

# LC2319

## Built-in 2A Power MOSFET Step-down DC-DC Converter

### DESCRIPTION

LC2319 is a current mode PWM step-down DC-DC converter that has an internal 2A power switch. It has a wide input voltage range of 3.6V to 20V, which make it suitable for regulating a wide variety of power sources.

LC2319 is made up of a PWM control circuit, a reference voltage unit, an error amplifier, a protection circuit, Chip Enable circuit, and under voltage lockout circuit. A low ripple high efficiency step-down DC-DC converter can be easily assembled by this IC with minimum external components: an inductor, a diode, capacitors and resistors. Desired output voltage can be achieved by adjusting the value of external resistors.

The LC2319 has cycle-by-cycle current limit circuitry; current limiting provides protection against shorted output. The low current (<5uA) shutdown provides complete output disconnect, enabling easy power management in battery powered systems.

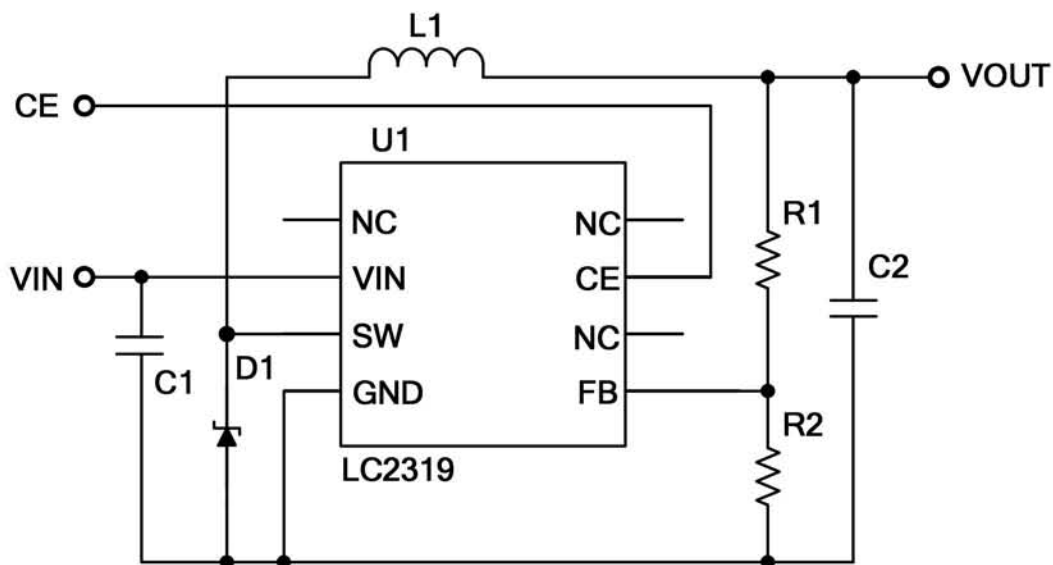
### FEATURES

- ◆ Range of Input Voltage: 3.6V~20V
- ◆ Built-in 90mΩ Power MOSFET
- ◆ <5μA Shutdown Current
- ◆ Oscillation Frequency: 500KHz
- ◆ High efficiency: 90%
- ◆ 2.5A Peak Current Limit Cycle by Cycle
- ◆ Operating Temperature Range: -40℃ ~85℃
- ◆ Demo Board Available

### APPLICATIONS

- ◆ Power source for portable communication equipment, cameras, video instruments such as VCRs, camcorders.
- ◆ Power source for battery-powered equipment.
- ◆ Power source for household electrical appliance

### TYPICAL APPLICATION



# LC2319

## ORDERING INFORMATION

LC2319 1 2 3

| Code | Description                                           |
|------|-------------------------------------------------------|
| 1    | Temperature & Rohs:<br>C: -40~85°C, Pb Free Rohs Std. |
| 2    | Package Type:<br>D8: SOP-8                            |
| 3    | Packing Type:<br>TR: Tape & Reel (Standard)           |

