

## DOLBY S-TYPE NOISE REDUCTION PROCESSOR

### GENERAL DISCRIPTION

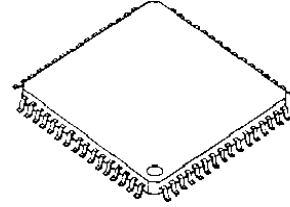
The **NJM2186** is a stereo Dolby S-type noise reduction processor. It applies to stereo system on 1 chip because it includes dual channel circuit.

The **NJM2186** contains all of necessary block for decoding operation, and it also performs encoding operation by connecting two external operational amplifiers.

The feature of minimum operating voltage from 7.5V ( $V^+/V^- = \pm 3.75V$ ) is most suitable for car audio applications.

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### PACKAGE OUTLINE

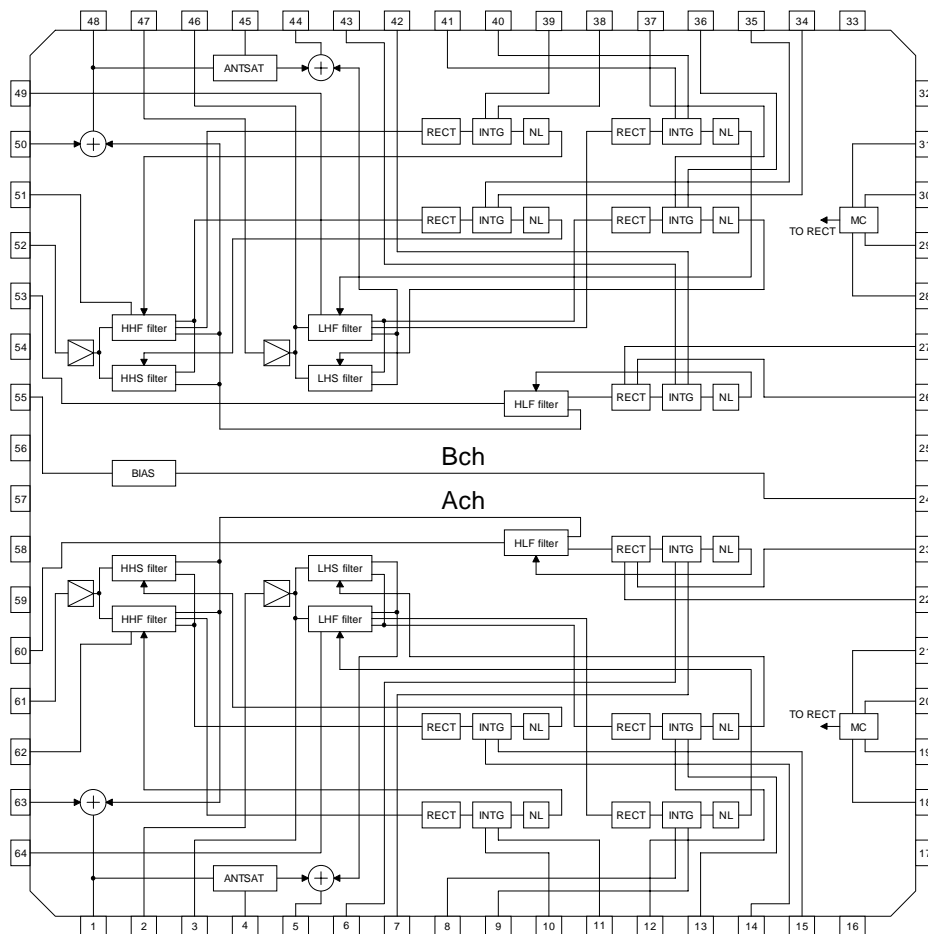


**NJM2186FG1**

### FEATURES

- Operating Voltage ( +7.5 or  $\pm 3.75$  V min )
- Dolby Level (-6dBm=388mVrms)
- Stereo system on 1 chip
- Few external parts
- Bipolar Technology
- Package Outline TQFP64

