

**Analog Product Selection Guide**

**Analog Circuit Expert**



3PEAK WeChat [www.3peakic.com.cn](http://www.3peakic.com.cn/)

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**Industrial**

**Comm.**

**T & M**

**Sp ace**

**Medical**

**Imag ing**

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## Operational Amplifiers

**Comparators**

**Interface**

**Video Filter Drivers**

**Audio Line Drivers**

**Power Management**

**Digital-to-Analog Convertors**

**Analog-to-Digital Convertors**

**PM2.5 AFE**

**Amplifier**

**Data**

**Converter**

**Amplifier**

**Data**

**Converter**

**Embedded Processing**

**The Real World Temperature Pressure Position**

**Speed Flow Humidity Sound Light**

**Identification**

**Logic**

**Clocks & Timing**

**Power Management**

**Interface**

|  |  |  |
| --- | --- | --- |
|  | **Precision amplifier quick selection: High voltage (Vs>5.5)** |  |
|  |  |
|  |  |  |  |  |
| **Low power****(Iq<=200uA)** |  | **Low Vos****(<=500uV)** |  | **Low noise (<=20nV/√Hz)** |  | **Wide GBW****(>=5MHz)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **TP1252/1254** | ***TP1271/1272/1274*** | **TP1271/1272/1274** | **TP2604** |
| *120uA, 1.3MHz* | *150uV, 7MHz* | *19nV/*√*Hz, 150uV* | *10MHz, 6.5V/us* |
| **LM321/358/324** | ***TP1252/1254*** | **TP07** | **TP1271/1272/1274** |
| *200uA, 1.2MHz* | *250uV, 1.3MHz* | *15nV/*√*Hz, 150uV* | *7MHz, 20V/us* |
| **LM2904/2902** | ***TP07*** |  | **TP2271/2272/2274** |
| *200uA, 1.2MHz* | *150uV, 1MHz* |  | *7MHz, 20V/us* |

####

**Precision amplifier quick selection: low voltage (Vs<=5.5)**

**Low power (Iq<=10uA)**

**Low Vos (<=500uV)**

**Low noise**

**(<=15nV/√Hz)**

**Wide GBW (>=10MHz)**

**Rail-to-Rail In & out**

**TP2111/2112** *500nA, 10kHz* **TP2121/2122/2124** *950nA, 18kHz* **TP2191**

*900nA, 18kHz* **TP1511/1512/1514** *5.6uA, 150kHz*

**TP2301/2302/2304** *50uV, 20MHz* **TP2311/2312/2314** *50uV, 10MHz* **TP2331/2332/2334** *50uV, 1.6MHz* **TP1561A/1562A/1564A** *400uV, 6MHz* **TP1541A/1542A/1544A** *400uV, 1.3MHz*

