



# TEA7533

## MONITOR AMPLIFIER

- 7 DIGITALLY PROGRAMMABLE GAINS IN STEPS OF 4.5dB
- ON/OFF POSITION
- LOW VOLTAGE (3.5V to 6.5V)
- POWER: >140mW at 5V; >250mW at 6.5V

### DESCRIPTION

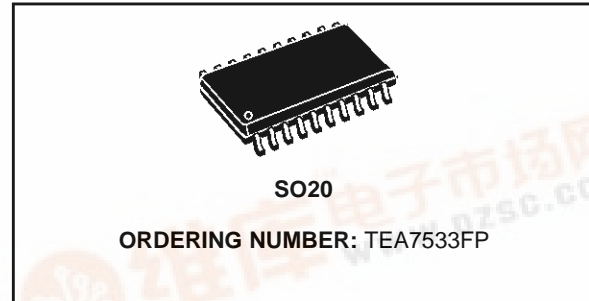
This 20 pins IC is designed for monitoring and loudspeaker telephone set and provides:

- a) signal amplification for monitoring (loudspeaker).
- b) antiacoustic feedback (antilarsen).
- c) antidistortion by automatic level adaptation.
- d) antilarsen adjustment (full duplex).
- e) antidistortion by automatic gain adaptation in current supply mode.
- f) service audio inputs with internal dedicated switches.

### FUNCTIONAL DESCRIPTION

TEA7533 performs the following functions:

The circuit amplifies the incoming signal and

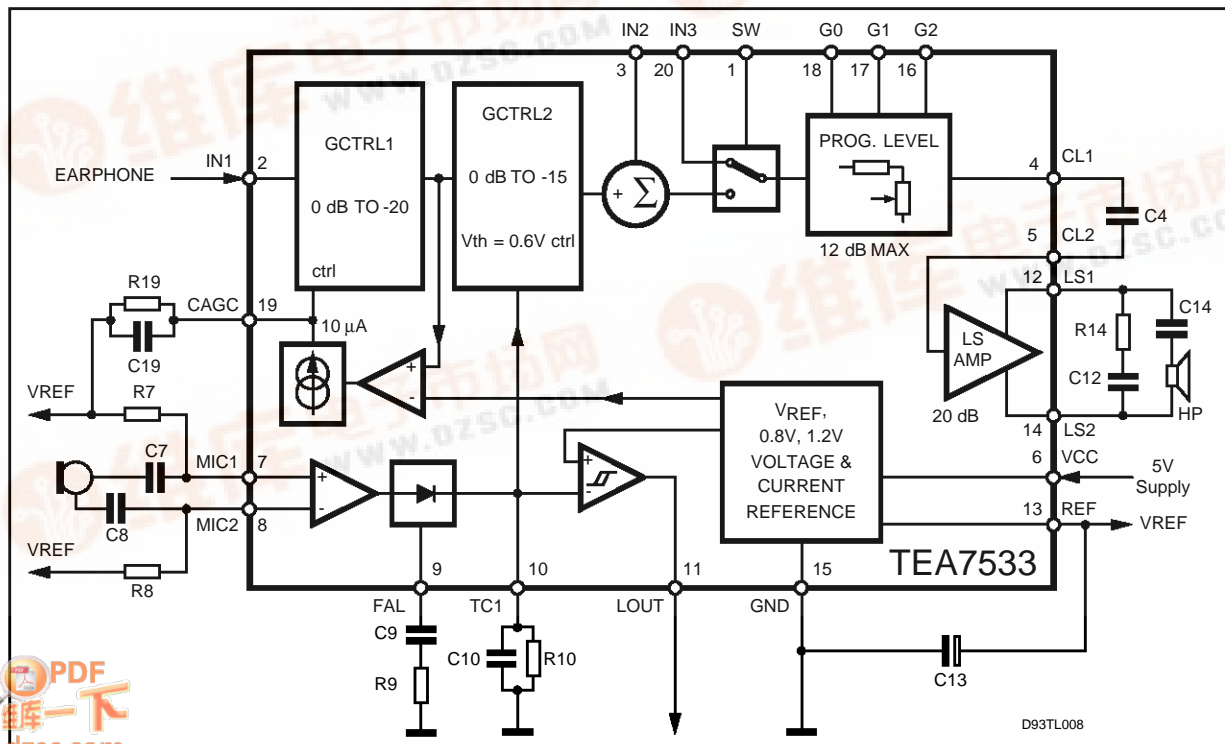


feeds it to the loudspeaker. PG0, PG1 and PG2 inputs are used to set the loudspeaker gain in a range of 32dB to 5dB in 7 steps of 4.5dB.

