



TS321

LINEAR INTEGRATED CIRCUIT

LOW-POWER SINGLE OPERATIONAL AMPLIFIER

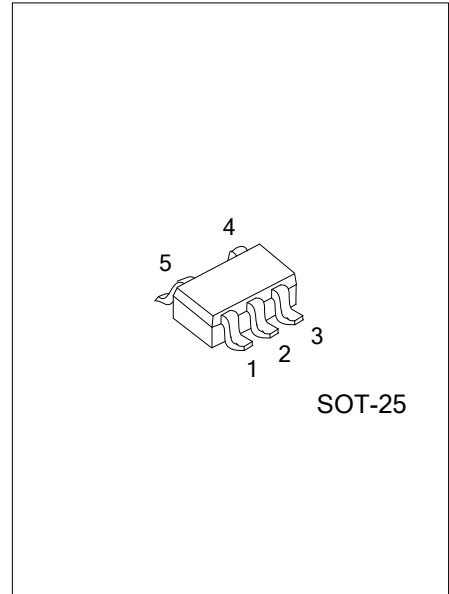
DESCRIPTION

The UTC **TS321**'s quiescent current is only 300 μ A (5V). The UTC **TS321** brings performance and economy to low power systems. With a high unity gain frequency and a specified 0.45V/ μ s slew rate. The device is able to operate in single supply applications as well as in dual supply applications.

The UTC **TS321** is a bipolar operational amplifier for cost-sensitive applications in which space savings are important.

FEATURES

- * Wide Power-Supply Range
Single Supply: 3V~30V or Dual Supply: $\pm 1.5V \sim \pm 15V$
- * Large Output Voltage Swing: 0V~3.5V (Min.) ($V_{CC}=5V$)
- * Low Supply Current: 300 μ A (Typ.)
- * Low Input Bias Current: 20nA (Typ.)
- * Low Input Offset Voltage: 4mV (Max.)
- * Stable With High Capacitive Loads

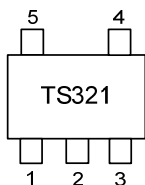


ORDERING INFORMATION

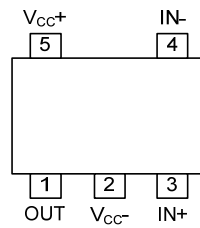
Ordering Number		Package	Packing
Lead Free	Halogen Free		
TS321L-AF5-R	TS321G-AF5-R	SOT-25	Tape Reel

<p>TS321G-AF5-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) AF5: SOT-25 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



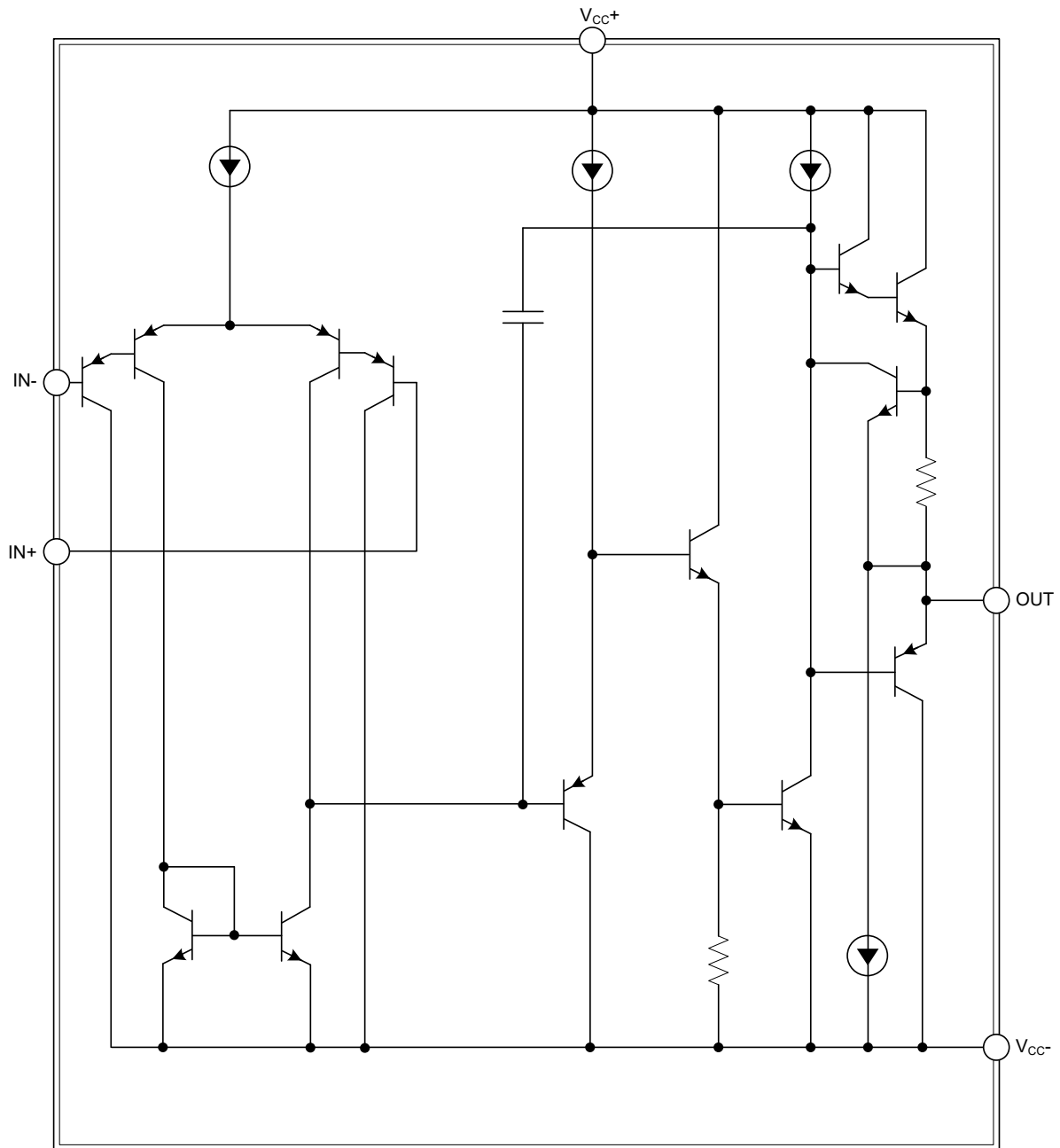
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT	Output
2	V _{CC-}	Ground
3	IN+	Non- negative input
4	IN-	Negative input
5	V _{CC+}	Power supply

