

## Multistandard AM FM Sound IF IC

**TDA 2460-2**

**Preliminary Data**

**Bipolar IC**

Controlled AM IF amplifier including a quasi-synchronous demodulator and integral mean value control for French sound IF, limiter amplifier with FM demodulator, AF part with SCART input and output, volume control and AF output.

### Features

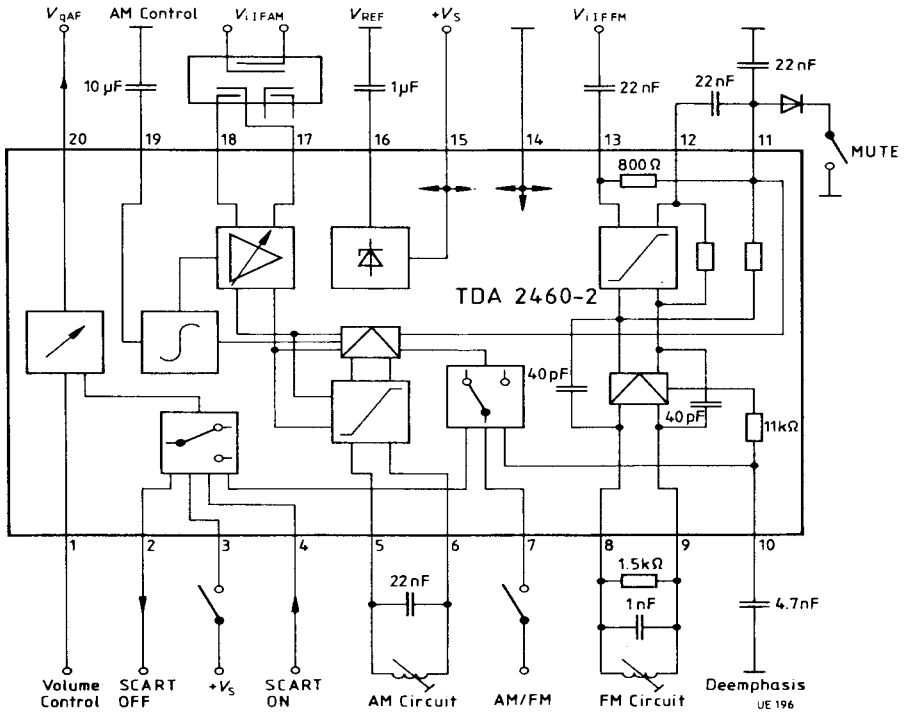
- Switch-over mode to CCIR standard for B/G and L systems
- Integral control for AF sound
- Standardized SCART interface
- High AM and FM sensitivity
- Low distortion factor

| Type       | Ordering Code | Package  |
|------------|---------------|----------|
| TDA 2460-2 | Q67000-A8200  | P-DIP-20 |

### Circuit Description

The component contains a four-stage, capacitatively coupled control amplifier, a quasi-synchronous demodulator, an integral mean value control voltage generator and an AF pre-amplifier according to the French sound IF standard. The FM section contains an eight-stage symmetrical limiter amplifier with a coincidence modulator and an AF pre-amplifier with connection for the deemphasis capacitor. The two AF sources are routed to the volume control via an analog switch of the SCART socket and a record/playback switch.

## Block Diagram



**Pin Definitions and Functions**

| <b>Pin No.</b> | <b>Function</b>                                 |
|----------------|-------------------------------------------------|
| 1              | Volume control adjustment voltage for AF output |
| 2              | SCART AF output                                 |
| 3              | SCART recording/playback switch                 |
| 4              | SCART AF input                                  |
| 5              | Demodulator circuit AM                          |
| 6              | Demodulator circuit AM                          |
| 7              | AM/FM bidirectional switch                      |
| 8              | Demodulator circuit FM                          |
| 9              | Demodulator circuit FM                          |
| 10             | Deemphasis FM                                   |
| 11             | Operation point feedback input FM and muting    |
| 12             | Operation point feedback FM                     |
| 13             | AF input FM                                     |
| 14             | GND                                             |
| 15             | Supply voltage                                  |
| 16             | Reference voltage                               |
| 17             | IF input AM                                     |
| 18             | IF input AM                                     |
| 19             | Control time constant AM amplifier              |
| 20             | AF output                                       |