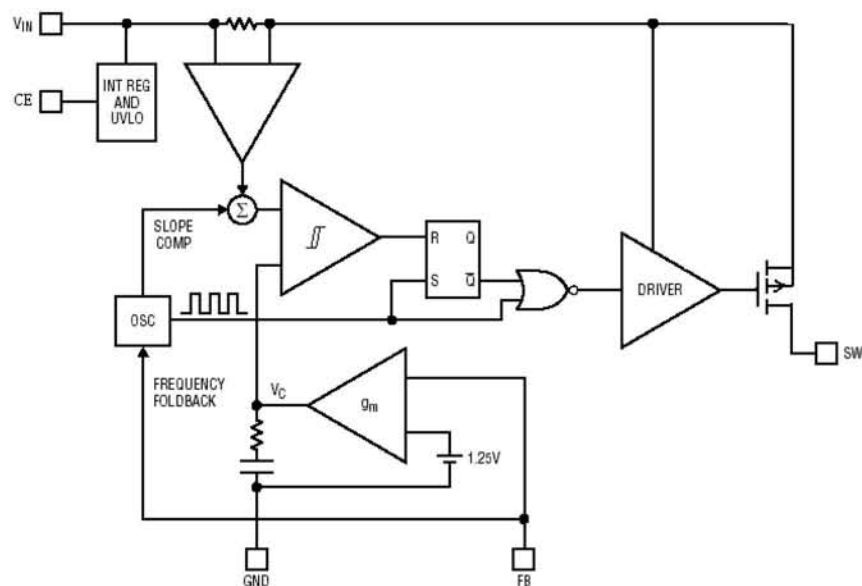
## PIN CONFIGURATION

| Product Classification |                               | LC2319CD8TR                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Marking                |                               | <div style="display: flex; justify-content: space-around; font-weight: bold;"> <span>8</span><span>7</span><span>6</span><span>5</span> </div> <div style="text-align: center; border: 1px solid black; padding: 5px; margin: 5px;">             HGXX<br/>             ● YYBZZ           </div> <div style="display: flex; justify-content: space-around; font-weight: bold;"> <span>1</span><span>2</span><span>3</span><span>4</span> </div> |
| HG XX<br>YYBZZ         | HG: Product Code              |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                        | XX: Output Voltage Adjustable |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                        | YY: LOT NO.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                        | B: FAB Code                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ZZ: Date Code          |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## PIN DESCRIPTION

| Pin No. | Symbol | Description                                        |
|---------|--------|----------------------------------------------------|
| 1       | NC     | Not Connected                                      |
| 2       | VIN    | Power Supply Pin                                   |
| 3       | SW     | Switching Node: PWM output connection to inductor. |
| 4       | GND    | Ground Pin                                         |
| 5       | FB     | Pin for Feedback Voltage                           |
| 6       | NC     | Not Connected                                      |
| 7       | CE     | Chip Enable Pin (Active with "H")                  |
| 8       | NC     | Not Connected                                      |

## BLOCK DIAGRAM



# LC2319

## ABSOLUTE MAXIMUM RATING

|                                      |                   |
|--------------------------------------|-------------------|
| Supply Voltage                       | 23V               |
| SW Pin Voltage                       | 25V               |
| CE Pin Voltage                       | -0.3V to Vin+0.3V |
| FB Pin Voltage                       | -0.3V to 6V       |
| Operating Ambient Temperature Range  | -40℃ to 85℃       |
| Storage Temperature Range            | -65℃ to 150℃      |
| Lead Temperature (Soldering, 10 sec) | 260℃              |
| Thermal resistance: $\Theta_{JA}$    | 150℃/W            |

## ELECTRICAL CHARACTERISTICS

(Test condition: Ta=25℃, VIN=12V, unless otherwise noted.)