**TP5531/5532/5534**

**Zero Drift (<=0.01uV/℃)**

*10uV, 0.008uV/*℃*,*

*34uA* **TP5591/5592/5594** *20uV, 0.01uV/*℃*,*

*510uA*

**TP5551/5552/5554**

*5uV, 0.006uV/*℃*,*

*550uA*

**TP2301/2302/2304**

*7.3nV/*√*Hz, 50uV*

**TP2401/2402/2404**

*7.3nV/*√*Hz, 1mV*

**TP2311/2312/2314**

*8.2nV/*√*Hz, 50uV*

**TP2411/2412/2414**

* 1. *nV/*√*Hz, 1mV*

**TP2331/2332/2334**

*13nV/*√*Hz, 50uV*

**TP2431/2432/2434**

*13nV/*√*Hz, 1mV*

**TPH2501/2502/2504** *250MHz, 130V/us* **TP2301/2302/2304** *20MHz, 19V/u* **TP2401/2402/2404**

*20MHz, 19V/us*

**TP2311/2312/2314**

*10MHz, 7V/us*

**TP2411/2412/2414**

*10MHz, 7V/us*

**TP1541A/1542A/1544A**

*Vos=0.4mV*

**TP1561A/1562A/TP1564A**

*Vos=0.4mV*

**LMV321A/358A/324A**

*Vos=1mV*

**TP2401/2402/2404**

*Vos=1mV*

**TP2411/2412/2414**

*Vos=1mV*

**TP2431/2432/2434**

*Vos=1mV*

**Nano-Power, Micro-Power OP-AMP Selection Guide**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | GBWP | IQ (Typ.)(per Ch) | IQ (Max.)( per Ch ) | IQ(off)(关断) | VOS(max) | Slew Rate | VOS TC (µV/°C) | eN @1kHz ( nV/√Hz ) | IBIAS (pA) | Rail-Rail | Package |
| TP2111 | 1 | 1.8~6.0 | 10kHz | 300nA | 500nA | N/A | 1.5mV | 6mV/us | 0.4 | 265 | 0.1fA | In/Out | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP2111N | 1 | 1.8~6.0 | 10kHz | 300nA | 500nA | 3nA | 1.5mV | 6mV/us | 0.4 | 265 | 0.1fA | In/Out | 6-Pin SOT23, 8-Pin SOIC |
| TP2112 | 2 | 1.8~6.0 | 10kHz | 300nA | 500nA | N/A | 1.5mV | 6mV/us | 0.4 | 265 | 0.1fA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2114 | 4 | 1.8~6.0 | 10kHz | 300nA | 500nA | N/A | 1.5mV | 6mV/us | 0.4 | 265 | 0.1fA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2121 | 1 | 1.8~6.0 | 18kHz | 600nA | 800nA | N/A | 1.5mV | 10mV/us | 0.5 | 170 | 1fA | In/Out | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP2121N | 1 | 1.8~6.0 | 18kHz | 600nA | 800nA | 3nA | 1.5mV | 10mV/us | 0.5 | 170 | 1fA | In/Out | 6-Pin SOT23, 8-Pin SOIC |
| TP2122 | 2 | 1.8~6.0 | 18kHz | 600nA | 800nA | N/A | 1.5mV | 10mV/us | 0.5 | 170 | 1fA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2124 | 4 | 1.8~6.0 | 18kHz | 600nA | 800nA | N/A | 1.5mV | 10mV/us | 0.5 | 170 | 1fA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1511 | 1 | 2.1~6.0 | 150kHz | 4uA | 5.6uA | N/A | 3.0mV | 0.09V/us | 0.6 | 95 | 1 | In/Out | 5-Pin SOT23, 8-Pin MSOP, 8-Pin SOIC |
| TP1511N | 1 | 2.1~6.0 | 150kHz | 4uA | 5.6uA | 0.1uA | 3.0mV | 0.09V/us | 0.6 | 95 | 1 | In/Out | 6-Pin SOT23, 8-Pin MSOP, 8-Pin SOIC |
| TP1512 | 2 | 2.1~6.0 | 150kHz | 4uA | 5.6uA | N/A | 3.0mV | 0.09V/us | 0.6 | 95 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP1514 | 4 | 2.1~6.0 | 150kHz | 4uA | 5.6uA | N/A | 3.0mV | 0.09V/us | 0.6 | 95 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1541\*\* | 1 | 2.1~6.0 | 1.3MHz | 37uA | 47uA | N/A | 1.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 5-Pin SOT23, 5-Pin SC70, 8-Pin SOIC |
| TP1541A | 1 | 2.1~6.0 | 1.3MHz | 55uA | 65uA | N/A | 0.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 6-Pin SOT23, 8-Pin MSOP, 8-Pin SOIC |
| TP1541NA | 1 | 2.1~6.0 | 1.3MHz | 55uA | 65uA | 0.2uA | 0.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 6-Pin SOT23, 8-Pin MSOP, 8-Pin SOIC |
| TP1542\*\* | 2 | 2.1~6.0 | 1.3MHz | 37uA | 47uA | N/A | 1.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP1542A | 2 | 2.1~6.0 | 1.3MHz | 55uA | 65uA | N/A | 0.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP,8-Pin DFN |
| TP1544\*\* | 4 | 2.1~6.0 | 1.3MHz | 37uA | 47uA | N/A | 1.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1544A | 4 | 2.1~6.0 | 1.3MHz | 55uA | 65uA | N/A | 0.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1561\*\* | 1 | 2.1~6.0 | 3.8MHz | 130uA | 190uA | N/A | 3.0mV | 3.6V/us | 0.6 | 27 | 1 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP1561A | 1 | 2.1~6.0 | 6MHz | 500uA | 800uA | N/A | 0.4mV | 4.5V/us | 1 | 19 | 1 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP1561NA | 1 | 2.1~6.0 | 6MHz | 500uA | 800uA | 0.2uA | 0.4mV | 4.5V/us | 1 | 19 | 1 | In/Out | 6-Pin SOT23, 8-Pin SOIC |
| TP1562\*\* | 2 | 2.1~6.0 | 3.8MHz | 130uA | 190uA | N/A | 3.0mV | 3.6V/us | 1 | 27 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP1562A | 2 | 2.1~6.0 | 6MHz | 500uA | 800uA | N/A | 0.4mV | 4.5V/us | 0.6 | 19 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP1564\*\* | 4 | 2.1~6.0 | 3.8MHz | 130uA | 190uA | N/A | 3.0mV | 3.6V/us | 0.6 | 27 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1564A | 4 | 2.1~6.0 | 6MHz | 500uA | 800uA | N/A | 0.4mV | 4.5V/us | 1 | 19 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP321 | 1 | 2.1~6.0 | 1MHz | 45uA | 87uA | N/A | 5.0mV | 1.0V/us | 2.0 | 45 | 10 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP358 | 2 | 2.1~6.0 | 1MHz | 45uA | 87uA | N/A | 5.0mV | 1.0V/us | 2.0 | 45 | 10 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP324 | 4 | 2.1~6.0 | 1MHz | 45uA | 87uA | N/A | 5.0mV | 1.0V/us | 2.0 | 45 | 10 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| LMV321A | 1 | 2.1~6.0 | 1MHz | 80uA | 120uA | N/A | 1.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| LMV321TP\*\* | 1 | 2.1~6.0 | 1.27MHz | 40uA | 51uA | N/A | 3.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| LMV358A | 2 | 2.1~6.0 | 1MHz | 80uA | 120uA | N/A | 1.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| LMV358TP\*\* | 2 | 2.1~6.0 | 1.27MHz | 40uA | 51uA | N/A | 3.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 8-Pin SOIC, 8-Pin MSOP |
| LMV324A | 4 | 2.1~6.0 | 1MHz | 80uA | 120uA | N/A | 1.4mV | 0.7V/us | 1 | 27 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| LMV324TP\*\* | 4 | 2.1~6.0 | 1.27MHz | 40uA | 51uA | N/A | 3.5mV | 0.9V/us | 0.6 | 39 | 1 | In/Out | 14-Pin SOIC, 14-Pin TSSOP |

Note: Marked "\*\*" products are not recommended for use in new designs.

**Ultra Low Distortion, Low Noise, 36V RRO Op-amps**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | GBWP | Slew Rate | THD+N (%) | eN @1kHz ( nV/√Hz ) | IQ(per Ch) | IBIAS (pA) | VOS(max) | VOS TC (µV/°C) | Temp Range(°C) | Package |
| TP4580 | 2 | 3.5~36 | 12 MHz | 6 V/μs | 0.001 | 12 | 2 mA | 1 | 6.0 mV | 2.0 | - 40~125 | 8-Pin SOIC,8-Pin MSOP |
| TP2604 | 2 | 2.7~36 | 10 MHz | 6.5 V/μs | 0.0001 | 17 | 1.2 mA | 0.04 | 4.0 mV | 2.0 | - 40~125 | 8-Pin SOIC,8-Pin MSOP |
| TP2618 | 4 | 2.7~36 | 1.5 MHz | 0.8 V/μs | 0.0002 | 17 | 125 μA | 0.04 | 4.0 mV | 2.0 | - 40~125 | 14-Pin SOIC,14-Pin TSSOP |
| TP2271 | 1 | 2.7~36 | 7 MHz | 20 V/μs | 0.0002 | 19 | 0.9 mA | 3 | 1.0 mV | 2.0 | - 40~125 | 5-Pin SOT23, 8-Pin SOIC |
| TP2272 | 2 | 2.7~36 | 7 MHz | 20 V/μs | 0.0002 | 19 | 0.9 mA | 3 | 1.0 mV | 2.0 | - 40~125 | 8-Pin SOIC, 8-Pin MSOP |
| TP2274 | 4 | 2.7~36 | 7 MHz | 20 V/μs | 0.0002 | 19 | 0.9 mA | 3 | 1.0 mV | 2.0 | - 40~125 | 14-Pin SOIC, 14-Pin TSSOP |
| LM321 | 1 | 3~36 | 1.2MHz | 0.55 V/μs | - | 48 | 0.1 mA | 60 | 3.0 mV | 1.0 | - 40~125 | 5-Pin SOT23, 8-Pin SOIC |
| LM358 | 2 | 3~36 | 1.2MHz | 0.55 V/μs | - | 48 | 0.1 mA | 60 | 3.0 mV | 1.0 | - 40~125 | 8-Pin SOP,8-Pin MSOP |
| LM324 | 4 | 3~36 | 1.2MHz | 0.55 V/μs | - | 48 | 0.1 mA | 60 | 3.0 mV | 1.0 | - 40~125 | 14-Pin SOP,14-Pin TSSOP |
| LM2904 | 2 | 3~36 | 1.2MHz | 0.55 V/μs | - | 48 | 0.1 mA | 60 | 3.0 mV | 1.0 | - 40~125 | 8-Pin SOP,8-Pin MSOP |
| LM2902 | 4 | 3~36 | 1.2MHz | 0.55 V/μs | - | 48 | 0.1 mA | 60 | 3.0 mV | 1.0 | - 40~125 | 14-Pin SOP,14-Pin TSSOP |

