

The KLR54 Series is a high input voltage, low quiescent current, low-dropout linear regulator able to provide 300mA load current. The LDO features very fast response against line voltage transient and load current transient, and ensures no overshoot voltage during the LDO start up and short circuit recovery.

The device features integrated short-circuit and thermal shutdown protection.

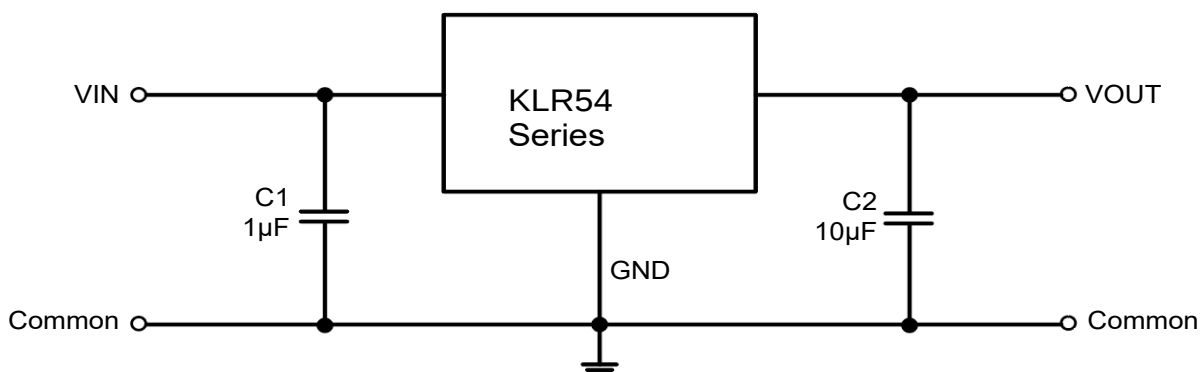
Features

- High Input Voltage Rating: Up to 55V
- Maximum Output Current: 350mA
- Standard Fixed Output Voltage Options: 1.8V, 2.8V, 3V, 3.3V, 5V, 6V
- Low Quiescent Current: 2.1uA
- PSRR=85dB@1KHz
- Low Dropout: 350mV @ 100mA
- Low Output Voltage Accuracy: $\pm 2\%$
- Fast Transient Response
- Thermal Shutdown Protection, Current Limiting Protection
- Available Packages: SOT-23, SOT-23-3, SOT-89, SOT-89-5, SOT-23-5, DFN1x1-4L and DFN2x2C-6L

Applications

- Battery-Powered Equipment
- Smoke Detector and Sensor
- Micro Controller Applications

Typical Application Circuit

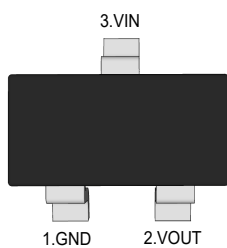


Functional Pin Description

Pin Name	Pin Function
EN	Chip Enable (Active High). Note that this pin is high impedance
NC	NO Connected
GND	Ground
VOUT	Output Voltage
VIN	Power Input Voltage

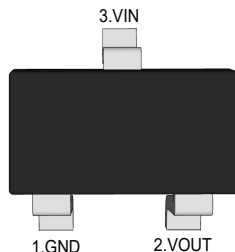
Pin Distribution

SOT-23



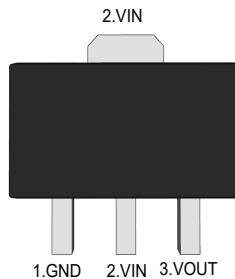
(Top View)

SOT-23-3



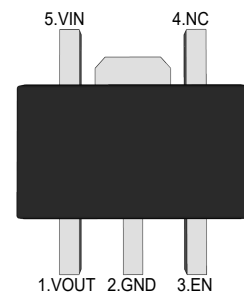
(Top View)

SOT-89



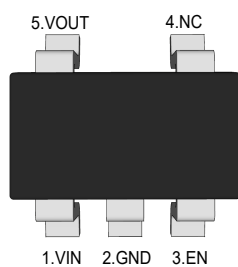
(Top View)

SOT-89-5



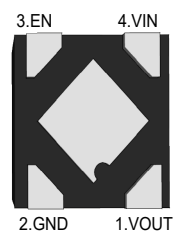
(Top View)

SOT-23-5



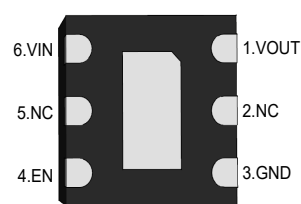
(Top View)

DFN1x1-4L



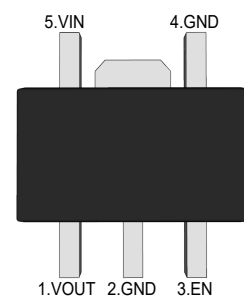
(Bottom View)

DFN2x2C-6L



Bottom View

SOT-89-5



(Top View)

Ordering Information

KLR54 □ □ □ □ □

Pin arrangement version number
 □ (Blank): Normal pin arrangement version
 -A: A version pin arrangement

Package Type
 SA:SOT-23 SC:SOT-23-3 SQ:SOT-89
 SR:SOT-89-5 SE:SOT-23-5
 DE:DFN1x1-4L DFC:DFN2x2C-6L

Output Voltage
 18 : 1.8V 28 : 2.8V 30 : 3V
 33 : 3.3V 50 : 5V 60 : 6V

Output current tap
 M : 350mA

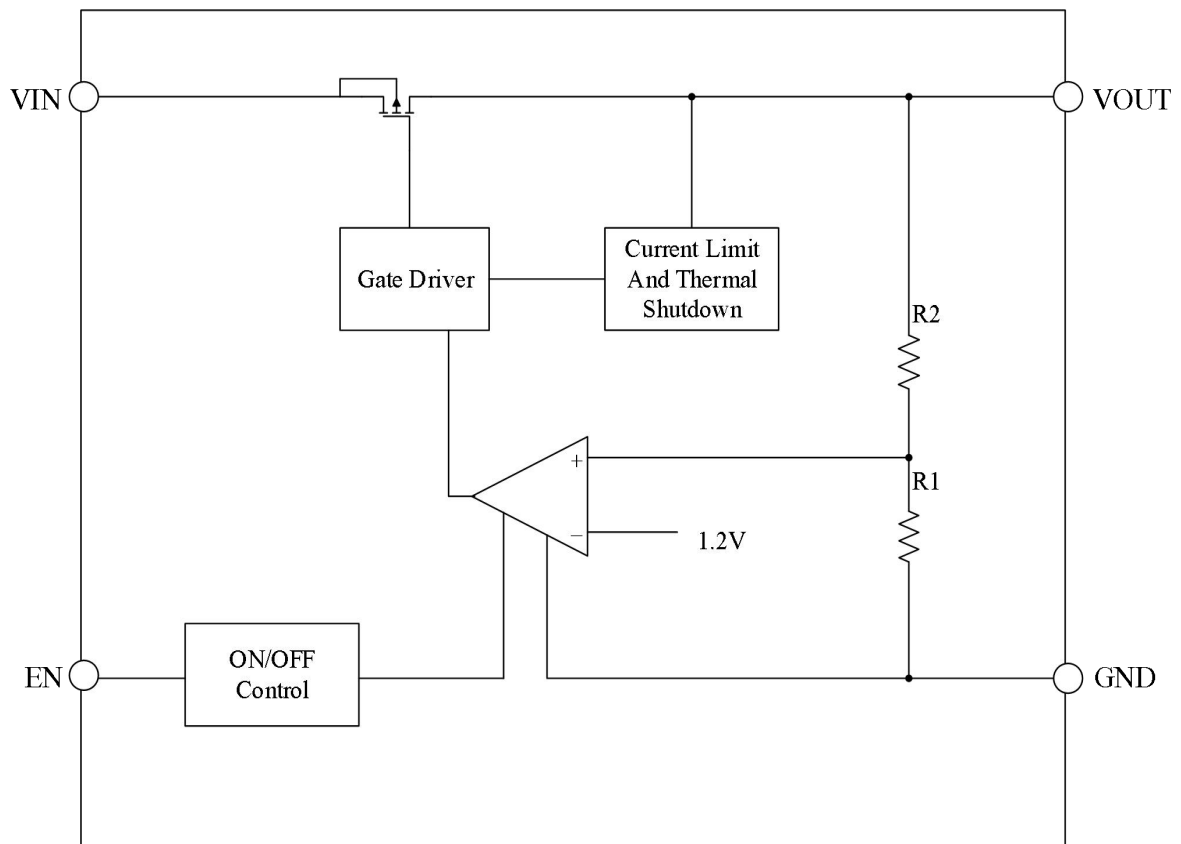
Marking Code ^{Note}

Output Voltage	Package	Marking Code
1.8V~5V	SOT-23	54XX
1.8V~5V	SOT-23-3	54XXC
1.8V~5V	SOT-23-5	54XXE
1.8V~5V	SOT-89	54XX
1.8V~5V	DFN1x1-4L	54XX

Note . XX : Output Voltage e.g . 30:3.0V 33:3.3V

KLR54 Low Dropout Regulators

Function Block Diagram



KLR54 Low Dropout Regulators

Absolute Maximum Ratings ^{Note2}

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter		Value	Unit
VIN to GND Voltage		-0.3 ~ +55	V
VOUT to GND Voltage		-0.3 ~ +6	V
VOUT to VIN Voltage		-55 ~ +0.3	V
EN to GND Voltage		-0.3 ~ +55	V
Output Current		Internally limited	--
Power Dissipation	SOT-23	320	mW
	SOT-23-3	500	mW
	SOT-89	920	mW
	SOT-89-5	920	mW
	SOT-23-5	500	mW
	DFN1x1-4L	500	mW
	DFN2x2C-6L	1700	mW
Thermal Resistance,Junction-to-Ambient	SOT-23	380	°C/W
	SOT-23-3	250	°C/W
	SOT-89	135	°C/W
	SOT-89-5	135	°C/W
	SOT-23-5	250	°C/W
	DFN1x1-4L	250	°C/W
	DFN2x2C-6L	73	°C/W
Operating Ambient Temperature		-40 ~ +85	°C
Junction temperature		150	°C
Storage temperature range		-40 ~ +150	°C

Note2: Exceed these limits to damage to the device, exposure to absolute maximum rating conditions may affect the reliability of the chip.