**Maximum Ratings**

| Parameter                          | Symbol                                                                 | Limit Values                                      | Unit             |
|------------------------------------|------------------------------------------------------------------------|---------------------------------------------------|------------------|
| Supply voltage                     | $V_S$                                                                  | 16                                                | V                |
| Control voltage                    | $V_{19}$                                                               | 4                                                 | V                |
| Reference current                  | $I_{REF}$                                                              | 2                                                 | mA               |
| DC voltages                        | $V_{3, 4, 7, 10}$<br>$V_{17, 18, 1}$<br>$V_{11, 12, 13}$<br>$V_{5, 6}$ | $V_S$<br>$V_S$<br>$V_{REF}$<br>$V_{REF}$ to $V_S$ | V<br>V<br>V<br>V |
| DC currents                        | $I_{2, 20}$<br>$I_{8, 9}$                                              | – 1 to 2<br>2                                     | mA<br>mA         |
| IF input voltage AM<br>$m = 80\%$  | $V_{I 17/18 \text{ rms}}$                                              | 300                                               | mV               |
| IF input voltage FM                | $V_{I 13 \text{ rms}}$                                                 | 600                                               | mV               |
| Junction temperature               | $T_j$                                                                  | 150                                               | °C               |
| Storage temperature range          | $T_{stg}$                                                              | – 55 to 125                                       | °C               |
| Thermal resistance<br>(system-air) | $R_{th SA}$                                                            | 58                                                | K/W              |

**Operating Range**

|                     |          |               |     |
|---------------------|----------|---------------|-----|
| Supply voltage      | $V_S$    | 10.5 to 15.75 | V   |
| Frequency range AM  | $f_{AM}$ | 15 to 45      | MHz |
| Frequency range FM  | $f_{FM}$ | 0.1 to 12     | MHz |
| Ambient temperature | $T_A$    | 0 to 70       | °C  |

**Characteristics** $V_S = 12\text{ V}$ ;  $T_A = 25\text{ }^{\circ}\text{C}$ 

| Parameter           | Symbol   | Limit Values |      |      | Unit |
|---------------------|----------|--------------|------|------|------|
|                     |          | min.         | typ. | max. |      |
| Current consumption | $I_S$    | 48           | 61   | 75   | mA   |
| Supply voltage      | $V_{15}$ | 10.5         |      | 15.5 | V    |

**AM Section** $f_{\text{IF}} = 39.2\text{ MHz}$ ;  $f_{\text{mod}} = 1\text{ kHz}$ 

|                                                                                                                           |                      |     |     |     |               |
|---------------------------------------------------------------------------------------------------------------------------|----------------------|-----|-----|-----|---------------|
| Input voltage for AGC threshold<br>$m = 80\%$ ;<br>$V_2$ (at $V_{17/18} = 1\text{ mV}$ ) $- 3\text{ dB}$                  | $V_{17/18}$          |     | 40  | 80  | $\mu\text{V}$ |
| AGC range<br>$m = 80\%$ ;<br>$V_2$ (at $V_{17/18} = 1\text{ mV}$ ) $\pm 3\text{ dB}$                                      | $\Delta G$           | 60  | 66  |     | dB            |
| Output voltage (SCART)<br>$V_{\text{IF}} = 1\text{ mV}$ ; $m = 80\%$                                                      | $V_{Q2\text{ rms}}$  | 700 | 800 | 900 | mV            |
| Controlled AF output voltage<br>$V_1 = 0.8 V_{\text{REF}}$ ; $V_{\text{IF}} = 1\text{ mV}$ ;<br>$m = 80\%$                | $V_{Q20\text{ rms}}$ | 650 | 800 | 950 | mV            |
| DC voltage<br>$V_{\text{IF}} = 1\text{ mV}$ ; $m = 0$                                                                     | $V_{Q2}$             | 3.5 | 4.0 | 4.5 | V             |
|                                                                                                                           | $V_{Q20}$            | 5   | 6   | 7   | V             |
| Total harmonic distortion<br>$V_{\text{IF}} = 1\text{ mV}$ ; $V_1 = 0.8 V_{\text{REF}}$ ;<br>$m = 30\%$<br><br>$m = 80\%$ | $THD_2$              |     | 0.3 | 1   | %             |
|                                                                                                                           | $THD_{20}$           |     | 0.3 | 1   | %             |
|                                                                                                                           | $THD_2$              |     | 1   | 2.5 | %             |
|                                                                                                                           | $THD_{20}$           |     | 1   | 2.5 | %             |

**Characteristics** (cont,d) $V_S = 12\text{ V}$ ;  $T_A = 25\text{ }^\circ\text{C}$ 

| Parameter | Symbol | Limit Values |      |      | Unit |
|-----------|--------|--------------|------|------|------|
|           |        | min.         | typ. | max. |      |

