

描述 / Descriptions

BRCO6216ME 是一款 300mA，低压差（LDO）线性稳压器，具有快速瞬态响应和高电源抑制比。它具有高输出精度、低压差和低静态电流以及快速的启动时间。它是基于 CMOS 工艺的。BRCO6216ME 被设计成与低 ESR 瓷片电容一起工作，在电源方案中减少 PCB 的面积占用。仅仅需要一个 1 μ F 的瓷片输出电容就能使器件在整个负载电流（0mA ~ 300mA）范围内保持稳定，BRCO6216ME 的输出电压可以通过外部分压电阻设定。当 FB 引脚连接到外部分压电阻时，其输出可以在 1.2V~5V 之间调整。其他的关键特征还包括过电流保护和过温保护。BRCO6216ME 封装在 SOT23-5 封装中,无卤产品。

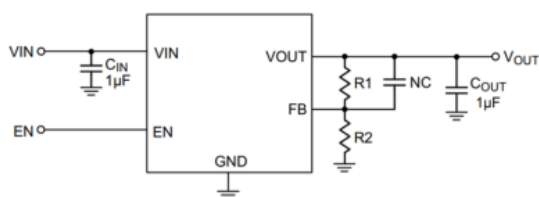
The BRCO6216ME is a 300mA, low-dropout (LDO) linear regulator with fast transient response and high PSRR. It offers high output accuracy, low dropout voltage and low quiescent current as well as fast start-up time. This regulator is based on a CMOS process. The BRCO6216ME is designed to work with low-ESR ceramic capacitors, reducing the amount of the PCB area necessary for power applications. Only a 1 μ F ceramic output capacitor can make the device stable over the whole load range current (0mA to 300mA). The output voltage of BRCO6216ME can be set by an external resistors divider. When the FB pin is connected to an external resistors divider, its output can be adjusted from 1.2V to 5V. Other key features include over-current protection and thermal shutdown. The BRCO6216ME is packaged in SOT23-5 packages. HF Product.

特征 / Features

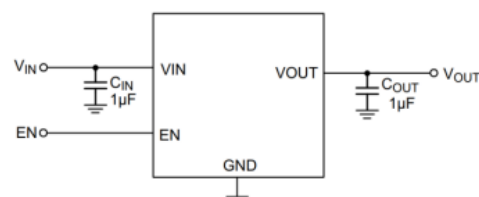
- ◆ 2.5V to 5.5V Input Voltage Range
- ◆ 320mV @300mA Dropout Voltage
- ◆ Excellent Transient Response
- ◆ Stable with 1 μ F Ceramic Output Capacitor
- ◆ 70dB PSRR at 1kHz
- ◆ Low 37 μ A Quiescent Current
- ◆ Low Shutdown Current: <1 μ A
- ◆ Output Accuracy: \pm 2%
- ◆ Current Limit Protection
- ◆ Thermal Shutdown
- ◆ Output Auto-Discharge in Shutdown

用途 / Applications

- ◆ Cellular Phones
- ◆ Bluetooth portable radios and Accessories
- ◆ Battery-Powered Equipment
- ◆ Laptop, Palmtops, Notebook Computer
- ◆ PDAs
- ◆ Digital still Camera and Video Recorders

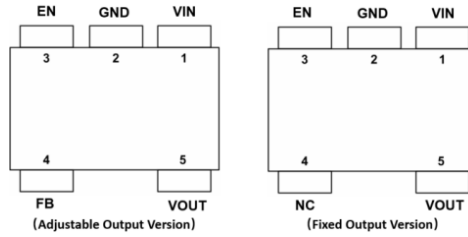
典型应用电路图 / Typical Application

Adjustable output circuit



Fixed output circuit

引脚排列 / Pinning



Pins	Name	Function
1	VIN	Input Supply of the LDO.
2	GND	Signal Ground
3	EN	Enable Pin. Connect this pin to ground or less than 0.4V to disable the device, connect EN to 1.5V or above to enable the device. This pin should not be floated.
4	FB/NC	Feedback Pin for adjustable output version NC for fixed output version
5	VOUT	Output of the LDO

