CE51L6XXQ - High PSRR Low Noise 300mA LDO

General Description

The CE51L6XXQ is the 300mA LDO with auto discharge function, it uses an advanced CMOS process and a PMOSFET pass device to achieve high power supply rejection ratio (PSRR), low noise, low dropout, low ground current, fast start-up and excellent output accuracy.

The CE51L6XXQ is stable with a 1.0μF ceramic output capacitor, uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response.

The CE51L6XXQ offered in a small SOT23-5 package and operates over an ambient temperature range of -40°C to 125°C.

Features

- Wide Input Voltage Range from 1.9V to 5.5V
- Up to 300mA Load Current
- Standard Fixed Output Voltage 1.8V
- Very Low IQ is 50μA Typical
- Low Dropout is Typical 275mV@1.8V at 300mA Load
- Very High PSRR: 75dB at 1KHz
- Very Low Noise is 40uVrms
- Auto Discharge Function
- Excellent Load/Line Transient Response
- Automotive AEC-Q100 Grade 1 Qualified
  -- Ambient Temperature Range of -40°C to 125°C
  -- ESD HBM 4KV PASS
  -- ESD CDM 1.5KV PASS
- Port No. and Package Information

Part No.	Package	Packing Option	MSL
CE51L6XXQ	SOT23-5 (1.6mm × 2.9mm)	Tape and Reel, 3K/Reel	1

Device information

CE 51L6 XX Q

XX Output Voltage		**Q** AEC-Q100 Qualified	
XX	X.XV Output Voltage For example, 33 is 3.3V output	Q	With AEC-Q100 Qualified

Applications

- Automotive Constant-Voltage Power Supply
- Automotive Infotainment and Cluster

Pin Configuration

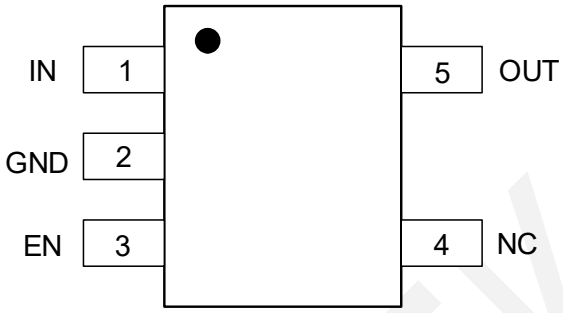


Figure1. Pin Configuration

Pin Function

Pin No.	Symbol	Pin Description
1	IN	Power Supply Input Voltage
2	GND	Power Supply Ground
3	EN	Chip Enable Pin
4	NC	No Connection.
5	OUT	Output Pin

Block Diagram

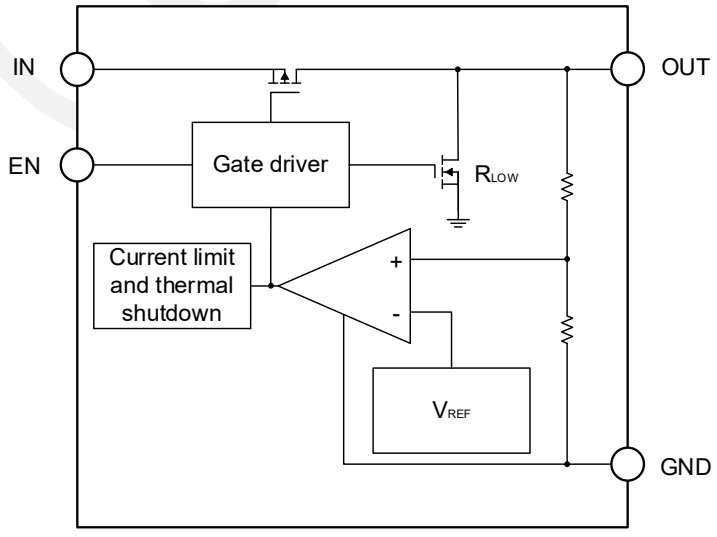


Figure2. Block Diagram

Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from 0.47μF to 4.7μF, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ, and temperature characteristics is X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

ON/OFF Input Operation

The CE51L6XXQ is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to IN pin to keep the regulator output on at all time.