**FM Section** $f_{\text{IF}} = 5.5\text{ MHz}$ ;  $f_{\text{mod}} = 1\text{ kHz}$ 

|                                                                                                   |                      |     |      |     |               |
|---------------------------------------------------------------------------------------------------|----------------------|-----|------|-----|---------------|
| Input voltage for limiter threshold ( $V_{Q2} = -3\text{ dB}$ )<br>$\Delta f = \pm 50\text{ kHz}$ | $V_{I13\text{ rms}}$ |     | 40   | 80  | $\mu\text{V}$ |
| Output voltage (SCART)<br>$\Delta f = \pm 50\text{ kHz}$ ; $V_{\text{IF}} = 10\text{ mV}$         | $V_{Q2\text{ rms}}$  | 850 | 1200 |     | mV            |
| Controlled AF output voltage<br>$V_1 = 0.8\text{ }V_{\text{REF}}$                                 | $V_{Q20\text{ rms}}$ | 850 | 1200 |     | mV            |
| DC voltage portion<br>$V_{\text{IF}} = 10\text{ mV}$ ; $\Delta f = 0$ ; $THD_{\text{min}}$        | $V_{Q2}$             | 3.6 | 4.1  | 4.6 | V             |
|                                                                                                   | $V_{Q20}$            | 5   | 6    | 7   | V             |
| Total harmonic distortion<br>$\Delta f = \pm 12.5\text{ kHz}$ ; $V_{\text{IF}} = 10\text{ mV}$    | $THD_2$              |     | 0.2  | 0.3 | %             |
| Total harmonic distortion controlled AF output<br>$V_1 = 0.8\text{ }V_{\text{REF}}$               | $THD_{20}$           |     | 0.2  | 0.3 | %             |
| AM suppression<br>$V_{\text{IF}} = 500\text{ }\mu\text{V}$ ; $m = 30\%$                           | $\alpha_{\text{AM}}$ | 60  | 70   |     | dB            |

**Characteristics** $V_S = 12\text{ V}$ ;  $T_A = 25\text{ }^\circ\text{C}$ 

| Parameter | Symbol | Limit Values |      |      | Unit |
|-----------|--------|--------------|------|------|------|
|           |        | min.         | typ. | max. |      |

**AF Section**

|                                                                                    |                      |     |    |       |    |
|------------------------------------------------------------------------------------|----------------------|-----|----|-------|----|
| AGC range for volume control<br>$V_1 = 0\text{ V} \dots 0.8\text{ V}_{\text{REF}}$ | $\Delta G$           | 80  | 85 |       | dB |
| Gain SCART input/AF output<br>$V_1 = 0.8\text{ V}_{\text{REF}}$                    | $V_{4-20}$           | - 1 | 0  | 1.5   | dB |
| Input voltage SCART                                                                | $V_{114\text{ rms}}$ | 2   |    |       | V  |
| Switching voltage SCART<br>Playback                                                | $V_3$                | 8   |    | $V_S$ | V  |
| Record                                                                             | $V_3$                | 0   |    | 5     | V  |
| Switching voltage muting<br>ON (AF off)                                            | $V_{11}$             | 0   |    | 1     | V  |
| OFF                                                                                | $V_{11}$             | 5   |    | $V_S$ | V  |
| Switching voltage FM<br>AM                                                         | $V_7$                | 0   |    | 0.8   | V  |
|                                                                                    | $V_7$                | 2.5 |    | 6     | V  |

**Characteristics** $V_S = 12\text{ V}$ ;  $T_A = 25\text{ }^\circ\text{C}$ 

| Parameter | Symbol | Limit Values |      |      | Unit |
|-----------|--------|--------------|------|------|------|
|           |        | min.         | typ. | max. |      |