型号 & 印章 / Model Number & Marking

Part Number	Output Voltage(V)	Top Mark
BRCO6216ME-ADJ	ADJ	See Marking Instructions
BRCO6216ME-1.2	1.2	
BRCO6216ME-1.5	1.5	
BRCO6216ME-1.8	1.8	
BRCO6216ME-2.5	2.5	
BRCO6216ME-2.8	2.8	
BRCO6216ME-3.0	3.0	
BRCO6216ME-3.3	3.3	

极限参数 / Absolute Maximum Ratings(Ta=25°C)

参数	符号	数值	单位
VIN, EN Input Voltage Range	V_{IN}, V_{EN}	-0.3 to 6	V
All other pins Voltage Range	V_{PIN}	-0.3 to ($V_{IN}+0.3$)	V
Junction Temperature	T_J	160	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C
Operating Junction Temperature	T_{opr}	-40 to +125	°C
Junction-to-ambient Thermal Resistance	$R_{\theta JA}$	250	°C/W
Lead Temperature Soldering, 10 Sec	T_{sold}	260	°C
Human Body Model for all pins	V_{ESD}	±2000	V

电性能参数 / Electrical Characteristics($T_A=25^\circ C$, $V_{IN}=V_{OUT}+1V$, or $V_{IN}=2.5V$ for $V_{OUT}<1.5V$)