Ultra-Fast Start-up

After enabled, the CE51L6XXQ is able to provide full power in as little as tens of microseconds, typically 60μs. This feature will help load circuitry move in and out of standby mode in real time.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin, the current limit protection will be triggered and clamp the output current to approximately 400mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal shutdown Protection

Thermal protection disables the output when the junction temperature rises to approximately 155°C, allowing the device to cool down. When the junction temperature reduces to approximately 130°C the output circuitry is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

Absolute Maximum Ratings

Symbol	Parameters		Value	Unit
V_{IN}	IN Voltage		-0.3 to 6.5	V
V_{EN}	Input Voltage (EN Pin)		-0.3 to V_{IN} + 0.3	V
V_{OUT}	Output Voltage		-0.3 to V_{IN} + 0.3	V
I_{MAX}	Maximum Load Current		> 300	mA
V_{ESD}	ESD Classification	Human Body Model (1)	±4000	V
		Charged Device Model (2)	±1500	
T_J	Operating Junction Temperature		-40 to 150	°C
T_{STG}	Storage Temperature		-65 to 150	°C
T_{SLOD}	Lead Temperature (Soldering, 10 sec)		300	°C

Note1: HBM tested per AEC-Q100-002(JEDEC JS-001);

Note2: CDM tested per AEC-Q100-011(JEDEC JS-002);

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SOT23-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	250	°C/W
P_D	SOT23-5	Power Dissipation in Still Air at 25°C	500	mW

Recommended Operating Conditions

Symbol	Parameters	Rating	Unit
V_{IN}	Input Voltage	1.9 to 5.5	V
I_{OUT}	Output Current	0 to 300	mA
T_A	Operating Ambient Temperature	-40 to 125	ºC
C_{IN}	Effective Input Ceramic Capacitor Value	0.47 to 4.7	μF
C_{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 4.7	μF
ESR	Input and Output Capacitor Equivalent Series Resistance (ESR)	5 to 100	mΩ

Electrical Characteristics[3]

(V_{IN} = V_{OUT} + 1V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, T_A = -40°C~125°C unless otherwise noted. Typical values are at T_A = 25°C.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		1.9		5.5	V
V_{OUT}	Regulated Output Voltage	I_{OUT} = 1mA, T_A = -40~125°C	-2		2	%
I_{Q_ON}	Quiescent Current	I_{OUT} = 0mA, T_A = 25°C		50	74	μA
$I_{Q\ OFF}$	Standby Current	V_{EN} = 0V, T_A = 25°C		0.01	1	μA
Reg_{LINE}	Line Regulation [6]	V_{IN} = V_{OUT} + 2V to 40V, I_{OUT} = 10mA		0.03	0.2	%/V
Reg_{LOAD}	Load Regulation [6]	1mA ≤ I_{OUT} ≤ 300mA,		15	40	mV
V_{DROP}	Dropout Voltage I_{OUT}=300mA [4] [6]	V_{OUT} = 1.8V		275	370	mV
I_{LIMIT}	Current Limit	R_{LOAD} = 1Ω	330			mA
I_{SHORT}	Short Current Limit	V_{OUT} = 0V		70		mA
V_{ENL}	EN Low Threshold	V_{IN} = 1.9V to 5.5V, V_{EN} Falling until the Output is Disabled			0.3	V
V_{ENH}	EN High Threshold	V_{IN} = 1.9V to 5.5V, V_{EN} Rising until the Output is Enabled	1.2			V
I_{EN}	EN Pin Input Current	V_{EN} = 5.5V		0	0.1	μA
PSRR[5]	Power Supply Rejection Ratio	f = 1kHz, C_{OUT} = 1μF, I_{OUT} = 30mA		75		dB
		f = 10kHz, C_{OUT} = 1μF, I_{OUT} = 30mA		65		dB
e_N[5]	Output Noise	10Hz to 100kHz, I_{OUT} = 100mA, C_{OUT} = 1μF		40		$μV_{RMS}$
t_{ON}	Soft-start Time	From Enable to Power on		60		μs
R_{PD}	EN Pull-Down Resistance		0.8	1	1.3	MΩ
R_{DIS}	Output Resistance of Auto Discharge at Off State	V_{EN} = 0V, V_{IN} = 4V, I_{OUT} = 10mA		80		Ω
T_{TSD}[5]	Over-Temperature Shutdown Threshold	T_J Rising		155		°C
T_{HYS}[5]	Over-Temperature Shutdown Hysteresis	T_J Falling from Shutdown		20		°C

Note3: Production test at 25°C. Specifications over the temperature range are guaranteed by design and characterization.

