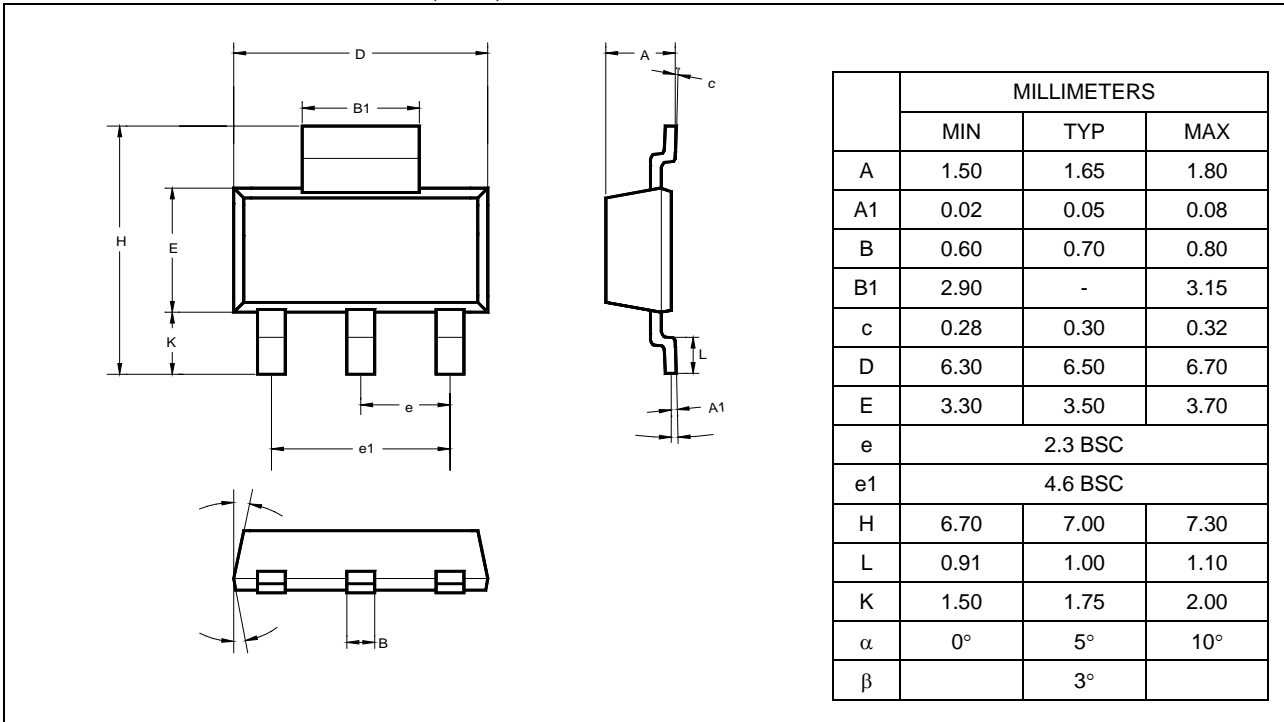
$\theta_{SA}$ : Thermal resistance from the mounting surface to ambient (thermal resistance of the heat sink).

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 $\theta_{SA}(^\circ\text{C/W})$	59	45	38	33	27	24	21
PCB heat sink size (mm <sup>2</sup> )	500	1000	1500	2000	3000	4000	5000

Recommended figure of PCB area used as a heat sink.



**PACKAGE**
**3-Pin Surface Mount SOT-89**

**3-Pin Surface Mount SOT-223 ( SK )**


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