BRCO6216ME

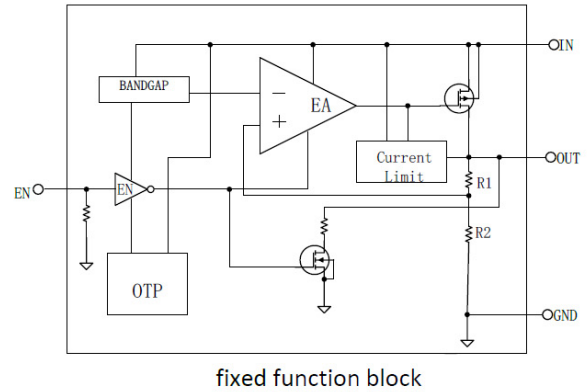
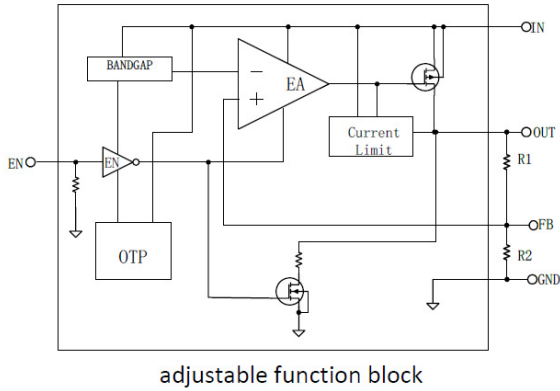
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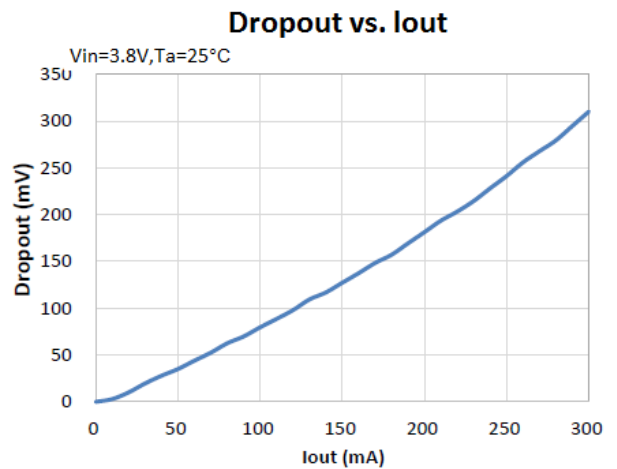
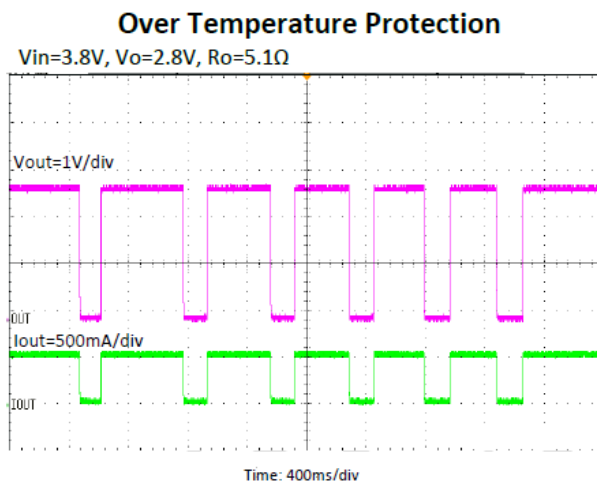
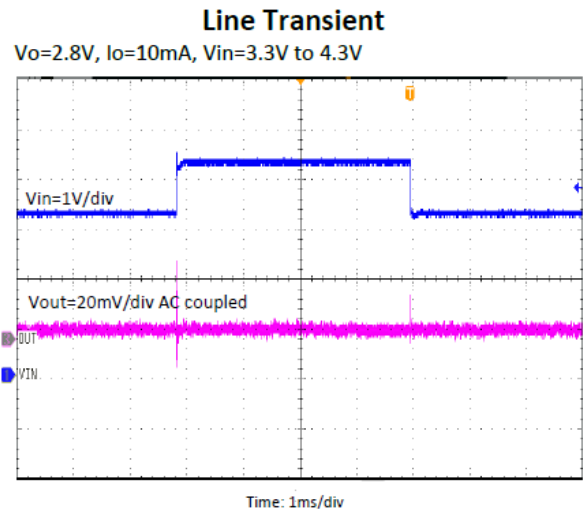
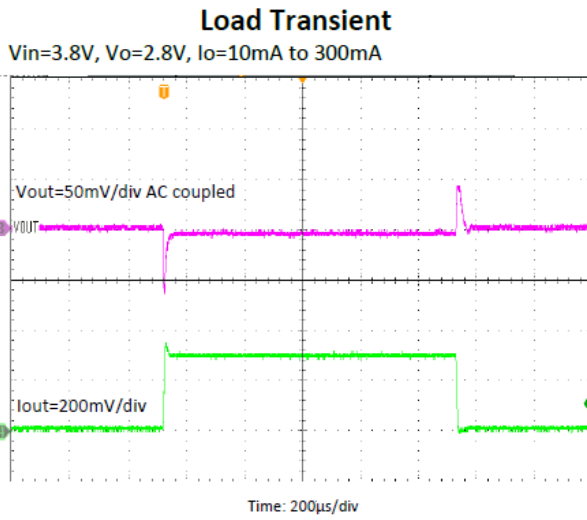
参数	符号	测试条件	最小值	典型值	最大值	单位
Input Voltage						
Input Voltage Range	V_{IN}		2.5		5.5	V
Quiescent Current	I_Q	$V_{EN}=2.5V, I_{OUT}=0mA$	35		70	μA
Shutdown Current	I_{SHDN}	$V_{EN}=0V$		0.1	1	μA
Power Supply Ripple Rejection	PSRR	$V_{IN}=V_{nom}+1V_{P-P}, f=1kHz,$ $I_{LOAD}=10mA$		70		dB
Enable						
Enable High Voltage	V_{ENH}	All temperature range	1.5			V
Enable Low Voltage	V_{ENL}	All temperature range			0.4	V
EN Input Current	I_{EN}	$V_{IN}=3.5V, V_{EN}=3.5V$ or 0V	-1	0.2	1	μA
Start-up Time	T_{ST}	$V_{IN}=3.5V, V_{OUT}=2.5V$		40		μs
Output Voltage						
Output Voltage Accuracy	V_{OUT}	$V_{IN}=V_{OUT}+1V, I_{OUT}=10mA$	-2		+2	%
		$V_{IN}=V_{OUT}+1V,$ $I_{OUT}=10mA, T_A=-40^{\circ}C$ to $+85^{\circ}C$	-3		+3	%
FB Pin Voltage	V_{FB}		1.176	1.2	1.224	V
Output Line Regulation	V_{LNR}	$V_{OUT}+0.5V < V_{IN} < 5.5V,$ $I_{OUT}=10mA$		0.01	0.1	%/V
Output Load Regulation	V_{LDR}	$1mA < I_{OUT} < 300mA,$ $V_{IN}=V_{NOM}+1.0V$		3	6	mV
Dropout Voltage (Note 1)	V_{DROP}	$I_{OUT}=300mA, (Applied$ for $V_{OUT} \geq 2.3V)$		320	350	mV
Maximum Output Current	I_{OUTMAX}		300			mA
Protection						
Current Limit	I_{limit}		350	470		mA
Resistance of Auto-Discharge	R_{AD}			130		Ω
Thermal Shutdown Temperature	T_{SD}	No Load, $V_{IN}=V_{EN}=5V$		155		$^{\circ}C$
Thermal Shutdown Hysteresis	T_{SDHYS}	No Load, $V_{IN}=V_{EN}=5V$		30		$^{\circ}C$