Note4: The minimum operating voltage is 1.9V. V_{DROP} = V_{IN} (min) - V_{OUT}.

Note5: Guaranteed by design and characterization.

Note6: At high temperatures, the maximum load current can be calculated according to the following formula：

$I_{OUT\_MAX} = (T_J - T_A) / R_{\theta JA} / (V_{IN} - V_{OUT})$

Application Circuits

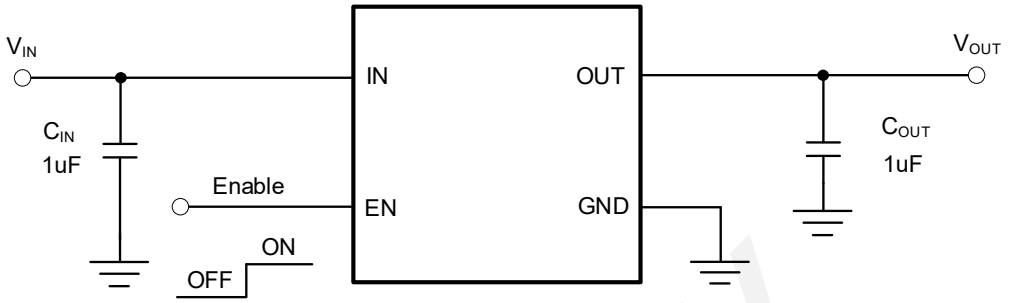


Figure3. Application Circuits

PCB Layout Guide

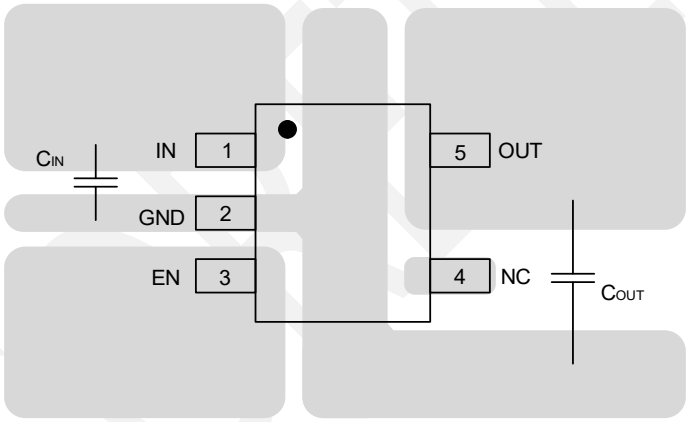
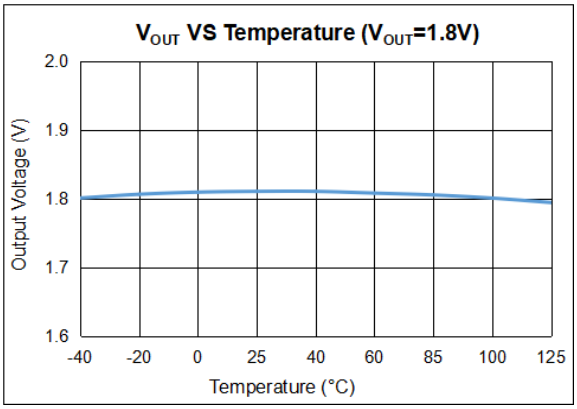