**High Precision, 36V RRO Op-amps** **TP1271 / TP1272 / TP1274**

* + - 2.7 to 36V Single or ±1.35 to ±18V Dual Supply
		- High Speed: 20V/μs Slew Rate, 7 MHz Bandwidth
		- 150μV VOS (Max.)
		- Integrated EMI Filter
		- No phase reversal
		- -40°C to +125°C Temperature Range

### Precision Op-Amp Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | GBWP | IQ (Typ.)( per Ch ) | IQ (Max.)( per Ch ) | VOS(max) | VOS TC (µV/°C) | eN @1kHz ( nV/√Hz ) | IBIAS | Slew Rate | CMRR (dB) | PSRR (dB) | AVOLdB) | Rail- Rail | Package |
| TP2191 | 1 | 1.8~6.0 | 18 kHz | 0.7 μA | 0.9 μA | 600 μV | 0.4 | 170 | 1 fA | 0.01V/μs | 130 | 92 | 120 | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2191N | 1 | 1.8~6.0 | 18 kHz | 0.7 μA | 0.9 μA | 600 μV | 0.4 | 170 | 1 fA | 0.01V/μs | 130 | 92 | 120 | In/Out | 6-Pin SC70, 6-Pin SOT23 |
| TP1221\* | 1 | 2.7~36 | 200 kHz | 15 μA | 23 μA | 500 μV | 4.0 | 90 | 0.05 pA | 0.5 V/μs | 126 | 130 | 100 | -/Out | 5-Pin SOT23, 8-Pin SOIC |
| TP1222\* | 2 | 2.7~36 | 200 kHz | 15 μA | 23 μA | 500 μV | 4.0 | 90 | 0.05 pA | 0.5 V/μs | 126 | 130 | 100 | -/Out | 8-Pin SOIC, 8-Pin MSOP |
| TP1224\* | 4 | 2.7~36 | 200 kHz | 15 μA | 23 μA | 500 μV | 4.0 | 90 | 0.05 pA | 0.5 V/μs | 126 | 130 | 100 | -/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1251 | 1 | 2.7~36 | 1.3 MHz | 75 μA | 120 μA | 250 μV | 0.9 | 50 | 3 pA | 4.1 V/μs | 126 | 130 | 110 | -/Out | 5-Pin SOT23, 8-Pin SOIC |
| TP1252 | 2 | 2.7~36 | 1.3 MHz | 75 μA | 120 μA | 250 μV | 0.9 | 50 | 3 pA | 4.1 V/μs | 126 | 130 | 110 | -/Out | 8-Pin SOIC, 8-Pin MSOP,8-Pin TSSOP, 8-Pin DIP |
| TP1254 | 4 | 2.7~36 | 1.3 MHz | 75 μA | 120 μA | 250 μV | 0.9 | 50 | 3 pA | 4.1 V/μs | 126 | 130 | 110 | -/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP1271 | 1 | 2.7~36 | 7 MHz | 0.9 mA | 1.2 mA | 150 μV | 0.9 | 19 | 3 pA | 20 V/μs | 126 | 130 | 118 | -/Out | 5-Pin SOT23, 8-Pin SOIC |
| TP1272 | 2 | 2.7~36 | 7 MHz | 0.9 mA | 1.2 mA | 150 μV | 0.9 | 19 | 3 pA | 20 V/μs | 126 | 130 | 118 | -/Out | 8-Pin SOIC, 8-Pin MSOP,8-Pin TSSOP, 8-Pin DIP |
| TP1274 | 4 | 2.7~36 | 7 MHz | 0.9 mA | 1.2 mA | 150 μV | 0.9 | 19 | 3 pA | 20 V/μs | 126 | 130 | 118 | -/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP07 | 1 | 2.7~36 | 1 MHz | 1.2 mA | 2.2 mA | 150 μV | 0.9 | 15 | 40 pA | 6 V/μs | 120 | 110 | 115 | -/Out | 8-Pin SOIC |

Note: with mark “\*” product, sample delivery time is about 3 months.

90

85

80

**EMIRR IN+(dB)**

75

70

65

60

55

50

400

TP127x EMI Immunity Performance

700

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
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**Frequency (MHz)**

|  |  |  |
| --- | --- | --- |
| **FREQUENCY** | **APPLICATION / ALLOCATION** | **EMIRR IN+** |
| 400 MHz | Mobile radio, mobile satellite/space operation, weather, radar, UHF | 56.3 dB |
| 900 MHz | GSM, radio com/nav./GPS (to 1.6 GHz), ISM, aeronautical mobile, UHF | 84.2 dB |
| 1.8 GHz | GSM, mobile personal comm. broadband, satellite, L-band | 84.8 dB |
| 2.4 GHz | 802.11b/g/n, Bluetooth™, mobile personal comm., ISM, amateur radio/satellite, S-band | 86.1 dB |
| 3.6 GHz | Radiolocation, aero comm./nav., satellite, mobile, S -band | 86.4 dB |
| 5 GHz | 802.11a/n, aero comm./nav., mobile comm., space/satellite operation, C-band | 85.7 dB |