### BLOCK DIAGRAM



# NJM2186

## ■ABSOLUTES MAXIMUM RATINGS(Ta=25°C,unless otherwise specified))

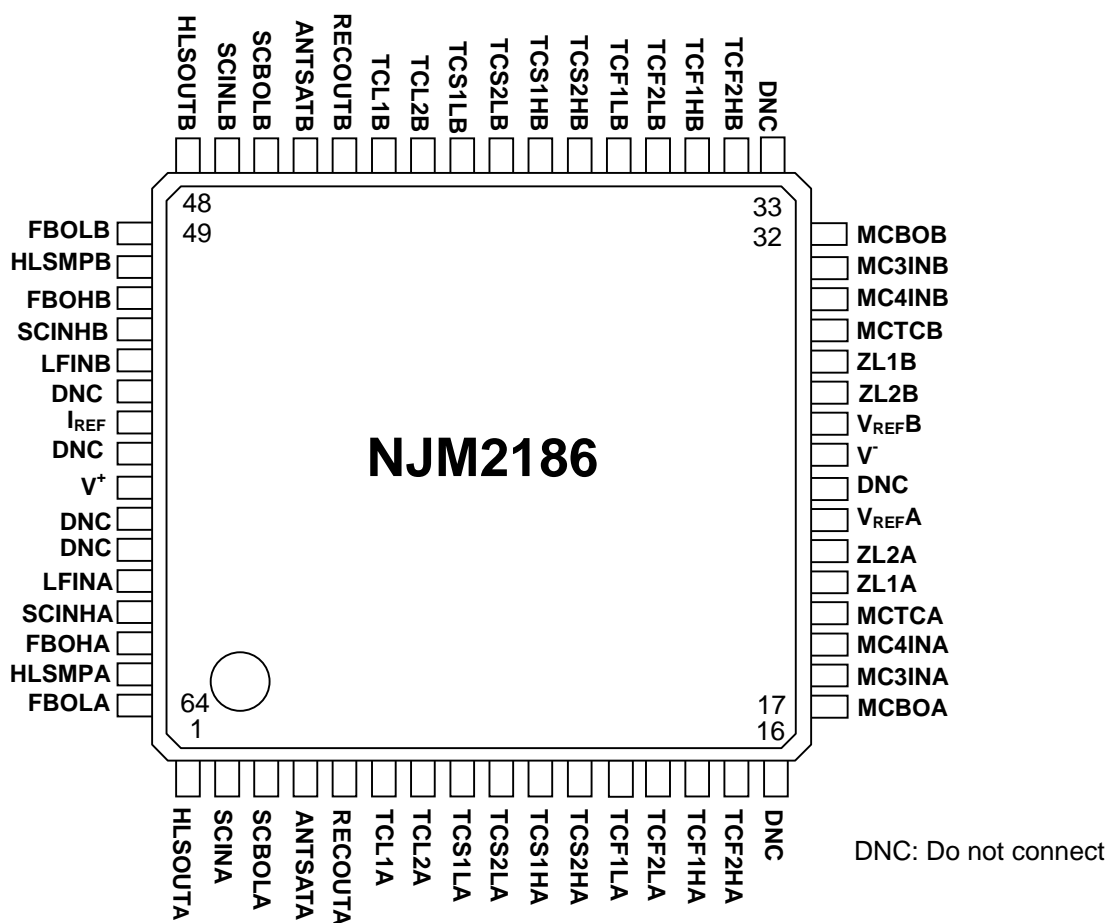
| Parameter             | Symbol  | Rates        | Unit |
|-----------------------|---|--------------|------|
| Supply Voltage        | V <sup>+</sup><br>(V <sup>+</sup> /V <sup>-</sup> ) | 14.0<br>(±7) | V    |
| Power Dissipation     | P <sub>D</sub>                                      | 700          | mW   |
| Operating Temperature | T <sub>OPR</sub>                                    | -40 to +85   | °C   |
| Storage Temperature   | T <sub>stg</sub>                                    | -40 to +125  | °C   |

## ■ELECTRICAL CHARACTERISTICS

(Ta=25°C V<sup>+</sup>/V<sup>-</sup>=±6,0dBd Reference is 388mVrms/400Hz,unless otherwise specified)

