DATA SHEET

TDA1597
IF amplifier/demodulator for FM radio receivers

Product specification
Supersedes data of May 1994
File under Integrated Circuits, IC01

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Philips Semiconductors

PHILIPS

FEATURES

- Balanced limiting amplifier
- Balanced coincidence demodulator
- Two open-collector stop pulse outputs for microcomputer tuning control
- Simulated behaviour of ratio detector (internal field strength and detuning dependent voltage for dynamic AF signal muting)
- Mono/stereo blend field strength indication control voltage
- AFC output
- 3-state mode switch for FM-MUTE-ON, FM-MUTE-OFF and FM-OFF
- Internal compensation of AF signal Total Harmonic Distortion (THD)
- Built-in hum and ripple rejection circuits.

GENERAL DESCRIPTION

The TDA1597 provides IF amplification, symmetrical quadrature demodulation and level detection for quality home and car FM radio receivers and is suitable for mono and stereo reception. It may also be applied to common front-ends, stereo decoders and AM receivers circuits.

All pin numbers mentioned in this data sheet refer to the SO version (TDA1597T) unless otherwise specified.

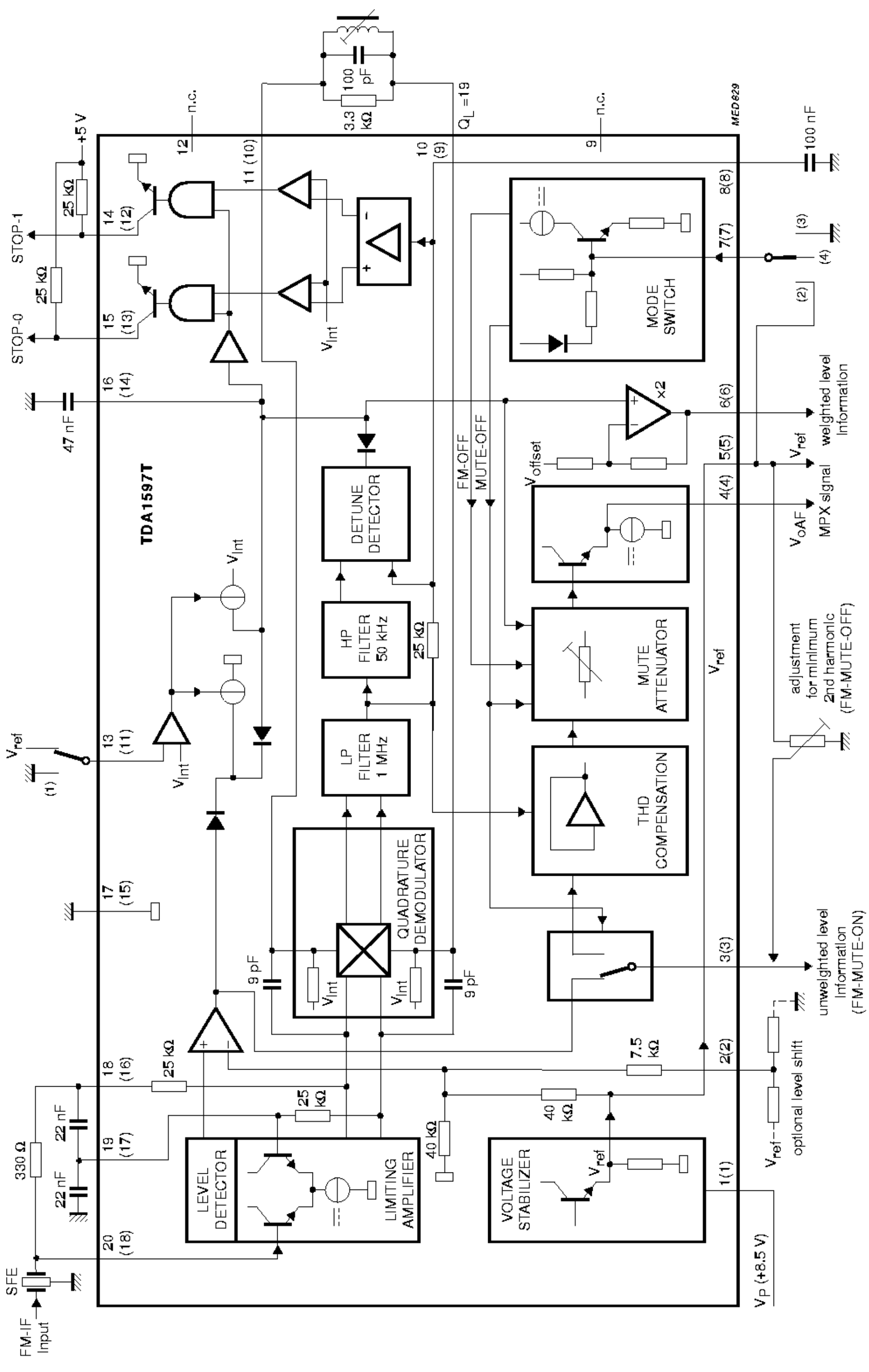
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage		7.5	8.5	12	V
I_P	supply current ($I_2 = I_7 = 0$)		–	20	26	mA
$V_{iIF(rms)}$	IF input sensitivity for limiting on pin 20 (RMS value)		14	22	35	μV
$V_{oAF(rms)}$	AF output signal on pin 4 (RMS value)		180	200	220	mV
S/N	signal-to-noise ratio	f_m = 400 Hz; Δf = ±75 kHz	–	82	–	dB
THD	total harmonic distortion	f_m = 1 kHz; Δf = ±75 kHz	–	0.1	0.3	%
		K2 adjustment and FM-MUTE-OFF	–	0.07	0.25	%
T_{amb}	operating ambient temperature		–40	–	+85	°C

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA1597	DIP18	plastic dual in-line package; 18 leads (300 mil)	SOT102-1
TDA1597T	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1

BLOCK DIAGRAM



The pin numbers given in parenthesis refer to the TDA1597.

1. Connecting pin 13 (11) to ground is only allowed to measure the current on pin 16 (14).
2. FM-MUTE-OFF.
3. FM-OFF.
4. FM-MUTE-ON.

Fig.1 Block diagram and application circuit.

PINNING

SYMBOL	PIN		DESCRIPTION
	DIP18	SO20	
V_P	1	1	supply voltage (+8.5 V)
LVA	2	2	level adjustment for stop condition
ULV	3	3	unweighted level output/K2 adjustment
V_{oAF}	4	4	audio frequency output (MPX signal)
V_{ref}	5	5	reference voltage output
WLV	6	6	weighted level output
MODE	7	7	mode switch input
DDV	8	8	detune detector voltage
n.c.	–	9	not connected
DEMI1	9	10	demodulator input 1
DEMI2	10	11	demodulator input 2
n.c.	–	12	not connected
TSW	11	13	tau switch input
ST1	12	14	STOP-1, stop pulse output 1
ST0	13	15	STOP-0, stop pulse output 0
MUTE	14	16	muting voltage
GND	15	17	ground (0 V)
LFB1	16	18	IF limiter feedback 1
LFB2	17	19	IF limiter feedback 2
V_{iIF}	18	20	IF signal input

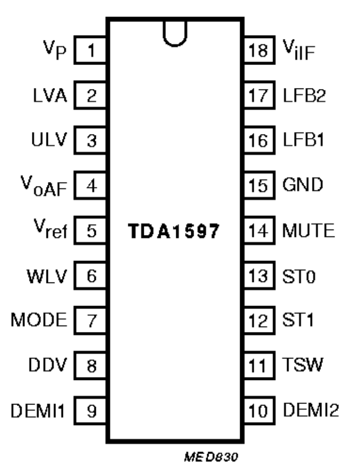


Fig.2 Pin configuration (DIP version).

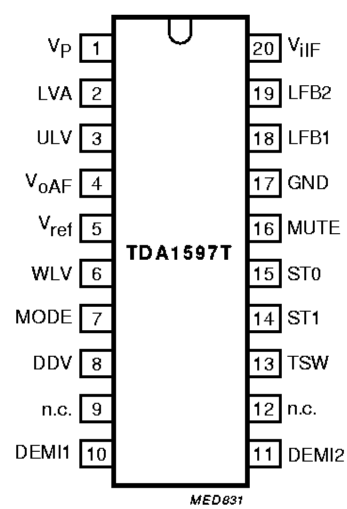


Fig.3 Pin configuration (SO version).

FUNCTIONAL DESCRIPTION

The limiter amplifier has five stages of IF amplification using balanced differential limiter amplifiers with emitter follower coupling.

Decoupling of the stages from the supply voltage line and an internal high-ohmic DC feedback loop gives a very stable IF performance. The amplifier gain is virtually independent of changes in temperature.