Note 1: Dropout is defined as $V_{IN}-V_{OUT}$ when V_{OUT} is 2% below the value of V_{OUT} for $V_{IN}=V_{OUT}+0.5V$.

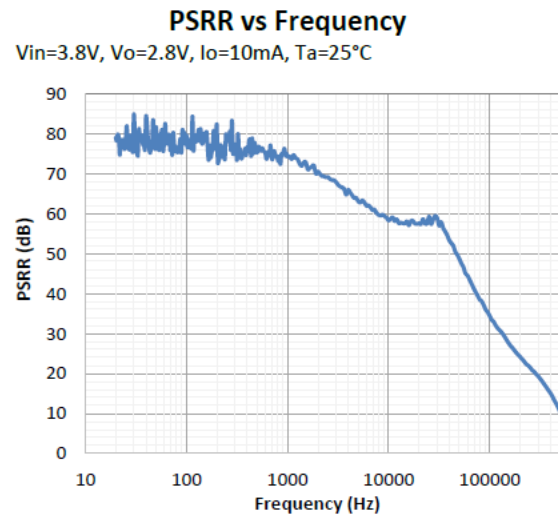
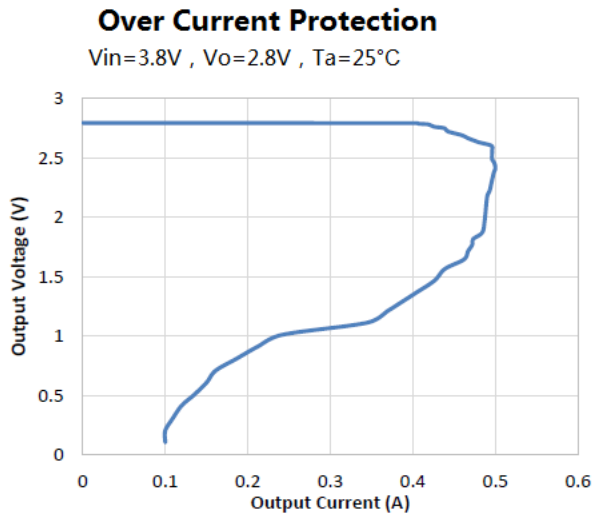
功能框图



电参数曲线图 / Electrical Characteristic Curve



电参数曲线图 / Electrical Characteristic Curve



工作原理 / Description of the Principle

BRCO6216ME 是一款高输出电流，低压差（LDO）线性稳压器，具有快速瞬态响应和高电源抑制比。它具有高输出精度、低压差和低静态电流以及快速的启动时间。BRCO6216ME 被设计成与低 ESR 的瓷片电容一起工作，在电源方案中减少 PCB 的面积占用。仅仅需要一个 $1\mu F$ 的瓷片输出电容就能使器件在整个负载电流范围内保持稳定。

如功能框图所示，BRCO6216ME 由带隙基准电压、误差放大器、P 沟道 MOSFET、外部分压电阻和一些附加的保护电路组成。连接到误差放大器的阴极端的参考电压与反馈电压进行比较，以调节输出电压，使其在整个负载电流范围内恒定。如果反馈电压低于参考电压，则晶体管栅极被拉低以提高其导电性。这允许更多的电流流向输出并提高输出电压。如果反馈电压高于参考电压，则晶体管栅极被拉高以降低其导电性。这允许较少的电流流向输出并降低输出电压。反馈点是连接到 V_{OUT} 引脚的外部分压电阻的输出。

The BRCO6216ME is a high output current, low dropout linear regulator with fast transient response and high PSRR. It offers high output accuracy, low quiescent current and fast start-up time. It is designed to work with low-ESR ceramic capacitor, reducing the amount of the PCB area. Only a $1\mu F$ ceramic output capacitor can make the device stable over the whole load range.