| Parameter                 | Symbol  | Test Conditions                      | Min.                | Typ.         | Max.           | Unit |      |
|---------------------------|---|--------------------------------------|---------------------|--------------|----------------|------|------|
| Supply Voltage Range      | V <sup>+</sup><br>(V <sup>+</sup> /V <sup>-</sup> ) |                                      | 7.5<br>(±3.75)      | 12.0<br>(±6) | 13.0<br>(±6.5) | V    |      |
| Supply Current            | I <sub>CC</sub>                                     | No Signal                            | -                   | 20           | 30             | mA   |      |
| Encode Response1          | ENC-1   | f=2kHz, Vin=-60dBd                   | 21.8                | 23.3         | 24.8           | dB   |      |
|                           | 2   | ENC-2                                | f=50Hz, Vin=-40dBd  | 5.8          | 7.3            |      | 8.8  |
|                           | 3   | ENC-3                                | f=400Hz, Vin=-40dBd | 15.1         | 16.6           |      | 18.1 |
|                           | 4   | ENC-4                                | f=15kHz, Vin=-40dBd | 11.3         | 12.8           |      | 14.3 |
|                           | 5   | ENC-5                                | f=400Hz, Vin=-20dBd | 6.0          | 7.5            |      | 9.0  |
|                           | 6   | ENC-6                                | f=2kHz, Vin=-20dBd  | 4.2          | 5.7            |      | 7.2  |
|                           | 7   | ENC-7                                | f=50Hz, Vin=0dBd    | -3.1         | -1.6           |      | -0.1 |
|                           | 8   | ENC-8                                | f=15kHz, Vin=0dBd   | -8.3         | -6.8           |      | -5.3 |
| Signal Handling           | SH1   | f=1kHz, THD=1%, V <sup>+</sup> =7.5V | 12.0                | 13.0         | -              | dB   |      |
|                           | SH2   | f=1kHz, THD=1%, V <sup>+</sup> =9.5V | 15.0                | 16.0         | -              |      |      |
| Total Harmonic Distortion | THD   | f=1kHz, Vin=0dBd                     | -                   | 0.05         | 0.15           | %    |      |
| S/N Ratio                 | S/N   | Rg=600Ω, CCIR/ARM                    | 62.0                | 65.0         | -              | dB   |      |
| Separation                | SEP   | Vin=0dBd                             | 60.0                | 72.0         | -              | dB   |      |

## PIN FUNCTION



| No. | Symbol  | No. | Symbol            | No. | Symbol  | No. | Symbol           |
|-----|---------|-----|-------------------|-----|---------|-----|------------------|
| 1   | HLSOUTA | 17  | MCBOA             | 33  | DNC     | 49  | FBOLB            |
| 2   | SCINA   | 18  | MC3INA            | 34  | TCF2HB  | 50  | HLSMPB           |
| 3   | SCBOLA  | 19  | MC4INA            | 35  | TCF1HB  | 51  | FBOHB            |
| 4   | ANTSATA | 20  | MCTCA             | 36  | TCF2LB  | 52  | SCINHB           |
| 5   | RECOUTA | 21  | ZL1A              | 37  | TCF1LB  | 53  | LFINB            |
| 6   | TCL1A   | 22  | ZL2A              | 38  | TCS2HB  | 54  | DNC              |
| 7   | TCL2A   | 23  | V <sub>REFA</sub> | 39  | TCS1HB  | 55  | I <sub>REF</sub> |
| 8   | TCS1LA  | 24  | DNC               | 40  | TCS2LB  | 56  | DNC              |
| 9   | TCS2LA  | 25  | V <sup>-</sup>    | 41  | TCS1LB  | 57  | V <sup>+</sup>   |
| 10  | TCS1HA  | 26  | V <sub>REFB</sub> | 42  | TCL2B   | 58  | DNC              |
| 11  | TCS2HA  | 27  | ZL2B              | 43  | TCL1B   | 59  | DNC              |
| 12  | TCF1LA  | 28  | ZL1B              | 44  | RECOUB  | 60  | LFINA            |
| 13  | TCF2LA  | 29  | MCTCB             | 45  | ANTSATA | 61  | SCINHA           |
| 14  | TCF1HA  | 30  | MC4INB            | 46  | SCBOLB  | 62  | FBOHA            |
| 15  | TCF2HA  | 31  | MC3INB            | 47  | SCINLB  | 63  | HLSMPA           |
| 16  | DNC     | 32  | MCBOB             | 48  | HLSOUTB | 64  | FBOLA            |

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## PIN FUNCTION

| No.                 | SYMBOL                               | FUNCTION   | EQUIVALENT CURCUIT |
|---------------------|--------------------------------------|--|--------------------|
| 1<br>48             | HLSOUTA<br>HLSOUTB                   | H Stage Out Ach<br>H Stage Out Bch   |                    |
| 2<br>47<br>61<br>52 | SCINLA<br>SCINLB<br>SCINHA<br>SCINHB | L Side Chane In Ach<br>L Side Chane In Bch<br>HH Side Chane Ach<br>HH Side Chane Bch |                    |
| 3<br>46             | SCBOLA<br>SCBOLB                     | L Side Chane Buffer Out Ach<br>L Side Chane Buffer Out Bch                           |                    |
| 4<br>45             | ANTSATA<br>ANTSATB                   | Anti-Saturation Ach<br>Anti-Saturation Bch   |                    |