The TEA7533 inputs (PG0, PG1, PG2) allows also the loudspeaker to be cut-off, thus ensuring privacy of communication.

- ◆ The antilarsen (antiacoustic feedback) system is incorporated.
- ◆ The maximum power available on a 50Ω impedance loudspeaker is 140mW at 5V and 250mW at 6.5V.

### BLOCK DIAGRAM



## TEA7533

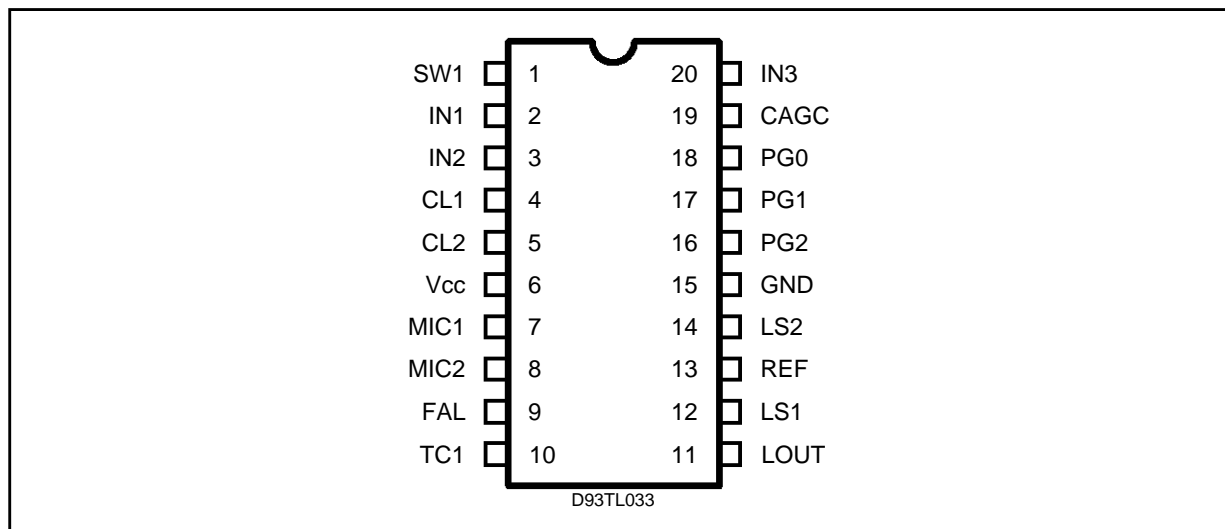
### PIN DESCRIPTION

N°	Symbol	Description
1	SW	Switch control: IN2 or IN3
2	IN1	Audio Input AVG Controlled
3	IN2	2nd Audio input; No Anti-distortion Control
4	CL1	Intermediate Receive Output (Decoupling capacitor)
5	CL2	Intermediate Receive Input (Decoupling capacitor)
6	V <sub>CC</sub>	Supply Voltage
7	MIC1	Microphone input 1
8	MIC2	Microphone input 2
9	FAL	Antilarsen Filter
10	TC1	Antilarsen Gain Set up
11	LOUT	Status Output, Digital Output.
12	LS1	Loudspeaker Output1
13	REF	Reference Voltage; (V <sub>CC</sub> - 0.7V/2)
14	LS2	Loudspeaker Output2
15	GND	Ground
16	PG2	Digital Input; Loudspeaker Level Control
17	PG1	Digital Input; Loudspeaker Level Control
18	PG0	Digital Input; Loudspeaker Level Control
19	CAGC	Gain Control Filter Capacitor
20	IN3	3rd Audio Input