The FM demodulator is fully balanced and contains two cross-coupled differential amplifiers.

The quadrature detection of the FM signal is performed by direct feeding of one differential amplifier from the limiter amplifier output and the other via an external 90 degrees phase shifting network. The demodulator has a good stability and a small zero cross-over shift. The bandwidth of the demodulator output is restricted by an internal low-pass filter to approximately 1 MHz. Non-linearities, which are introduced by demodulation, are compensated for by the THD compensation circuit. For this reason, the demodulator resonance circuit (between pins 10 and 11) must have a loaded Q-factor of 19.

Consequently, there is no need for the demodulator tuned circuit to be adjusted for minimum distortion. Adjustment criterion is a symmetrical stop pulse. The control voltage for the mute attenuator (pin 16) is derived from the values of the level detector and the detuning detector output signals. The mute attenuator has a fast attack and a slow decay, determined by the capacitor connected to pin 16. The AF signal is fed via the mute attenuator to the output (pin 4). A weighted control voltage (pin 6) is obtained from the mute attenuator control voltage via a buffer amplifier that introduces an additional voltage shift and gain.

The level detector generates a voltage output signal proportional to the amplitude of the input signal.
The unweighted level detector output signal is available in the FM-MUTE-ON condition (mode switch).

The open-collector tuning stop output voltages STOP-0 and STOP-1 (pins 15 and 14) are derived from the detuning and the input signal level. Pins 14 and 15 may be tied together if only one tuning-stop output is required.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_P	supply voltage		−0.3	+13	V
V_n	voltage at pins 2, 4, 5, 6, 10, 11 and 16		−0.3	+10	V
	voltage at pins 3, 7, 8, 14, 15, 18, 19 and 20		−0.3	V_P	V
V_{13}	voltage on pin 13		−	6	V
$I_{14, 15}$	current at pins 14 and 15		−	2	mA
P_{tot}	total power dissipation		−	360	mW
T_{stg}	storage temperature		−55	+150	°C
T_{amb}	operating ambient temperature		−40	+85	°C
V_{es}	electrostatic handling				
	all pins except pins 5 and 7	note 1	−2000	+2000	V
	pin 5	note 1	−2000	+800	V
	pin 7	note 1	−2000	+1000	V

Note

1. Equivalent to discharging a 100 pF capacitor through a 1.5 kΩ series resistor.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air		
	SOT102-1	80	K/W
	SOT163-1	90	K/W

CHARACTERISTICS

V_P = 8.5 V; T_{amb} = 25 °C; FM-MUTE-ON (I_7 = 0); f_{IF} = 10.7 MHz; deviation ±22.5 kHz with f_m = 400 Hz; V_i = 10 mV (RMS) at pin 20; de-emphasis of 50 µs; tuned circuit at pins 10 and 11 aligned for symmetrical stop pulses; measurements taken in Fig.4; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage		7.5	8.5	12	V
I_P	supply current	$I_2 = I_7 = 0$	–	20	26	mA
Mode switch input						
I_7	input current	FM-MUTE-ON	–	0	–	mA
V_7	input voltage	FM-MUTE-ON	2.4	2.8	3.2	V
		FM-MUTE-OFF	$0.9V_{ref}$	–	–	V
		FM-OFF; AF attenuation >60 dB	–	–	1.4	V
IF amplifier and demodulator						
Z_i	demodulator input impedance between pins 10 and 11		25	40	55	kΩ
C_i	demodulator input capacitance between pins 10 and 11		–	6	–	pF
AF output (pin 4)						
R_o	output resistance		–	400	–	Ω
V_4	DC output voltage level	$V_{iIF} \leq 5$ µV (RMS) on pin 20	2.75	3.1	3.45	V
PSRR	power supply ripple rejection (pin 4)	f = 1000 Hz; V_{ripple} = 50 mV (RMS)	33	36	–	dB
Tuning stop detector						
$\Delta f_{STOP\text{-}0}$	detuning frequency for STOP-0 (pin 15)	$V_{15} \geq 3.5$ V; see Fig.11	–	–	26	kHz
		$V_{15} \leq 0.3$ V; see Fig.11	38	–	–	kHz
$\Delta f_{STOP\text{-}1}$	detuning frequency for STOP-1 (pin 14)	$V_{14} \geq 3.5$ V; see Fig.10	–	–	–26	kHz
		$V_{14} \leq 0.3$ V; see Fig.10	–38	–	–	kHz
$V_{20(rms)}$	dependence on input voltage for STOP-0 and STOP-1 (RMS value)	$V_{14,\,15} \geq 3.5$ V; see Fig.9	250	–	–	µV
		$V_{14,\,15} \leq 0.3$ V; see Fig.9	–	–	50	µV
$V_{14,\,15}$	output voltage	$I_{14,\,15}$ = 1 mA	–	–	0.3	V
Reference voltage source (pin 5)						
V_{ref}	reference output voltage	I_5 = –1 mA	3.3	3.7	4.1	V
R_5	output resistance	I_5 = –1 mA	–	40	80	Ω
TC	temperature coefficient		–	3.3	–	mV/VK

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
External muting						
V_{16}	muting voltage at $I_2 = 0$	$V_{20} \leq 5\ \mu V$ (RMS); see Fig.12	1.45	1.75	2.05	V
		$V_{20} = 1$ mV (RMS)	3.0	3.45	3.9	V
S	steepness of control voltage	slope: $100\ \mu V \leq V_{20} \leq 100$ mV; $20\Delta\log V_{20} = 20\ dB \frac{\Delta V_{16}}{\Delta \log V_{20}}$	–	0.85	–	V/dec
Internal mute α; note 1						
α	mute voltage	$V_{16} \geq V_{ref}$	–	0	–	dB
		$V_{16} = 0.77V_{ref}$	1.5	–	4.5	dB
		$V_{16} = 0.55V_{ref}$	–	20	–	dB
I_{16}	current for capacitor (pin 16)					
	charge current	$V_{13} = 0$ V	–	−8	–	μA
	discharge current	$V_{13} = 0$ V	–	120	–	μA
	charge current	$V_{13} = V_{ref}$	–	−100	–	μA
	discharge current	$V_{13} = V_{ref}$	–	120	–	μA
Level detector						
R_6	output resistance pin 6		–	–	500	Ω
V_6	output voltage at $I_2 = 0$	$V_{20} \leq 5\ \mu V$ (RMS); see Fig.14	0.1	–	1.1	V
		$V_{20} = 1$ mV (RMS)	3.0	–	4.2	V
		±200 kHz detuning	1.2	1.5	1.8	V
	output voltage at $V_2 = V_5$	$V_{20} \leq 5\ \mu V$ (RMS)	–	–	0.3	V
ΔV_6	output voltage at detuning	±45 kHz detuning	–	–	0.2	V
TC	temperature coefficient		–	3.3	–	mV/VK
Δf	detuning frequency	$V_6 = 1.8$ V; see Fig.13	90	–	160	kHz
S	steepness of control voltage	slope: $50\ \mu V \leq V_{20} \leq 50$ mV; $20\Delta\log V_{20} = 20\ dB \frac{\Delta V_6}{\Delta \log V_{20}}$	1.4	1.7	2.0	V/dec
$\Delta V_6/\Delta f$	slope of output voltage at detuning	$\Delta f = 125 \pm 20$ kHz	–	35	–	mV/kHz
S	level shift adjustments					
	range by pin 2	$\pm\Delta V_6/V_{ref}$	0.42	0.5	–	V/V
	gain	$-\Delta V_6/\Delta V_2$	–	1.7	–	V/V
	range by pin 2	$\pm\Delta V_{16}/V_{ref}$	0.21	0.25	–	V/V
	gain	$-\Delta V_{16}/\Delta V_2$	–	0.85	–	V/V

Note

1. $\alpha = 20\ \log \frac{\Delta V_{4(FM-MUTE-OFF)}}{\Delta V_{4(FM-MUTE-ON)}}$