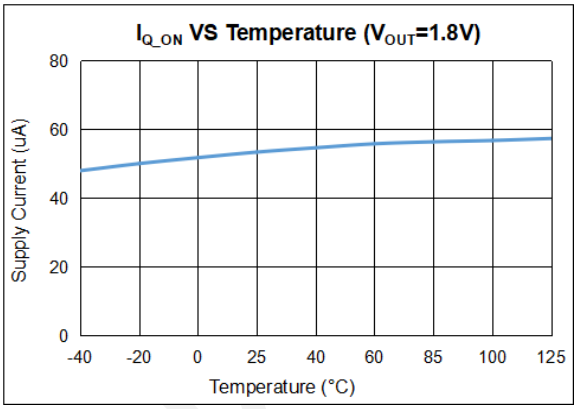
Figure4. PCB Layout Guide

Typical Characteristics

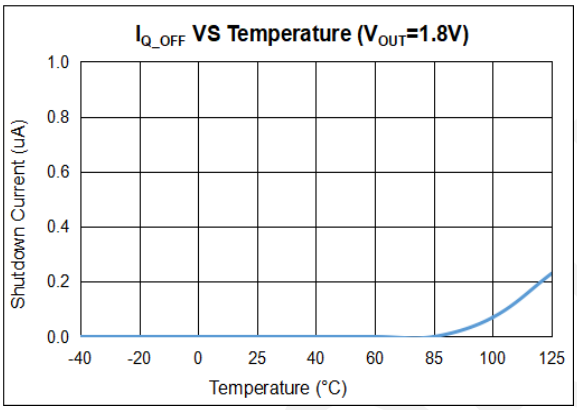
(V_{IN} = 2.8V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, T_A = -40°C ~125°C unless otherwise noted. Typical values are at T_A = 25°C.)