4000

### Zero Drift, Ultra Low Noise, RR-IO Op-Amps Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | GBWP | IQ (Typ.)(per Ch) | IQ (Max.)( per Ch ) | CMRR (dB) | VOS(max) | Slew Rate | VOS TC (µV/°C) | eN @1kHz ( nV/√Hz ) | IBIAS (pA) | Rail- Rail | Package |
| TP5531 | 1 | 1.8~5.5 | 350 kHz | 34 μA | 55 μA | 130 | 10 μV | 0.16 V/μs | 0.008 | 55 | 50 pA | In/Out | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP5532 | 2 | 1.8~5.5 | 350 kHz | 34 μA | 55 μA | 130 | 10 μV | 0.16 V/μs | 0.008 | 55 | 50 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP5534 | 4 | 1.8~5.5 | 350 kHz | 34 μA | 55 μA | 130 | 10 μV | 0.16 V/μs | 0.008 | 55 | 50 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP5551 | 1 | 1.8~5.5 | 3.5 MHz | 500 μA | 820 μA | 130 | 5 μV | 2.5 V/μs | 0.006 | 12 | 50 pA | In/Out | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP5552 | 2 | 1.8~5.5 | 3.5 MHz | 500 μA | 820 μA | 130 | 5 μV | 2.5 V/μs | 0.006 | 12 | 50 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC, 8-Pin TSSOP |
| TP5554 | 4 | 1.8~5.5 | 3.5 MHz | 500 μA | 820 μA | 130 | 5 μV | 2.5 V/μs | 0.006 | 12 | 50 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP5591 | 1 | 1.8~5.5 | 3.3 MHz | 550 μA | 820 μA | 127 | 20 μV | 2.5 V/μs | 0.01 | 14 | 60 pA | In/Out | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP5592 | 2 | 1.8~5.5 | 3.3 MHz | 550 μA | 820 μA | 127 | 20 μV | 2.5 V/μs | 0.01 | 14 | 60 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC, 8-Pin TSSOP |
| TP5594 | 4 | 1.8~5.5 | 3.3 MHz | 550 μA | 820 μA | 127 | 20 μV | 2.5 V/μs | 0.01 | 14 | 60 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |

**Zero Drift, Ultra Low Noise, RR-IO Op-Amps** **TP2311 / TP2312/ TP2314**

* High speed:7 V/μs Slew Rate,10 MHz Bandwidth
* Low noise:8.2 nV/√Hz(f = 1kHz)
* 50 μV maximum offset voltage
* Integrated EMI filter
* Low THD+N:0.0005%
* High output current: up to 70 mA current output (1 V drop)
* - 40 ° C to + 125 ° C temperature range, suitable for the most harsh work environment

### TP2331 / TP2332/ TP2334

* Low noise:13 nV/√Hz(f = 1kHz)
* Low power consumption: 190 μA quiescent current
* 50 μV maximum offset voltage
* Power supply: 2.2~5.5 V
* High output current: up to 70 mA current output (1 V drop)
* Integrated EMI filter, EMIRR = 85 dB at 2.4 GHz

1000

100

**Noise(nV/√Hz)**

10

1

**Input Voltage Noise Spectral Density**

####

1 10 100 1k 10k 100k

1M

**Frequency(Hz)**

### Ultra Low Noise, High Precision ,RR-IO Op-Amps Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | GBWP | IQ(Typ.) (per Ch) | IOUT (mA) | VOS(max) | Slew Rate | VOSTC (µV/°C) | VN @0.1Hz to 10Hz ( μVPP) | eN @1kHz( nV/√Hz ) | IBIAS (pA) | Rail- Rail | Package |
| TP2301 | 1 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 50 μV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2302 | 2 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 50 μV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2304 | 4 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 50 μV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2311 | 1 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 50 μV | 7 V/μs | 1 | 3.1 | 8.2 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2312 | 2 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 50 μV | 7 V/μs | 1 | 3.1 | 8.2 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC, 8-Pin SOT |
| TP2314 | 4 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 50 μV | 7 V/μs | 1 | 3.1 | 8.2 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2321\* | 1 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 50 μV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2322\* | 2 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 50 μV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2324\* | 4 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 50 μV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2331 | 1 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 50 μV | 0.92 V/μs | 1 | 3.2 | 13 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2332 | 2 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 50 μV | 0.92 V/μs | 1 | 3.2 | 13 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2334 | 4 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 50 μV | 0.92 V/μs | 1 | 3.2 | 13 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2401 | 1 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 1 mV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2402 | 2 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 1 mV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2404 | 4 | 2.2~5.5 | 20 MHz | 3.5 mA | 130 | 1 mV | 19 V/μs | 1 | 2.0 | 7.3 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2411 | 1 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 1 mV | 7 V/μs | 1 | 3.14 | 8.2 | 0.3 pA | In/Out | 8-Pin SOP, 5-Pin SOT23 |
| TP2412 | 2 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 1 mV | 7 V/μs | 1 | 3.14 | 8.2 | 0.3 pA | In/Out | 8-Pin SOP, 8-Pin SOT, 8-Pin MSOP |
| TP2414 | 4 | 2.2~5.5 | 10 MHz | 1.4 mA | 130 | 1 mV | 7 V/μs | 1 | 3.14 | 8.2 | 0.3 pA | In/Out | 14-Pin SOP, 14-Pin TSSOP |
| TP2421\* | 1 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 1 mV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 5-Pin SC70, 5-Pin SOT23 |
| TP2422\* | 2 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 1 mV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 8-Pin MSOP, 8-Pin SOIC |
| TP2424\* | 4 | 2.2~5.5 | 6 MHz | 0.70 mA | 130 | 1 mV | 3.36 V/μs | 1 | 3.1 | 9.6 | 0.3 pA | In/Out | 14-Pin SOIC, 14-Pin TSSOP |
| TP2431 | 1 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 1 mV | 0.9 V/μs | 1 | 4.1 | 13 | 0.3 pA | In/Out | 8-Pin SOP, 5-Pin SOT23 |
| TP2432 | 2 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 1 mV | 0.9 V/μs | 1 | 4.1 | 13 | 0.3 pA | In/Out | 8-Pin SOP, 8-Pin MSOP |
| TP2434 | 4 | 2.2~5.5 | 1.6 MHz | 0.19 mA | 130 | 1 mV | 0.9 V/μs | 1 | 4.1 | 13 | 0.3 pA | In/Out | 14-Pin SOP, 14-Pin TSSOP |

**High Speed, High Dynamic Range, Low Power Precision RR-IO Operational Amplifier**

**TPH2501/TPH2503/TPH2502/TPH2504**

* High-speed, fast settling:
	+ − 3 dB Bandwidth：250 MHz (G = +1);
	+ Slew Rate：180 V/μs
	+ 0.1% setting time：25ns
* Video features ( G = +2, RL = 150Ω)
	+ 0.1dB flatness bandwidth: 25 MHz
	+ Different gain error:0.02%
	+ Differential phase error: 0.3°
* Supply voltage range：2.5 V to 5.5 V
* Input and output swing to within 50 mV of supply
* Low Distortion：SFDR：79 dBc ( 1 MHz )
* Linear Output Current：100 mA
* Low power：6.5mA/channel