OPERATING CHARACTERISTICS

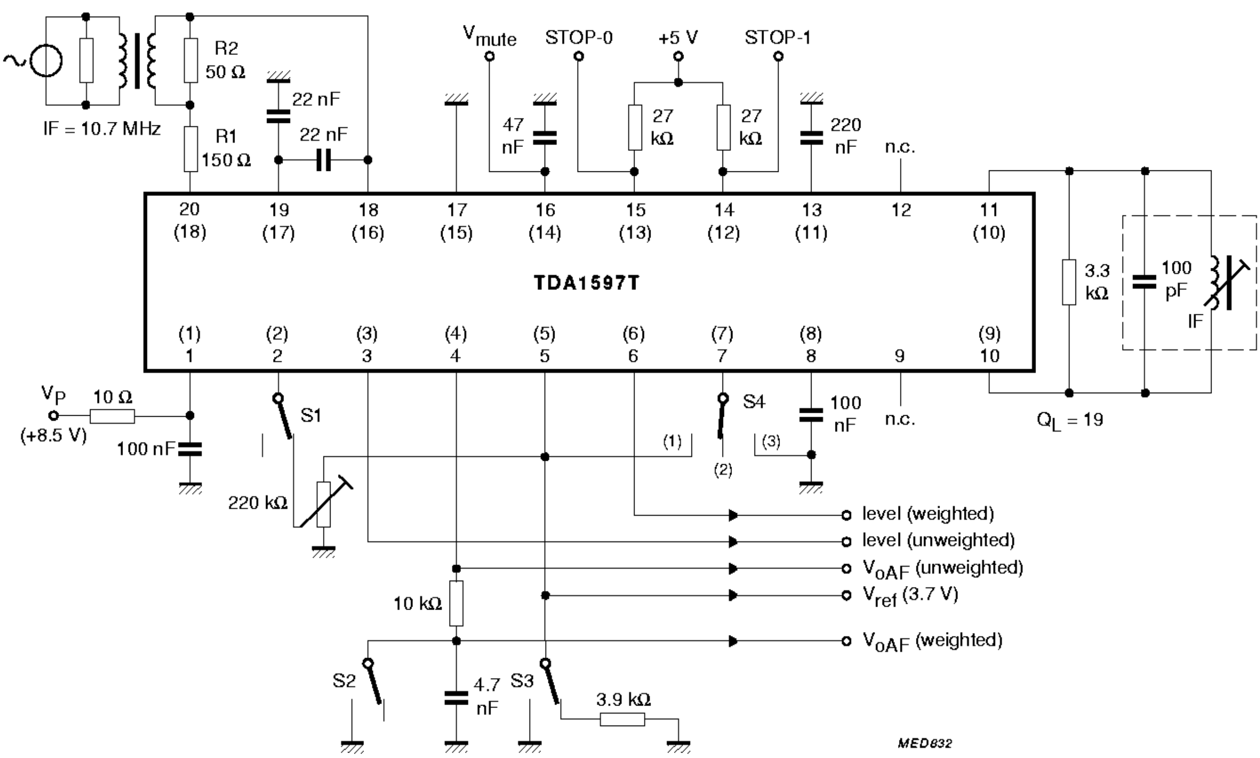
V_P = 7.5 to 12 V; T_{amb} = 25 °C; FM-MUTE-ON (I_7 = 0); f_{IF} = 10.7 MHz; deviation ±22.5 kHz with f_m = 400 Hz; V_i = 10 mV (RMS) at pin 20; de-emphasis of 50 µs; tuned circuit at pins 10 and 11 aligned for symmetrical stop pulses; measurements taken in Fig.4; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
IF amplifier and demodulator						
$V_{i(rms)}$	input signal for start of limiting (−3 dB) (RMS value; pin 20)	$V_7 = V_{ref}$; FM-MUTE-OFF	14	22	35	µV
	input signal for signal-to-noise ratio (RMS value)	f = 250 to 15000 Hz; $V_7 = V_{ref}$				
		S/N = 26 dB	–	15	–	µV
		S/N = 46 dB	–	60	–	µV
S/N	signal-to-noise ratio	deviation ±75 kHz	–	82	–	dB
$V_{o(rms)}$	AF output signal (RMS value; pin 4)		180	200	220	mV
THD	total harmonic distortion without de-emphasis					
	without detuning	deviation ±75 kHz; f_m = 1 kHz; I_7 = 0	–	0.1	0.3	%
	±25 kHz detuning	deviation ±75 kHz; f_m = 1 kHz; I_7 = 0	–	–	0.6	%
	compensated via pin 3	deviation ±75 kHz; f_m = 1 kHz; I_7 = 0; $V_7 = V_{ref}$	–	0.07	0.25	%
ΔV_4	K2 adjustment $\Delta V_4 = V_4 (V_3 = 0) - V_4 (V_3 = V_{ref})$		10	–	–	mV
α_{AM}	AM suppression on pin 4	$V_7 = V_{ref}$; m = 30%				
	V_i = 0.3 to 1000 mV (RMS)	on pin 20	46	55	–	dB
	V_i = 1 to 300 mV (RMS)	on pin 20	60	65	–	dB
Dynamic mute attenuation α; note 1						
α	dynamic mute attenuation	deviation ±75 kHz; f_m = 100 kHz; V_2 = 1 V	–	14	–	dB

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Tuning stop detector						
Δf_{STOP-0}	detuning frequency for STOP-0 (pin 15)	$V_{15} \geq 3.5$ V; see Fig.11	–	–	26	kHz
		$V_{15} \leq 0.3$ V; see Fig.11	38	–	–	kHz
Δf_{STOP-1}	detuning frequency for STOP-1 (pin 14)	$V_{14} \geq 3.5$ V; see Fig.10	–	–	−26	kHz
		$V_{14} \leq 0.3$ V; see Fig.10	−38	–	–	kHz
$V_{20(rms)}$	dependence on input voltage for STOP-0 and STOP-1 (RMS value)	$V_{14,\,15} \geq 3.5$ V; see Fig.9	250	–	–	μV
		$V_{14,\,15} \leq 0.3$ V; see Fig.9	–	–	50	μV
R_8	internal low-pass resistance of detune detector		12	25	50	kΩ
V_8	voltage on capacitor	$V_i \leq 5$ μV (RMS) on input pin 20; $I_7 = 0$	–	2.2	–	V
Level detector ($I_2 = 0$)						
V_6	output voltage	$V_{20} \leq 5$ μV (RMS)	0.1	–	1.1	V
		$V_{20} = 1$ mV (RMS)	3.0	–	4.2	V
Reference voltage source (pin 5)						
V_{ref}	reference output voltage	$I_5 = -1$ mA	3.3	3.7	4.1	V
Operation with AM-IF						
Level and stop information (on pins 6, 13, 14, 15 and 16) is provided for the modes FM-MUTE-ON and FM-MUTE-OFF. This information is also available in the FM-OFF mode when an AM-IF signal is input (for example 455 kHz). This can also provide a valid detuning information when a suitable AM-IF resonance circuit is provided for demodulator (see Fig.18).						

Note

1. $\alpha = 20 \log \frac{\Delta V_{4(FM-MUTE-OFF)}}{\Delta V_{4(FM-MUTE-ON)}}$



The pin numbers given in parenthesis refer to the TDA1597.

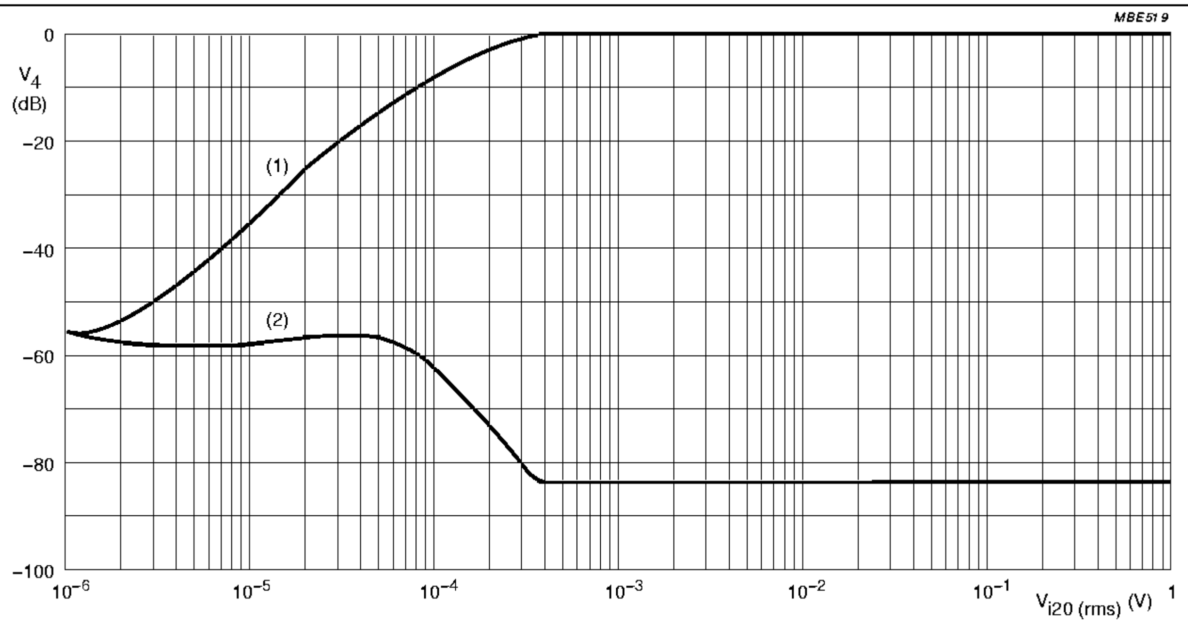
switch S4 (MODE):

(1) FM-MUTE-OFF.