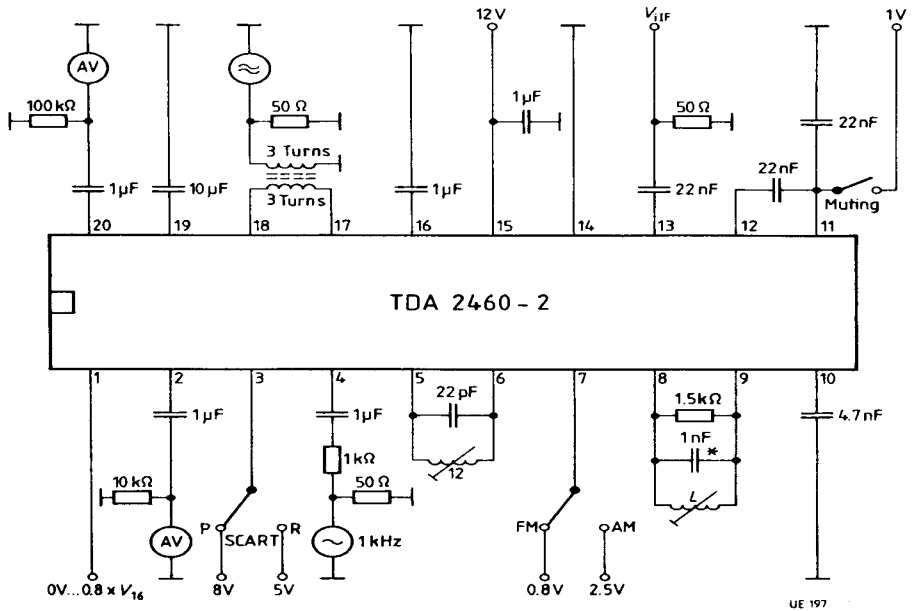
**Design-Related Values**

|                                                                              |                 |    |          |     |                  |
|------------------------------------------------------------------------------|-----------------|----|----------|-----|------------------|
| Input resistance                                                             | $R_{I\ 8,9}$    | 22 |          |     | $\text{k}\Omega$ |
| Output resistance                                                            | $R_{O\ 2,20}$   |    |          | 200 | $\Omega$         |
| Input impedance                                                              | $Z_{I\ 11,13}$  |    | 800      |     | $\Omega$         |
| Frequency deviation<br>$AM_{\min} / THD_{\min}$<br>$f_{FM}$ section          |                 |    | $\pm 10$ |     | $\text{kHz}$     |
| Input resistance                                                             | $R_{I\ 17/18}$  |    | 1.8      |     | $\text{k}\Omega$ |
| Output resistance                                                            | $R_{5/6}$       |    | 6.6      |     | $\text{k}\Omega$ |
| Input resistance                                                             | $R_4$           | 20 |          |     | $\text{k}\Omega$ |
| Input current                                                                | $I_1$           |    |          | 15  | $\mu\text{A}$    |
| Cross-talk rejection<br>$V_3 = 5\text{ V}$ ; $V_{4\text{ rms}} = 2\text{ V}$ | $\alpha_{4-20}$ | 60 |          |     | $\text{dB}$      |
| Control current ratio for<br>high speed load circuit/integral                | $\Delta i_{19}$ |    | 140      |     |                  |

**Switching Currents**

|                                      |                   |     |  |     |               |
|--------------------------------------|-------------------|-----|--|-----|---------------|
| SCART record                         | $I_{3\text{ L}}$  | - 1 |  | 0   | $\mu\text{A}$ |
| SCART playback<br>$V_3 = 8\text{ V}$ | $I_{3\text{ H}}$  | 30  |  | 150 | $\mu\text{A}$ |
| MUTE OFF                             | $I_{11\text{ H}}$ | - 1 |  | 0   | $\mu\text{A}$ |
| ON                                   | $I_{11\text{ L}}$ | 3   |  | 50  |               |
| AF/FM switch FM                      | $I_{7\text{ L}}$  | - 1 |  | 0   | $\mu\text{A}$ |
| AM ( $V_7 = 5\text{ V}$ )            | $I_{7\text{ H}}$  | 80  |  | 250 |               |