**VIN**

**+5V**

####

**75Ω Vout**

**75Ω**

**TPH2501**

**75Ω**

**1K**

**1K**

**High-Speed, High Dynamic Range, Low-Power Precision RR-IO Operational Amplifier Selec- tion Guide**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Ch | VDD (V) | Topology | BW | IQ (Typ.)(1 Channel) | IOUT (mA) | VOS(max) | Slew Rate | Gmin（V/V） | eN @1MHz ( nV/√Hz ) | IBIASmax | Rail- Rail | Package |
| TPH2501 | 1 | 2.5~5.5 | VFA | 250 MHz | 6.5 mA | 100 | 1 mV | 180 V/μs | 1 | 6.3 | 300pA | In/Out | 5-Pin SOT23,SC70 |
| TPH2503\* | 1 | 2.5~5.5 | VFA | 250 MHz | 6.5 mA | 100 | 1 mV | 180 V/μs | 1 | 6.3 | 300pA | In/Out | 5-Pin SOT23,SC70 |
| TPH2502 | 2 | 2.5~5.5 | VFA | 250 MHz | 6.5 mA | 100 | 1 mV | 180 V/μs | 1 | 6.3 | 300pA | In/Out | 8-Pin MSOP, 8-Pin SOP |
| TPH2504 | 4 | 2.5~5.5 | VFA | 250 MHz | 6.5 mA | 100 | 1 mV | 180 V/μs | 1 | 6.3 | 300pA | In/Out | 14-Pin SOP, 14-Pin TSSOP |

\*: With shutdown feature

### 250na (Max) Ultra-Low Power, High Swing, Small Package Comparators TP2011/TP2012

TP201x series comparators with small size and low power are ideal for cellular phone, notebook, and portable medical equipment’s, which demand very low power and small board space.

**kV**

**8**

**-40°C**

**+85°C**

**PUS H**

**PULL**

**OP EN**

**DRAIN**

**PIN**

 COMPATIBLE

**ULTRA**

**LOW**

**POWER**

The device adopts full swing input structure and unique output stage, which limits the surge current. These devices maintain high impedance at power down (VDD or VREF = 0 V) mode. TP2011, TP2012 and TP2014 have push-pull output stage that can source and sink current. Output drive stage can achieve full swing output, with load current up to 25 mA.

### TP2021

In many applications, an accurate reference voltage as a precise reference source is required. In simple designs customers can use a resistor divider or use TL431 to generate a reference voltage, but there are certain limitations with these approaches. Using resistor di-

vider, the reference voltage is dependent on supply voltage, therefore may not provide enough accuracy to meet the system requirement. Using a dedicated reference voltage source provides a supply independent reference, at the cost of increased PCB area and total BOM cost.

TP2021 comparator incorporates an on-chip 1.248V ± 1.4% precision reference source. While consuming only 440 nA current, it provides a very low transmission delay of 13μs. The proprietary output stage design minimizes supply current fluctuations when switching, eliminating ubiquitous power interference issues common to most comparators from other vendors. This unique circuit topology also reduces the overall power consumption under dynamic conditions.

These features make the TP2021 series ideal for portable applications. It is very suitable for single lithium ion (Li+) or two nickel cadmium or alkaline battery power supply systems. The ultra low-power TP202 series significantly extends the battery life of portable products.

TP2021 comparator is extremely simple to use in all applications. Users can rely on the internal hysteresis circuit to eliminate the impact of input voltage fluctuation in the system.

+3.3V

R1

R4

R3

IN+

VCC

OUT

R5

IN- REF

**TP2021**

VEE

REF 1.248V

OUT

R2

Nanopower 2.9V VCC Threshold Detector

**Rail-To-Rail IO, High-Speed, Low-Power, 2.7 ~ 5.5v, Single-Supply Comparators**

**TP1961/TP1962/TP1964**

* Rail-to-rail voltage supply voltage：2.7 V to 5.5 V
* Input common-mode voltage range：−0.2 V to VCC + 0.2 V
* CMOS / TTL compatible output stage
* Propagation delay：7 ns
* Low power ：2.5 mW ( at 2.5 V supply )
* Power Supply Rejection Ratio：110 dB
* Operating temperature range：−40°C to +125° C