Recommended Operating Conditions

Parameter	Value	Unit
Supply Voltage	3~45	V
Maximum Output Current	350	mA
Operating Ambient Temperature	-40 ~ +85	°C

KLR54 Low Dropout Regulators

Electrical Characteristics

($V_{IN}=V_{OUT}+1$, $C_{IN}=1\mu F$, $C_{OUT}=10\mu F$, $T_A=25^\circ C$, unless otherwise noted.)

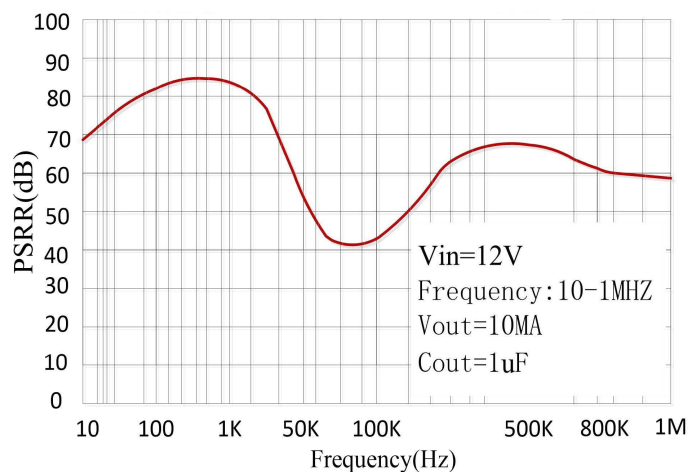
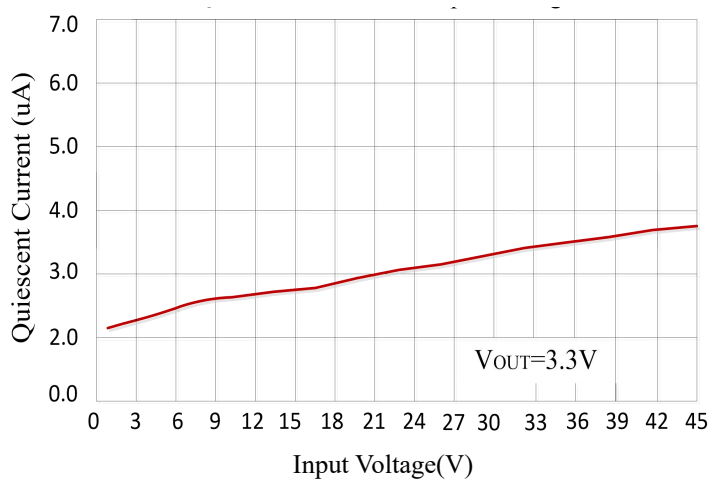
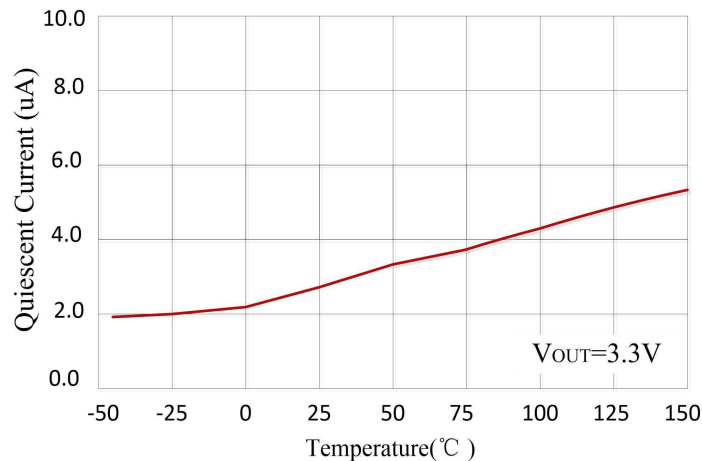
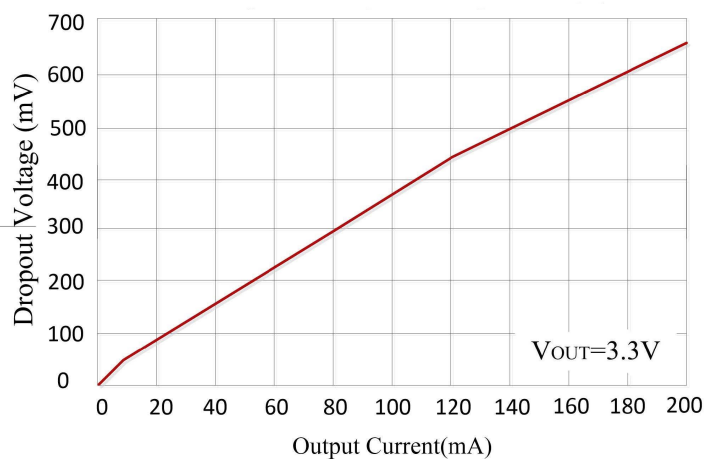
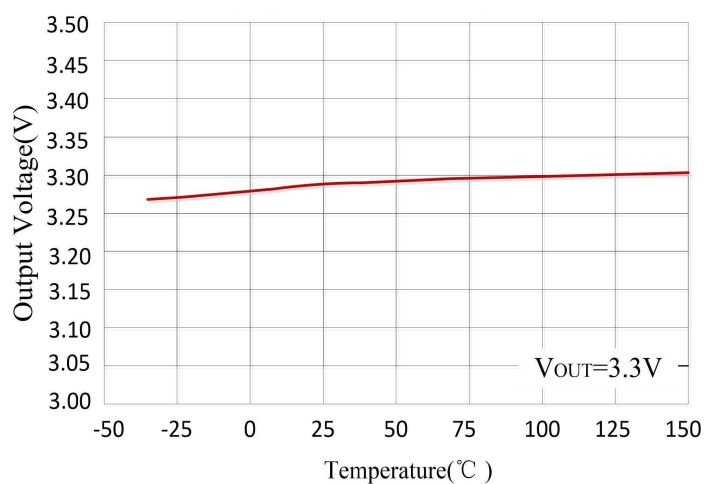
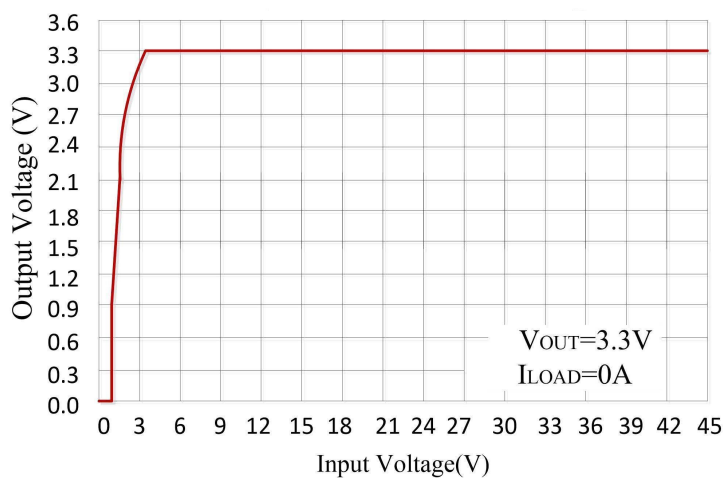
Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}		3	--	45	V
Output Voltage Accuracy		ΔV_{OUT}	$V_{IN}=12V$, $I_{OUT}=10mA$	-2	--	+2	%
Quiescent Current		I_Q	$V_{IN}=12V$, $I_{OUT}=0mA$	--	2.1	--	μA
Maximum Output Current		I_{OUT_Max}		300	350	--	mA
Dropout Voltage ^{Note3}		V_{DROP}	$V_{IN}=V_{OUTNOM}-0.1V$, $I_{OUT}=10mA$	--	35	--	mV
			$V_{IN}=V_{OUTNOM}-0.1V$, $I_{OUT}=100mA$	--	350	--	
Line Regulation		ΔV_{LINE}	$V_{OUTNOM}+0.5V \leq V_{IN} \leq 40V$ $I_{OUT}=1mA$	--	0.01	--	%/V
Load Regulation		ΔV_{LOAD}	$V_{IN}=12V$, $1mA < I_{OUT} < 100mA$	--	0.02	--	%/mA
Current Limit		I_{LIM}		--	500	--	mA
EN Input Threshold	Logic Low	V_{IL}		--	--	0.4	V
	Logic High	V_{IH}		1	--	--	V
Output Noise Voltage		V_N	10Hz~100KHz, $C_{OUT}=1\mu F$ $V_{OUT}=3V$	--	110	--	μV_{RMS}
Power Supply Rejection Ratio		PSRR	$V_{IN}=12V$, $I_{OUT}=10mA$ $f=1KHz$, $V_{OUT}=3.3V$	--	85	--	dB
Thermal Shutdown Temperature		T_{SHDN}	Shutdown, Temp increasing	--	150	--	$^\circ C$
Thermal Reset Temperature		T_{SHDN}	Reset, Temp decreasing	--	140	--	$^\circ C$

Note3: The dropout voltage difference is the voltage difference between the input and output, where the output voltage is 2% lower than its nominal value.