(2) FM-MUTE-ON.

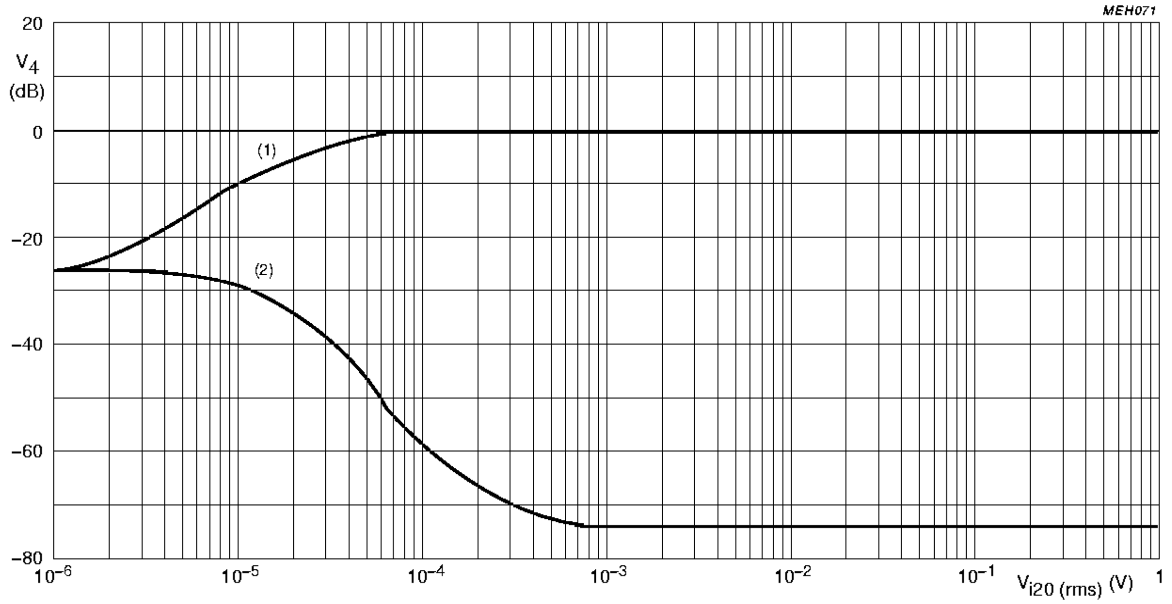
(3) FM-OFF.

Fig.4 Test circuit.



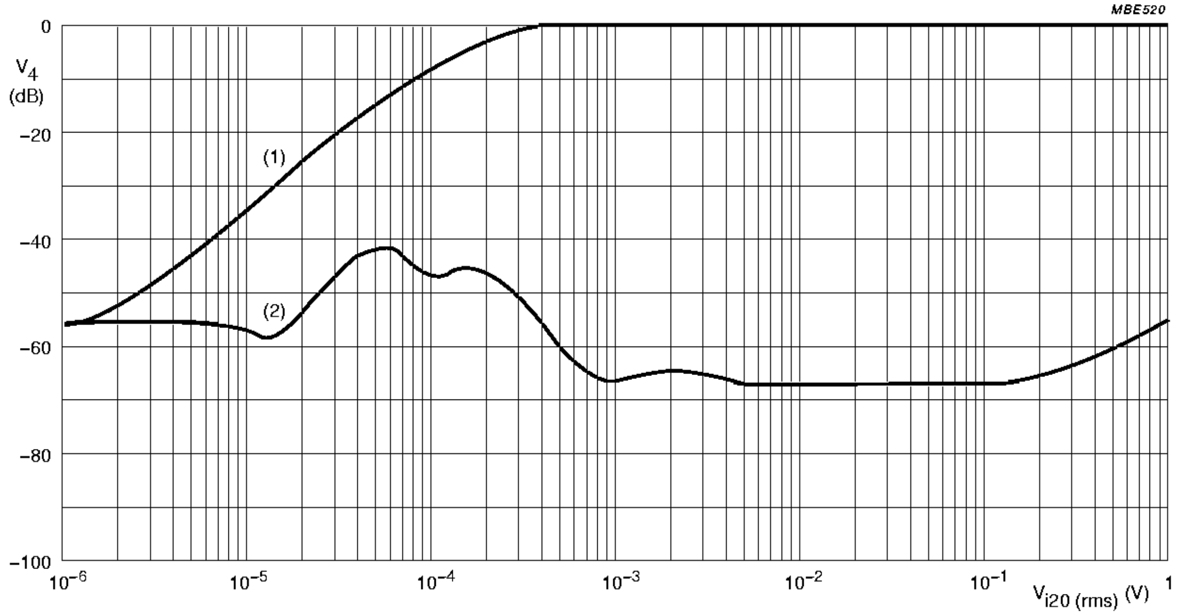
(1) Audio signal.
(2) Noise.

Fig.5 FM-MUTE-ON: Audio signal and noise as functions of the input signal V_{iIF} (pin 20) with $\Delta f = \pm 22.5$ kHz; $f_m = 1$ kHz; de-emphasis 50 μs.



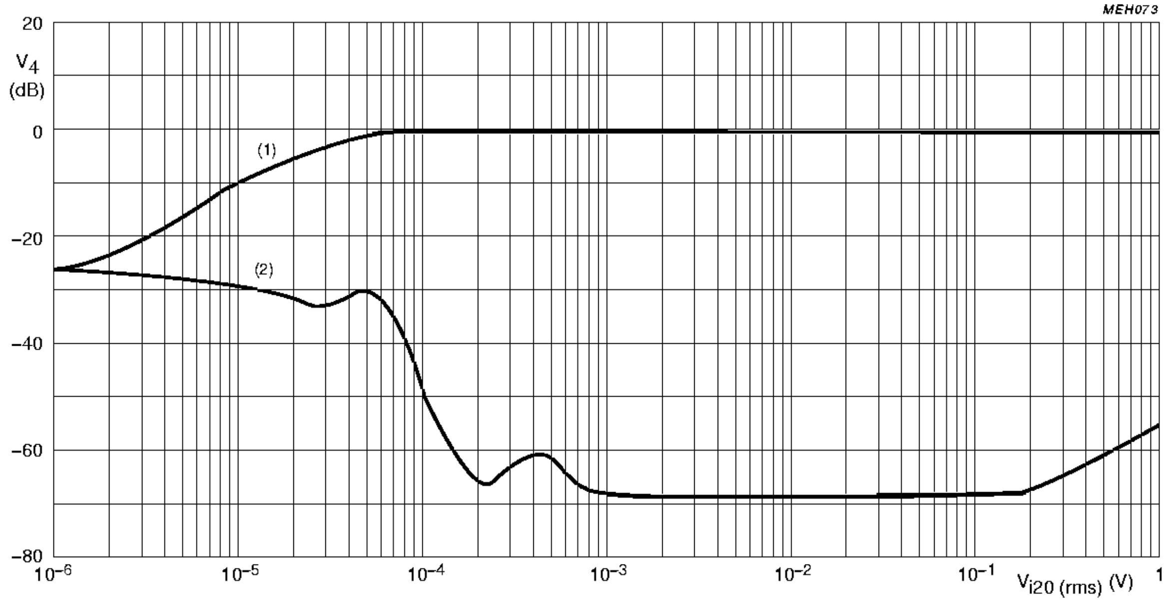
(1) Audio signal.
(2) Noise.

Fig.6 FM-MUTE-OFF: Audio signal and noise as functions of the input signal V_{iIF} (pin 20) with $\Delta f = \pm 22.5$ kHz; $f_m = 1$ kHz; de-emphasis 50 μs.



(1) Audio signal.
(2) Spurious AM signal.

Fig.7 FM-MUTE-ON: Typical AM suppression as a function of the input signal V_{iIF} (pin 20) with Δf = ±22.5 kHz; f_m = 1 kHz; AM with f_m = 400 Hz; m = 0.3 and 250 to 15000 Hz bandwidth.



(1) Audio signal.
(2) Spurious AM signal.

Fig.8 FM-MUTE-OFF: Typical AM suppression as a function of the input signal V_{iIF} (pin 20) with Δf = ±22.5 kHz; f_m = 1 kHz; AM with f_m = 400 Hz; m = 0.3 and 250 to 15000 Hz bandwidth.