### Nano-power& Micro-power Comparator Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Product Description | Ch | VDD (V) | IQ (Typ.)(per Ch) | IQ(Max.) (per Ch) | tPD+ | tPD- | VOS(max) | Hyst. | Output Type | Package |
| TP2021 | 1.8V, 440nA (max.) Comparator with 1.248V±1.4% Voltage Reference | 1 | 1.8~5.5 | 390 nA | 440 nA | 13 μs | 14 μs | 2 mV | 4 mV | Push-Pull | 6-Pin SC70, 5-Pin SOT23, 6-Pin SOT23,8-Pin SOIC |
| TP2011 | Single, 1.6V, 250nA (max.), RRIO, Push-Pull Output Comparator | 1 | 1.6~5.5 | 200 nA | 250 nA | 13 μs | 14 μs | 2 mV | 4 mV | Push-Pull | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP2012 | Dual, 1.6V, 250nA (max.), RRIO,Push-Pull Comparator | 2 | 1.6~5.5 | 200 nA | 250 nA | 13 μs | 14 μs | 2 mV | 4 mV | Push-Pull | 8-Pin SOT23, 8-Pin SOIC, 8-Pin MSOP |
| TP1941 | Single, 68ns, 1.8V, 46uA, RRI, Push-Pull Output Comparator | 1 | 1.8~5.5 | 46 uA | 58 uA | 68 ns | 72 ns | 3 mV | 6 mV | Push-Pull | 5-Pin SC70, 5-Pin SOT23, 8-Pin SOIC |
| TP1942 | Dual, 68ns, 1.8V, 46uA, RRI, Push- Pull Output Comparator | 2 | 1.8~5.5 | 46 uA | 58 uA | 68 ns | 72 ns | 3 mV | 6 mV | Push-Pull | 8-Pin SOT23, 8-Pin SOIC,8-Pin MSOP, 8-Pin DIP |
| TP1944 | Quad, 68ns, 1.8V, 46uA, RRI,Push-Pull Output Comparator | 4 | 1.8~5.5 | 46 uA | 58 uA | 68 ns | 72 ns | 3 mV | 6 mV | Push-Pull | 14-Pin SOIC, 14-Pin TSSOP,14Pin DIP |
| TP1946 | Dual, 70ns, 1.8V, 49uA, RRIO,Open Drain Output Comparator | 2 | 1.8~5.5 | 49 uA | 60 uA | - | 70 ns | 3 mV | 6 mV | Open Drain | 8-Pin SOT23, 8-Pin SOIC, 8-Pin MSOP |
| TP1948 | Quad, 70ns, 1.8V, 49uA, RRIO,Open Drain Output Comparator | 4 | 1.8~5.5 | 49 uA | 60 uA | - | 70 ns | 3 mV | 6 mV | Open Drain | 14-Pin SOIC, 14-Pin TSSOP |
| TP1961 | Single,7 ns, 2.7V to 5V Comparator with RRIO | 1 | 2.7~5.5 | 2.4mA | -- | 7 ns | 7 ns | 5mV | 7.5 mV | Push-Pull | 5-Pin SC70, 5-Pin SOT23 |
| TP1962 | Dual,7 ns, 2.7V to 5V Comparator with RRIO | 2 | 2.7~5.5 | 2.4mA | -- | 7 ns | 7 ns | 5mV | 7.5mV | Push-Pull | 8-Pin MSOP,8-Pin SOIC |
| TP1964 | Quad, 7 ns, 2.7V to 5V Comparator with Rail-to-Rail Output | 4 | 2.7~5.5 | 2.4mA | -- | 7 ns | 7 ns | 5 mV | 7.5 mV | Push-Pull | 14-Pin SOIC, 14-Pin TSSOP |
| LMV331TP | General Purpose, Single, 1.8V, RRI, 120ns, Open Drain Comparator | 1 | 1.8~5.5 | 40 uA | 70 uA | - | 120ns | 3.5 mV | 6 mV | Open Drain | 5-Pin SC70, 5-Pin SOT23 |
| LMV393TP | General Purpose, Dual, 1.8V, RRI, 120ns, Open Drain Comparator | 2 | 1.8~5.5 | 40 uA | 70 uA | - | 120ns | 3.5 mV | 6 mV | Open Drain | 8-Pin SOIC, 8-Pin MSOP,8-Pin TSSOP, 8-Pin DIP |
| LM393 | Dual Differential Comparators | 2 | 2.0~36 | 0.15 mA | 0.3 mA | - | 2 μs | 3mV | - | Open Drain | 8-Pin SOP |
| LM339 | Quad Differential Comparators | 4 | 2.0~36 | 0.15 mA | 0.3 mA | - | 2 μs | 3mV | - | Open Drain | 14-Pin SOP |
| LM2903 | Dual Differential Comparators | 2 | 2.0~36 | 0.15 mA | 0.3 mA | -- | 2 μs | 3mV | - | Open Drain | 8-Pin SOP |
| LM2901 | Quad Differential Comparators | 4 | 2.0~36 | 0.15 mA | 0.3 mA |  | 2 μs | 3 mV | - | Open Drain | 14-Pin SOP |

**+3.0V To +5.5V, RS-232 Transceiver With Transmission Rate Up To 470 kbps**

TP3222N/TP3232N consists of two transmitters and two receivers to ensure a 250 Kbps data rate in the standard operation mode. The TP3222E has a shutdown mode which reduces power consumption down to 0.01uA. In shutdown mode, TP3222E receivers remain in active state and allows for peripheral monitoring.

**TP3232**


##### 3.3V / 5V

DATA **Tx**

IN

##### Rx

 DATA

OUT

EIA/TIA RS-232 Transceiver

### Full Fail-Safe, Enhanced ESD and EFT Protection, +3.0V to +5.5V, High Common Mode Volt- age RS485 transceiver

* De-polarized TP485E: built-in bus identification circuit allows arbitrarily connected A / B bus
* Polarized TP8485E: fully compatible with most high-performance half-duplex RS485 chips on the market
* Support 300 bps to 250 kbps transmission rate
* Receiver input impedance is 1/8 of unit load, up to 256 transceivers on the same bus
* Output provides above18 kV HBM ESD protection、± 15 kV IEC air-gap discharge mode、4 kV IEC61000-4-4 EFT level of protection. Ideal for applications in video surveillance, power electronics, industrial instrumentation, and other applications in harsh environments.

### 3 ~ 5.5V,Low-power High-speed 10 Mbps Half-duplex 485 Transceiver TP75176E

 Meets EIA RS-485 / RS-422 standard in the entire common mode range

 Data Rate：up to 10 Mbps

 Half-duplex

 Up to 64 transceivers on a bus

 Bus Common Mode Range：- 7 V to+12 V

 Rated temperature range：- 40°C to +125°C

 8-pin SOIC and MSOP packages are available

### RS-232 、 RS-485 Transceiver Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Drivers Per Pack- age | Receivers Per Pack- age | VCC（Min）（V） | VCC（Max）（V） | Data Rate (Max) (kBPS) | ICC（Max）（mA） | ESD HBM (kV) | IEC-61000-4 SUPPORT | Operating Temperature Range (°C) | Additional Features | Package |
| TP3232N | 2 | 2 | 3.0 | 5.5 | 470 | 0.2 | 2 kV | / | -40 to +125 | - | 16-Pin SOIC,16-Pin TSSOP |
| TPT485E | 1 | 1 | 3.0 | 5.5 | 250 | 0.93 | 18kv | Yes | -40 to +125 | Half Duplex | 8-Pin SOIC/MSOP |
| TPT485EN | 1 | 1 | 3.0 | 5.5 | 250 | 0.93 | 18kv | Yes | -40 to +125 | Half Duplex, Bus-Po- larity Correcting | 8-Pin SOIC/MSOP |
| TP8485E | 1 | 1 | 3.0 | 5.5 | 250 | 0.93 | 18kv | Yes | -40 to +125 | Half Duplex | 8-Pin SOIC/MSOP |
| TP485E | 1 | 1 | 3.0 | 5.5 | 250 | 0.93 | 18kv | Yes | -40 to +125 | Half Duplex, Bus-Po- larity Correcting | 8-Pin SOIC/MSOP |
| TP75176E | 1 | 1 | 3.0 | 5.5 | 10000 | 2 | 15kv | Yes | -40 to +125 | Half Duplex, High- Speed | 8-Pin SOIC/MSOP |

####

**+ VDD**

**Clamp Circuit**

**Level**

**Shift**

**Video**

**DAC**

**6 dB**

***3PEAK***

**LPF**

STB、DVB

The main chip

**TPF1xx Series**

Supports SD, ED, HD and Full-HD video With a single-channel, three-channel, four-channel, six-channel product options