| Symbol                | Item                                        | Conditions                    | Min.  | Typ. | Max.  | Unit  |
|-----------------------|---------------------------------------------|-------------------------------|-------|------|-------|-------|
| VUVLO                 | Under Voltage Lockout                       |                               |       | 3.35 | 3.6   | V     |
| VFB                   | Feedback Voltage                            |                               | 1.225 | 1.25 | 1.275 | V     |
| IFB                   | FB Pin Bias Current                         | VFB=1.25V                     |       | 150  | 600   | nA    |
| IQ                    | Supply Current                              | VFB=1.3V, VCE=VIN             |       | 2    |       | mA    |
|                       | Quiescent Current in Shutdown               | VCE=0V                        |       | 2    | 5     | uA    |
| $\Delta VFB/\Delta V$ | Reference Line Regulation                   | VIN=5V to 20V                 |       | 0.08 |       | %/V   |
| $\Delta VFB/\Delta T$ | Feedback Voltage Temperature Coefficient    | -40℃ ≤ T <sub>opt</sub> ≤ 85℃ |       | ±100 |       | ppm/℃ |
| FOSC_MAX              | Oscillator Frequency                        | VFB=1.1V                      |       | 500  |       | KHz   |
| FOSCTH                | Frequency Shift Threshold on FB Pin         | FSW=200K                      |       | 0.44 |       | V     |
| DMAX                  | Max Duty Cycle                              |                               |       | 97   |       | %     |
| ILIMIT                | Switch Current Limit                        |                               |       | 2.5  |       | A     |
| Rds_on                | Static P-Channel MOSFET On State Resistance |                               |       | 90*  |       | mΩ    |
| ISW                   | Switch Leakage Current                      |                               |       |      | 1     | uA    |
| ICEH                  | CE "H" Input Current                        | VCE =3V                       |       | 6.7  | 15    | uA    |
| ICEL                  | CE "L" Input Current                        | VCE = 0V                      |       | 0.03 | 0.1   | uA    |
| VCEH                  | CE "H" Input Voltage                        | VIN = 12V                     | 1.8   |      |       | V     |
| VCEL                  | CE "L" Input Voltage                        | VIN = 12V                     |       |      | 0.4   | V     |

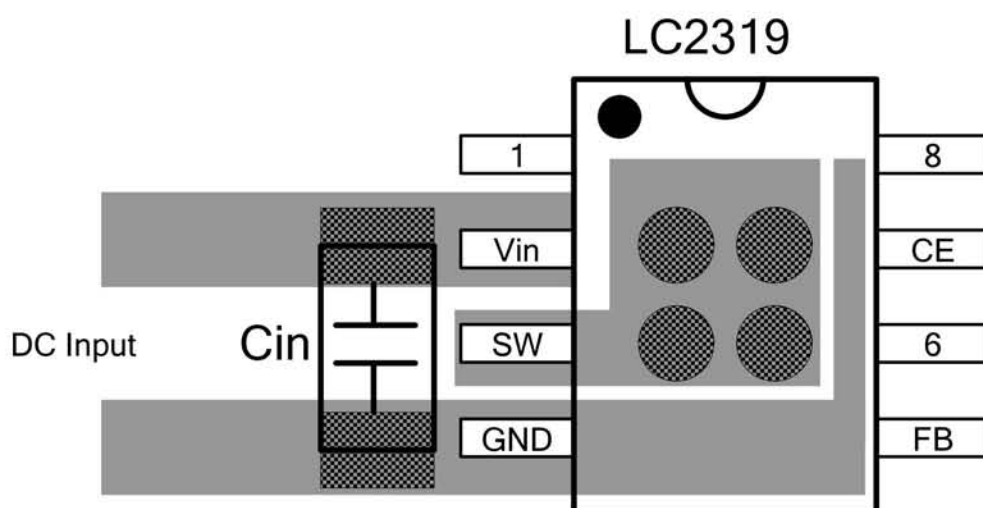
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## DEMO BOARD BOM

| No. | Reference | Type      | Specification            | Note |
|-----|-----------|-----------|--------------------------|------|
| 1   | C1        | Capacitor | MLCC 10uF; SMD 0805      |      |
| 2   | C2        | Capacitor | MLCC 10uF; SMD 0805      |      |
| 3   | D1        | Diode     | SS34; 40V, 3A; SMD       |      |
| 4   | L1        | Inductor  | 10uH; 3A; SMD, Shielding |      |
| 5   | IC1       | IC        | LC2319; SMD SOP-8        |      |
| 6   | R1        | Resistor  | SMD 0805; 30K; 1%        |      |
| 7   | R2        | Resistor  | SMD 0805; 10K; 1%        |      |