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Test Conditions	Unit
V <sub>CC</sub>	Max. Supply Voltage	7	V
I <sub>CC</sub>	Max Supply Current at t > 300ms at t ≤ 300ms	100 150	mA mA
V <sub>LOGIC</sub>	Voltage Level (logic pins)	-0.6/V <sub>CC</sub> +0.6	V
T <sub>op</sub>	Operative Temperature Range	-20 to +70	°C
T <sub>stg</sub>	Storage Temperature Range	-55 to +125	°C

### PIN CONNECTION (Top view)



**ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $R_{BIAS} = 60\text{K}\Omega$ ;  $V_{G0} = V_{G1} = V_{G2} = \text{H}$ ;  $V_{in} = 0\text{Vrms}$ ;  $V_{TG1} = 0\text{V}$ ; unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{CC}$	Supply Voltage		3.5	5	6.5	V
$I_{CC}$	Supply Current	$V_{CC} = 5\text{V}$ ; $\text{PG0} = \text{PG1} = \text{PG2} = \text{L}$ $V_{CC} = 5\text{V}$ ; $\text{PG0} = \text{PG1} = \text{PG2} = \text{H}$	–	0.75 1.6	1 2.1	mA mA
$V_{ref}$	Voltage Reference	$V_{CC} = 5\text{V}$	– 1.72	$(V_{CC} - 0.7)/2$ 2.15	– 2.6	V
$I_{ref}$	Current Available at $V_{ref}$	Source Sink	– –	30 400	– –	$\mu\text{A}$ $\mu\text{A}$
<b>IN2 &amp; IN3 AMPLIFIER SECTIONS</b>						
$G_O$	Final Stage Gain $(V_{LS1} - V_{LS2})/V_{CL2}$		19	20	21	dB
$G$	Loudspeaker Amplifier Gain $(V_{LS1} - V_{LS2})/IN3$ (or IN2)	$V_{TC1} = 0\text{V}$ ; $V_{IN} = 60\text{mVrms}$ $V_{CAGL} = 0\text{V}$				
		PG2, PG1, PG0				
G111	Gain max	H H H	30	31.5	33	dB
G110	Gain 1st step	H H L	25.5	27	28.5	dB
G101	Gain 2nd step	H L H	21	22.5	24	dB
G100	Gain 3rd step	H L L	16.5	18	19.5	dB
G011	Gain 4th step	L H H	12.0	13.5	15	dB
G010	Gain 5th step	L H L	7.5	9	10.5	dB
G001	Gain 6th step	L L H	3	4.5	6	dB
G000	Off step	L L L	-	-40	-30	dB
$V_{OFF}$	Output Offset	$G = G111$ ; $R_{LOAD} = 50\Omega$	-50	-	50	mV
LS DIN	Loudspeaker Dynamic $(V_{LS1} - V_{LS2})$	$R_{LOAD} = 50\Omega$ $V_{CC} = 3.5\text{V}$ ; THD = 4% $V_{CC} = 5\text{V}$ ; THD = 4%	4.5 6.5	5 6.7	- -	$V_{pp}$ $V_{pp}$
THD	Output Distortion	$V_{CC} = 5\text{V}$ $G = G111(32\text{dB})$ $\text{SW} = \text{L}$ ; $V_{OUT} = 2\text{Vrms}$ $\text{SW} = \text{H}$ ; $V_{OUT} = 2\text{Vrms}$	- -	- -	2 2	% %
<b>IN1 AMPLIFIER SECTION</b>						
$G_1$	Loudspeaker Amplifier Gain $(V_{LS1} - V_{LS2}) / IN1$	$V_{CAG} (19) = V_{REF}$ ; $V_{TC1} = 0\text{V}$ $V_{IN1} = 45\text{mVrms}$	29.5	31.5	34.5	dB
THD1	Distortion	$V_{IN} = 45\text{mVrms}$	–	1	2	%
<b>IN1 ANTIDISTORTION SECTION</b>						
ALG1	Antilarsen Attenuation on IN1 Chain	$V_{CAGC} = V_{REF}$ ; $V_{TC1} = 0.8\text{V}$	-17	-15	-13	dB
ALTHD	Distortion with Antilarsen Active		–	4.5	6.0	%
CAGC THD	Distortion with AGC Control Active	$V_{IN1} = 80\text{mV}$ $V_{IN1} = 560\text{mV}$	– –	– –	3 10	% %
PG	Logic Interface PG0, PG1, PG2, SW=L, IN3=ON					
PGH	Logical Input High		0	-	$0.4 \times (V_{CC} - 0.7)$	V
PGL	Logical Input Low		$0.6 \times (V_{CC} - 0.7)$	-	$V_{CC}$	V
$I_{PGL}$	Input Current Low state	$V_{IN} = 0\text{V}$	-1	-	+1	$\mu\text{A}$
$I_{PGH}$	Input Current High State	$V_{IN} = V_{CC}$	-1	-	+1	$\mu\text{A}$
<b>ANALOG INTERFACE</b>						
$I_{BIAS}$	Biasing Current Analog Inputs	IN1, IN2, IN3, MIC1, MIC2	–	17	100	mA