As shown in the function block diagram, the BRCO6216ME is composed of the bandgap reference voltage, the error amplifier, P-channel MOSFET pass transistor, external resistor divider and some additional protection circuits. The reference voltage, connected to the cathode terminal of the error amplifier, compares with the feedback voltage to regulate the output voltage to make it constant over the whole load current range. If the feedback voltage is lower than the reference voltage, the pass transistor gate is pulled lower to increase its conductivity. This allows more current to flow to the output and increase the output voltage. If the feedback voltage is higher than the reference voltage, the pass transistor gate is pulled higher to decrease its conductivity. This allows less current to flow to the output and decrease the output voltage. The feedback point is the output of the external resistor divider connected to the V_{OUT} pin.

工作原理 / Description of the Principle

Enable/Shutdown

当 EN 脚连接到地或其电压低于 0.4V，BRCO6216ME 将被除能，此时静态电流小于 1uA。EN 脚的电压大于或等于 1.5V，BRCO6216ME 将被使能。EN 脚不能悬空使用。

The BRCO6216ME is disabled when the EN pin is connected to ground or the voltage less than 0.4V, and the quiescent current is less than 1μA. Connect EN pin to 1.5V or higher voltage to enable the device. This pin cannot be floated.

Output Auto Discharge

当调节器被禁用时，内部 130Ω 电阻器连接在 V_{OUT} 和 GND 之间，以释放输出电容 C_{OUT} 的电量。

When the regulator is disabled, an internal 130Ω resistor is connected between V_{OUT} and GND to discharge output capacitor C_{OUT}.

Current Limit

BRCO6216ME 包含一个电流限制电路，用于监测晶体管的栅极电压以限制输出电流。当输出电流高于过电流限制时，电路将箝位晶体管的栅极电压以限制输出电流。典型的输出电流限制为 450mA。

The BRCO6216ME includes a current limit circuit to monitor the gate voltage of the pass transistor to limit the output current. When the output current is higher than the over-current limit, the circuit will clamp the gate voltage of the pass transistor to limit the output current. The typical output current limit is 450mA.

Adjustable Output Voltage

BRCO6216ME 具有宽输出电压范围。输出电压可以通过外部分压电阻进行设定，通过以下公式计算，V_{REF} 是内部电压基准，为 1.2V。

BRCO6216ME has a wide output voltage range. The output voltage is programmed by an external resistor divider. The output can be calculated by the following equation:

$$V_{OUT}=(1+R1/R2) \times V_{REF}$$

Where V_{REF} is the internal reference voltage, which is 1.2V in BRCO6216ME.

Short Circuit Protection

当 V_{OUT} 引脚短路到 GND 时，将触发短路保护电路，并将输出电流钳位到大约 90mA。这个特性保护调节器不受过流导致而热损坏。

When V_{OUT} pin is short-circuit to GND, short circuit protection will be triggered and clamp the output current to approximately 90mA. This feature protects the regulator from over current condition and damage due to overheating.

Thermal Shutdown

BRCO6216ME 监控内部温度。当结温超过 155°C 时，过温保护 (OTP) 电路关闭晶体管，直到器件冷却到 30°C，然后晶体管恢复。为了继续工作，不要超过绝对最大结温。

The BRCO6216ME monitors internal temperature. When the junction temperature exceeds 155°C, the over temperature protection (OTP) circuit turn off the pass transistor until the device is cooled down by 30°C. Then the pass transistor resumes. For continue operation, do not exceed absolute maximum junction temperature.

应用信息 / Application Information**External capacitor**

BRCO6216ME 需要外部电容器的稳定性。它是专门设计与低 ESR 电容器一起工作，需要最低 PCB 面积。所以需尽可能将外部电容器靠近器件。

The BRCO6216ME requires external capacitor for stability. It is specifically designed to work with low-ESR capacitors requiring minimum PCB area. Place the external capacitors as close as possible to the device.