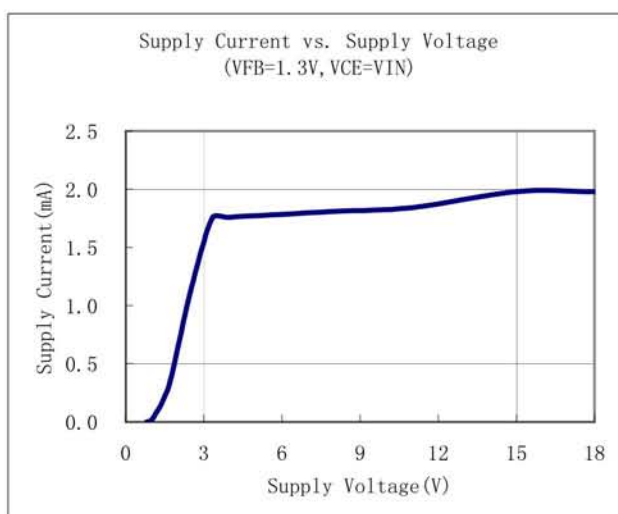
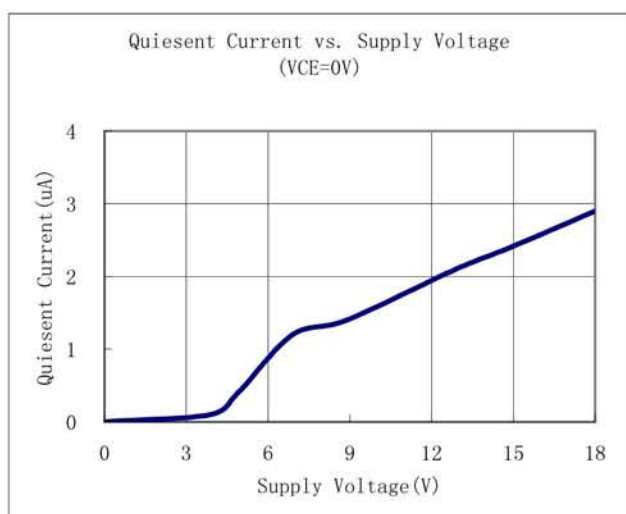
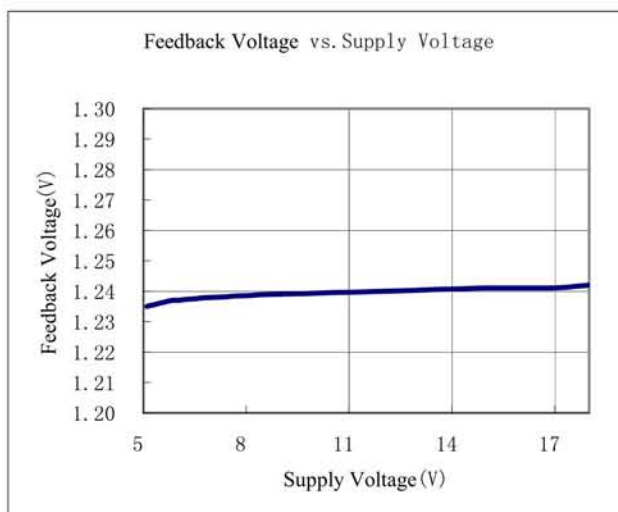
