

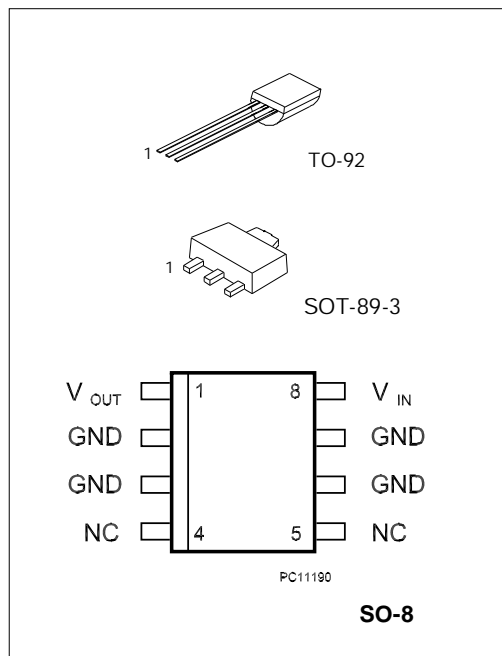
## 3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

### DESCRIPTION

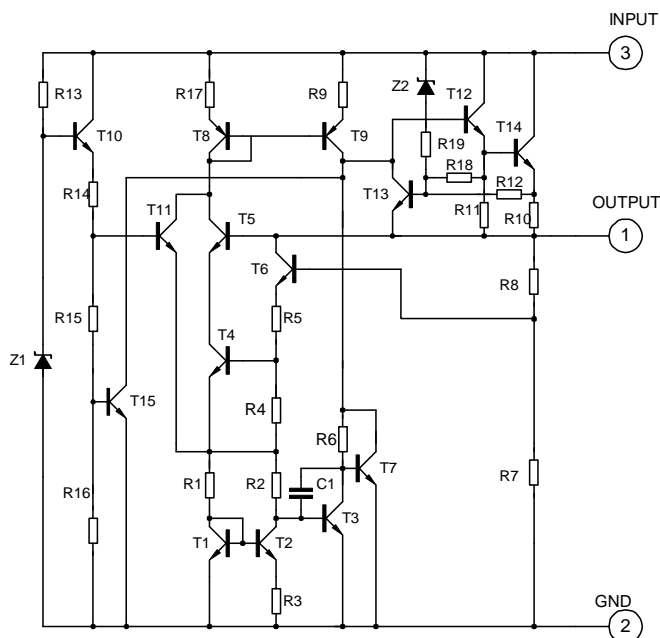
The 78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 100mA.

### FEATURE

- \*Maximum output current of 100mA
- \*Output voltage of 5V,6V,8V,9V,10V,12V,15V and 24V
- \*Thermal overload protection
- \*Short circuit current limiting



### BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS** (Operating temperature range applies unless otherwise specified)

CHARACTERISTICS	SYMBOL	VALUE	UNITS
Input voltage(for $V_o=5,8V$ )	$V_i$	30	V
(for $V_o=12,15V$ )	$V_i$	35	V
High power dissipation	$P_d$	700	mW
Operating Junction Temperature Range	$T_{OPR}$	-20~+120	°C
Storage Temperature Range	$T_{STG}$	-55~+150	°C

**78L05 ELECTRICAL CHARACTERISTICS**

( $V_i=10V, I_o=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^\circ C$	4.8	5.0	5.2	V
		$7V \leq V_i \leq 20V, I_o=1mA \sim 40mA$	4.75		5.25	V
		$7V \leq V_i \leq V_{MAX}, I_o=1mA \sim 70mA$	4.75		5.25	V (note 2)
Output Voltage(note 3)	$V_o$	$T_j=25^\circ C$	4.9	5.0	5.1	V
		$7V \leq V_i \leq 20V, I_o=1mA \sim 40mA$	4.85		5.15	V
		$7V \leq V_i \leq V_{MAX}, I_o=1mA \sim 70mA$	4.85		5.15	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25^\circ C, I_o=1mA \sim 100mA$		11	60	mV
		$T_j=25^\circ C, I_o=1mA \sim 40mA$		5.0	30	mV
Line regulation	$\Delta V_o$	$7V \leq V_i \leq 20V, T_j=25^\circ C$		8	150	mV
		$8V \leq V_i \leq 20V, T_j=25^\circ C$		6	100	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	$8V \leq V_i \leq 20V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_i \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		40		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_o=5mA$		0.65		$mV/^\circ C$
Ripple Rejection	RR	$8V \leq V_i \leq 20V, f=120Hz, T_j=25^\circ C$	40	49		dB
Dropout Voltage	$V_d$	$T_j=25^\circ C$		1.7		V