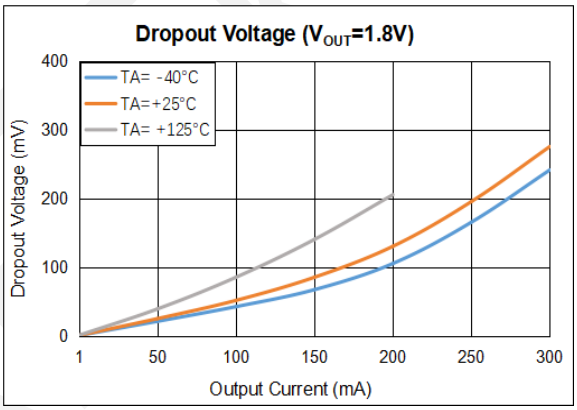
Output Voltage VS Temperature



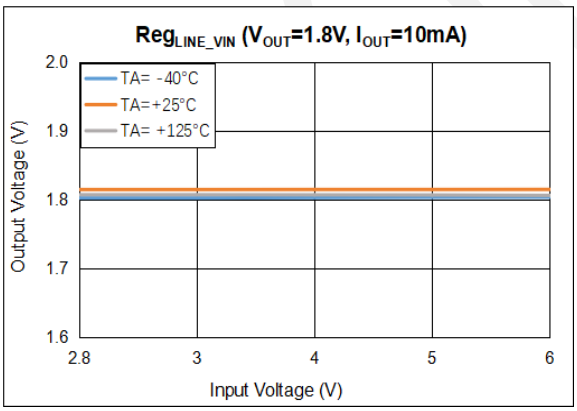
Supply Current VS Temperature



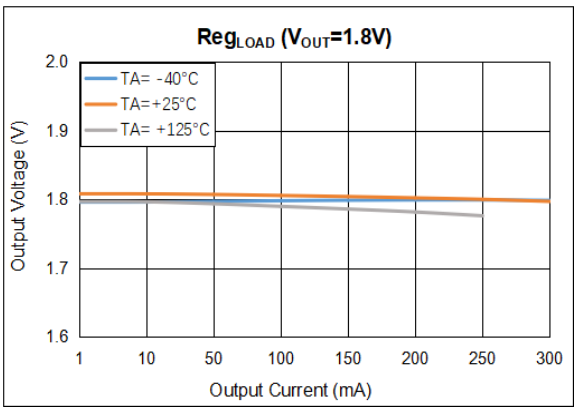
Shutdown Current VS Temperature



Dropout Voltage VS Output Current



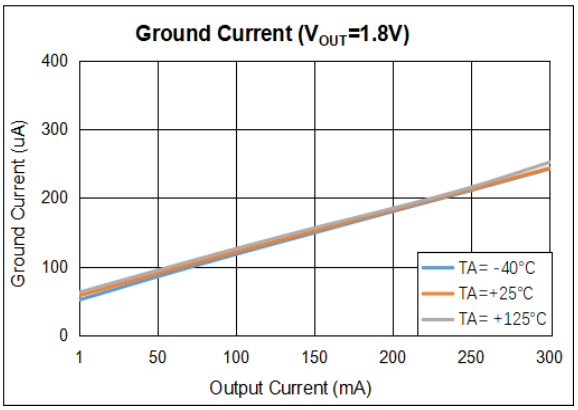
Output Voltage VS Input Voltage



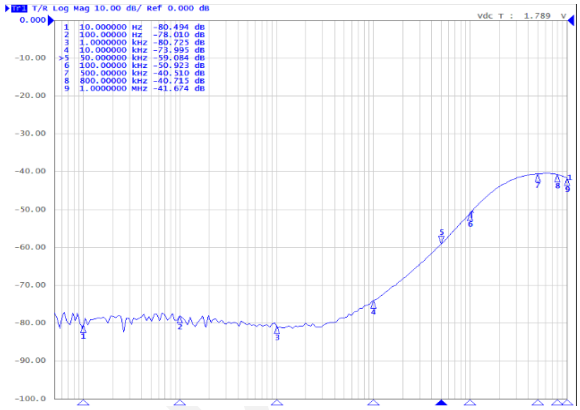
Output Voltage VS Output Current

Typical Characteristics (Continued)

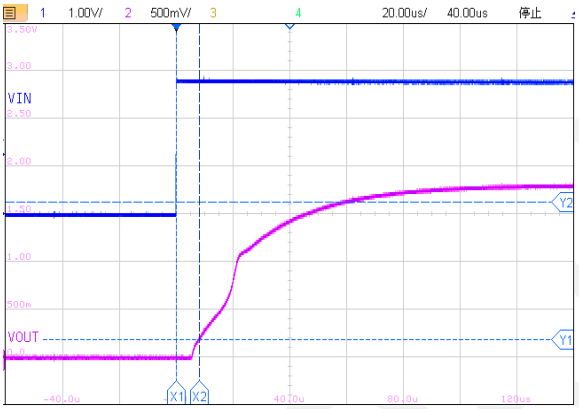
(V_{IN} = 2.8V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, T_A = -40°C~125°C unless otherwise noted. Typical values are at T_A = 25°C.)



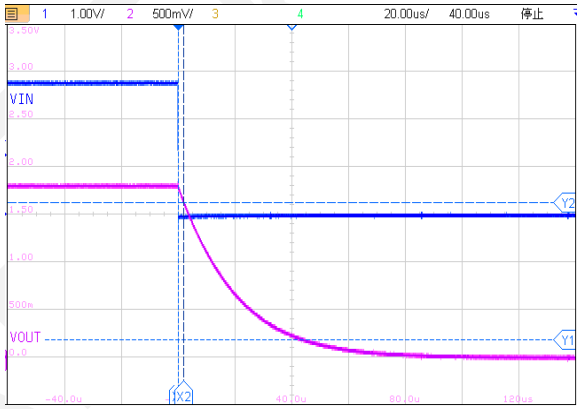
Ground Current VS Output Current



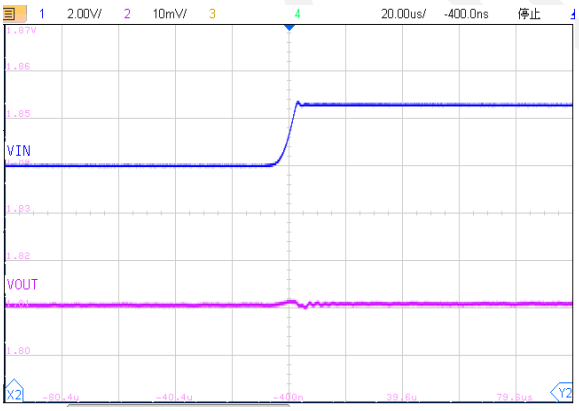
PSRR VS Output Current (I_{OUT} = 30mA)