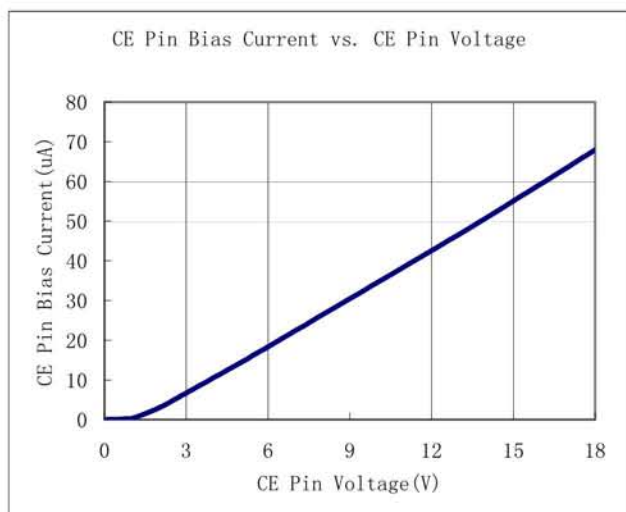
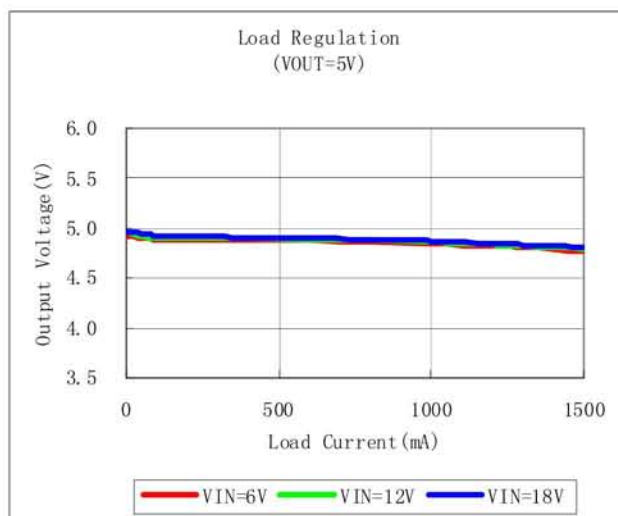
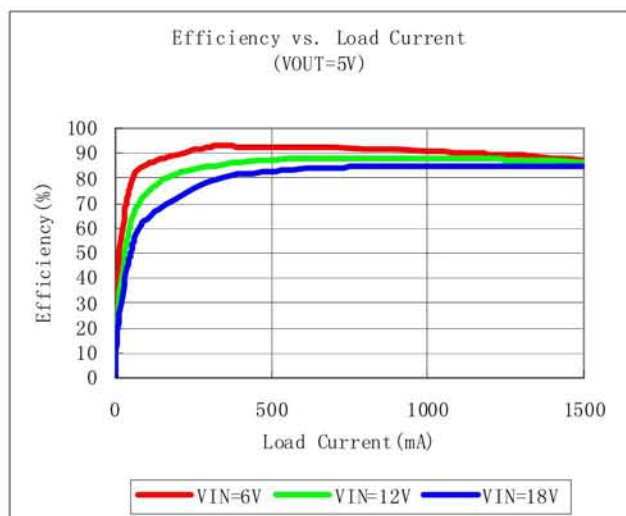
## LAYOUT CONSIDERATION