KLR54 Low Dropout Regulators

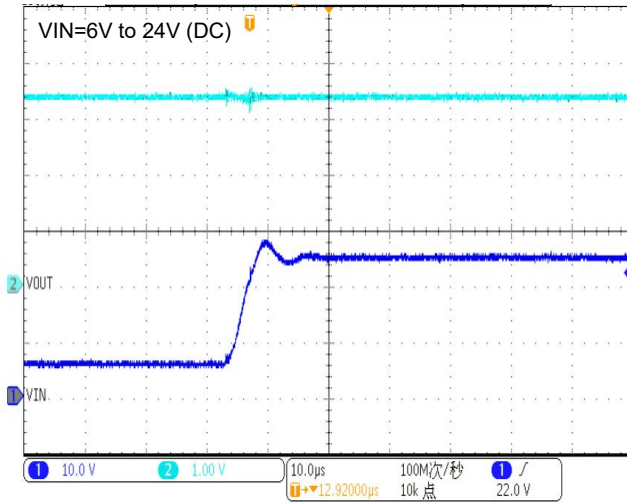
Typical Characteristic Curves

Test Condition: $T_A=25^{\circ}\text{C}$, $I_{\text{out}}=1\text{mA}$, $C_{\text{OUT}}=10\mu\text{F}$, unless otherwise noted

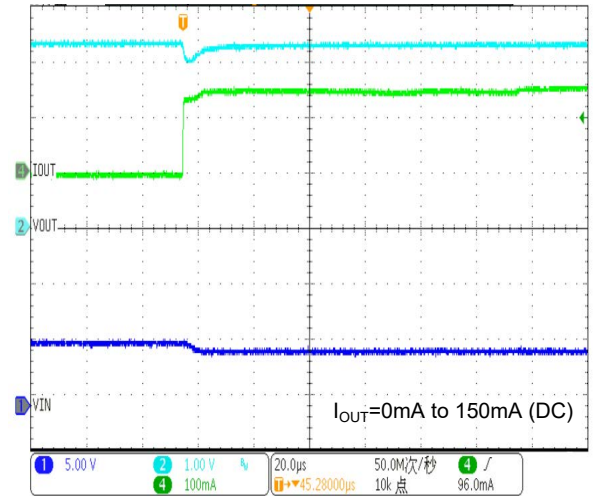


KLR54 Low Dropout Regulators

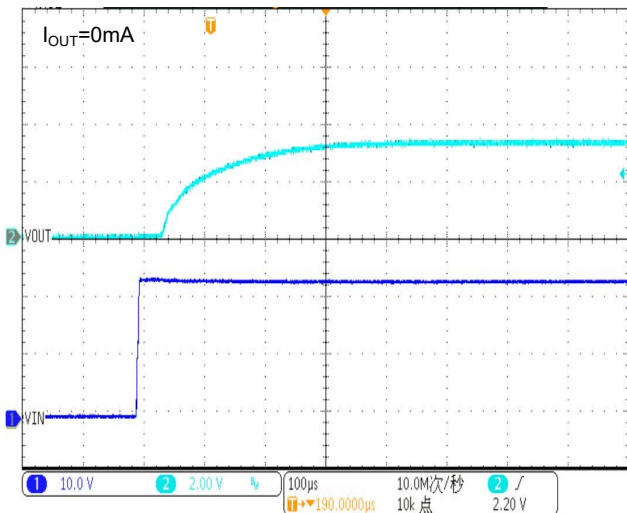
Line transient



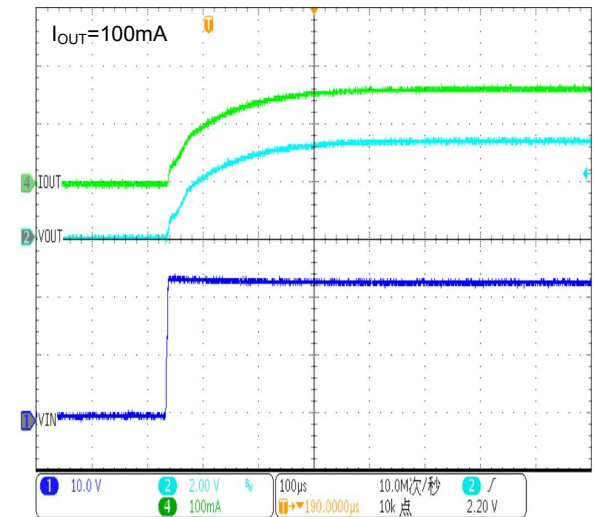
Load transient



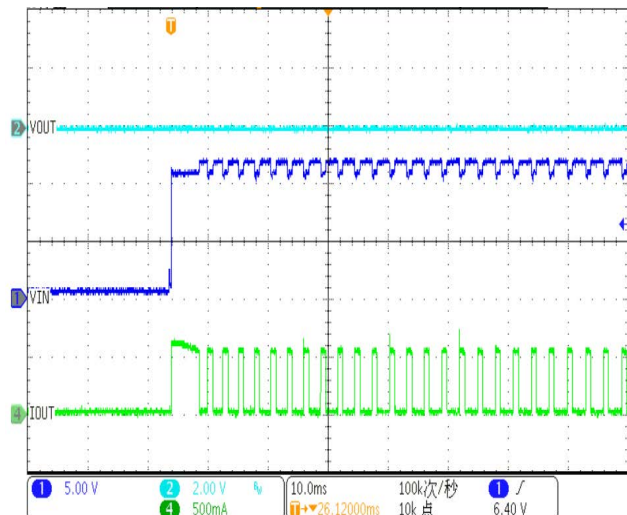
No-load start



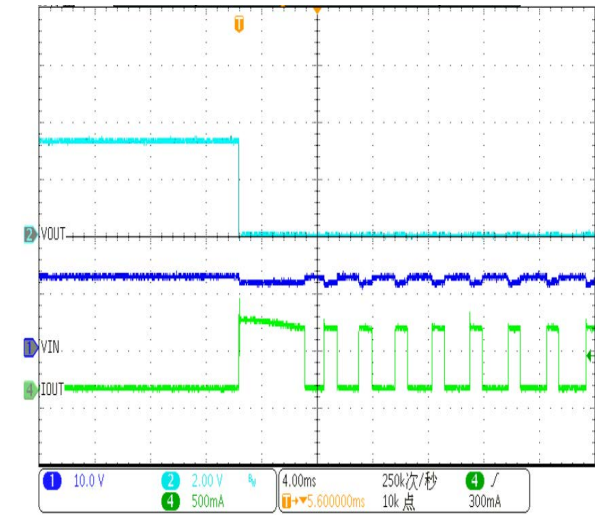
Start with load



Short-circuit Power-on



Power-on short



Functional Description

Input Capacitor

A 1 μ F 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 minimum output capacitance is 10 μ F, ceramic capacitor is recommended, and temperature characteristics are 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 VOUT and GND pins.

EN Pin Operation

The KLR54 Series is turned on by setting the EN pin to "H". Since the EN pin is neither pulled down nor pulled up internally, do not set it in floating status. When the EN pin is not used, connect the EN pin with VIN to keep the LDO in operating mode.

Current Limit and Short Circuit Protection

When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

Thermal Protection

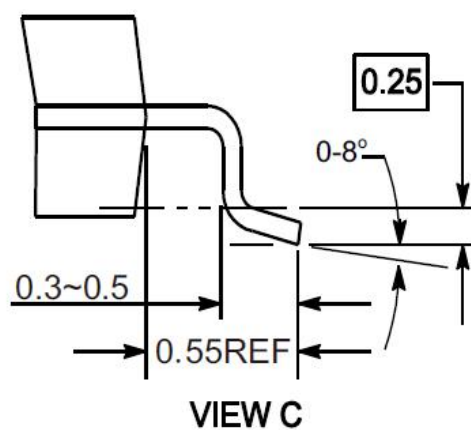
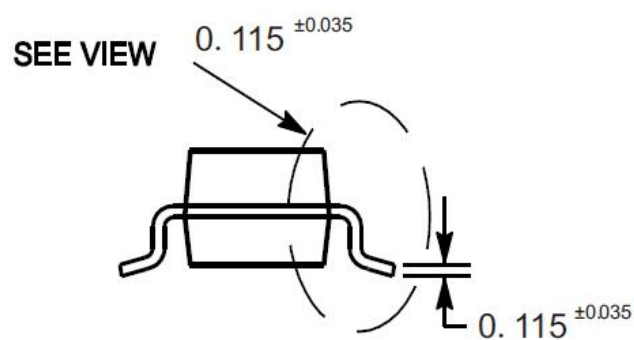
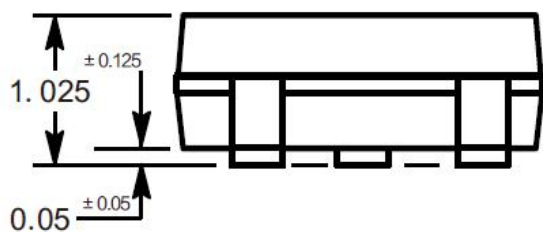
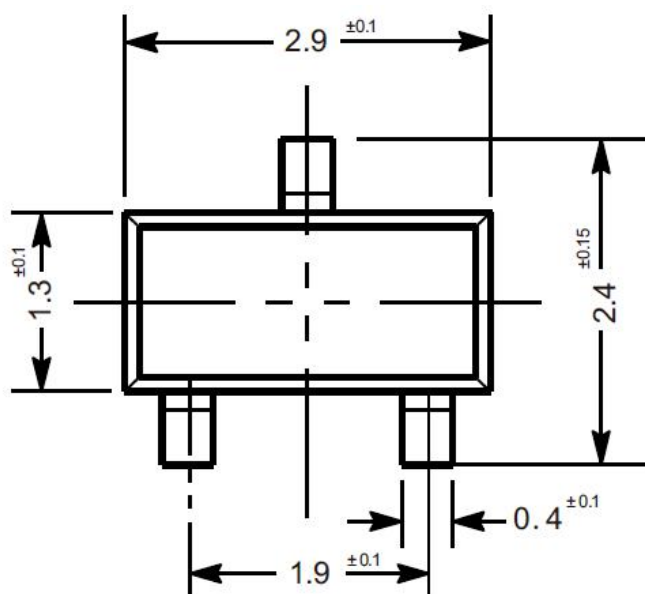
The KLR54 Series has internal thermal sense and protection circuits. When excessive power dissipation happens on the device, such as short circuit at the output pin or very heavy load current with a large voltage drop across the device, the internal thermal protection circuit will be triggered, and it will shut down the power MOSFET to prevent the LDO from damage. As soon as excessive thermal condition is removed and the temperature of the device drops down, the thermal protection circuit will lease the control of the power MOSFET, and the LDO device goes to normal operation.