Turn On Speed VS EN Voltage (I_{OUT} = 30mA)

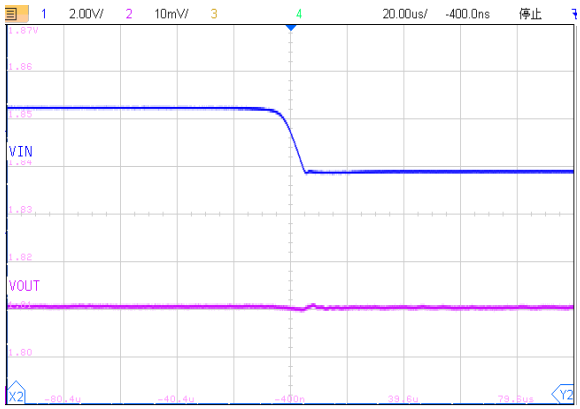


Turn Off Speed VS EN Voltage (I_{OUT} = 30mA)



Line Transient Response

V_{IN} = 2.8V~5.5V, V_{OUT} = 1.8V, I_{OUT} = 1mA

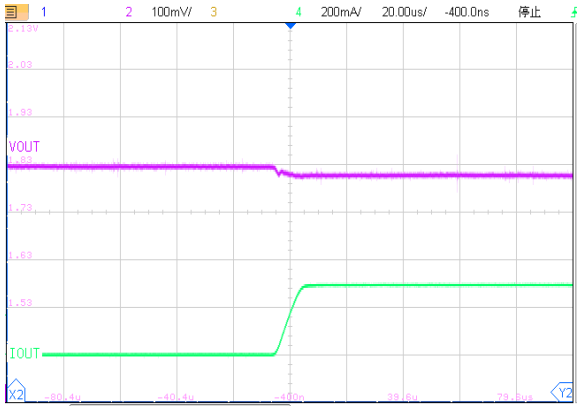


Line Transient Response

V_{IN} = 5.5V~2.8V, V_{OUT} = 1.8V, I_{OUT} = 1mA

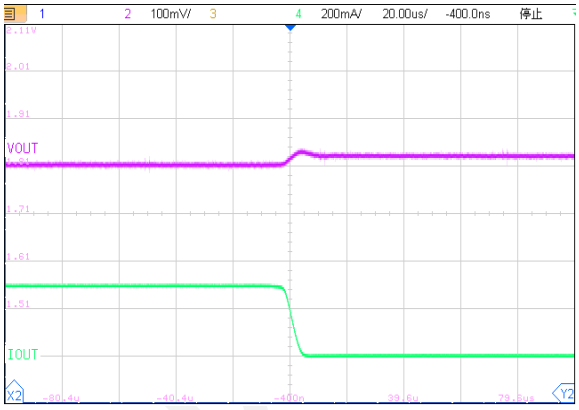
Typical Characteristics

(V_{IN} = 2.8V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, T_A = -40°C~125°C unless otherwise noted. Typical values are at T_A = 25°C.)