- Careful PCB layout is critical to achieving low switching losses and clean, stable operation. The switching power stage requires particular attention. If possible, mount all the power components on one side of the board, with their ground terminals as close to one another as possible.
- Keep the high-current paths short, especially the distance between Cin and the Vin (GND) terminals. It is essential for stable, jitter-free operation, showing as the following figure. The ESR of Cin should be smaller enough and the capacitance of Cin should be large enough for filtering the switching noise across power path, a 10uF ceramic capacitor is recommended.
- Keep the trace connecting to SW terminal wide enough for heat dissipation, if possible, it is better to place some vias connected to the bottom copper for enhancement.
- Route high-speed switching nodes, for example SW terminal, away from sensitive analog trace (eg. FB terminal).

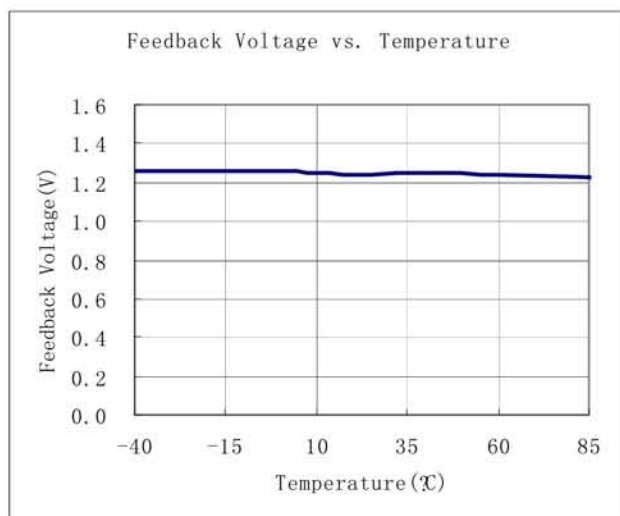
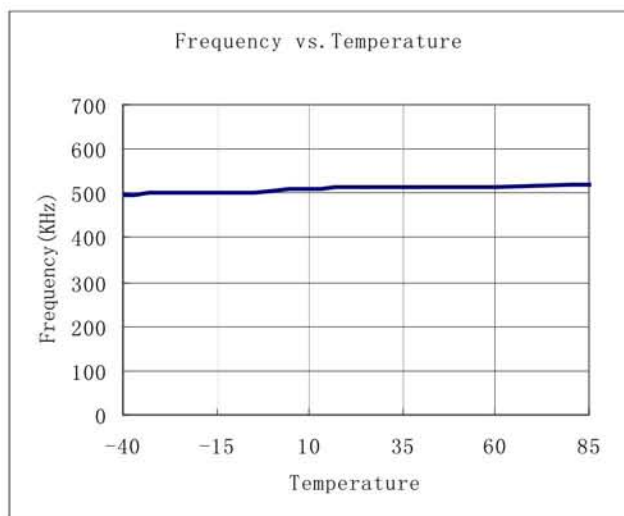


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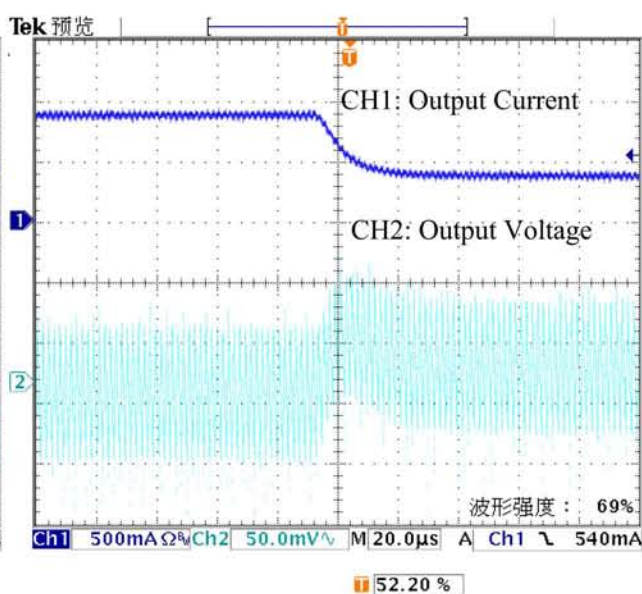
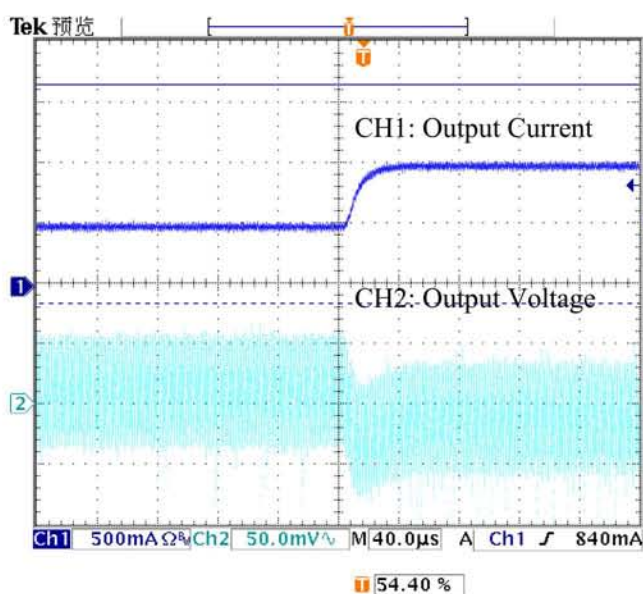
## DEMO BOARD MEASUREMENT