KLR54 Low Dropout Regulators

Package Outline

SOT-23

Dimensions in mm

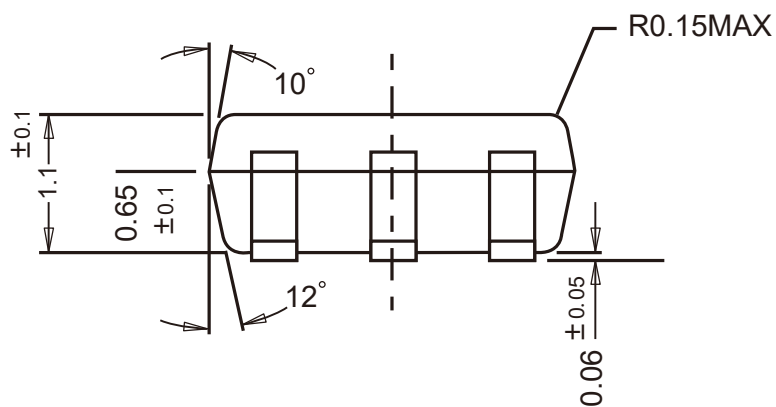
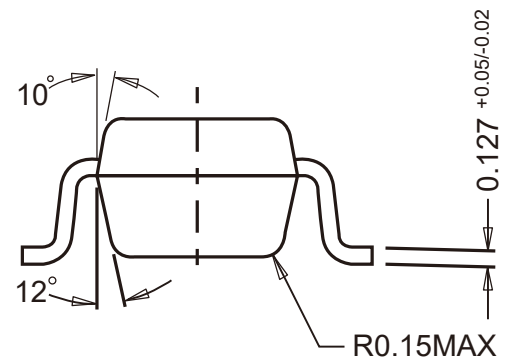
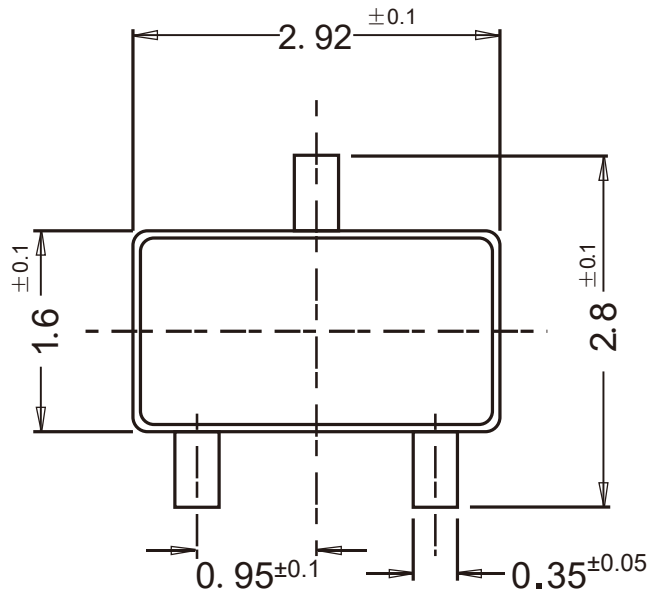