### 78L06 ELECTRICAL CHARACTERISTICS

( $V_I=12V, I_O=40mA, 0 < T_J < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_J=25^\circ C$	5.75	6.0	6.25	V
		$8.5V \leq V_I \leq 20V, I_O=1mA \sim 40mA$	5.7		6.3	V
		$8.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	5.7		6.3	V (note 2)
Output Voltage(note 3)	$V_o$	$T_J=25^\circ C$	5.88	6.0	6.12	V
		$8.5V \leq V_I \leq 20V, I_O=1mA \sim 40mA$	5.82		6.18	V
		$8.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	5.82		6.18	V (note 2)
Load Regulation	$\Delta V_o$	$T_J=25^\circ C, I_O=1mA \sim 100mA$		12.8	80	mV
		$T_J=25^\circ C, I_O=1mA \sim 70mA$		5.8	40	mV
Line regulation	$\Delta V_o$	$8.5V \leq V_I \leq 20V, T_J=25^\circ C$		64	175	mV
		$9V \leq V_I \leq 20V, T_J=25^\circ C$		54	125	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	$9V \leq V_I \leq 20V$			1.5	mA
	$\Delta I_q$	$1mA \leq I_O \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		49		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_O=5mA$		0.75		$mV/^\circ C$
Ripple Rejection	RR	$10V \leq V_I \leq 20V, f=120Hz, T_J=25^\circ C$	38	46		dB
Dropout Voltage	$V_d$	$T_J=25^\circ C$		1.7		V

### 78L08 ELECTRICAL CHARACTERISTICS

( $V_I=14V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^\circ C$	7.7	8.0	8.3	V
		$10.5V \leq V_I \leq 23V, I_O=1mA \sim 40mA$	7.6		8.4	V
		$10.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	7.6		8.4	V (note 2)
Output Voltage(note 3)	$V_o$	$T_j=25^\circ C$	7.84	8.0	8.16	V
		$10.5V \leq V_I \leq 23V, I_O=1mA \sim 40mA$	7.76		8.24	V
		$10.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	7.76		8.24	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25^\circ C, I_O=1mA \sim 100mA$		15	80	mV
		$T_j=25^\circ C, I_O=1mA \sim 70mA$		8.0	40	mV
Line regulation	$\Delta V_o$	$10.5V \leq V_I \leq 23V, T_j=25^\circ C$		10	175	mV
		$11V \leq V_I \leq 23V, T_j=25^\circ C$		8	125	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	$11V \leq V_I \leq 23V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		49		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_O=5mA$		0.75		$mV/^\circ C$
Ripple Rejection	RR	$11V \leq V_I \leq 23V, f=120Hz, T_j=25^\circ C$	36	45		dB
Dropout Voltage	$V_d$	$T_j=25^\circ C$		1.7		V

### 78L09 ELECTRICAL CHARACTERISTICS

( $V_I=15V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^\circ C$	8.64	9.0	9.36	V
		$11.5V \leq V_I \leq 24V, I_O=1mA \sim 40mA$	8.55		9.45	V
		$11.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	8.55		9.45	V (note 2)
Output Voltage(note 3)	$V_o$	$T_j=25^\circ C$	8.82	9.0	9.18	V
		$11.5V \leq V_I \leq 24V, I_O=1mA \sim 40mA$	8.73		9.27	V
		$11.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	8.73		9.27	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25^\circ C, I_O=1mA \sim 100mA$		20	90	mV
		$T_j=25^\circ C, I_O=1mA \sim 40mA$		10	45	mV
Line regulation	$\Delta V_o$	$11.5V \leq V_I \leq 24V, T_j=25^\circ C$		90	200	mV
		$13V \leq V_I \leq 24V, T_j=25^\circ C$		100	150	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	$13V \leq V_I \leq 24V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		49		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_O=5mA$		0.75		mV/ $^\circ C$
Ripple Rejection	RR	$12V \leq V_I \leq 23V, f=120Hz, T_j=25^\circ C$	36	44		dB
Dropout Voltage	$V_d$	$T_j=25^\circ C$		1.7		V