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## ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>ANTILARSEN SECTION</b>						
G <sub>MIC</sub>	Microphone Amplifier Gain $= V_{FAL}/(V_{MIC1} - V_{MIC2})$	V <sub>IN</sub> = 4.5mVrms; f = 5KHz	19.5	21	22.5	dB
V <sub>TC1 TH</sub>	TC1 Threshold for -3dB attenuation on IN1 chain		0.55	0.68	0.75	V
V <sub>TC1 LOW</sub>	TC1 Level with V <sub>mic</sub> = 0 Vrms		0	0.07	0.2	V
TC1 H	High Thershold of LOUT Comparator	V <sub>LOUT</sub> < 0.4V	1.1	1.2	-	V
TC1 L	Low Thershold of LOUT Comparator	V <sub>LOUT</sub> > 4.1V	-	0.8	0.9	V
I <sub>LOUT L</sub>	Output Current of Comparator LOUT	V <sub>TC1</sub> = 1.5V; V <sub>LOUT</sub> = 0.5V	5	20	-	μA
I <sub>LOUT H</sub>	LOUT	V <sub>TC1</sub> = 0.6V; V <sub>LOUT</sub> = 3.5V	-	-1	-0.5	μA
V <sub>LOUT L</sub>	Output Voltage of Comparator LOUT	V <sub>TC1</sub> = 1.5V	-	0.08	0.4	V
V <sub>LOUT H</sub>	LOUT	V <sub>TC1</sub> = 0.6V	4.1	4.33	-	V