KLR54 Low Dropout Regulators

Package Outline

SOT-23-3

Dimensions in mm

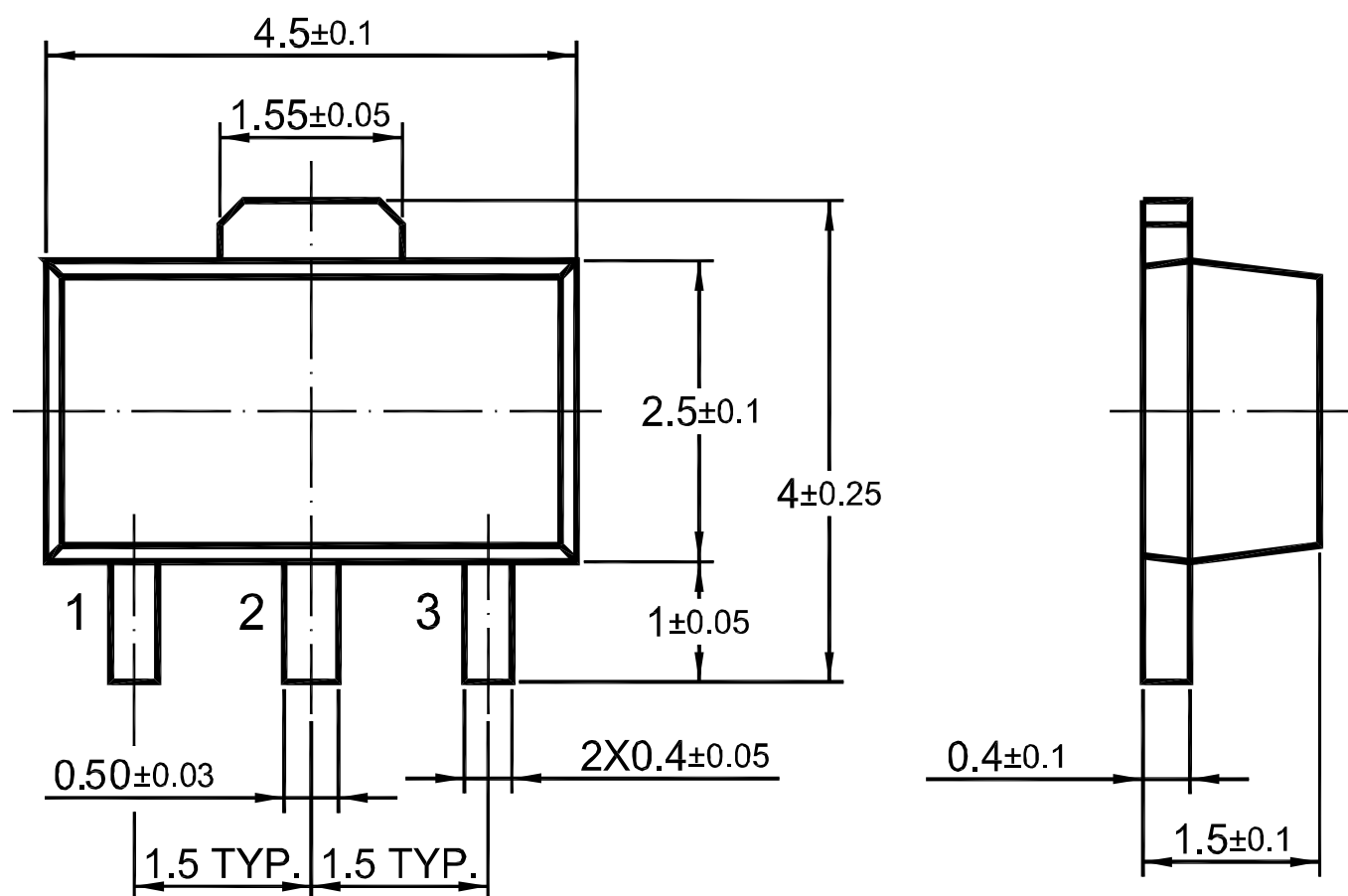


KLR54 Low Dropout Regulators

Package Outline

SOT-89

Dimensions in mm

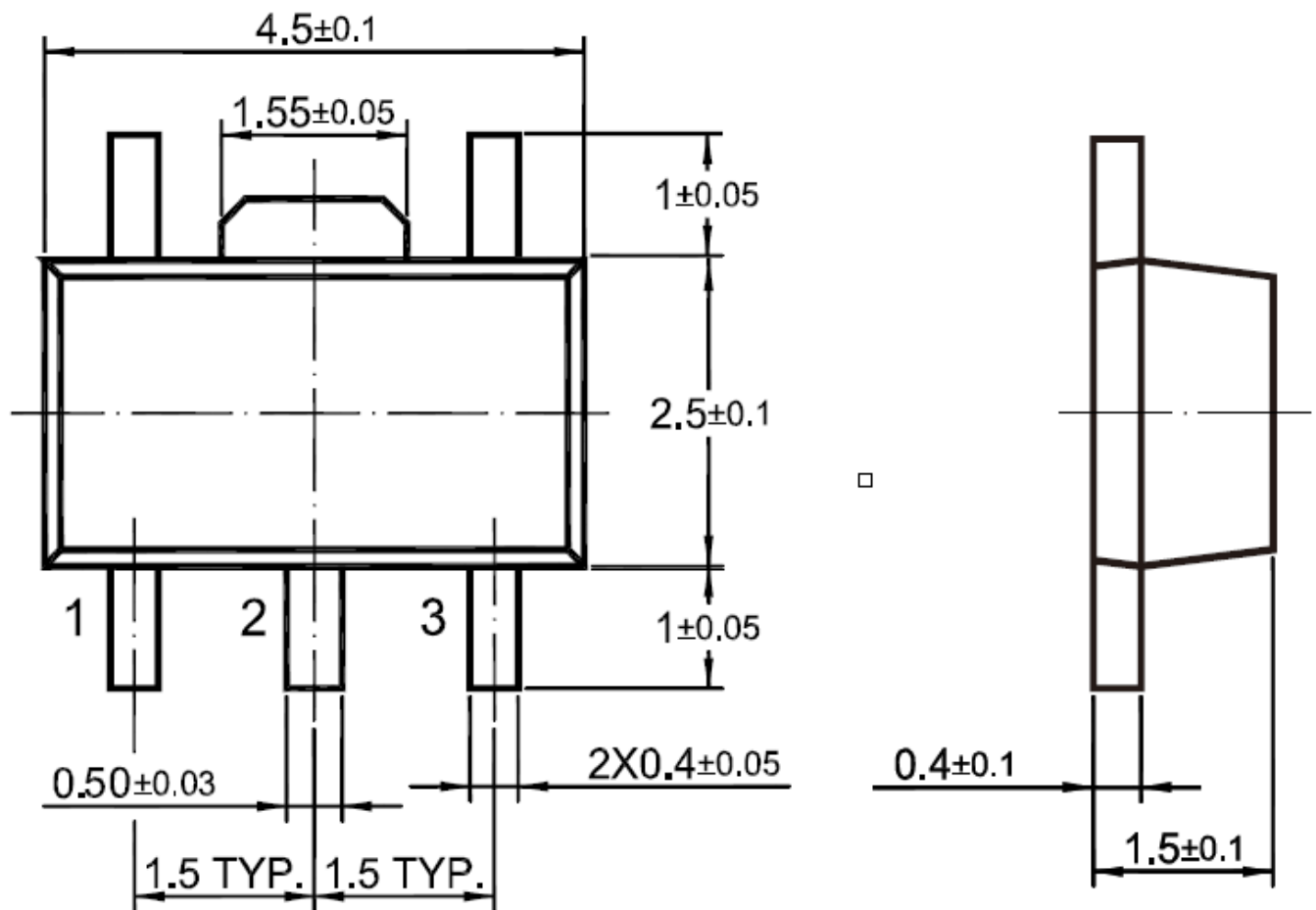


KLR54 Low Dropout Regulators

Package Outline

SOT-89-5

Dimensions in mm

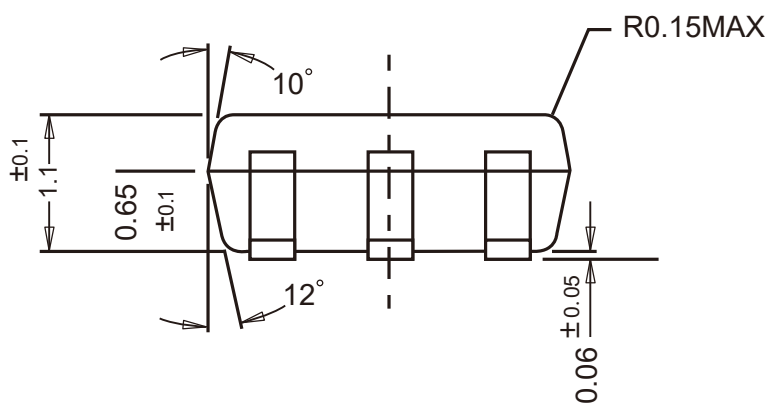
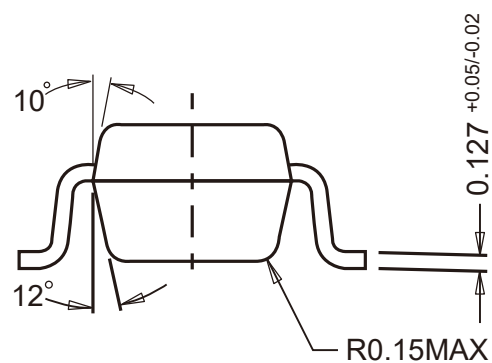
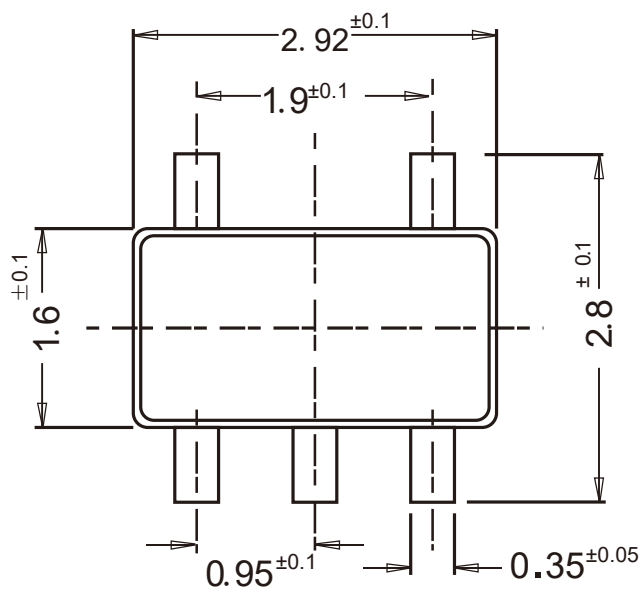


KLR54 Low Dropout Regulators

Package Outline

SOT-23-5

Dimensions in mm

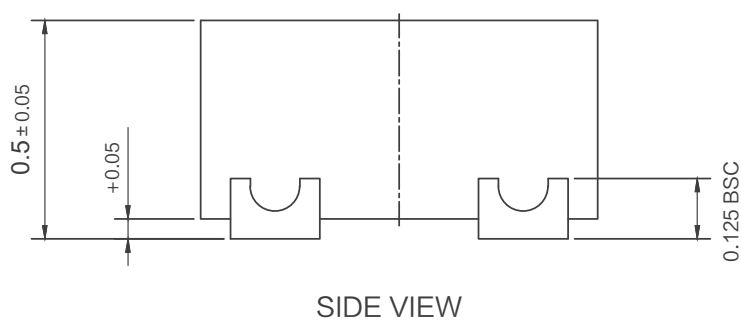
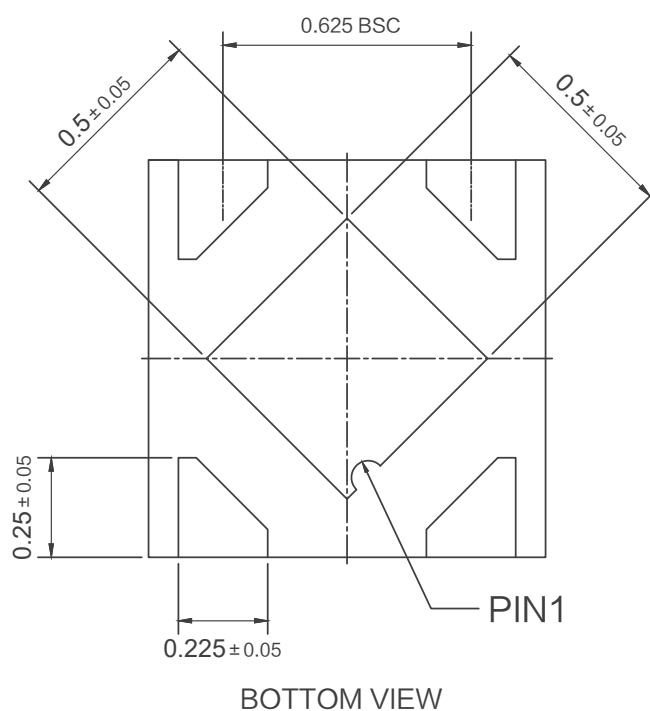
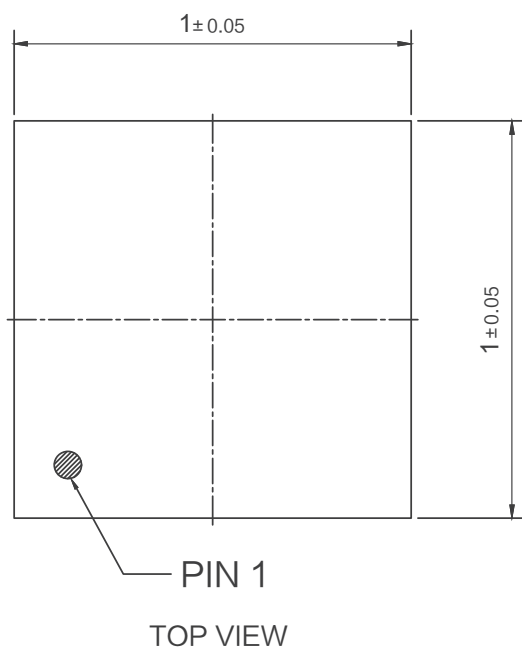