### 78L12 ELECTRICAL CHARACTERISTICS

( $V_I=19V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^\circ C$	11.5	12	12.6	V
		$14.5V \leq V_I \leq 27V, I_O=1mA \sim 40mA$	11.4		12.6	V
		$14.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	11.4		12.6	V (note 2)
Output Voltage(note 3)	$V_o$	$T_j=25^\circ C$	11.76	12.0	12.24	V
		$14.5V \leq V_I \leq 27V, I_O=1mA \sim 40mA$	11.64		12.36	V
		$14.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	11.64		12.36	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25^\circ C, I_O=1mA \sim 100mA$		25	150	mV
		$T_j=25^\circ C, I_O=1mA \sim 40mA$		12	75	mV
Line regulation	$\Delta V_o$	$14.5V \leq V_I \leq 27V, T_j=25^\circ C$		25	300	mV
		$16V \leq V_I \leq 27V, T_j=25^\circ C$		20	250	mV
Quiescent Current	$I_q$			2.0	5.5	mA
Quiescent Current Change	$\Delta I_q$	$16V \leq V_I \leq 27V$			1.5	mA
	$\Delta I_q$	$1mA \leq I_O \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		80		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_O=5mA$		1.0		$mV/^\circ C$
Ripple Rejection	RR	$15V \leq V_I \leq 25V, f=120Hz, T_j=25^\circ C$	36	42		dB
Dropout Voltage	$V_d$	$T_j=25^\circ C$		1.7		V

### 78L15 ELECTRICAL CHARACTERISTICS

( $V_I=23V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^\circ C$	14.4	15	15.6	V
		$17.5V \leq V_I \leq 30V, I_O=1mA \sim 40mA$	14.25		15.75	V
		$17.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	14.25		15.75	V (note 2)
Output Voltage(note 3)	$V_o$	$T_j=25^\circ C$	14.7	15.0	15.3	V
		$17.5V \leq V_I \leq 30V, I_O=1mA \sim 40mA$	14.55		15.45	V
		$17.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	14.55		15.45	V (note 2)
Load Regulation	$\Delta V_o$	$T_j=25^\circ C, I_O=1mA \sim 100mA$		20	150	mV
		$T_j=25^\circ C, I_O=1mA \sim 70mA$		25	150	mV
Line regulation	$\Delta V_o$	$17.5V \leq V_I \leq 30V, T_j=25^\circ C$		25	150	mV
		$20V \leq V_I \leq 30V, T_j=25^\circ C$		15	75	mV
Quiescent Current	$I_q$			2.2	6.0	mA
Quiescent Current Change	$\Delta I_q$	$20V \leq V_I \leq 30V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		90		$\mu V$
Temperature coefficient of $V_o$	$\Delta V_o / \Delta T$	$I_O=5mA$		1.3		$mV/^\circ C$
Ripple Rejection	RR	$18.5V \leq V_I \leq 28.5V, f=120Hz, T_j=25^\circ C$	33	39		dB
Dropout Voltage	$V_d$	$T_j=25^\circ C$		1.7		V

### 78L18 ELECTRICAL CHARACTERISTICS

( $V_I=27V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	17.3	18	18.7	V
		21V ≤ Vi ≤ 33V, Io=1mA~40mA	17.1		18.9	V
		21V ≤ Vi ≤ VMAX, Io=1mA~70mA	17.1		18.9	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	17.64	18.0	18.36	V
		21V ≤ Vi ≤ 33V, Io=1mA~40mA	17.46		18.54	V
		21V ≤ Vi ≤ VMAX, Io=1mA~70mA	17.46		18.54	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		30	170	mV
		Tj=25°C, Io=1mA~40mA		15	85	mV
Line regulation	ΔVo	21V ≤ Vi ≤ 33V, Tj=25°C		145	300	mV
		22V ≤ Vi ≤ 33V, Tj=25°C		135	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	21V ≤ Vi ≤ 33V			1.5	mA
	ΔIq	1mA ≤ Vi ≤ 40mA			0.1	mA
Output Noise Voltage	Vn	10Hz ≤ f ≤ 100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.8		mV/°C
Ripple Rejection	RR	23V ≤ Vi ≤ 33V, f=120Hz, Tj=25°C	32	38		dB
Dropout Voltage	Vd	Tj=250°C		1.7		V