Load Transient Response

V_{IN} = 2.8V, V_{OUT} = 1.8V, I_{OUT} = 1mA~300mA

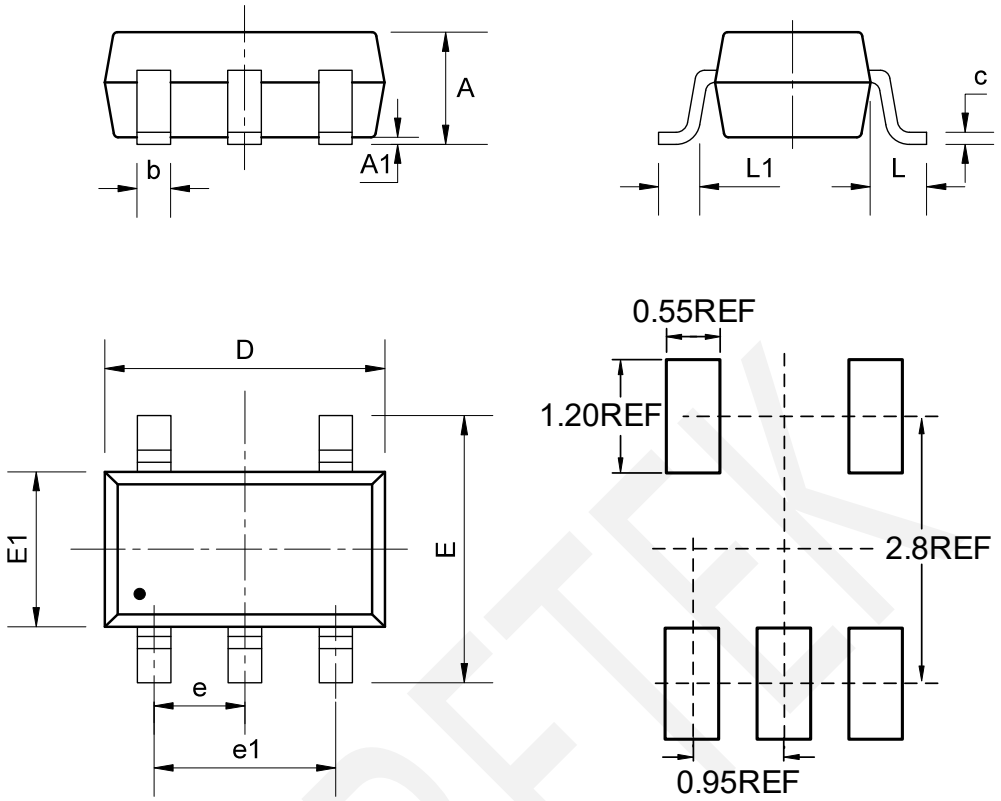


Load Transient Response

V_{IN} = 2.8V, V_{OUT} = 1.8V, I_{OUT} = 300mA~1mA

Package Dimension

SOT23-5 (1.6mm × 2.9mm)



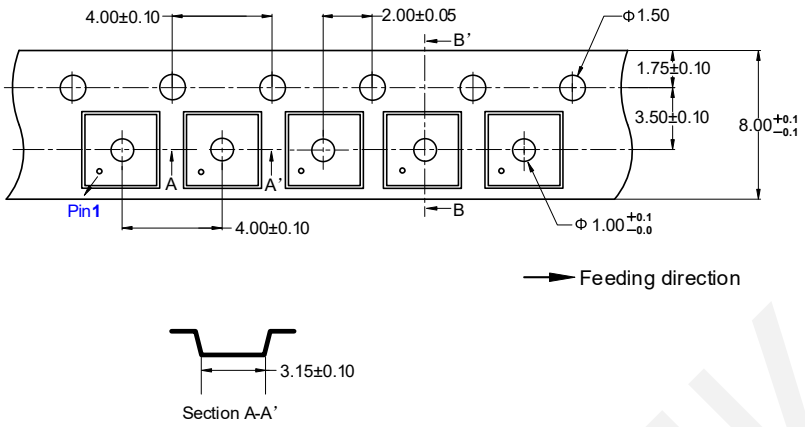
COMMON DIMENSIONS

(Unit: mm)

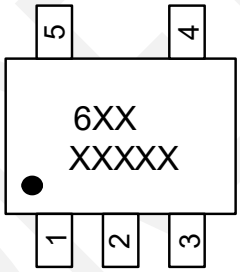
SYMBOL	MIN	NOM	MAX
A	-	-	1.45
A1	0.00	-	0.15
b	0.28	0.35	0.50
c	0.08	0.15	0.22
D	2.75	2.9	3.05
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
E	2.60	2.80	3.00
E1	1.45	1.6	1.75
L	0.60REF		
L1	0.30	0.45	0.60

Tape Information

SOT23-5 (1.6mm × 2.9mm)



Marking Information



6XX = Output Version, e.g. 618: 1.8V

XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2022-12-08	Original Version	Yang xiaoxu	Liu xiaomin	Yang xiaoxu
1.1	2025-10-25	Update EC table, Format and Package	Yang xiaoxu	Liu xiaomin	Yang xiaoxu