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (Note 1)

Over operating free-air temperature range (unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)	Single	32	V
	Dual	±16	V
Differential Input Voltage (Note 3)	V_{ID}	32	V
Input Voltage Range (Note 2, 4)	V_I	-0.3 ~ 32	V
Input Current (Note 4)	I_I	50	mA
Duration Of Output Short Circuit To Ground	T_{SHORT}	Unlimited	
Power Dissipation	P_D	0.595	W
Operating Virtual Junction Temperature	T_J	+150	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. These voltage values are with respect to the midpoint between V_{CC+} and V_{CC-} .
3. Differential voltages are at $IN+$ with respect to $IN-$.
4. Neither input must ever be more positive than V_{CC+} or more negative than V_{CC-} .

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	Single Supply	3 ~ 30	V
	Dual Supply	±1.5 ~ ±15	V
Operating Free-Air Temperature	T_A	-40 ~ +125	°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	210	°C/W

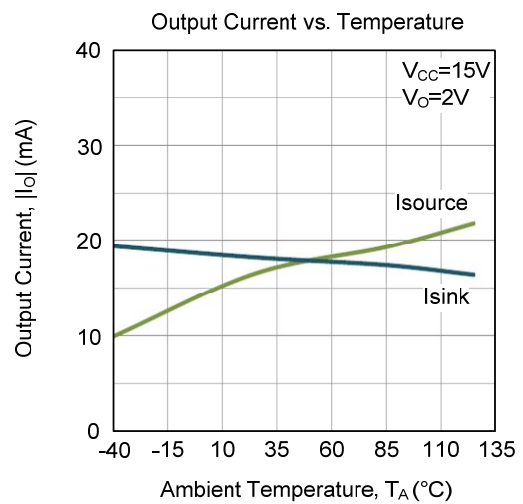
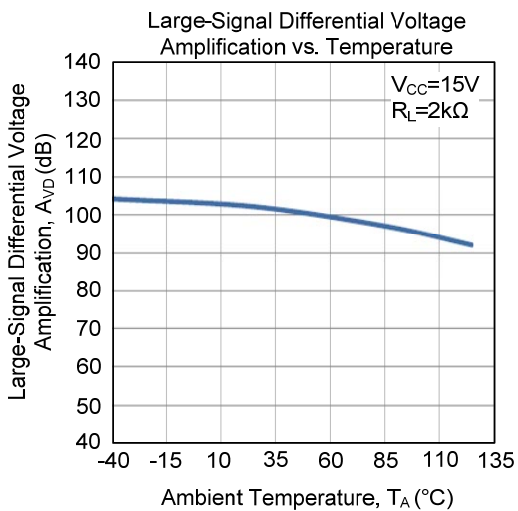
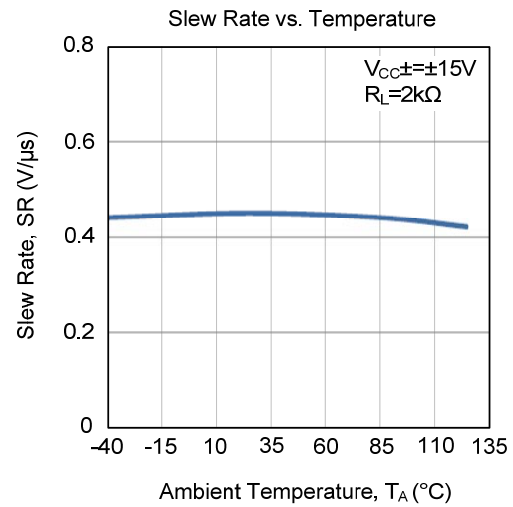
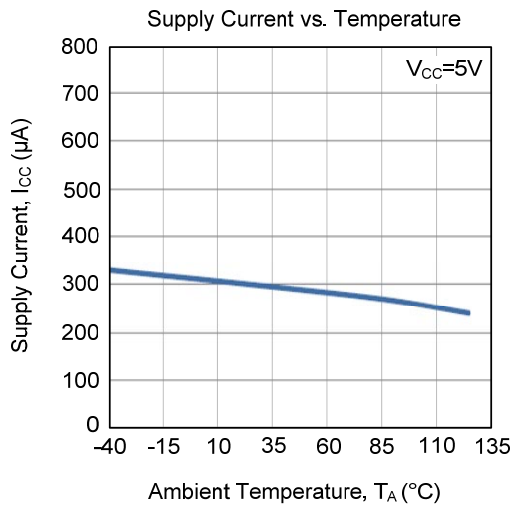
■ ELECTRICAL CHARACTERISTICS ($V_{CC+}=5V$, $V_{CC-}=GND$, $V_O=1.4V$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Input Offset Voltage	V_{IO}	$R_S=0$, $5V < V_{CC+} < 30V$ $0 < V_{IC} < (V_{CC+} - 1.5V)$		0.5	4	mV	
Input Offset Current	I_{IO}			2	30	nA	
Input Bias Current (Note 1)	I_{IB}			20	150	nA	
Large-Signal Differential Voltage Amplification	A_{VD}	$V_{CC}=15V$, $R_L=2k\Omega$, $V_O=1.4V \sim 11.4V$	50	100		V/mV	
