ZERO-DRIFT, SINGLE-SUPPLY, RAIL-TO-RAIL INPUT/ OUTPUT CMOS OPERATIONAL AMPLIFIERS

■ Description

The TTESEMI TK8551 has ultralow offset, drift, and bias current. The TTESEMI TK8551 is dual amplifiers featuring rail-to-rail input and output swings. Single supply as low as 2.7V and up to 5V may be used.

With an offset voltage of only 1μV. The TTESEMI TK8551 is perfectly suited for applications in which error sources cannot be tolerated. Position and pressure sensors and strain gage amplifiers benefit greatly from nearly zero drift. The rail-to-rail input and output swings provided by the TTESEMI TK8551 make both high-side and low-side sensing easy.

■ Features

* Single-supply operation: 2.7V~5.5V
* Low offset voltage: 18μV (TYP) at +5V
* Rail-to-rail input and output swing
* Slew Rate: 0.3V/μs

■ Applications

* Temperature sensors
* Pressure sensors
* Precision current sensing
* Strain gage amplifiers
* Medical instrumentation
* Thermocouple amplifiers

■ Ordering Information

Ordering Number	Package	Packing
TK8551ARUZ	TSSOP-8	Tape Reel
TK8551ARZ	SOIC-8	Tape Reel

For other encapsulation type products, please contact us.

■ Pin Assignment

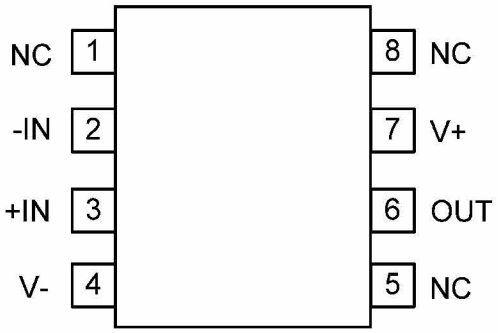


Fig1 8-Lead SOIC and 8-Lead TSSOP

PIN NO.	PIN NAME	DESCRIPTION
1, 5, 8	NC	No connect
2	-IN	Inverting input pin of AMP
3	+IN	Non-inverting input of AMP
4	V-	Negative power supply
6	OUT	Output pin of A AMP
7	V+	Positive power supply