KLR54 Low Dropout Regulators

Package Outline

DFN1x1-4L

Dimensions in mm

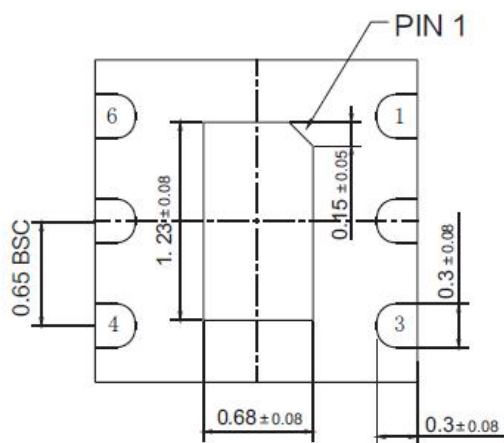


KLR54 Low Dropout Regulators

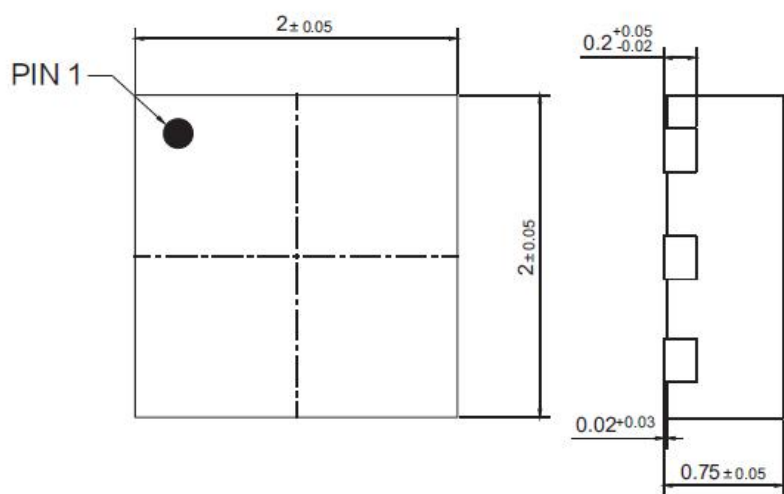
Package Outline

DFN2x2C-6L

Dimensions in mm



BOTTOM VIEW



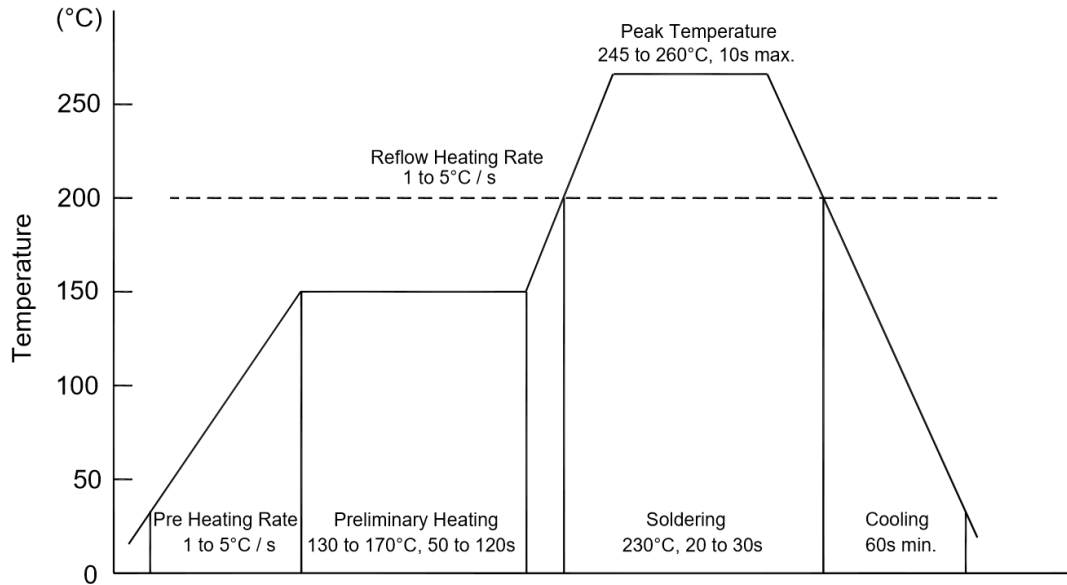
TOP VIEW

SIDE VIEW

KLR54 Low Dropout Regulators

Conditions of Soldering and Storage

◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

◆ Conditions of hand soldering

- Temperature: 300°C
- Time: 3s max.
- Times: one time

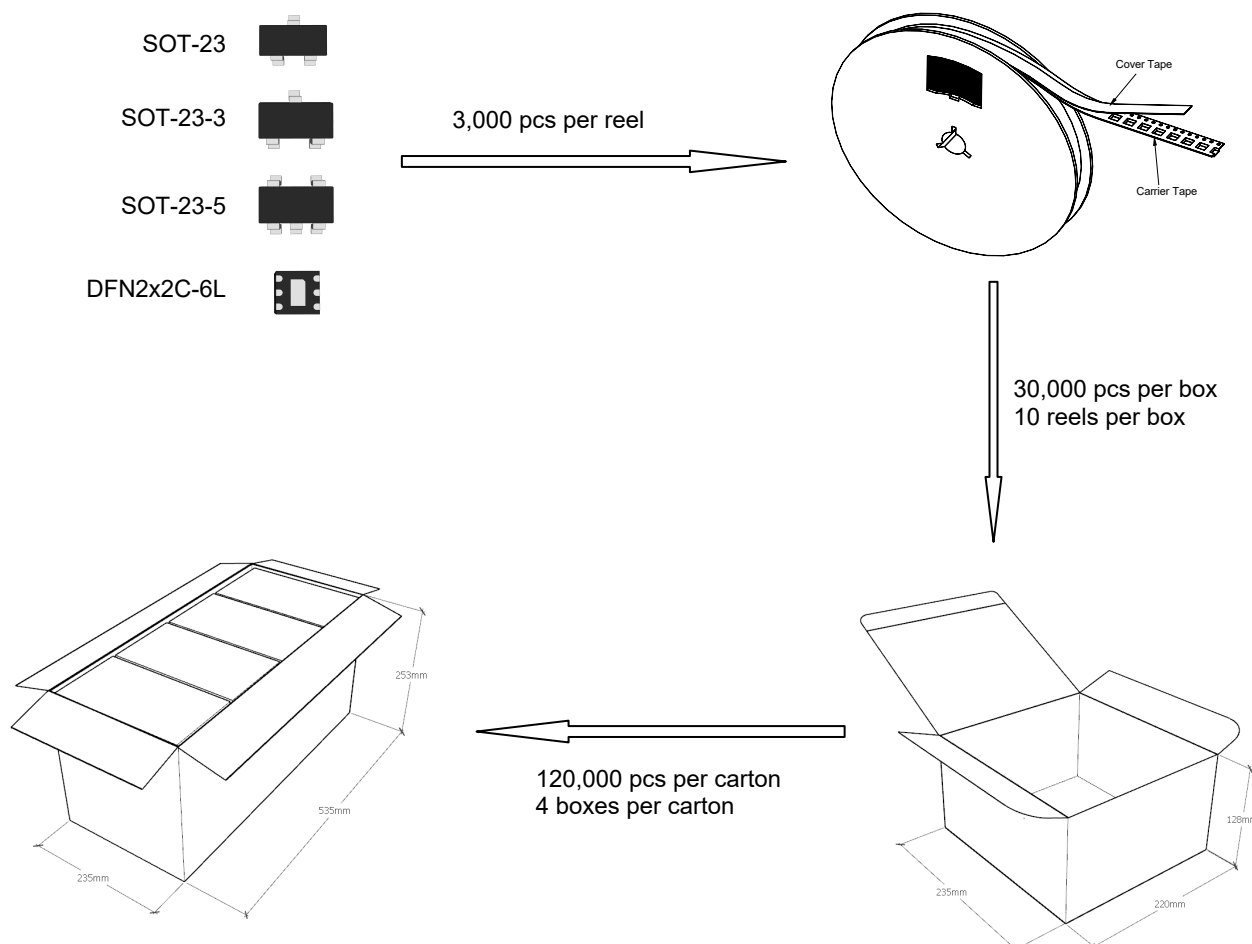
◆ Storage conditions

- **Temperature**
5 to 40°C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing

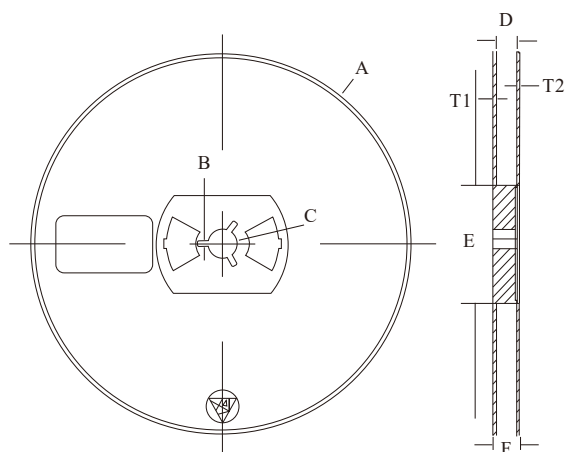
KLR54 Low Dropout Regulators

Package Specifications (SOT-23/SOT-23-3/SOT-23-5/DFN2x2C-6L)