### 78L24 ELECTRICAL CHARACTERISTICS

( $V_I=33V, I_O=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

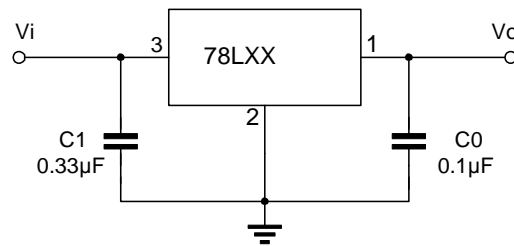
Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	23	24	25	V
		27V ≤ Vi ≤ 38V, Io=1mA~40mA	22.8		25.2	V
		27V ≤ Vi ≤ VMAX, Io=1mA~70mA	22.8		25.2	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	23.5	24	24.5	V
		27V ≤ Vi ≤ 38V, Io=1mA~40mA	23.25		24.75	V
		27V ≤ Vi ≤ VMAX, Io=1mA~70mA	23.25		24.75	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		40	200	mV
		Tj=25°C, Io=1mA~40mA		20	100	mV
Line regulation	ΔVo	27V ≤ Vi ≤ 38V, Tj=25°C		160	300	mV
		28V ≤ Vi ≤ 38V, Tj=25°C		150	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	27V ≤ Vi ≤ 38V			1.5	mA
	ΔIq	1mA ≤ Vi ≤ 40mA			0.1	mA
Output Noise Voltage	VN	10Hz ≤ f ≤ 100kHz		200		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		2.0		mV/°C
Ripple Rejection	RR	27V ≤ Vi ≤ 38V, f=120Hz, Tj=25°C	30	37		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

Note 1: The Maximum steady state usable output current and input voltage are very dependent on the heating sinking and/or lead temperature length of the package. The data above represent pulse test conditions with junction temperatures as indicated at the initiation of test.

Note 2: Power dissipation < 0.75W.

Note 3: Output voltage of 78LXXA.

TYPICAL APPLICATION



Note 1: To specify an output voltage, substitute voltage value for "XX".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