■ Functional Diagram

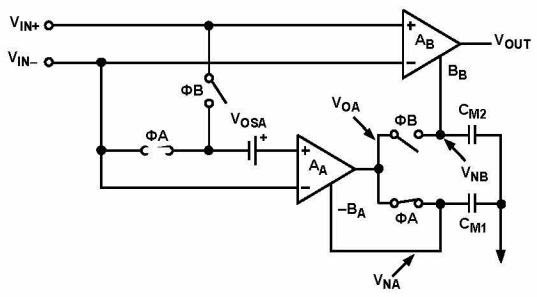


Fig2 Auto-Zero Phase of the TK8551

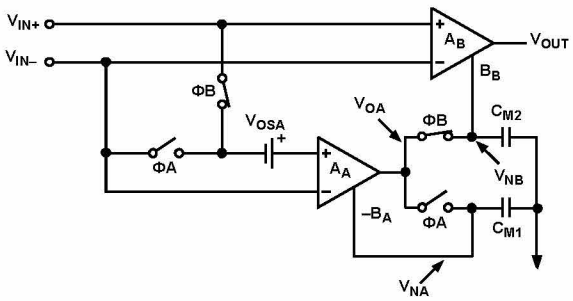


Fig3 Output Phase of the Amplifier

■ Block Diagram

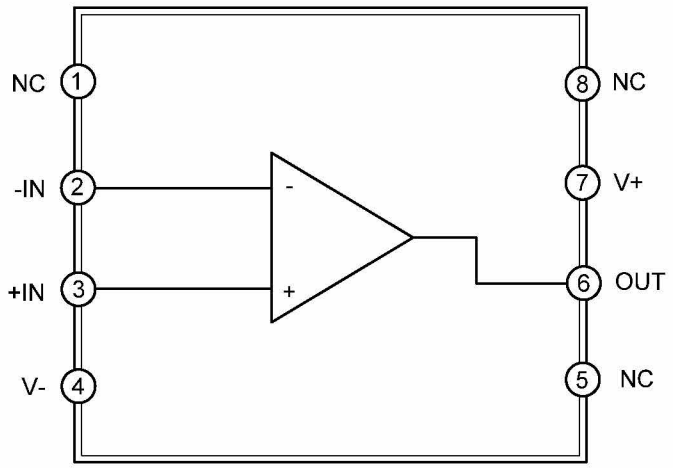


Fig 4 Block Diagram for TK8551

■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	6	V
Input Voltage	V_{IN}	(V-) - 0.1~ (V+) + 0.1	V
Differential Input Voltage (Note 2)	V_{ID}	±5	V
Junction Temperature Range	T_J	+150	°C
Operating Temperature Range	T_{OPR}	-40 ~ +125	°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. Different I input voltage is limited to ±5.0 V or the supply voltage, whichever is less.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	158	°C/W
Junction to Case	θ_{JC}	43	°C/W

■ ELECTRICAL CHARACTERISTICS

(T_A=25°C, Vs=5V, R_L=10kΩ connected to V_S/2, and V_{OUT}=V_S/2, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Supply Current/Amplifier	I_Q	V_O=V_S/2		850	1000	μA
Power Supply Rejection Ratio	PSRR	V_S=2.7V~5V	100	110		dB
OFFSET VOLTAGE						
Offset Voltage	V_{OS}	V_{CM}=0V~5V		1	20	μV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		10		nV/°C
INPUT CHARACTERISTICS						
Input Bias Current	I_B	V_{CM}=0V		10		pA
Input Offset Current	I_{OS}			20		pA
Common-Mode Voltage Range	V_{CM}		0		5	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V~5V	100	120		dB
Large Signal Voltage Gain	A_V	R_L=10kΩ, V_O=0.3V~4.7V	80	100		dB
		-40°C ≤ T_A ≤ +125°C	75			dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L=100kΩ ~ V-	4.99	4.998		V
		R_L=10kΩ ~ V-	4.95	4.98		V
Output Voltage Low	V_{OL}	R_L=100kΩ ~ V+		1	10	mV
		R_L=10kΩ ~ V+		10	30	mV
Short-Circuit Current	I_{SC}		±25	±60		mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	A_V =+1, R_L=10kΩ		0.3		V/μs
Gain Bandwidth Product	GBW	A_V =+100		1.2		MHz
NOISE PERFORMANCE						
Input Voltage Noise	$e_{n\ p\text{-}p}$	0Hz~10Hz		1.0		μV p-p
Input Voltage Noise Density	e_n	f=1kHz		42		nV/$\sqrt{Hz}$

■ ELECTRICAL CHARACTERISTICS (Cont.)

(T_A=25°C, Vs=2.7V, R_L=10kΩ connected to V_S/2, and V_{OUT}=V_S/2, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Supply Current/Amplifier	I_Q	V_O=V_S/2		750	900	μA
Power Supply Rejection Ratio	PSRR	V_S=2.7V~5 V	100	110		dB
OFFSET VOLTAGE						
Offset Voltage	V_{OS}	V_{CM}=0V~2.7V		1	20	μV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		10		nV/°C
INPUT CHARACTERISTICS						
Input Bias Current	I_B	V_{CM}=0V		10		pA
Input Offset Current	I_{OS}			10		pA
Common-Mode Voltage Range	V_{CM}		0		2.7	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V~2.7V	100	120		dB
Large Signal Voltage Gain	A_V	R_L=10kΩ, V_O=0.3V~2.4V	70	90		dB
		-40°C ≤ T_A ≤ +125°C	65			dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L=100kΩ ~ V-	2.685	2.697		V
		R_L=10kΩ ~ V-	2.67	2.68		V
Output Voltage Low	V_{OL}	R_L=100kΩ ~ V+		1	10	mV
		R_L=10kΩ ~ V+		10	20	mV
Short-Circuit Current	I_{SC}		±10	±20		mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	A_V =+1, R_L=10kΩ		0.4		V/μs
Gain Bandwidth Product	GBW	A_V =+100		1		MHz
NOISE PERFORMANCE						
Voltage Noise	$e_{n\ p\text{-}p}$	0Hz~10Hz		1.6		μV p-p
Voltage Noise Density	e_n	f=1kHz		75		nV/$\sqrt{Hz}$