- The method of packaging



◆ reel data



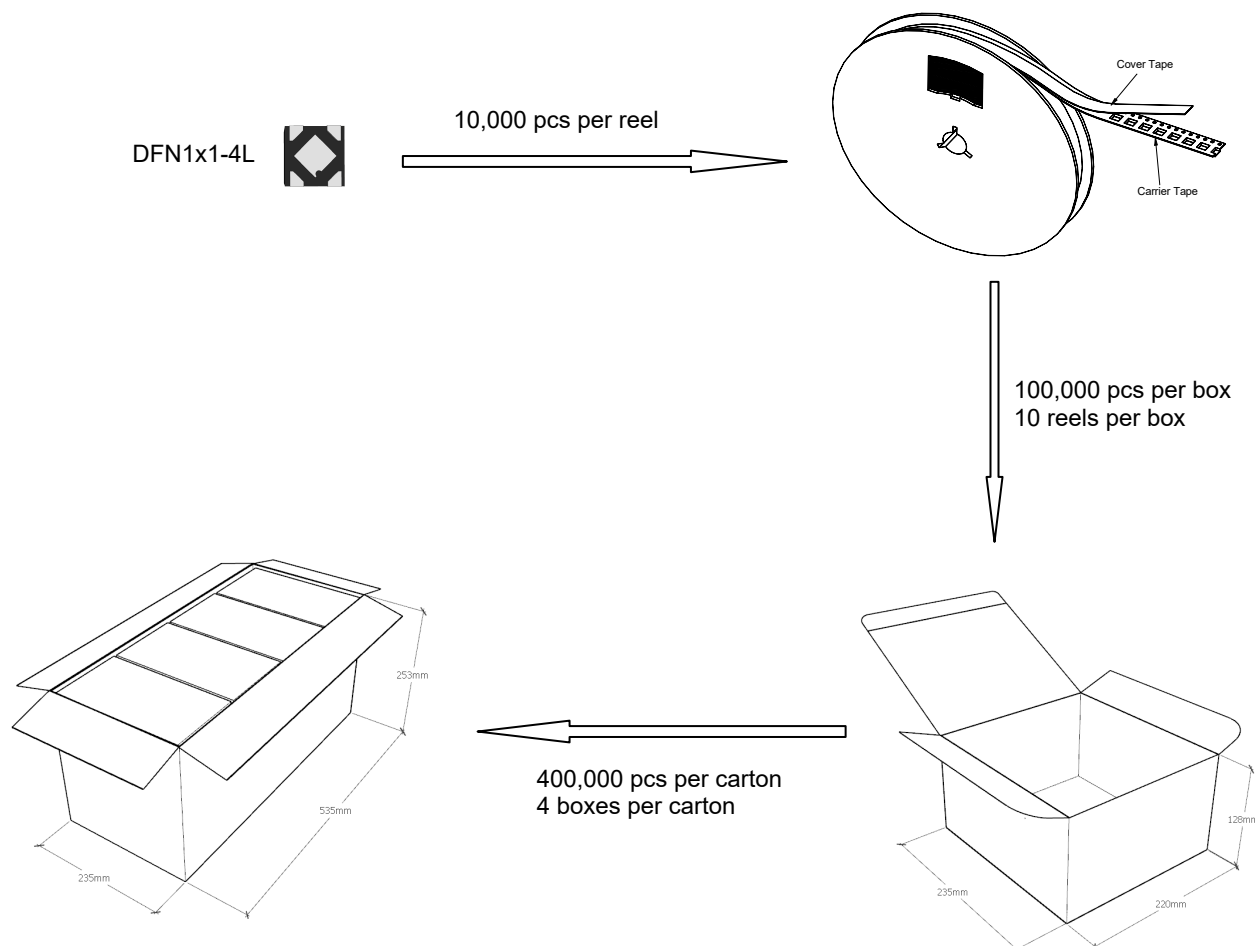
Reel (7")

Symbol	Value (unit: mm)
A	$\varnothing 177.8 \pm 1$
B	2.7 ± 0.2
C	$\varnothing 13.5 \pm 0.2$
E	$\varnothing 54.5 \pm 0.2$
F	12.3 ± 0.3
D	$9.6 + 2 / - 0.3$
T1	1.0 ± 0.2
T2	1.2 ± 0.2

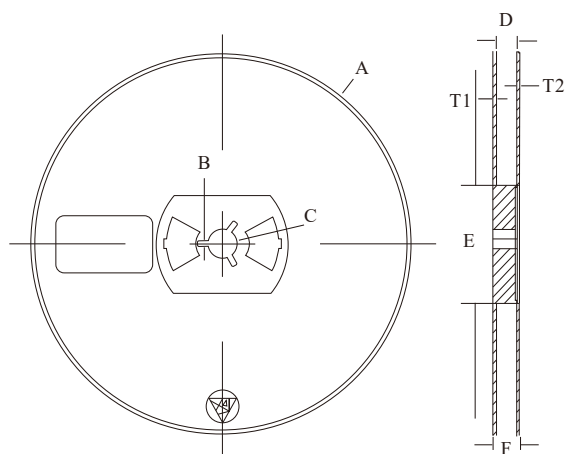
KLR54 Low Dropout Regulators

Package Specifications (DFN1x1-4L)

- The method of packaging



reel data

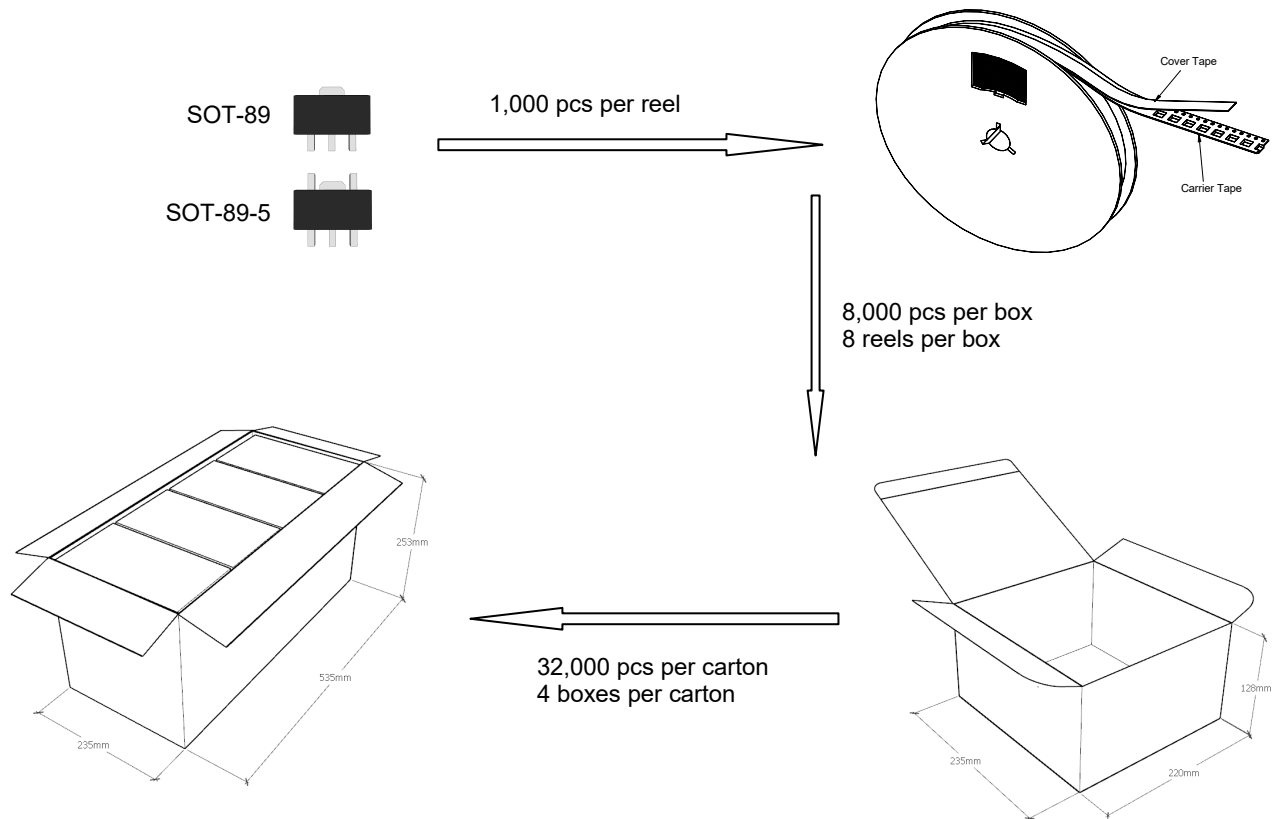


Symbol	Value (unit: mm)
A	$\varnothing 177.8 \pm 1$
B	2.7 ± 0.2
C	$\varnothing 13.5 \pm 0.2$
E	$\varnothing 54.5 \pm 0.2$
F	12.3 ± 0.3
D	$9.6 +2/-0.3$
T1	1.0 ± 0.2
T2	1.2 ± 0.2

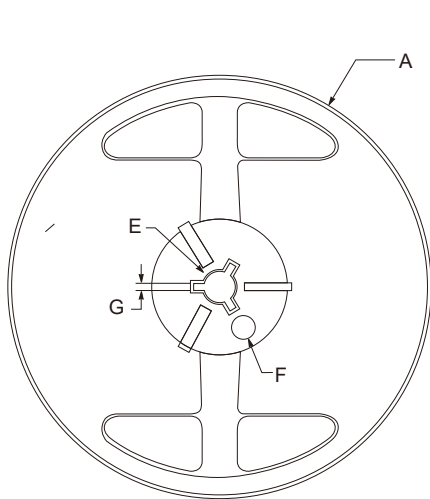
KLR54 Low Dropout Regulators

Package Specifications (SOT-89/SOT-89-5)

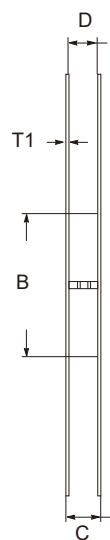
- The method of packaging (1,000PCS/Reel&7inches)