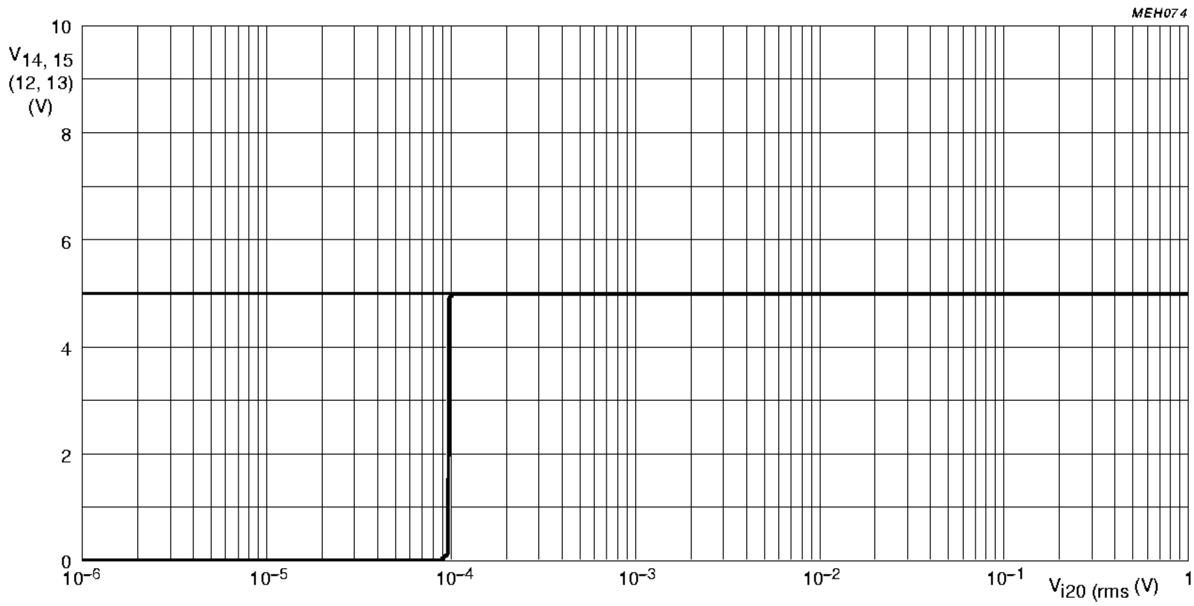


Fig.9 STOP-0 and STOP-1 output voltage dependent on input signal V_{iIF} (pin 20).

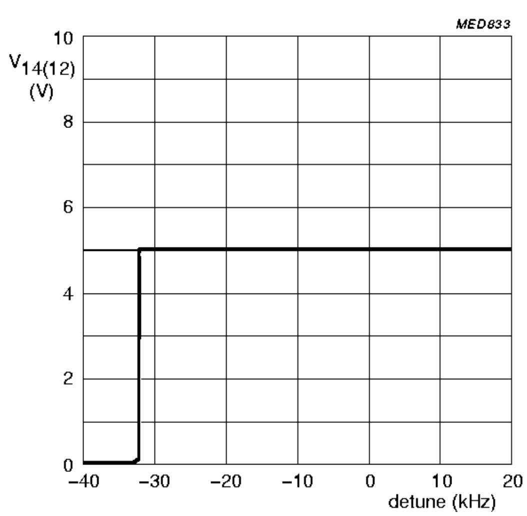


Fig.10 STOP-1 output voltage dependent on V_{iIF} = 10 mV (RMS) (pin 20).

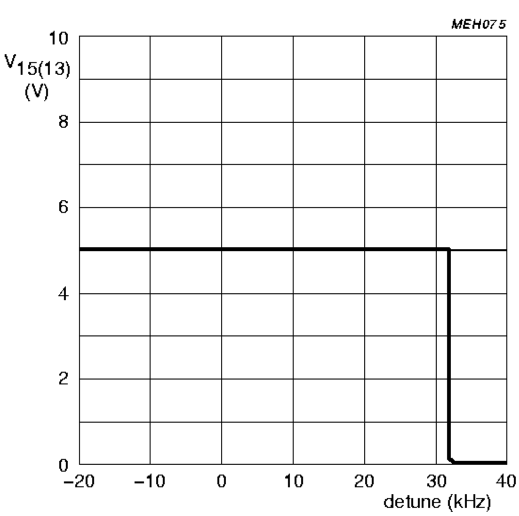
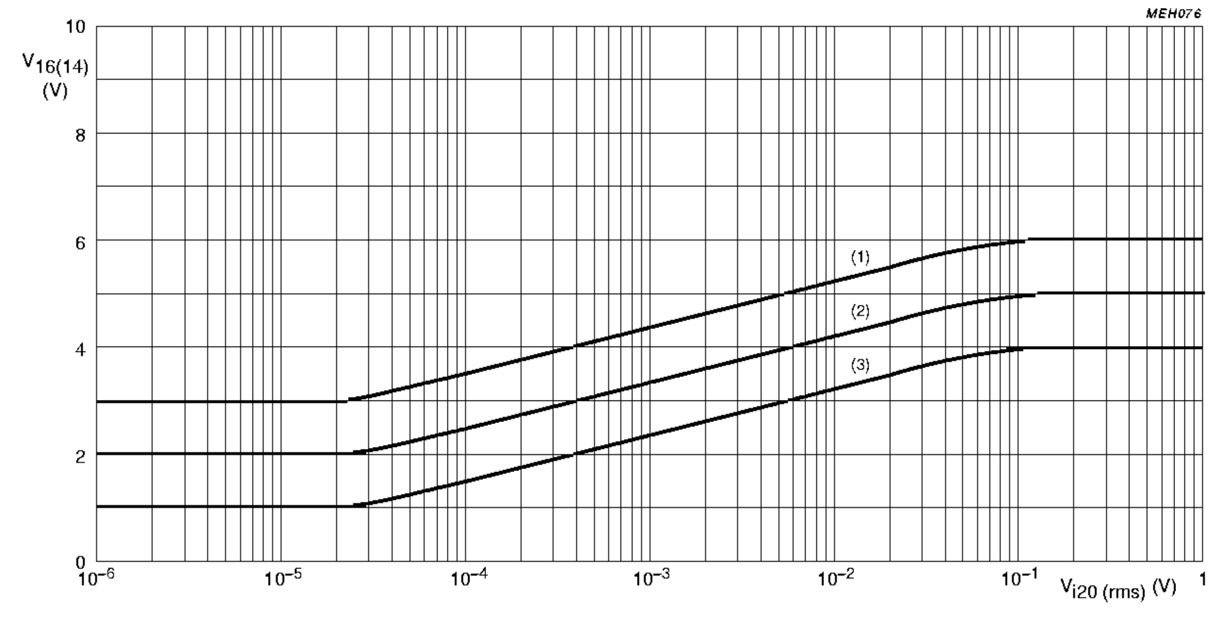


Fig.11 STOP-0 output voltage dependent on V_{iIF} = 10 mV (RMS) (pin 20).



(1) $V_2 = 0$ V.
(2) $I_2 = 0$ mA.
(3) $V_2 = V_{ref}$.

Fig.12 External mute voltage $V_{16(14)}$ dependent on input signal V_{iIF} (pin 20); typical adjusting range.