■ TYPICAL PERFORMANCE CHARACTERISTICS

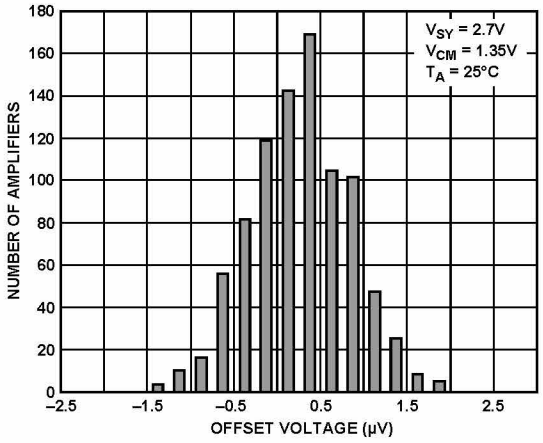


Figure 5. Input Offset Voltage Distribution at 2.7 V

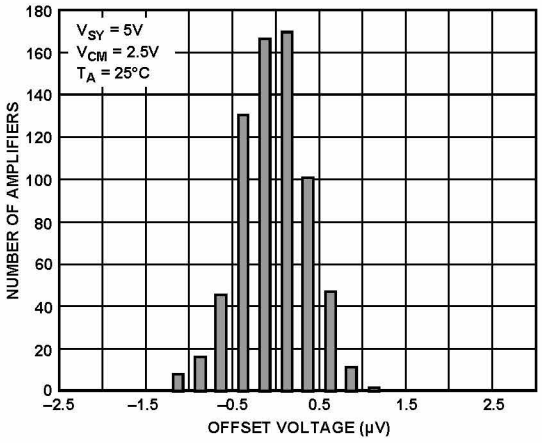


Figure 8. Input Offset Voltage Distribution at 5 V

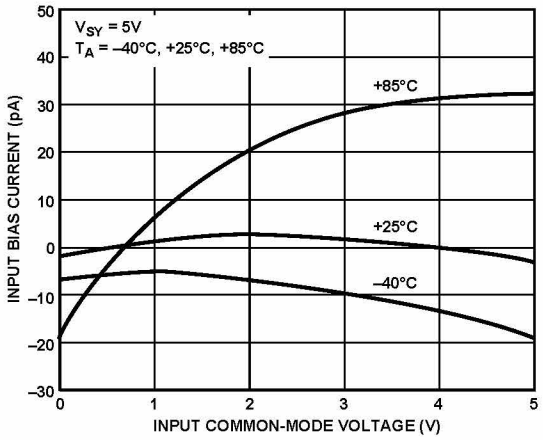


Figure 6. Input Bias Current vs. Common-Mode Voltage

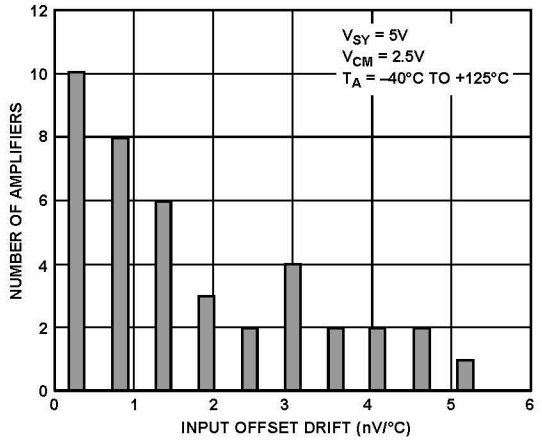


Figure 9. Input Offset Voltage Drift Distribution at 5 V

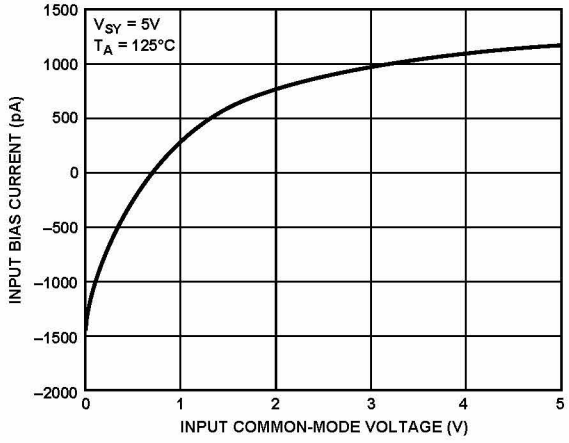


Figure 7. Input Bias Current vs. Common-Mode Voltage

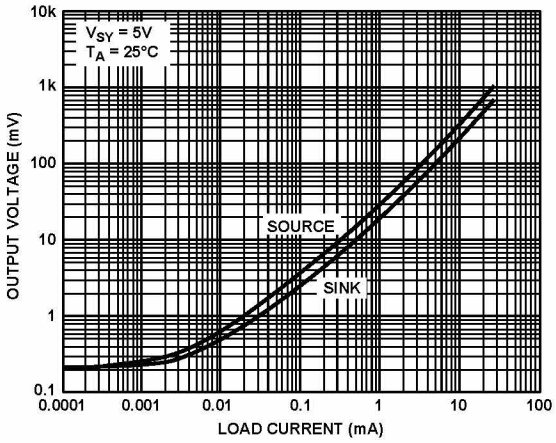


Figure 10. Output Voltage to Supply Rail vs. Load Current at 5 V

■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)