CVBS, S- Video, component video, VGA video output



**Video Filter Driver Selection Guide**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Num- ber | Description | Resolution | Channel | VDD (V) | -3dBBand- width | Quiescent Current @3.3V | Voltage Gain | Stop-band rejection @27MHz(dB) | Diff. Gain (%) | Diff. Phase (Deg) | THD (%) | Package | Cross Reference |
| TPF110 | Low power consump- tion, a shutdown func- tion and SAG correc-tion, single six-order 9MHz | 480i, 576i | 1-SD | 2.85~5.5 | 9MHz | 3.9mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | SC70-6 | ADA4430-1, OPA360/361\*/362\*, NCS2561, FMS6151\*, ISL59110/59111\*/59112\*, SGM9110/9121/9122\* |
| TPF110U | With Shutdown and SAG correction, single six-order 9MHz | 480i, 576i | 1-SD | 2.85~5.5 | 9MHz | 3.9mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | SOT23-6 | NJM2575, SGM9114, IA171,MS1651/1671 |
| TPF111 | Ultra-portable, single- channel, six-order CVBS video amplifier | 480i, 576i | 1-SD | 3.0~5.5 | 9MHz | 3.8mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | SC70-5, SO-8 | FMS6141/6404\*, SGM9111, DIO2551, ADA4431-1\*, NE592\* |
| TPF111U | Ultra-portable, single- channel, six-order CVBS video amplifier | 480i, 576i | 1-SD | 3.0~5.5 | 9MHz | 3.8mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | SC70-5, SO-8 | SGM9113, DIO2531 |
| TPF113 | Low power consump- tion, sixth-order low- pass filtering and 9MHz 6dB gain, 3-channel SD video | 480i, 576i | 3-SD | 3.0~5.5 | 9MHz | 11.6mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | SO-8 | FMS6143, THS7314/7313\*/7315\*, NCS2553, ISL59119/59115\*/59114\*, SGM9119/9115/9122\*/9123,DIO2543 |
| TPF114 | With a sixth-order filter and 6dB gain 9MHz, 4- channel SDTV Video Amplifier | 480i, 576i | 4-SD | 3.0~5.5 | 9MHz | 16.0mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | MSOP10, TSSOP14 | THS7374/7375\*, FMS6144, SGM9124, SGM9127 |
| TPF116 | 9MHz sixth-order filter, 6-SD channel support CVBS, S- video and component video | 480i, 576i | 6-SD | 3.0~5.5 | 9MHz | 23.2mA | 6dB | 51.2 | 0.4 | 0.7 | 0.1 | TSSOP14 | FMS6146/6145, THS7368, SGM9126/9125 |
| TPF130 | Low Power, 36MHz fil- ter, a shutdown, single- channel high-definition video drive | 720p,1080i | 1-HD | 3.0~5.5 | 36MHz | 6.0mA | 6dB | 31.1dB @74.25MHz | 0.2 | 0.4 | 0.3 | SOT23-6 | MS1691,SGM9155 |
| TPF131 | Low Power, 36MHz fil- ter and 6dB gain, sin- gle-channel high-defini- tion video drive | 720p,1080i | 1-HD | 3.0~5.5 | 36MHz | 6.0mA | 6dB | 31.1dB @74.25MHz | 0.2 | 0.4 | 0.3 | SOT23-6 | MS1681 |
| TPF133 | Low Power, 36MHz fil- ter and 6dB gain, 3- channel HD video drive | 720p,1080i | 3-HD | 3.0~5.5 | 36MHz | 18.0mA | 6dB | 31.1dB @74.25MHz | 0.2 | 0.4 | 0.3 | SO-8 | THS7316, FMS6363, NCS2563, ADA4417-3\*/4411-3\*/4412-3\*, SGM9116/9203\*, DIO2563,MS6363 |
| TPF134 | With a 1-SD and 3-HD filter and 6dB gain, 4- channel video filter | 1080i,720p | 1-SD & 3- HD | 3.0~5.5 | 9MHz,36MHz | 22.0mA | 6dB | 31.1dB @74.25MHz | 0.2 | 0.4 | 0.3 | MSOP10, TSSOP14 | THS7373, NCS2564, FMS6364, SGM9128, SGM9133, DIO2564/2573 |
| TPF140 | Low-power, single- channel sixth-order with enable function Full-HD Video Filter Driver | 1080p,1080i,720p | 1-FHD | 3.0~5.5 | 72MHz | 11.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | SOT23-6 | MS1631/1661 |
| TPF140R | Low-power, single- channel sixth-order with enable function Full-HD Video Filter Driver | 1080p,1080i,720p | 1-FHD | 3.0~5.5 | 72MHz | 11.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | SOT23-6 | MS1631 |
| TPF141 | Low power, small foot- print, single six-order Full-HD Video Filter Driver | 1080p,1080i,720p | 1-FHD | 3.0~5.5 | 72MHz | 11.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | SOT23-6 | MS1631,SGM9154 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TPF142 | With a 1-SD and 1-FHD filter and 6dB gain, 2- channel video filter | 1080p,1080i,720p | 1-SD & 1- FHD | 3.0~5.5 | 9MHz,72MHz | 14.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | MSOP8, TSSOP14 | THS7372,MS7372 |
| TPF143 | 6dB gain, 3-Channel Full-HD Video Filter Driver | 1080p,1080i,720p | 3-FHD | 3.0~5.5 | 72MHz | 34.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | SO-8 | THS7327\*, FMS6303\*, SGM9203\*, DIO2583\*,MS6367 |
| TPF144 | With a 1-SD and 3 Full HD filter and 6dB gain, 4-channel video driver | 1080p,1080i,720p | 1-SD & 3- FHD | 3.0~5.5 | 9MHz,72MHz | 45.0mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | MSOP10, TSSOP1 4 | THS7372, SGM9133, SGM9135 |
| TPF146\* | Low-Power 6 channels with 3-SD and 3 Full HD filter and 6dB Gain | 1080p,1080i,720p | 3-SD & 3- FHD | 3.0~5.5 | 9MHz,72MHz | 46.0mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | TSSOP20 | NCS2566, FMS6346E/6646/6690, THS7365/7364/7368/7360\*, SGM9346, ADA4420-6/4410-6\* |
| TPF153 | Low Power, 3-channel 6dB gain video buffer | 1080p,1080i | 3-CH | 3.0~5.5 | 220MHz | 33.0mA | 6dB | - | 0.4 | 0.3 | 0.2 | SO-8 | SGM9117/9203\*, FMS6303\*, THS7303\*/7327\*, DIO2583\* |
| TPF147 | Low Power，72MHz FHD/36MHz HD | 1080P/601080P/30 | 1-FHD or HD | 3.0-5.5 | 36MHzor 72MHz | 11.5mA | 6dB | 32dB@74MHz 34dB@148MHz | 0.2/0.4 | 0.4/0.7 | 0.15 | SOT23-6 |  |
| TPF1341 | Low Power，36MHz HD video filter，inte- grated comparator | 1080P | 1-HD | 3.0-5.5 | 36MHz | 11mA | 6dB | 31.1dB @74.25MHz | 0.2 | 0.4 | 0.3 | SOP8/MS OP8 | MS7682 |
| TPF1441 | Low Power，36MHz HD video filter，inte-grated comparator | 1080P/60 | 1-HD | 3.0-5.5 | 72MHz | 11.5mA | 6dB | 31.2dB @148MHz | 0.1 | 0.3 | 0.6 | SOP8/MS OP8 | MS7632 |