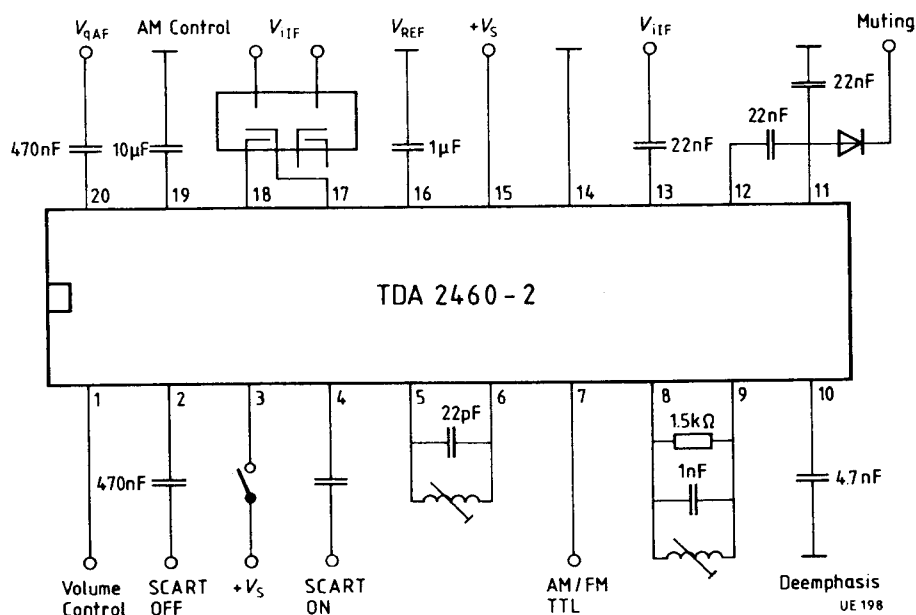
## Test and Measurement Circuit



$L = 10\text{ Turns } 0.2\text{ CuL}; Q_s \text{ approx. } 25$   
 e.g. Coil Assembly Vogt 5171200000

\* STYROFLEX Capacitor  
 AV = Audio Voltmeter

## Application Circuit



### Simplified External Circuitry for the TDA 2460 Demodulator Circuit

The TDA 2460 AM (double side-band) demodulator circuit allows simplified external circuitry.

The new sound demodulator circuit, developed for application in television L standard and multistandard sets, provides the user with the following advantages:

**Cost savings** by not requiring the carrier select circuit (L, C) and the necessary tuning (time).

The circuit that is part of the carrier generation circuit becomes unnecessary because of the excellent capture ratio features of the limiter.

**Capture ratio** defines the ability of a limiter amplifier to distinguish a useable signal from an interference signal with a lower amplitude.

In this specific section, the modulation side-bands represent the interference signal and the carrier the useable signal (desired switching carrier).

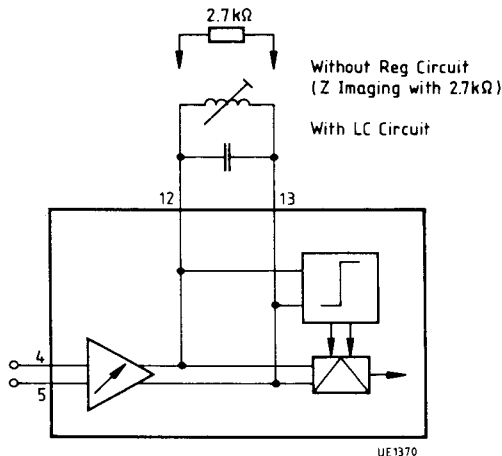
Even with a 100% modulation (France 80%) the distance from the side-bands to the carrier is 6 dB.

The system guarantees secure function. This is also shown by measurements with respect to:

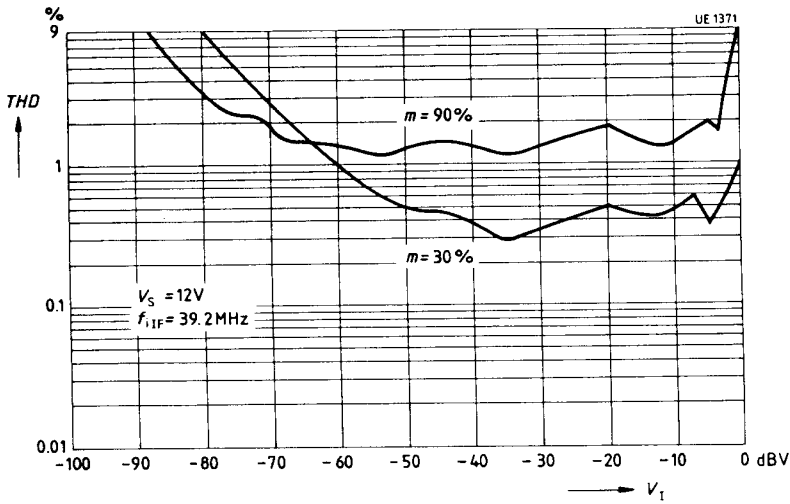
- harmonic distortion
- noise
- signal/noise ratio

in a comparison with/without regenerative circuit. Only the control threshold shifts by 2 dB.