Common-Mode Input Voltage (Note 2)	V_{ICR}	$V_{CC}=30V$	0		$V_{CC+} - 1.5$	V	
High-Level Output Voltage	V_{OH}	$V_{CC}=30V$	$R_L=2k\Omega$	26	27	V	
			$R_L=10k\Omega$	27	28		
		$V_{CC}=5V$	$R_L=2k\Omega$	3.5			
Low-Level Output Voltage	V_{OL}	$R_L=10k\Omega$		5	15	mV	
Gain Bandwidth Product	GBP	$V_{CC}=30V$, $V_I=10mV$, $R_L=2k\Omega$, $f=100kHz$, $C_L=100pF$		0.8		MHz	
Slew Rate	SR	$V_{CC}=15V$, $V_I=0.5V \sim 3V$, $R_L=2k\Omega$, $C_L=100pF$, unity gain		0.45		V/ μs	
Phase Margin	ϕ_m			60		$^\circ$	
Common-Mode Rejection Ratio	CMRR	$R_S \leq 10k\Omega$	65	85		dB	
Output Source Current	I_{SOURCE}	$V_{CC}=15V$, $V_O=2V$, $V_{ID}=1V$	10	20		mA	
Output Sink Current	I_{SINK}	$V_{CC}=15V$, $V_{ID}=1V$	$V_O=2V$	10	20	mA	
			$V_O=0.2V$	12	50	μA	
Short-Circuit To GND	I_O	$V_{CC}=15V$		40	60	mA	
Supply-Voltage Rejection Ratio	SVR	$V_{CC}=5V \sim 30V$	65	110		dB	
Total Supply Current	I_{CC}	No load	$V_{CC}=5V$		300	800	μA
			$V_{CC}=30V$		450	900	μA
Total Harmonic Distortion	THD	$V_{CC}=30V$, $V_O=2V_{PP}$, $A_V=20dB$, $R_L=2k\Omega$, $f=1kHz$, $C_L=100pF$		0.015		%	
Equivalent Input Noise Voltage	e_N	$V_{CC}=30V$, $f=1kHz$, $R_S=100\Omega$		50		nV/\sqrt{Hz}	

Notes: 1. The direction of the input current is out of the device. This current essentially is constant, independent of the state of the output, so no loading change exists on the input lines.

2. The input common-mode voltage of either input signal should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5V$, but either or both inputs can go to 32V without damage.

■ TYPICAL CHARACTERISTICS



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