Fig. 1 78L05/12 Output Voltage vs Ambient Temperature

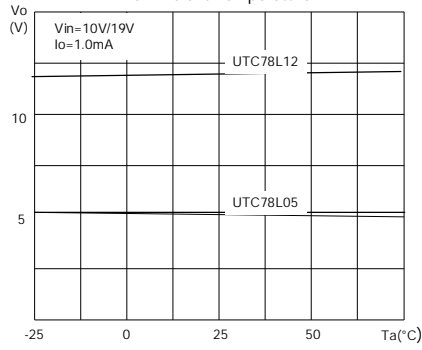


Fig 2 78L05/12 Quiescent Current vs Output Current

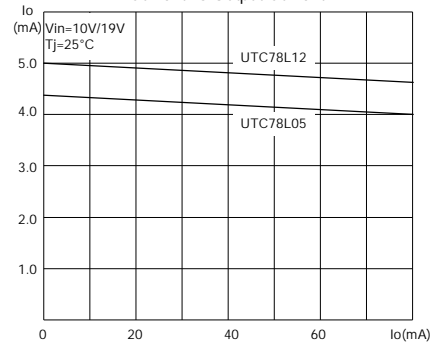


Fig.3 78L05 Quiescent Current vs Input

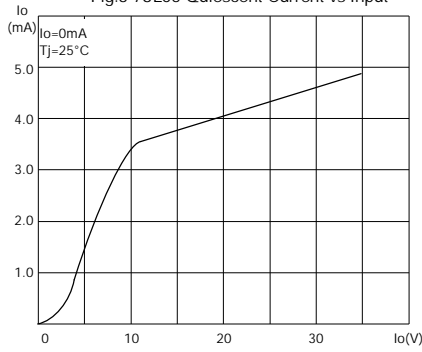


Fig.4 78L05/12/24 Thermal Shutdown

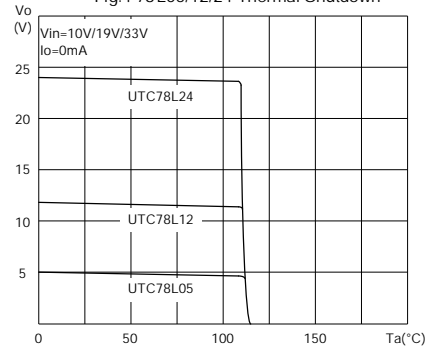


Fig.5 78L05/12/24 Output Characteristics

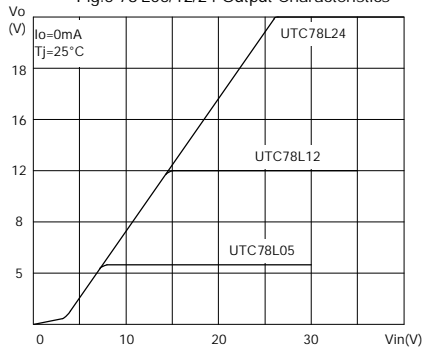
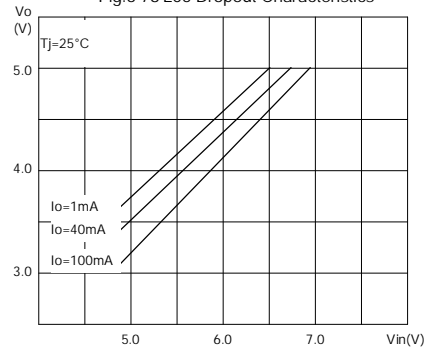
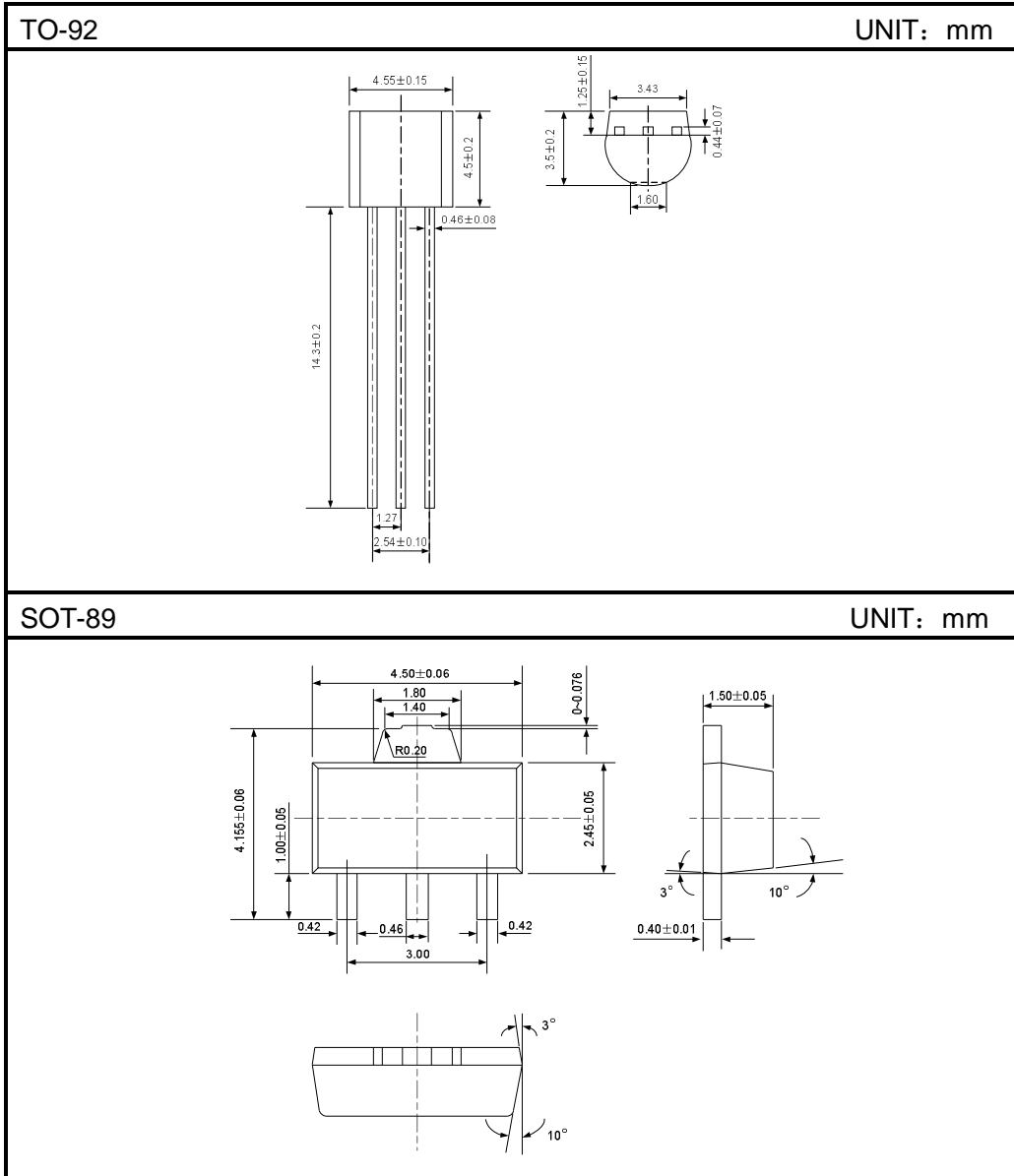