◆ reel data



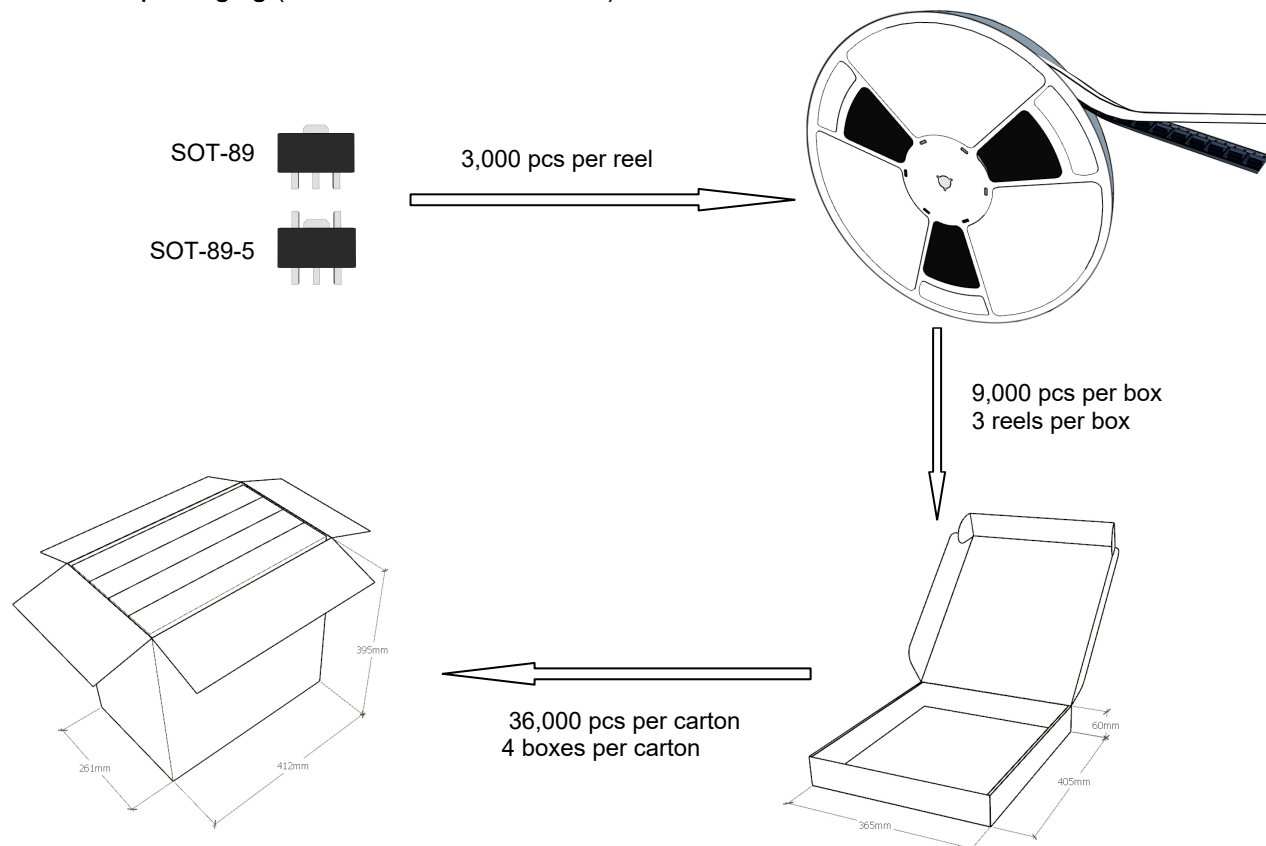
Reel (7")



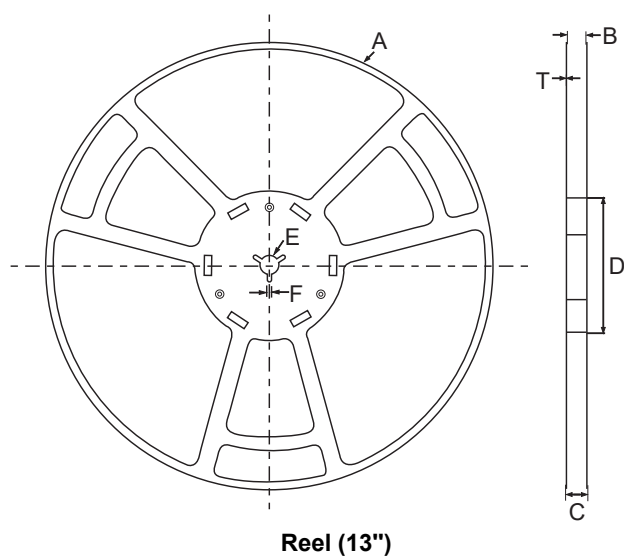
symbol	Value(unit:mm)
A	$\Phi 179 \pm 1$
B	60.5 ± 0.2
C	15.3 ± 0.3
D	$12.5 \sim 13.7$
E	$\Phi 13.5 \pm 0.2$
F	$\Phi 10.0 \pm 0.2$
G	2.7 ± 0.2
T1	1.0 ± 0.2

Package Specifications (SOT-89/SOT-89-5)

- The method of packaging (3,000PCS/Reel&13inches)



reel data

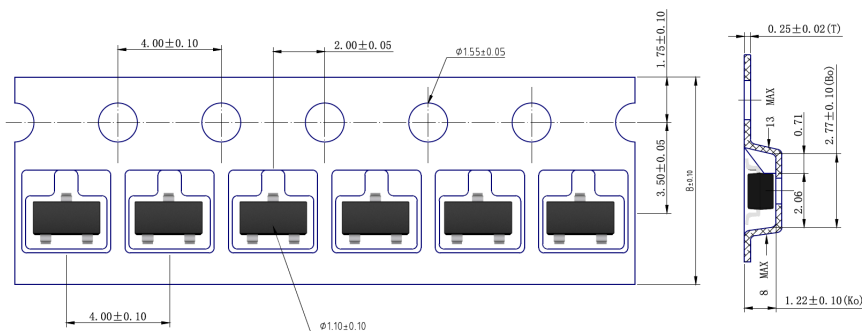


symbol	Value(unit:mm)
A	$\phi 330 \pm 1$
B	12.7 ± 0.5
C	16.5 ± 0.3
D	$\phi 99.5 \pm 0.5$
E	$\phi 13.6 \pm 0.3$
F	2.8 ± 0.3
T	1.9 ± 0.2

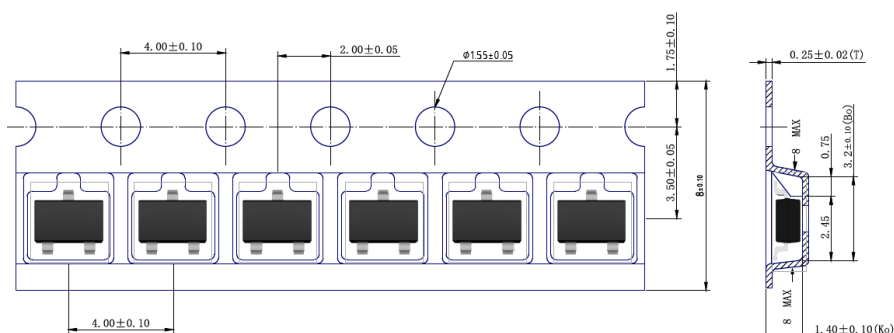
KLR54 Low Dropout Regulators

◆ Embossed tape data

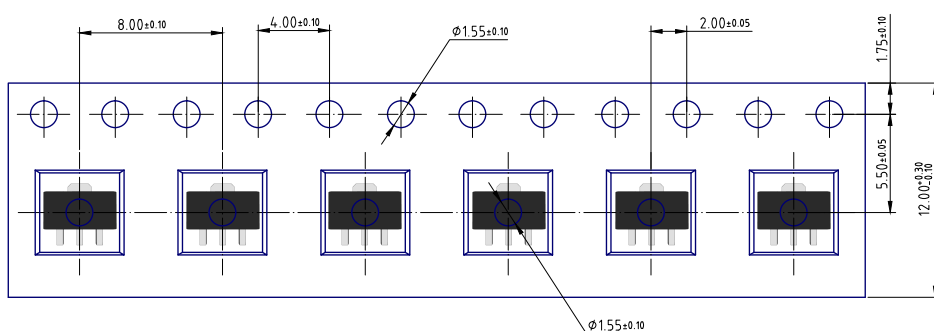
SOT-23



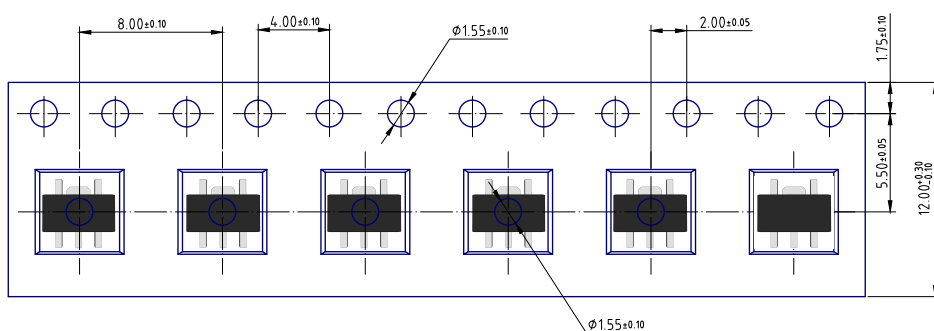
SOT-23-3



SOT-89



SOT-89-5



SOT-23-5