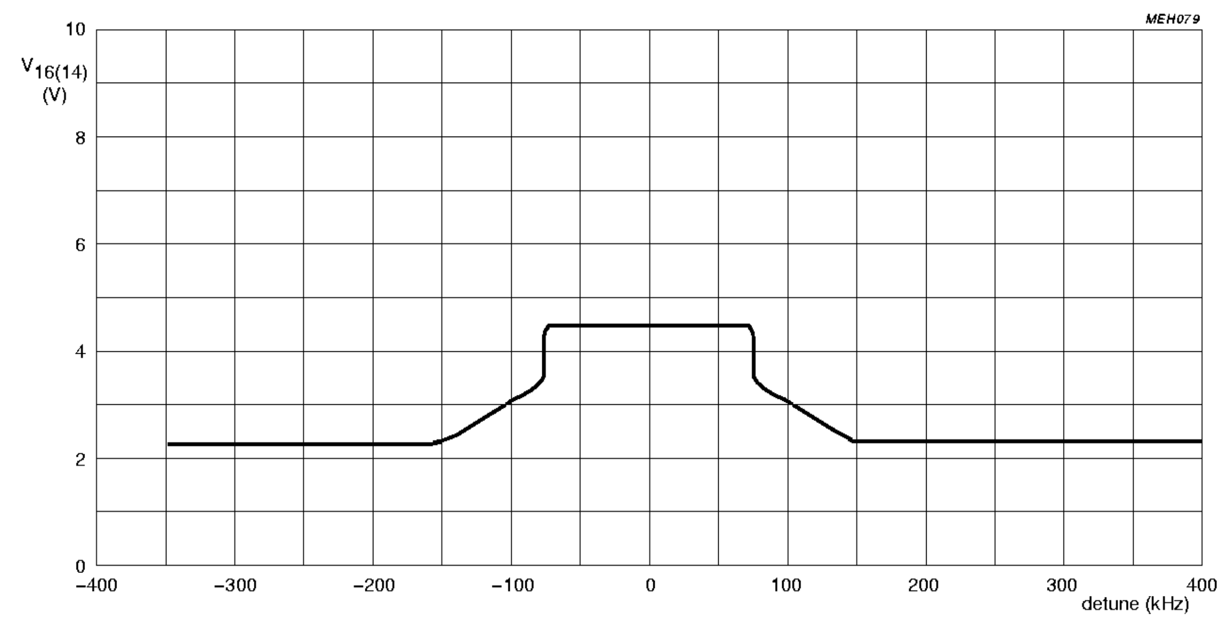
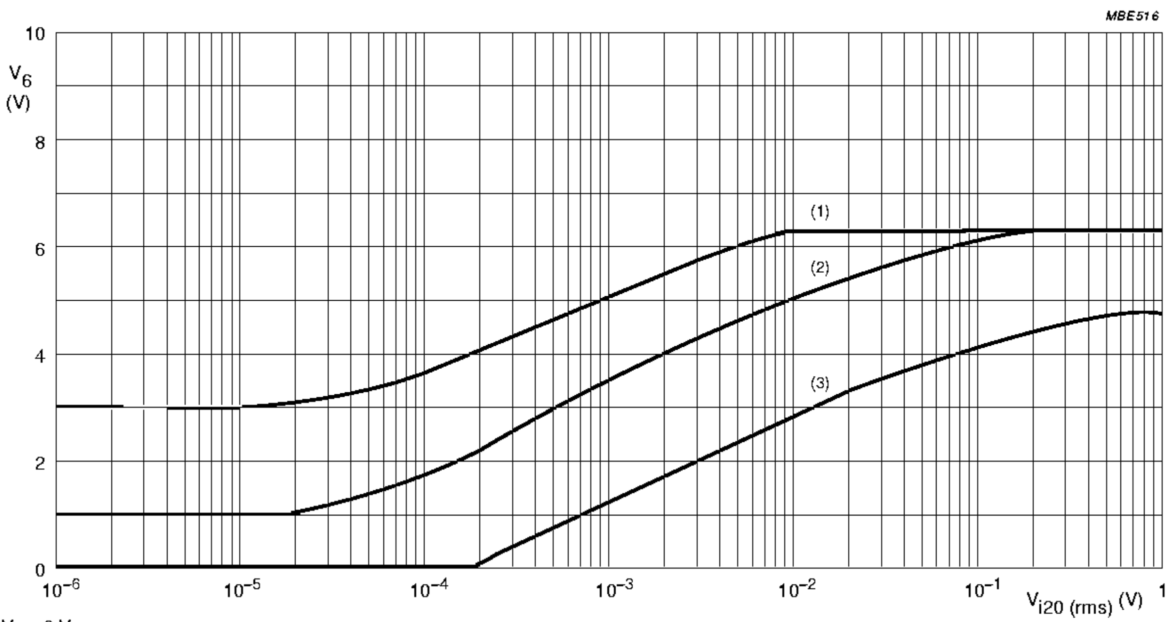


Fig.13 Mute voltage $V_{16(14)}$ dependent on detuning; V_{iIF} = 10 mV (RMS).



(1) $V_2 = 0$ V.

(2) $I_2 = 0$ mA.

(3) $V_2 = V_{ref}$.

Fig.14 Control voltage V_6 dependent on input signal V_{iIF} (pin 20); typical adjusting range.

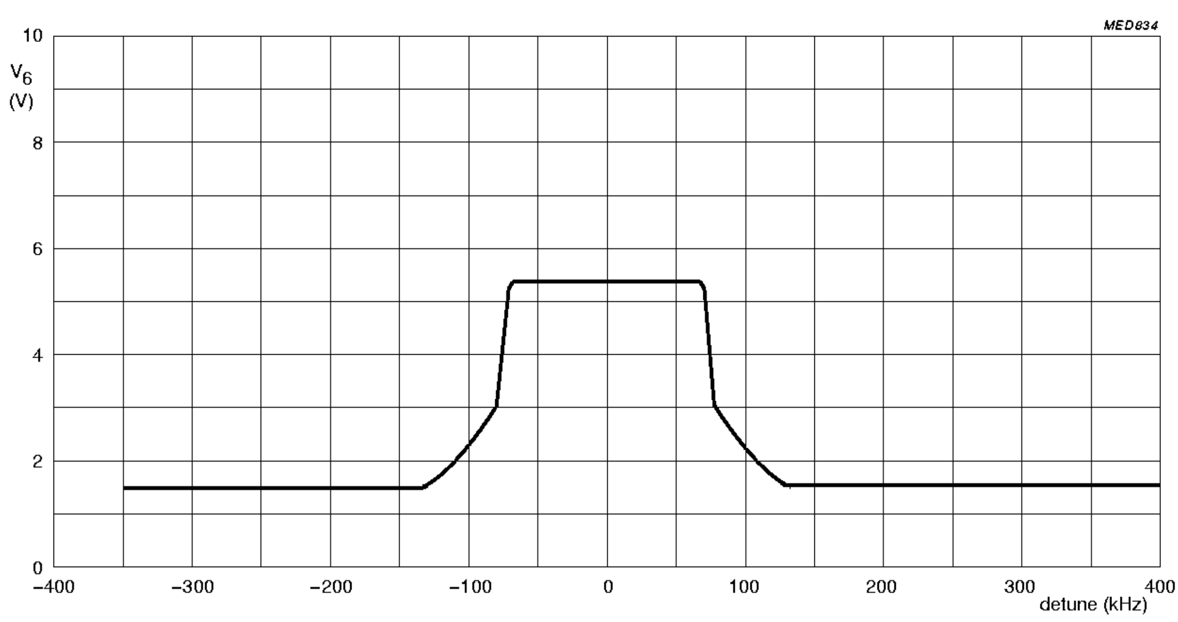
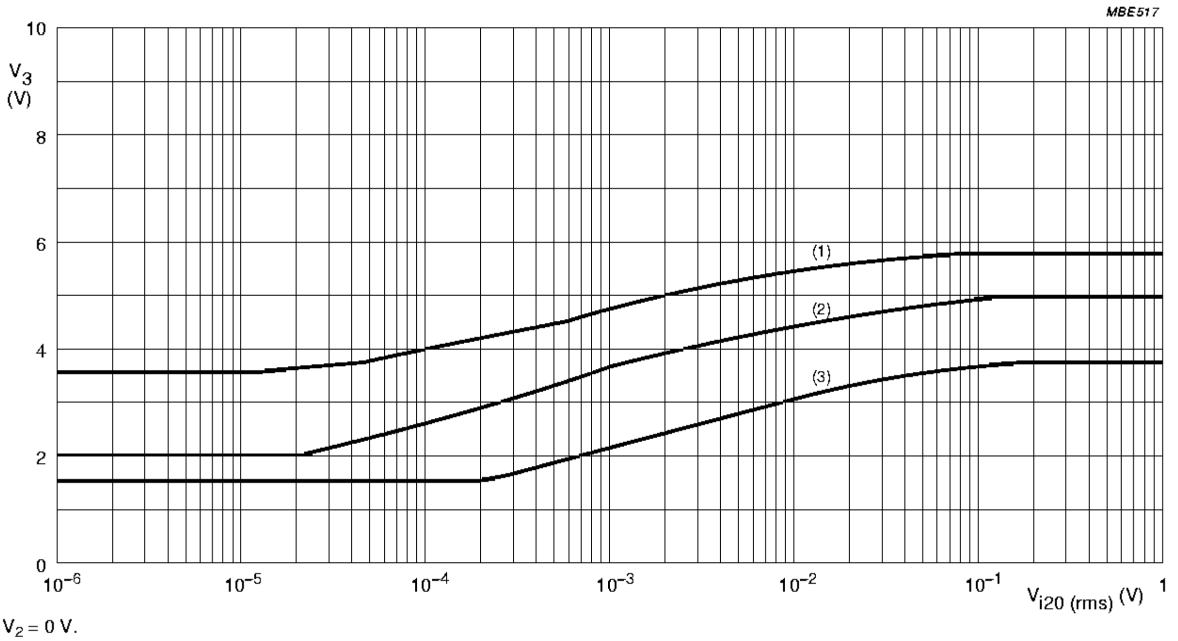


Fig.15 Control voltage V_6 dependent on detuning; V_{iIF} = 10 mV (RMS).



(1) $V_2 = 0$ V.
(2) $I_2 = 0$ mA.
(3) $V_2 = V_{ref}$.

Fig.16 Level output voltage V_3 dependent on input signal V_{iIF} (pin 20); typical adjusting range.