Fig.6 78L05 Dropout Characteristics

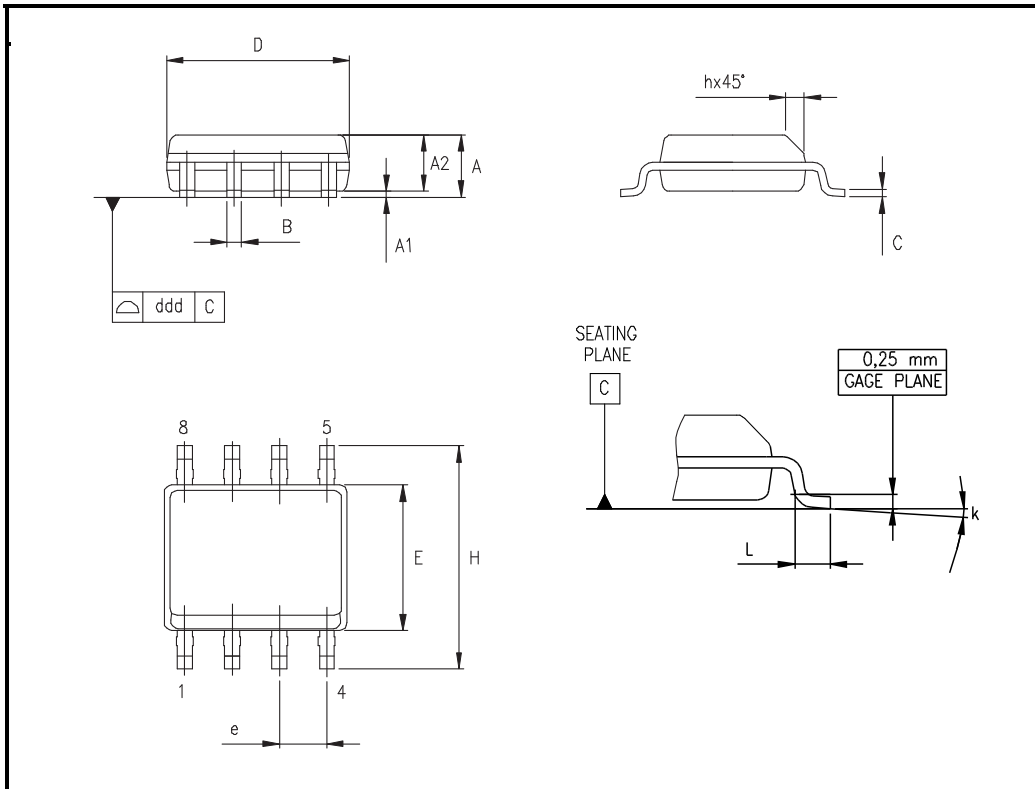


PACKAGE OUTLINE



SO-8

UNIT : mm



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