## ■PIN FUNCTION

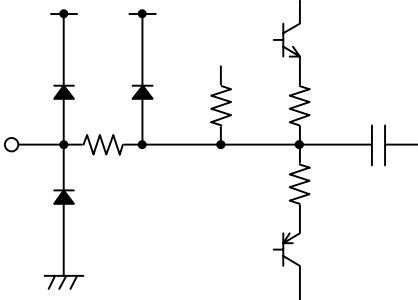
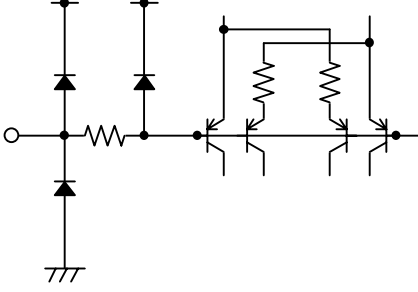
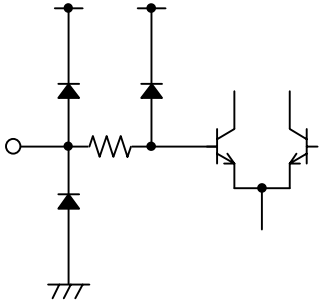
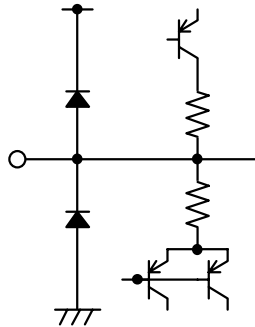
| No.                 | SYMBOL                               | FUNCTION   | EQUIVALENT CURCUIT |
|---------------------|--------------------------------------|--|--------------------|
| 5<br>44             | RECOUTA<br>RECOUTB                   | Encoder Out Ach<br>Encoder Out Bch   |                    |
| 6<br>43             | TCL1A<br>TCL1B                       | HL Time Constant 1 Ach<br>HLF Time Constant 1 Bch  |                    |
| 7<br>42             | TCL2A<br>TCL2B                       | HL Time Constant 2 Ach<br>HLF Time Constant 2 Bch  |                    |
| 8<br>41<br>10<br>39 | TCS1LA<br>TCS1LB<br>TCS1HA<br>TCS1HB | LHS Time Constant 1 Ach<br>LHS Time Constant 1 Bch<br>HHS Time Constant 1 Ach<br>HHS Time Constant 1 Bch |                    |

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## PIN FUNCTION

| No.                  | SYMBOL                               | FUNCTION   | EQUIVALENT CURCUIT |
|----------------------|--------------------------------------|--|--------------------|
| 9<br>40<br>11<br>38  | TCS2LA<br>TCS2LB<br>TCS2HA<br>TCS2HB | LHS Time Constant 2 Ach<br>LHS Time Constant 2 Bch<br>HHS Time Constant 2 Ach<br>HHS Time Constant 2 Bch |                    |
| 12<br>37<br>14<br>35 | TCS1LA<br>TCS1LB<br>TCS1HA<br>TCS1HB | LHF Time Constant 1 Ach<br>LHF Time Constant 1 Bch<br>HHF Time Constant 1 Ach<br>HHF Time Constant 1 Bch |                    |
| 13<br>36             | TCF2LA<br>TCF2LB                     | LHF Time Constant 2 Ach<br>LHF Time Constant 2 Bch   |                    |
| 15<br>34             | TCF2HA<br>TCF2HB                     | HHF Time Constant 2 Ach<br>HHF Time Constant 2 Bch   |                    |

## ■PIN FUNCTION

| No.      | SYMBOL           | FUNCTION                               | EQUIVALENT CURCUIT  |
|----------|------------------|--|---|
| 17<br>32 | MCBOA<br>MCBOB   | MC Buffer OUT Ach<br>MC Buffer OUT Bch |     |
| 18<br>31 | MC3INA<br>MC3INB | MC3 In Ach<br>MC3 In Bch               |    |
| 19<br>30 | MC4INA<br>MC4INB | MC4 In Ach<br>MC4 In Bch               |  |
| 20<br>29 | MCTCA<br>MCTCB   | MC Time Constant<br>MC Time Constant   |  |