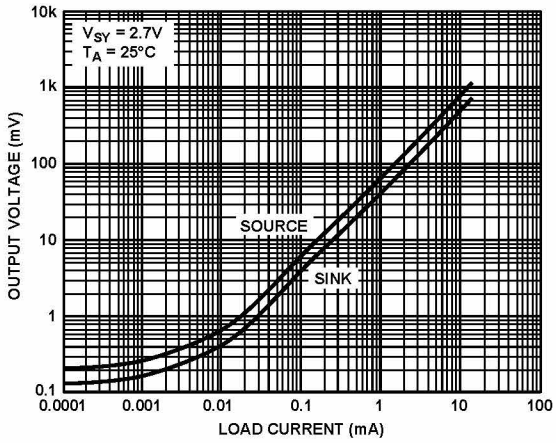


Figure 11. Output Voltage to Supply Rail vs. Load Current at 2.7 V

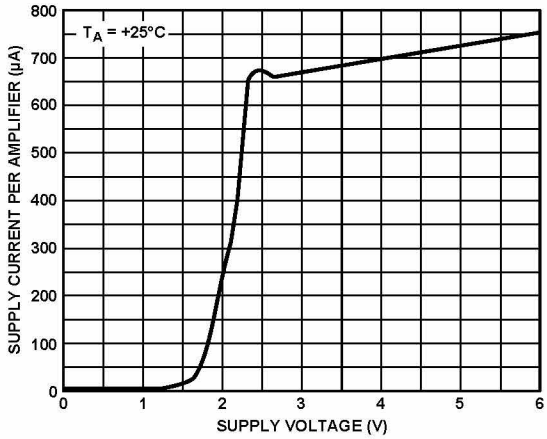


Figure 14. Supply Current per Amplifier vs. Supply Voltage

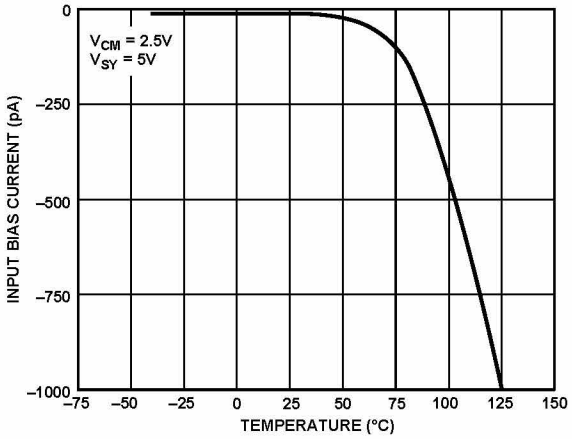


Figure 12. Input Bias Current vs. Temperature

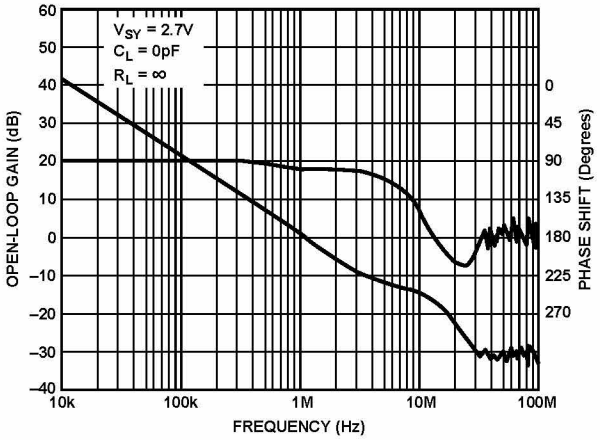