# LC2319



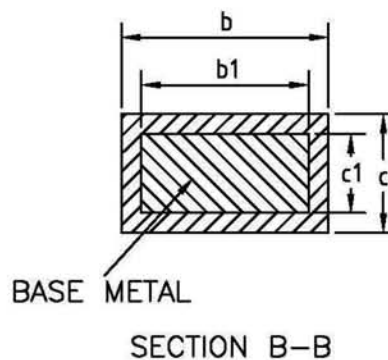
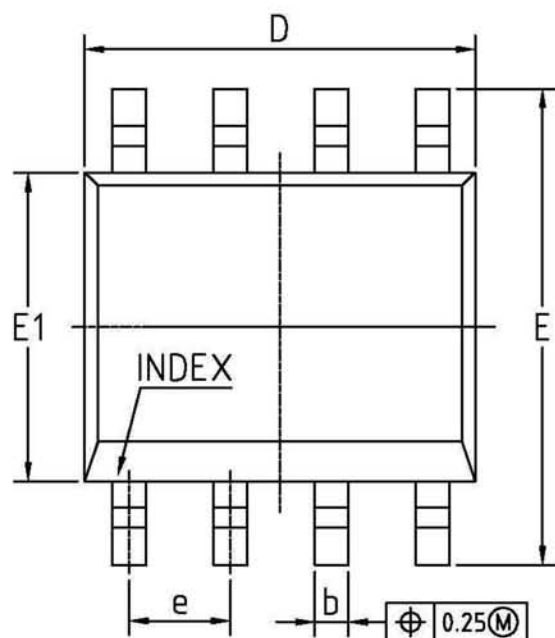
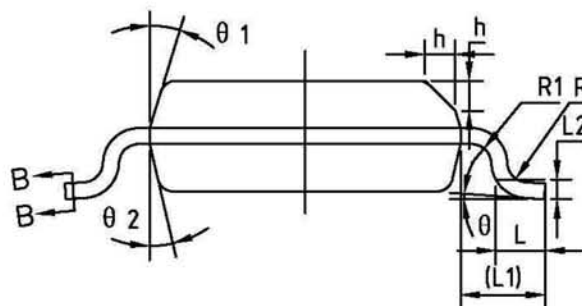
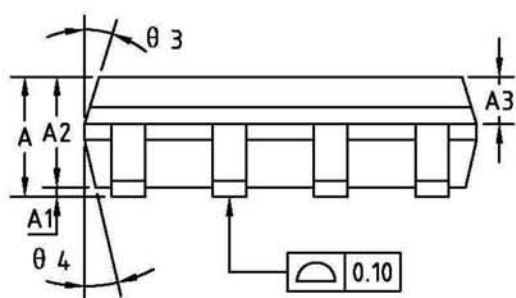
## Transient Loading Response



**LC2319****PACKAGE LINE**

|         |       |                  |         |      |    |
|---------|-------|------------------|---------|------|----|
| Package | SOP-8 | Devices per reel | 2500Pcs | Unit | mm |
|---------|-------|------------------|---------|------|----|

Package specification:



| Sym)ol | Dimension (mm) |      |      | Sym)ol | Dimension (mm) |      |     |
|--------|----------------|------|------|--------|----------------|------|-----|
|        | MIN            | NOM  | MAX  |        | MIN            | NOM  | MAX |
| A      | -              | -    | 1.77 | D      | 4.7            | 4.9  | 5.1 |
| A1     | 0.08           | 0.18 | 0.28 | E      | 5.8            | 6    | 6.2 |
| A2     | 1.2            | 1.4  | 1.6  | E1     | 3.7            | 3.9  | 4.1 |
| A3     | 0.55           | 0.65 | 0.75 | e      | 1.27BSC        |      |     |
| )      | 0.39           | -    | 0.48 | L      | 0.5            | 0.65 | 0.8 |
| )1     | 0.38           | 0.41 | 0.43 | L1     | 1.05BSC        |      |     |
| c      | 0.21           | -    | 0.26 | θ      | 0              | -    | 8°  |