Input capacitor

VIN 引脚和 GND 引脚之间需要一个 1 μ F 或更高电容值的陶瓷电容器。把它放在尽可能靠近器件的地方。对输入电容器的 ESR 没有要求，但在整个工作温度范围内，容差不超过 1 μ F。

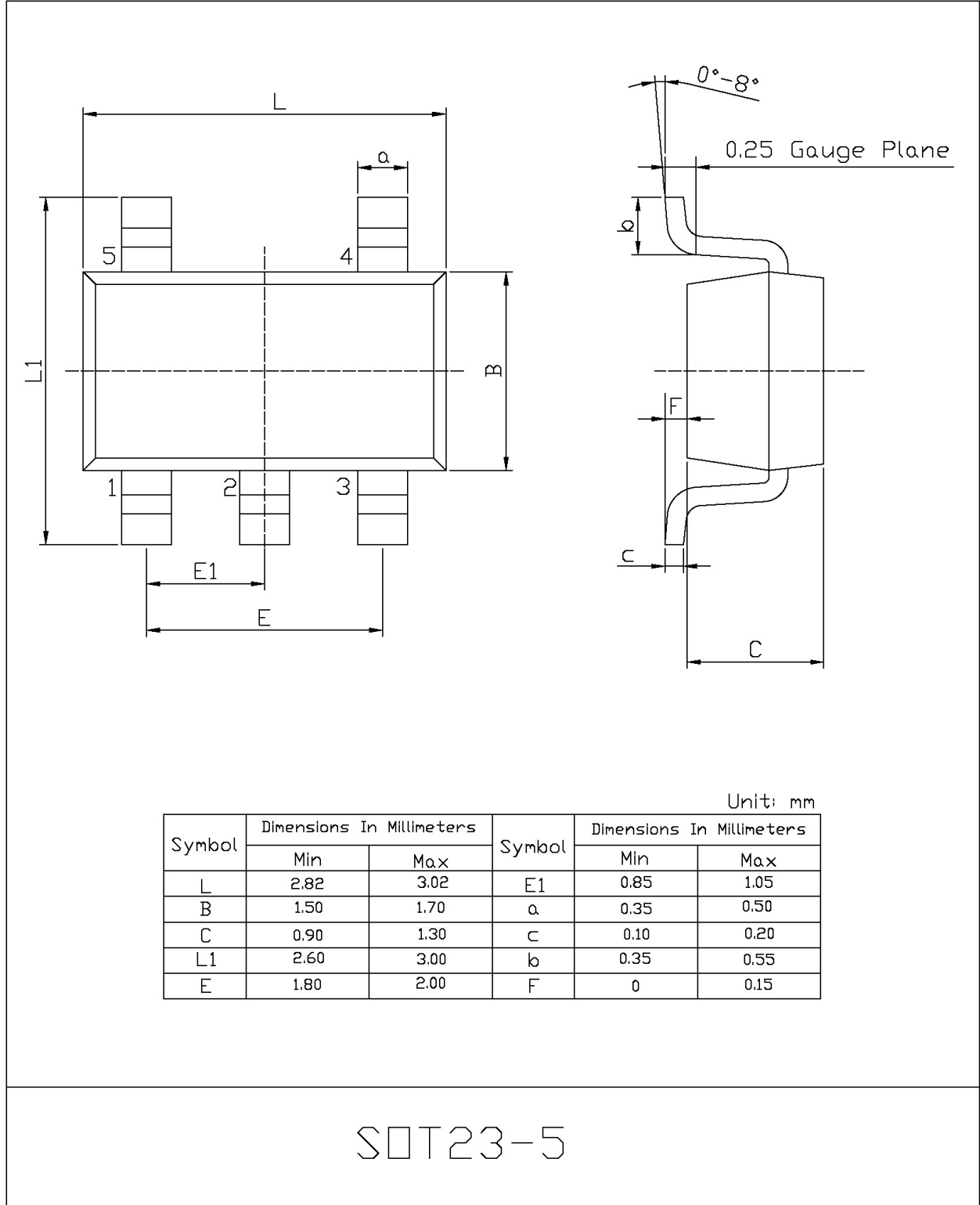
A 1 μ F or higher capacitance value ceramic capacitor is required between the VIN pin and the GND pin. Place it as close as possible to the device. There are no requirements for the ESR on the input capacitor, but the tolerance and temperature coefficient must be capacitance is 1 μ F over the whole operating temperature range.