## TEST CIRCUIT

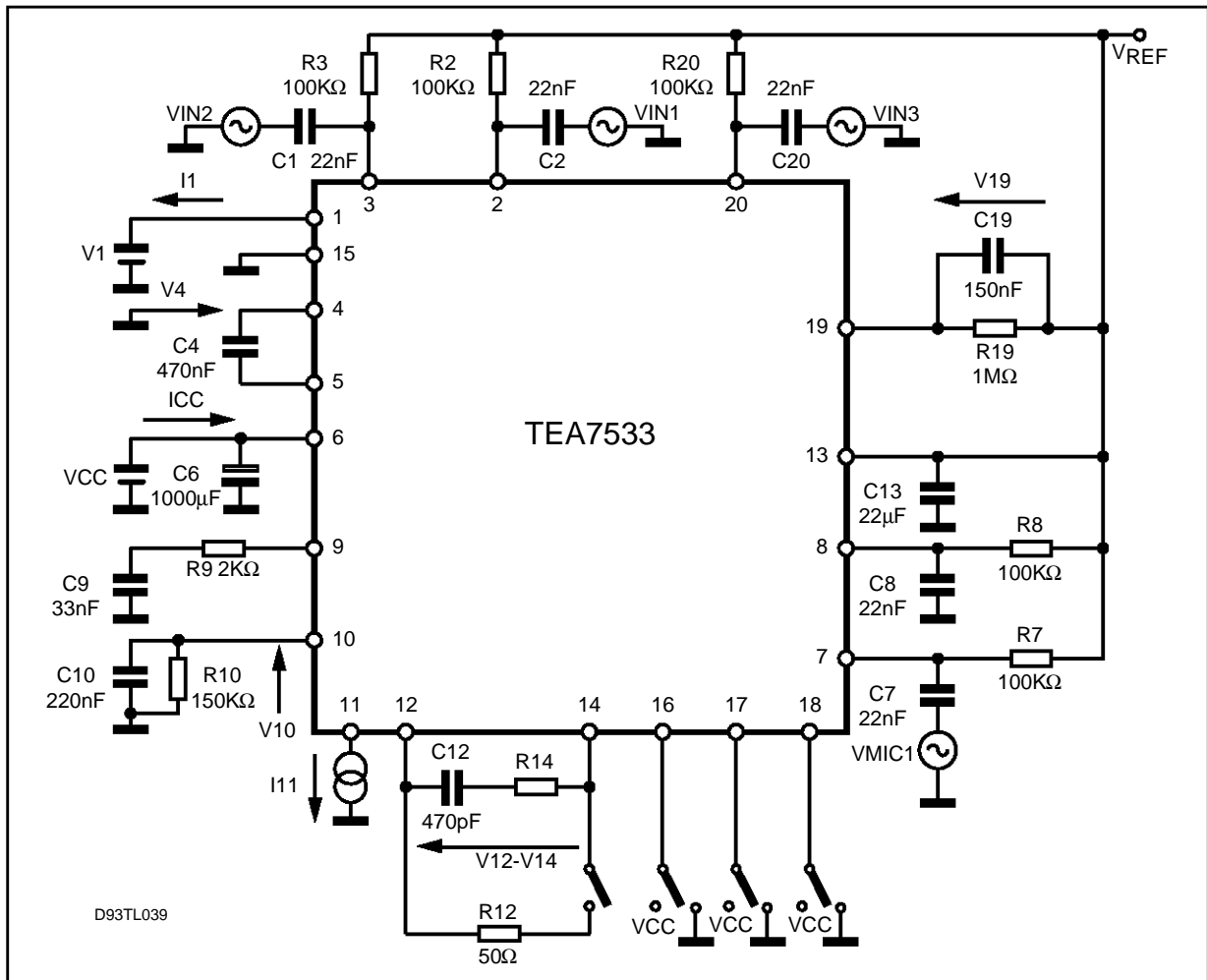


Figure 1: IN1 Channel - AGC Gain (Typical)

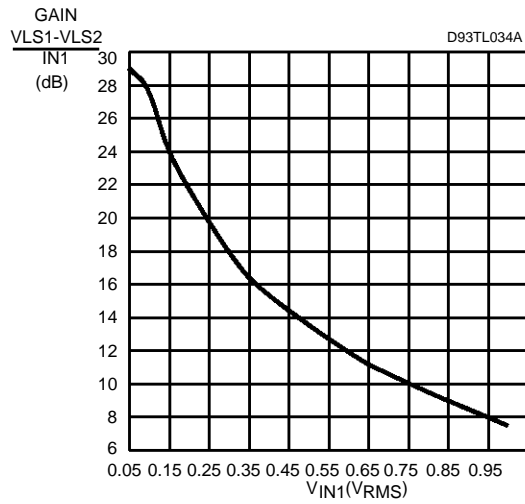


Figure 2: IN1 Channel (VCAGC - VREF)

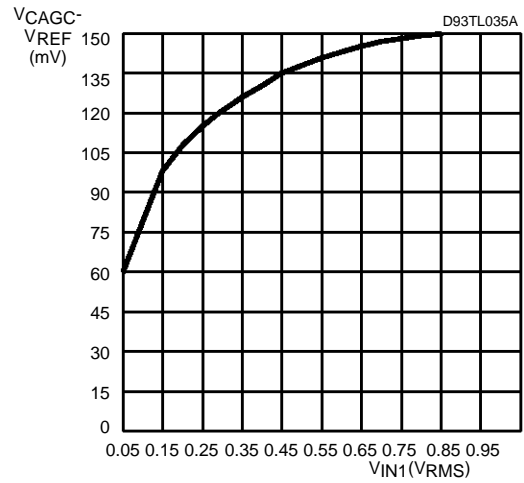


Figure 3: IN1 Channel - Distortion (Typical)