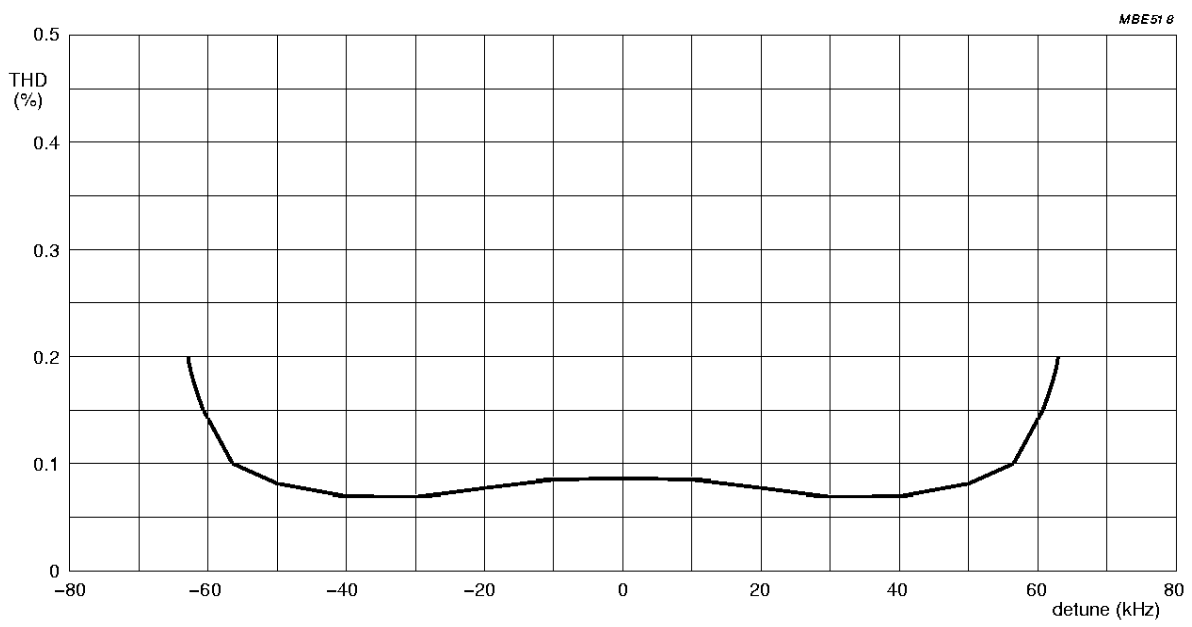


Fig.17 Total harmonic distortion dependent on detuning at FM-MUTE-ON; $\Delta f = \pm 75$ kHz; $f_m = 1$ kHz; $V_{iIF} = 10$ mV.

APPLICATION INFORMATION

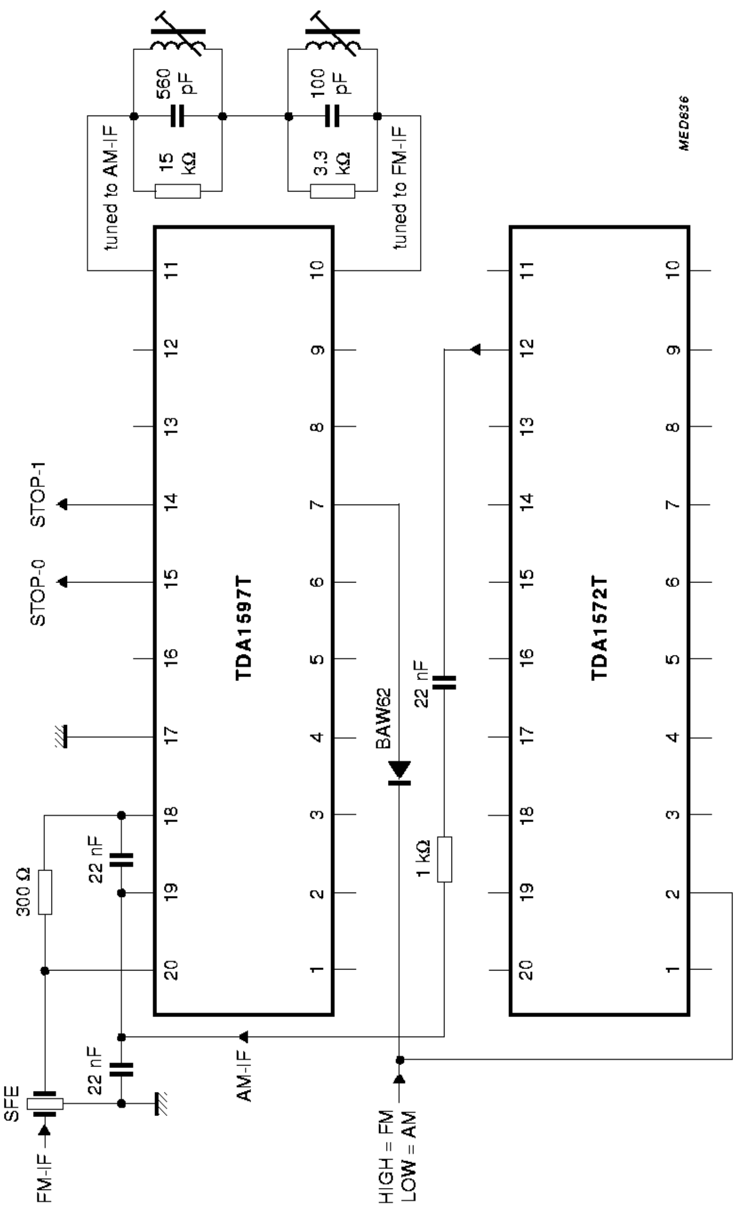


Fig.18 Interface for AM stop pulse application (SO version).

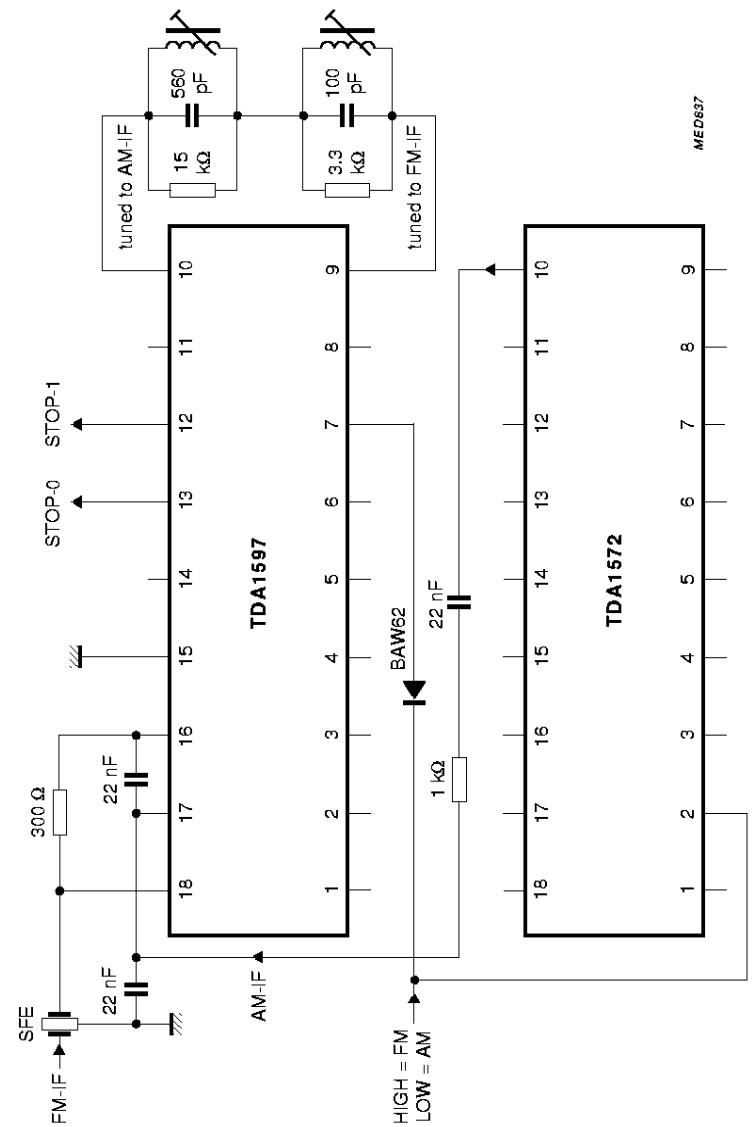
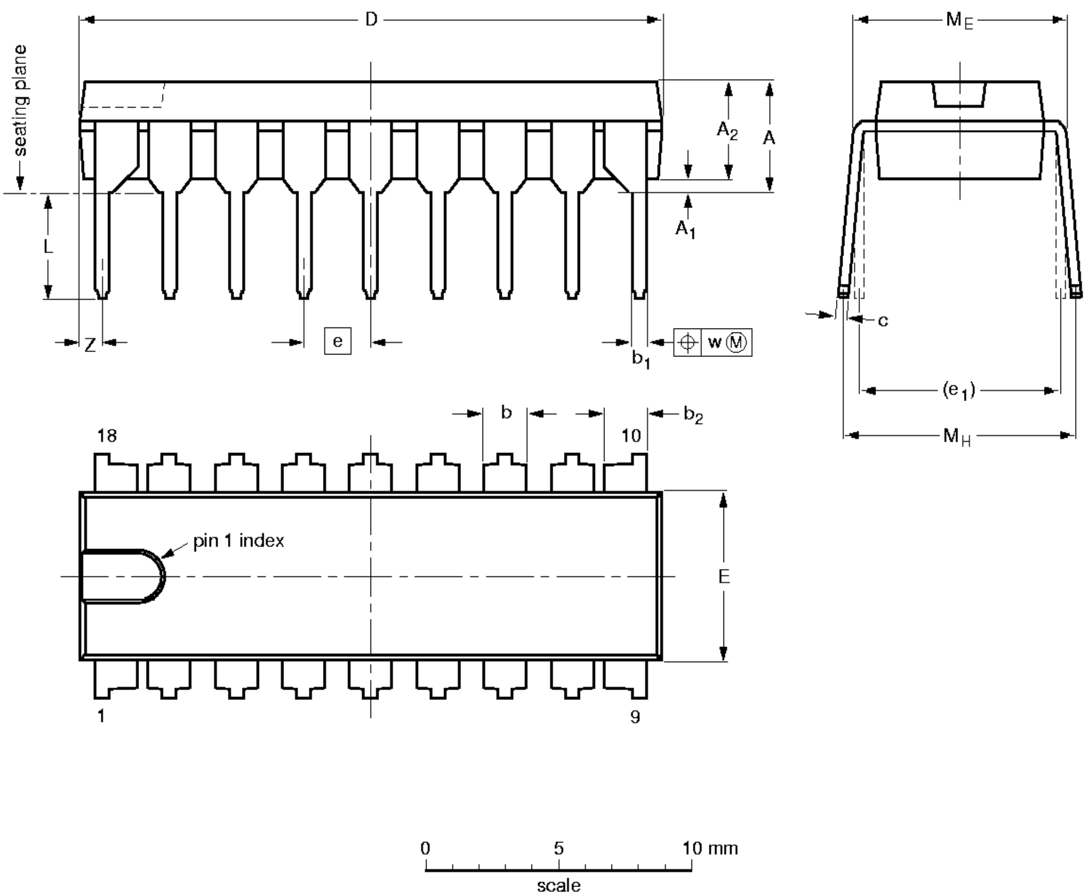