Figure 15. Open-Loop Gain and Phase Shift vs. Frequency at 2.7 V

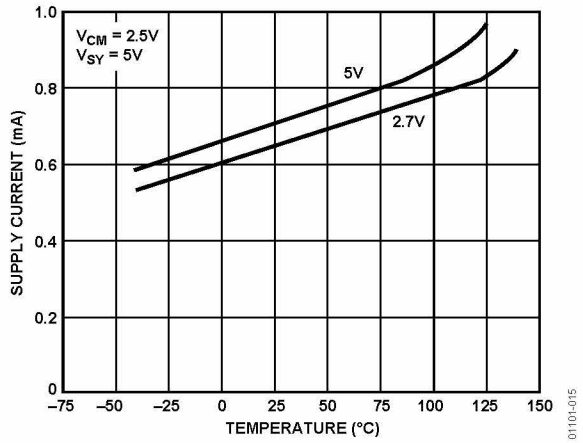


Figure 13. Supply Current vs. Temperature

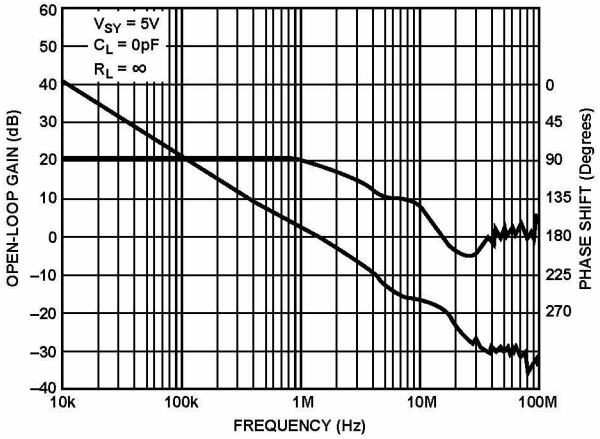


Figure 16. Open-Loop Gain and Phase Shift vs. Frequency at 5 V

■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

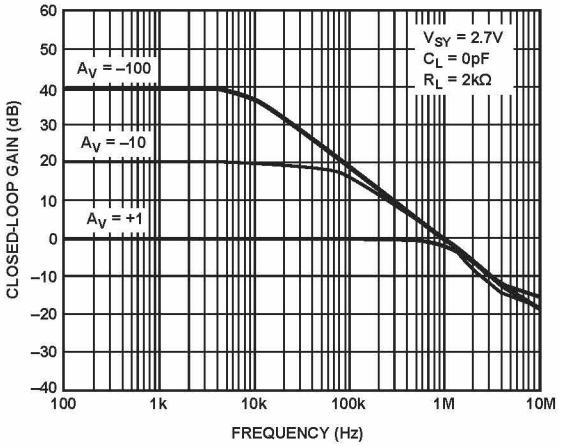