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## PIN FUNCTION

| No.      | SYMBOL         | FUNCTION                       | EQUIVALENT CURCUIT |
|----------|----------------|--------------------------------|--------------------|
| 21<br>28 | ZL1A<br>ZL1B   | HLF LPF 1 Ach<br>HLF LPF 1 Bch |                    |
| 22<br>27 | ZL2A<br>ZL2B   | HLF LPF 2 Ach<br>HLF LPF 2 Bch |                    |
| 23<br>26 | VREFA<br>VREFB | VREF Ach<br>VREF Bch           |                    |
| 55       | IREF           | Iref                           |                    |

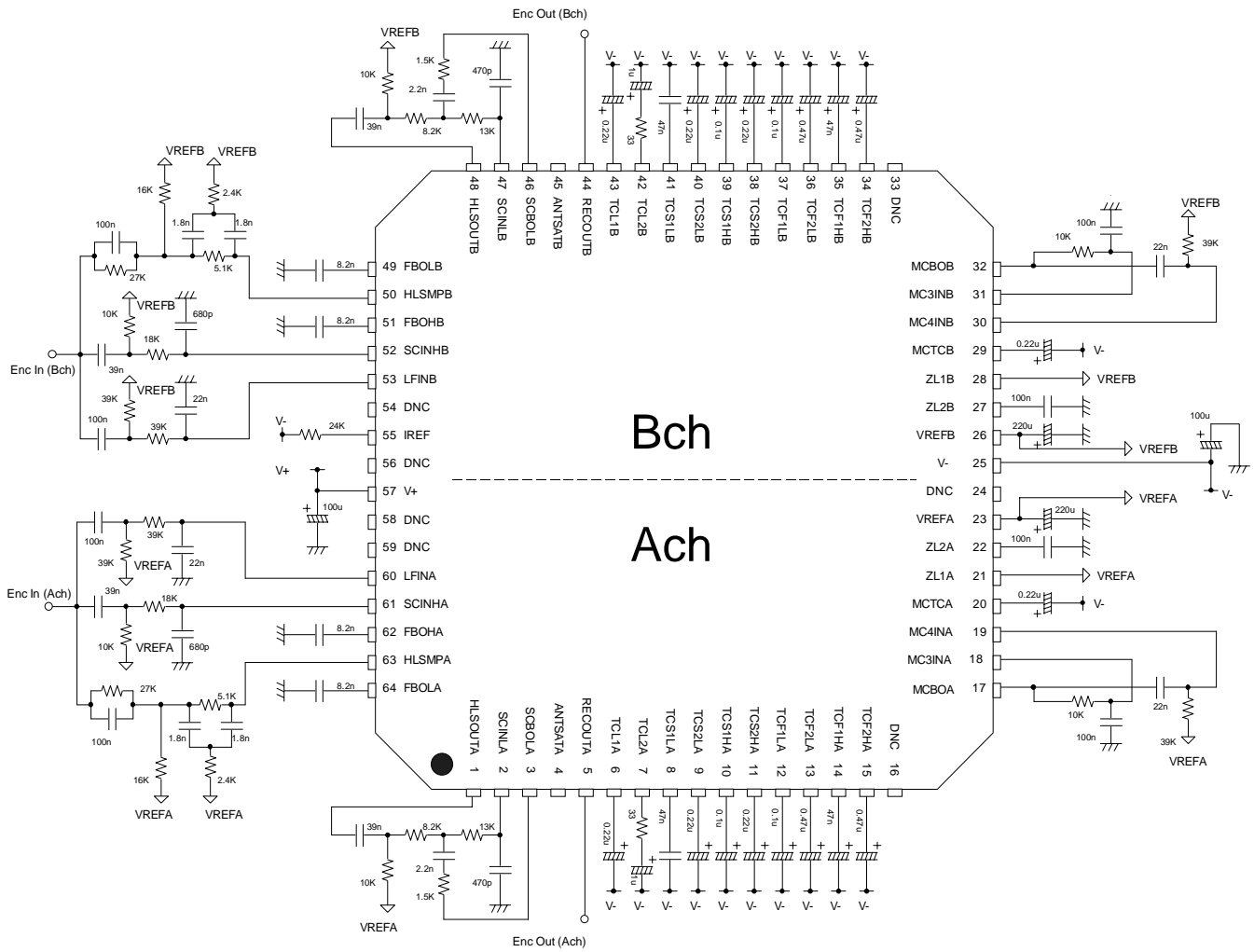


## ■PIN FUNCTION

| No.                  | SYMBOL                           | FUNCTION   | EQUIVALENT CURCUIT |
|----------------------|----------------------------------|--|--------------------|
| 60<br>53             | LFINA<br>LFINB                   | HL Side Chane Ach<br>HL Side Chane Bch                                   |                    |
| 63<br>50             | HLSMPA<br>HLSMPB                 | H Stage Ach<br>H Stage Bch   |                    |
| 64<br>49<br>62<br>51 | FBOLA<br>FBOLB<br>FBOHA<br>FBOHB | LHF VCR LPF Ach<br>LHF VCR LPF Bch<br>HHF VCR LPF Ach<br>HHF VCR LPF Bch |                    |