Output capacitor

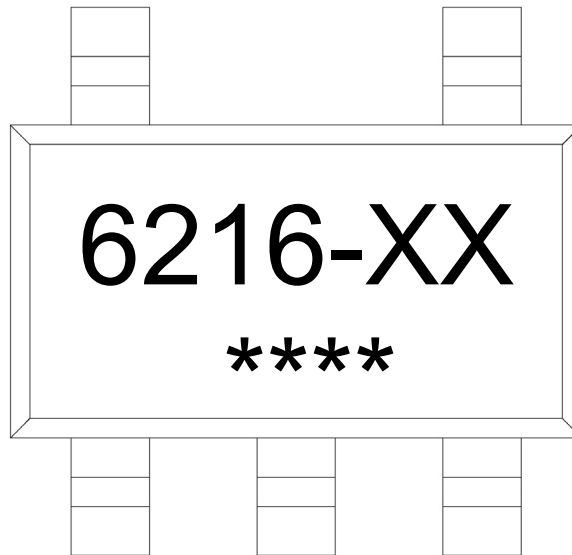
需要在输出端增加一个输出电容 C_{OUT} 以提高瞬态响应和维持稳定。BRCO6216ME 只需要一个非常小的瓷片输出电容即可维持输出电压稳定，在 1 μ F 到 10 μ F 之间最佳。

An output capacitor (C_{OUT}) is needed to improve transient response and maintain stability. The BRCO6216ME is stable with very small ceramic output capacitors. A 1 μ F to 10 μ F capacitor is suitable for the most BRCO6216ME applications.

外形尺寸图 / Package Dimensions



印章说明 / Marking Instructions



说明：

6216： 为产品型号

XX： 代表输出电压，如下表所示

Part Number	Marking
BRCO6216ME-ADJ	6216-AD
BRCO6216ME-1.2	6216-12
BRCO6216ME-1.5	6216-15
BRCO6216ME-1.8	6216-18
BRCO6216ME-2.5	6216-25
BRCO6216ME-2.8	6216-28
BRCO6216ME-3.0	6216-30
BRCO6216ME-3.3	6216-33

****： 为生产批号代码，随生产批号变化。

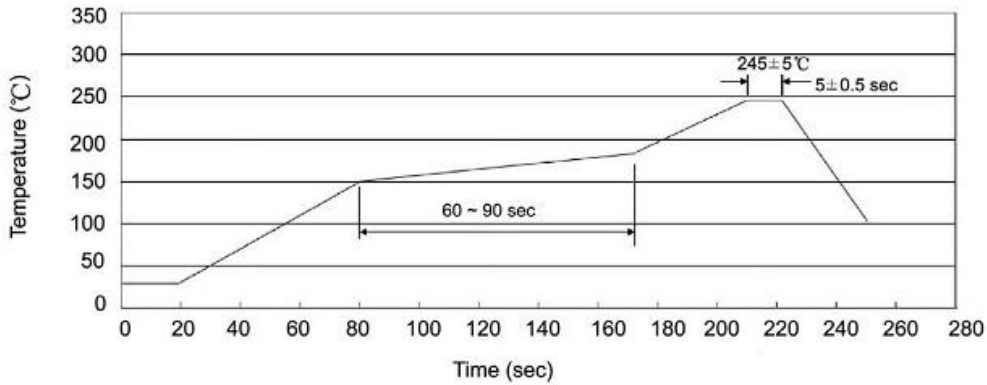
Note:

6216: Product Type.

XX : Output Voltage.

****: Lot No. Code, code change with Lot No.

回流焊温度曲线图(无铅) / Temperature Profile for IR Reflow Soldering(Pb-Free)



说明：

- 1、预热温度 150 ~ 180°C，时间 60 ~ 90sec;
- 2、峰值温度 245±5°C，时间持续为 5±0.5sec;
- 3、焊接制程冷却速度为 2 ~ 10°C/sec.

Note:

- 1.Preheating:150~180°C, Time:60~90sec.
- 2.Peak Temp.:245±5°C, Duration:5±0.5sec.
3. Cooling Speed: 2~10°C/sec.

耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions

温度：260±5°C

时间：10±1 sec.

Temp.:260±5°C

Time:10±1 sec

包装规格 / Packaging SPEC.

卷盘包装 / REEL

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm ³)		
	Units/Reel 只/卷盘	Reels/Inner Box 卷盘/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Reel	Inner Box 盒	Outer Box 箱
SOT23-5/6	3,000	10	30,000	4	120,000	7" ×8	210×205×205	435×225×420

使用说明 / Notices