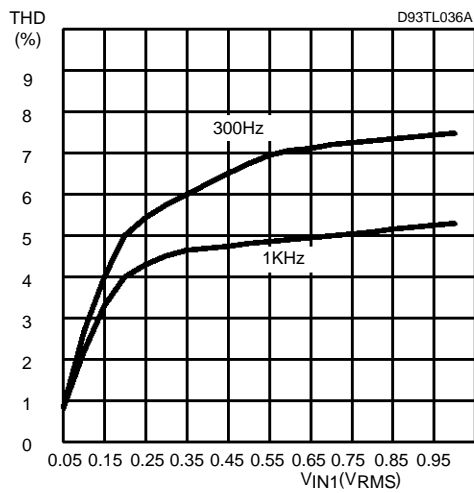
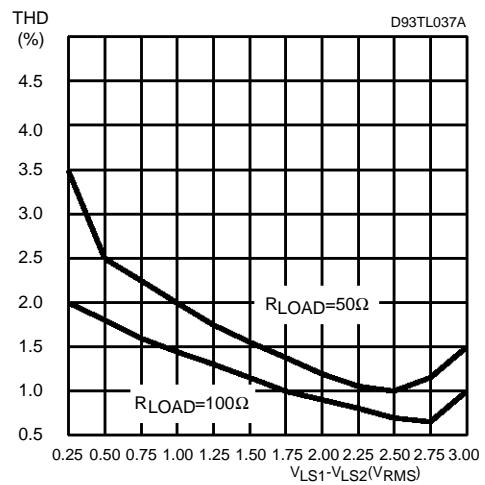
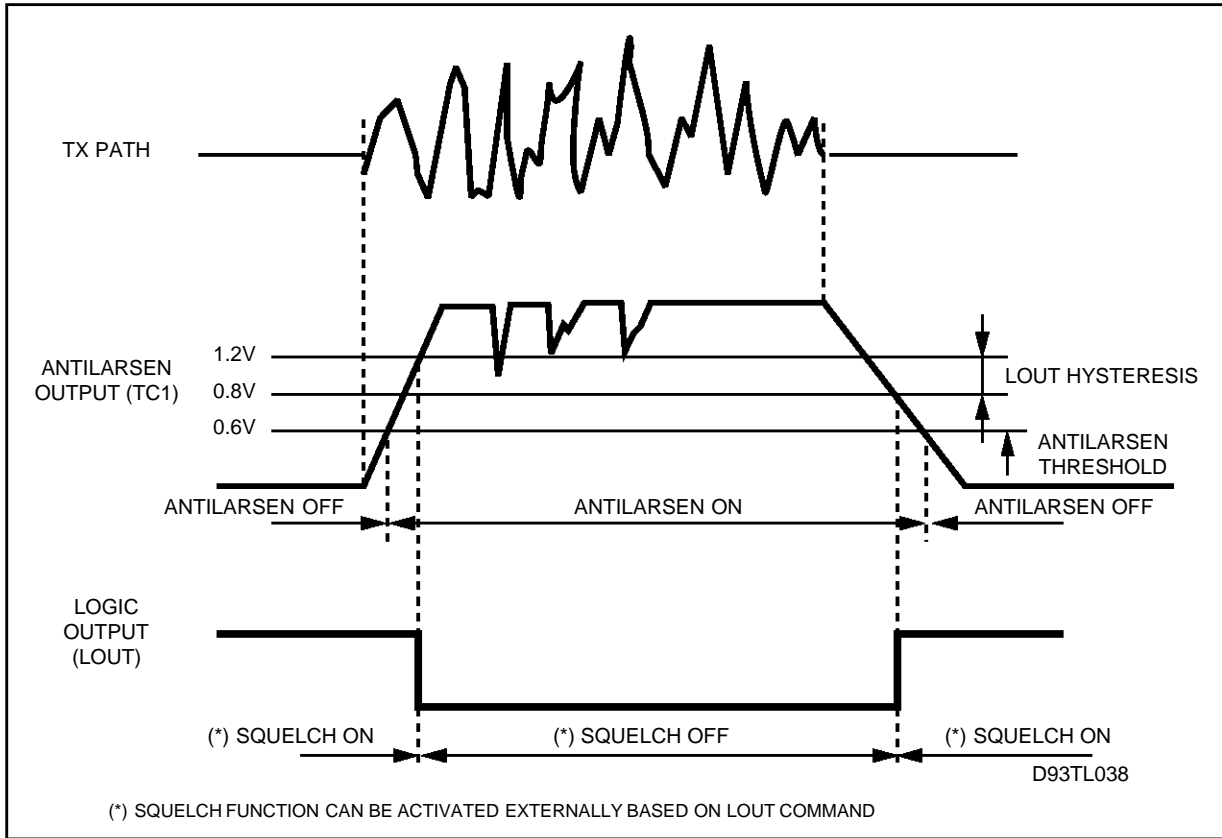