Figure 17. Closed-Loop Gain vs. Frequency at 2.7 V

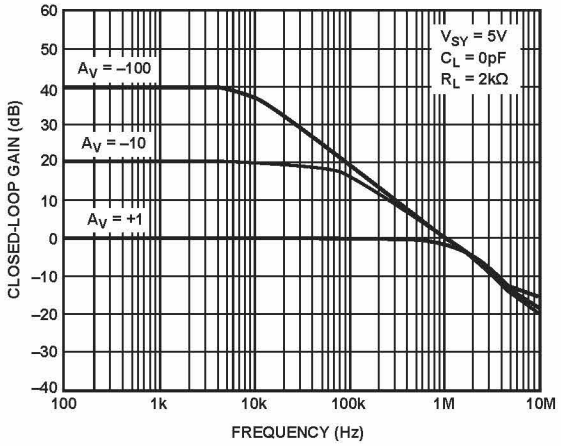


Figure 18. Closed-Loop Gain vs. Frequency at 5 V

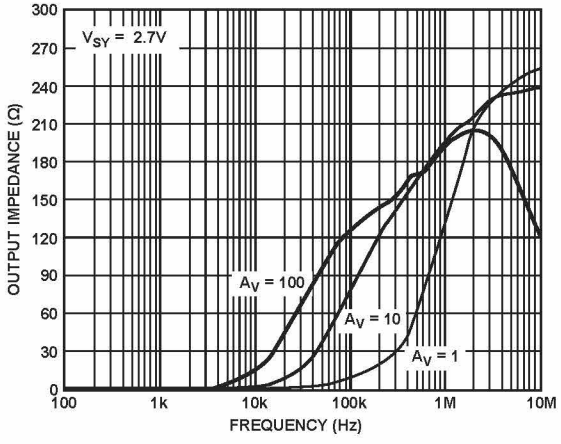


Figure 19. Output Impedance vs. Frequency at 2.7 V

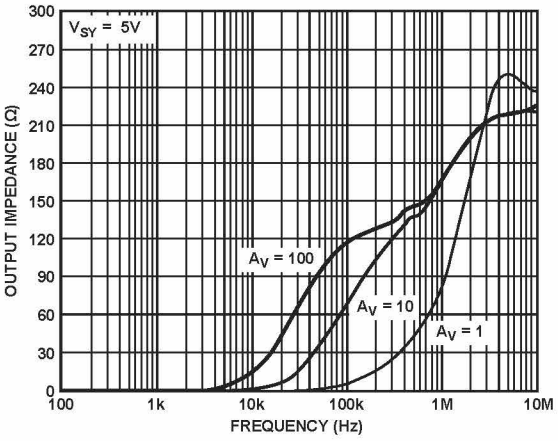


Figure 20. Output Impedance vs. Frequency at 5 V

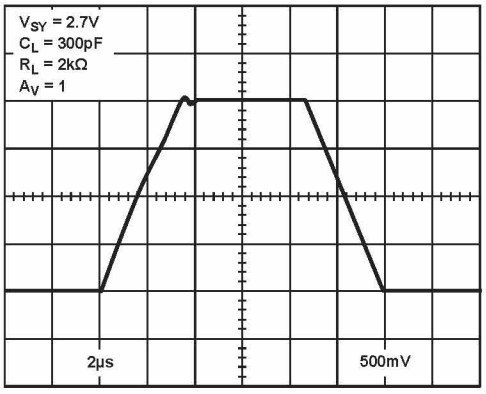