Fig.19 Interface for AM stop pulse application (DIP version).

PACKAGE OUTLINES

DIP18: plastic dual in-line package; 18 leads (300 mil) **SOT102-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

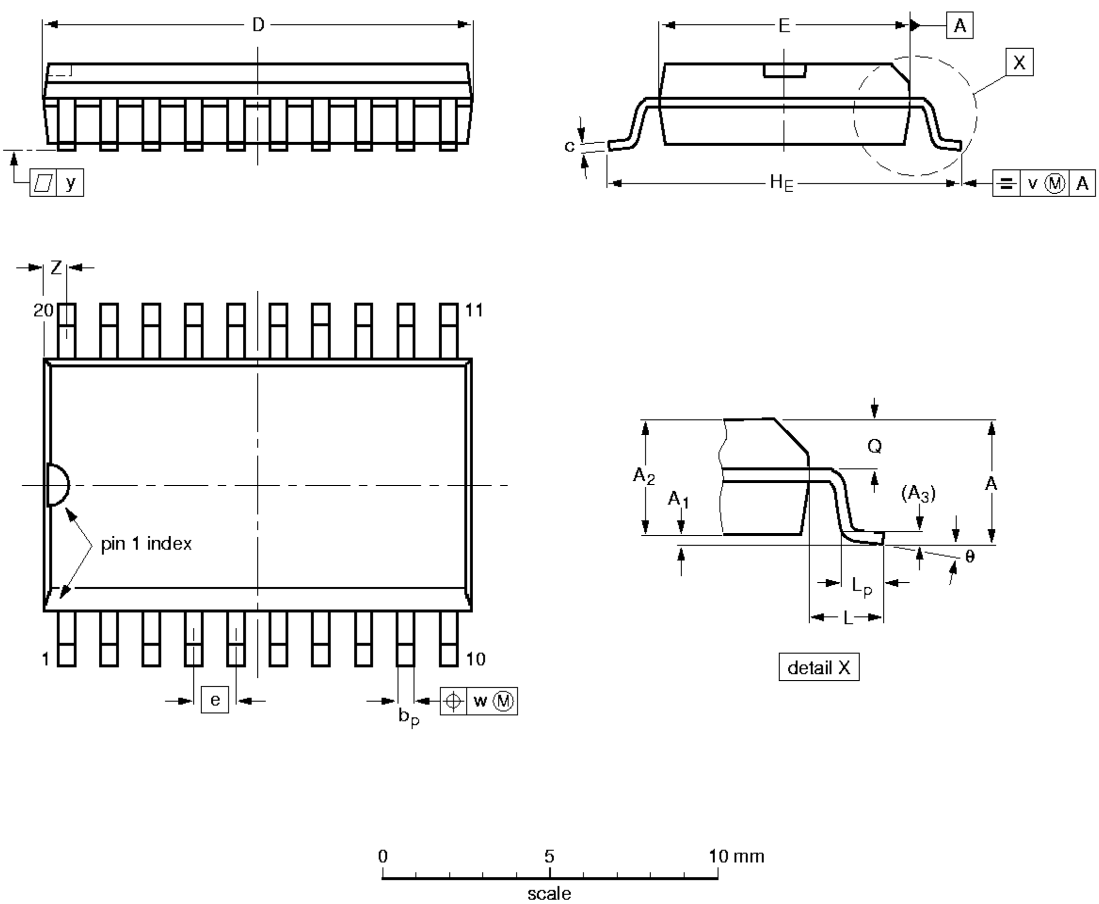
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	b_2	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.7	0.51	3.7	1.40 1.14	0.53 0.38	1.40 1.14	0.32 0.23	21.8 21.4	6.48 6.20	2.54	7.62	3.9 3.4	8.25 7.80	9.5 8.3	0.254	0.85
inches	0.19	0.020	0.15	0.055 0.044	0.021 0.015	0.055 0.044	0.013 0.009	0.86 0.84	0.26 0.24	0.10	0.30	0.15 0.13	0.32 0.31	0.37 0.33	0.01	0.033

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT102-1						~~93-10-14~~ 95-01-23

SO20: plastic small outline package; 20 leads; body width 7.5 mm **SOT163-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D [1]	E [1]	e	H_E	L	L_p	Q	v	w	y	Z [1]	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				~~92-11-17~~ 95-01-24

SOLDERING

Plastic dual in-line packages

BY DIP OR WAVE

The maximum permissible temperature of the solder is 260 °C; this temperature must not be in contact with the joint for more than 5 s. The total contact time of successive solder waves must not exceed 5 s.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

REPAIRING SOLDERED JOINTS

Apply a low voltage soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C, it must not be in contact for more than 10 s; if between 300 and 400 °C, for not more than 5 s.

Plastic small outline packages

BY WAVE

During placement and before soldering, the component must be fixed with a droplet of adhesive. After curing the adhesive, the component can be soldered. The adhesive can be applied by screen printing, pin transfer or syringe dispensing.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder bath is 10 s, if allowed to cool to less than 150 °C within 6 s. Typical dwell time is 4 s at 250 °C.

A modified wave soldering technique is recommended using two solder waves (dual-wave), in which a turbulent wave with high upward pressure is followed by a smooth laminar wave. Using a mildly-activated flux eliminates the need for removal of corrosive residues in most applications.

BY SOLDER PASTE REFLOW

Reflow soldering requires the solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the substrate by screen printing, stencilling or pressure-syringe dispensing before device placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt, infrared, and vapour-phase reflow. Dwell times vary between 50 and 300 s according to method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 min at 45 °C.

REPAIRING SOLDERED JOINTS (BY HAND-HELD SOLDERING IRON OR PULSE-HEATED SOLDER TOOL)

Fix the component by first soldering two, diagonally opposite, end pins. Apply the heating tool to the flat part of the pin only. Contact time must be limited to 10 s at up to 300 °C. When using proper tools, all other pins can be soldered in one operation within 2 to 5 s at between 270 and 320 °C. (Pulse-heated soldering is not recommended for SO packages.)

For pulse-heated solder tool (resistance) soldering of VSO packages, solder is applied to the substrate by dipping or by an extra thick tin/lead plating before package placement.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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