Figure 4: IN3 and IN2 Channels - Distortion



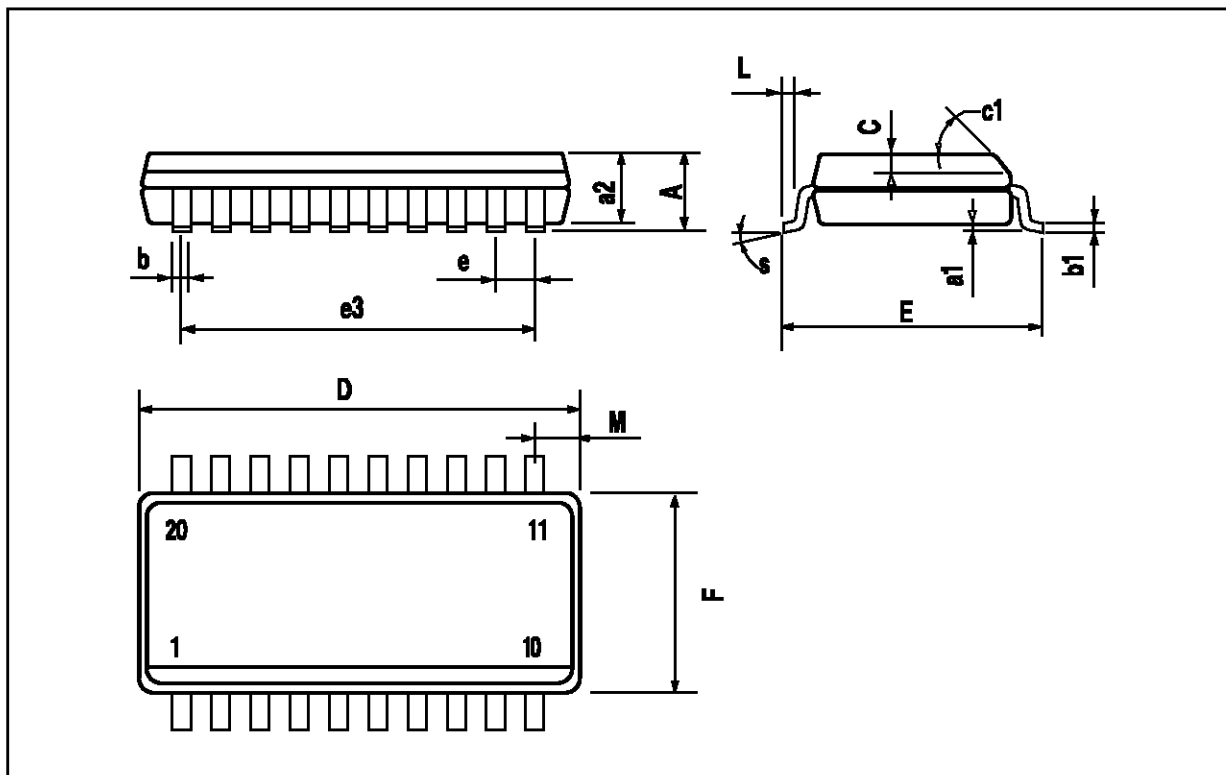
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**Figure 5:** Time Diagram for TC1 (Antilarsen) and LOUT.



## SO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1	45° (typ.)					
D	12.6		13.0	0.496		0.510
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.4		7.6	0.291		0.300
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S	8° (max.)					



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