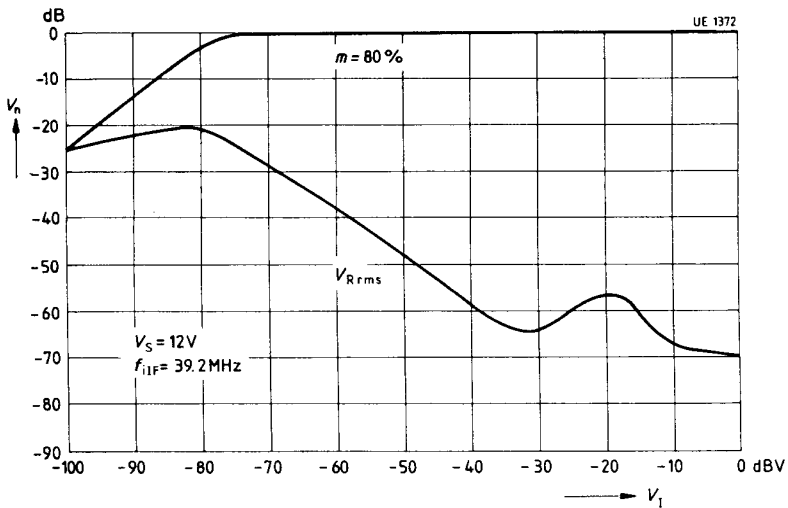
### AM Demodulator Circuit



## Circuit with LC Circuit

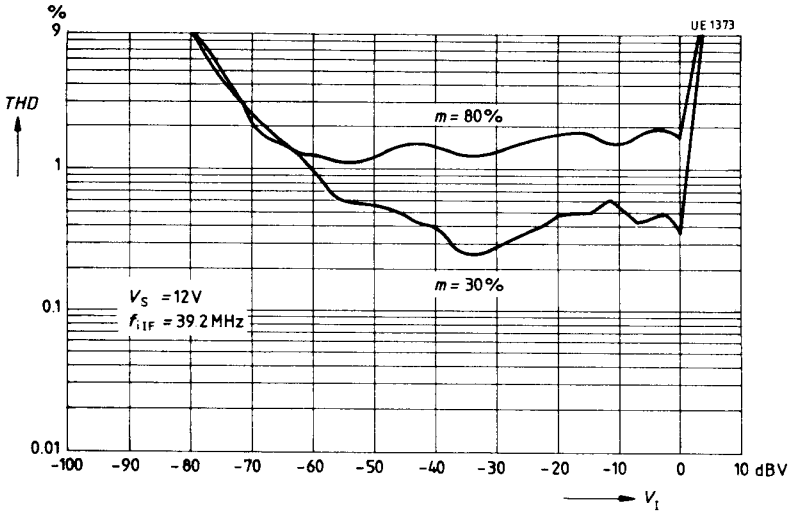
Total harmonic Distortion versus Input voltage  
Standard Circuit

## Sensitivity

Noise voltage versus input voltage  
Standard circuit

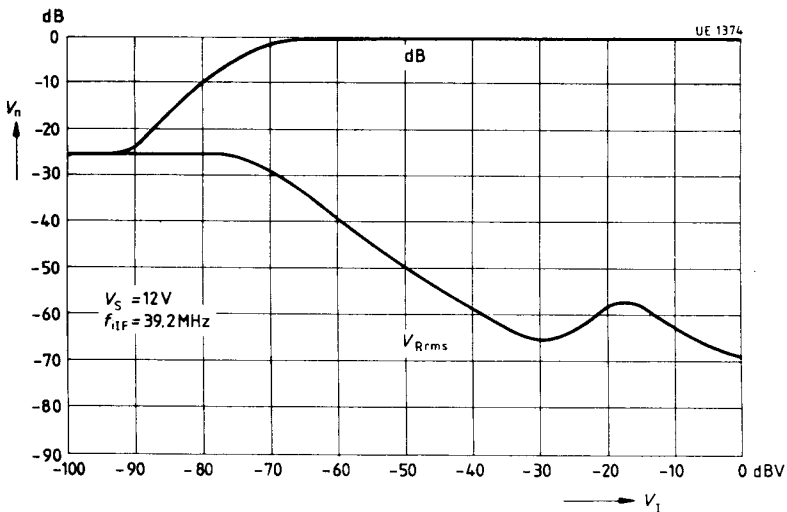
Circuit with  $R = 2.7 \text{ k}\Omega$

**Total harmonic distortion versus input voltage**  
Standard circuit



**Sensitivity**

**Noise voltage versus input voltage**  
Standard circuit



Circuit with  $R = 2.7\text{ k}\Omega$

Total harmonic distortion versus input voltage