Figure 21. Large Signal Transient Response at 2.7 V

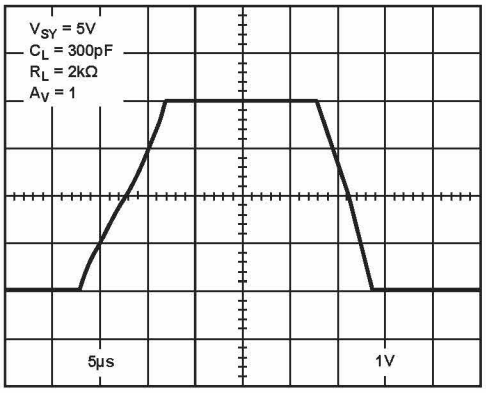
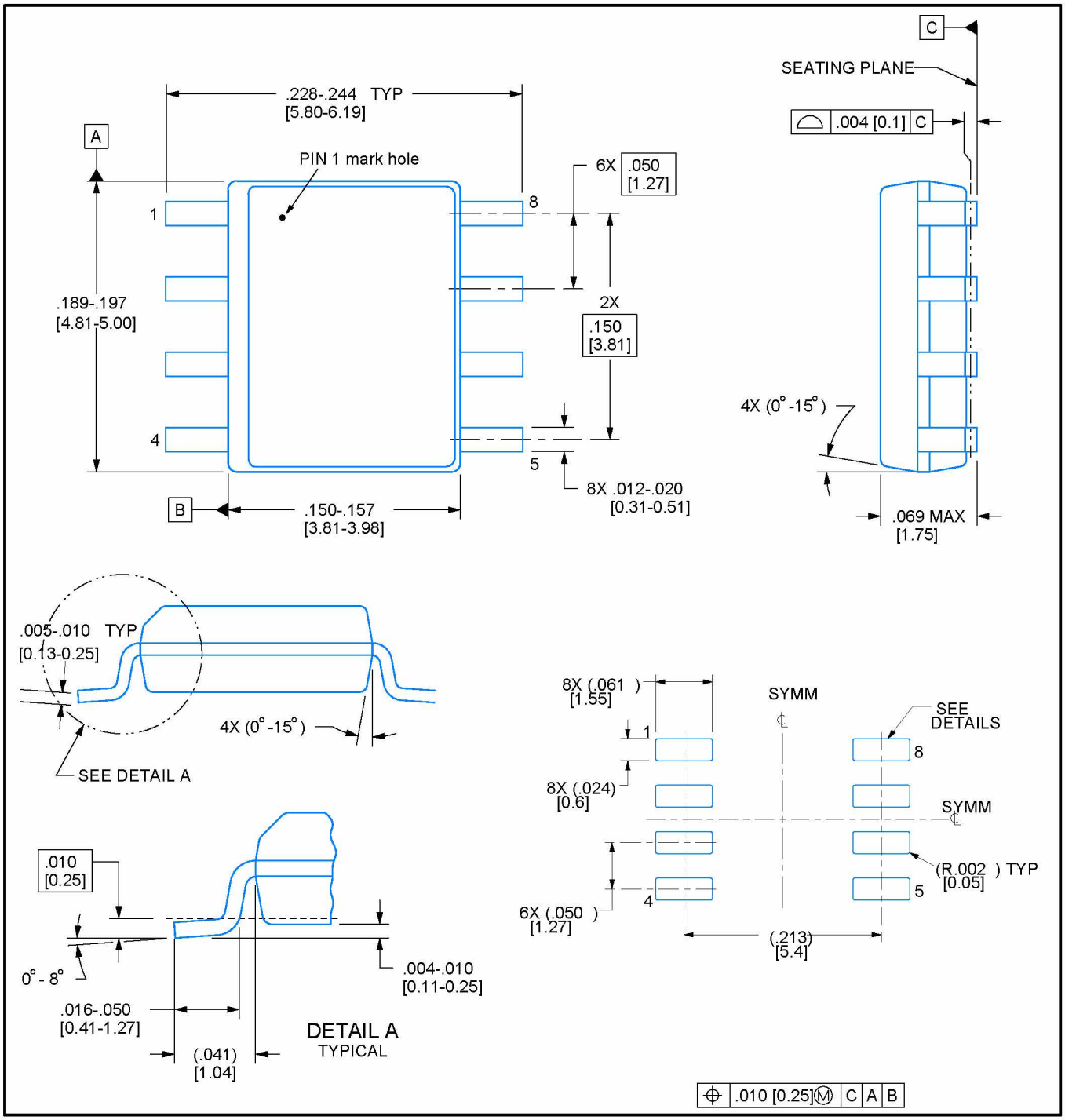


Figure 22. Large Signal Transient Response at 5 V

PACKAGE OUTLINE SOIC - 8,1.75 mm max height



NOTES: Linear dimensions are in inches [millimeters]. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 0.15 per side.