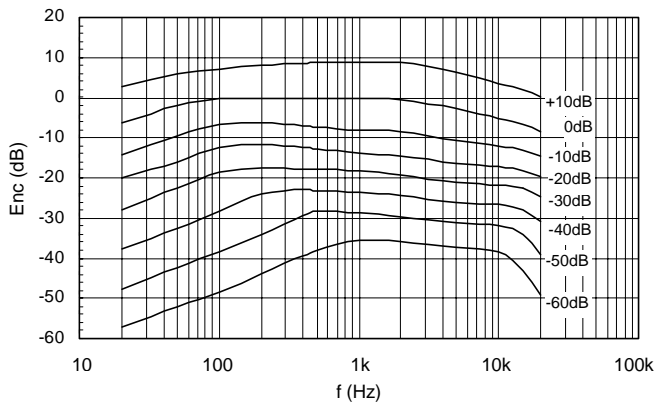
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## APPLICATION CIRCUIT

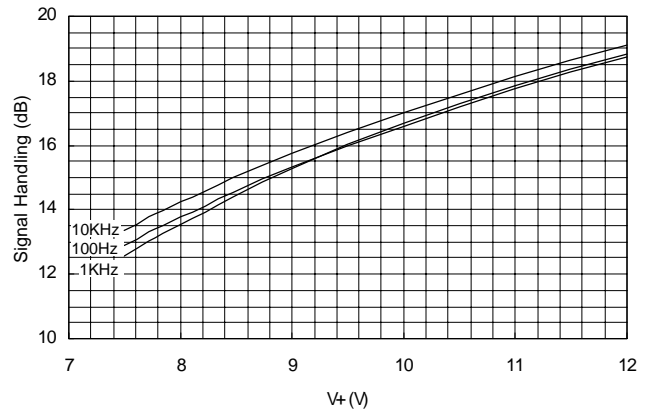


## CHARACTERISTICS

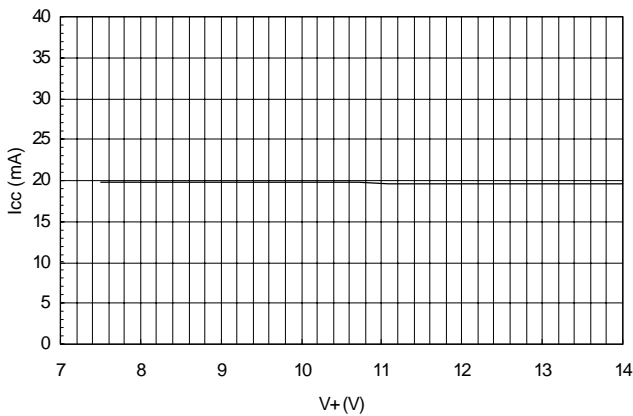
### Encode Responce



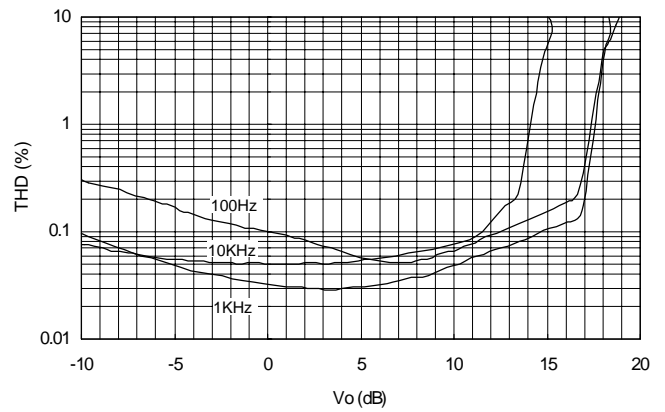
### Signal Handling



### Operating Current vs. Operating Voltage



### Total Harmonic Distortion



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