**High Performance, Cost Competitive: Simplify Audio Design, Improve Audio Quality**

**9 V - 12 V**

**+**

**+ Mut e Circuit CO**

**5V or 3.3 V**

**+**

***Internal charge pump to***

***provide a negative voltage rail***

**RC4558**

 **+ Output**

**TPF632A**

**Output**

*GND*

***VDD***

***VSS***

**Enable**

**Enable**

**Conventional Audio Line Driving Design:**

* Need >9V power supply or dual power rail
* Need large value DC blocking capacitors
* Extra mute circuit to minimize click & pop

**Easy to Design, Innovated Single-Chip Solution:**

* 3V or 5V Single Power Supply
* Built-in Mute Control & UVP for Pop-free Design
* Improve Low Frequency Response & THD+N Performance
* Integrated Output Short-Circuit Protection
* High ESD Rating & Anti-surge Function when Hot Plug

In order to produce a 2VRMS or 3VRMS audio signal, traditional single-supply audio line driver requires 9 V to 12 V power supply. High supply voltage increases system com- plexity and total cost. To obtain maximum dy- namic range, traditional single power supply audio amplifier output is biased at a specified DC voltage (usually 1/2 VDD). To isolate the DC bias a large value coupling capacitor is re- quired. In addition to tuning the circuit for fre- quency response flatness and THD + Noise performance, Pop and Click noise need to be

minimized when system is turned on or turned off., which further complicates the design of the audio system.

3PEAK’s audio line driver products ad- dress the above mentioned application needs in the traditional audio systems. Targeting set-top boxes, LCD TV, DVD player, mini- component systems, sound cards, notebook computers and other applications, our audio line driver products have industry-leading noise suppression performance using 3PEAK’s proprietary circuit topology. Using an

inverting charge pump, a built-in negative supply voltage is generated, which allows the amplifier output to be biased at ground. The audio signal’s dynamic range is nearly dou- bled, eliminating the need for high voltage power supply and the large size coupling ca- pacitor.

In addition, 3PEAK’s audio line driver im- plements active mute control and under volt- age detection functions, making them ideal in small size and low cost audio systems with single power supply.

**10**

**VDD=3.3V RL=2.5kΩ**

**f=1kHz**

|  |  |  |  |
| --- | --- | --- | --- |
| Part Number | Package | Product Description | Cross Reference |
| TPF632A | TSSOP-14 | 2.7V ~ 5.5V power supply, providing 3VRMS or 2VRMS output, support differ- ential input | SGM8903,SGM89000,DIO2112H,DIO2103,DRV632,DRV603,DIO2133 |
| TPF605A | MSOP-10-EP | 2.7V ~ 5.5V power supply, providing 3VRMS or 2VRMS output, support for sin- gle-ended input | SGM8905, DIO2125 |
| TPF607A | MSOP-10 | 2.7V ~ 5.5V power supply, providing 3VRMS or 2VRMS output, support for sin- gle-ended input, no external UVP control | SGM8904, DIO2124 |

**1**

**THD+N (%)**

**0.1**

**0.01**

**0.001**

**0.0001**

**0.1 1 10**

**Output Voltage (Vrms)**

TPF632A: THD+N & Output Voltage

3PEAK provides TPL700 series low dropout, low quiescent current, high PSRR LDO products.TPL700 series LDO are optimized for PSRR and low Iq, so they have better performance in these two facts. TPL700 series products are low dropout products. They can support 170mV dropout when output current reach 200mA. Otherwise, TPL700 can support fix output voltage between 0.8V to 5V with 0.1V minimum step. For different applications,

TPL700 provide two kinds of packages. One is normal SOT23-5 and the other is small size

**Typical Application Circuit**

DFN package (1mmx1mm).

* Input voltage range 2V-5.5V

**TPL700xx**

VI N

VO UT

VO UT

VI N

On

Cin

Cout 1uF

Off

EN

GND

* Max 200mA current output
* Low Iq and shutdown current
* 2% output voltage accuracy
* Low dropout voltage，170mV dropout when output current reach 200mA
* Fix output voltage between 0.8V to 5V with 0.1V minimum step
* SOT23-5（3x3）or DFN（1x1）package

### Low Dropout，Low Quiescent Current，High Power Supply Rejection LDO Selection Guide

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Vin(V) | Accuracy | Output (V) | IQ (uA.) | Temp Range (°C) | PSRR@1KHZ(dB) | Dropout voltage@200mA out- put(mV) | Package |
| TPL700F12-TR | 2-5.5 | 2% | 1.2 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F15-TR | 2-5.5 | 2% | 1.5 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F18-TR | 2-5.5 | 2% | 1.8 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F25-TR | 2-5.5 | 2% | 2.5 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F28-TR | 2-5.5 | 2% | 2.8 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F29-TR | 2-5.5 | 2% | 2.9 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F30-TR | 2-5.5 | 2% | 3.0 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |
| TPL700F33-TR | 2-5.5 | 2% | 3.3 | 33 | -40~125℃ | -50 | 170 | SOT23-5,DFN |

TPA4128 is designed for earth leakage protection application, can support both A series and AC series earth leakage application. Differentiate with traditional M54123 series product.TPA4128 is higher integrated product and more sockets in M54123 solution are integrated into this sockets, so TPA4128 is more reliable and low cost solution. TPA4128 integrated differential amplifier, voltage regulator, high precision rectifier, EMI filter, digital clock, latch counter and SCR driver. TPA4128 get leakage current signal from zero sequence current transformer (ZCT) and drive SCR work.

* Match international GB16917GB16916GB14048 standard
* Test both half wave and full wave current leakage with normal trigged
* High input sensitivity（VT = 6.5mVrms Typ.）
* Few components around（Integrated EMI filter）
* High noise rejection and against inrush capability
* Integrated counter circuit and trig SCR accurately
* Super low static power consumption（Pd = 0.9mW Typ.）
* Suitable for 110/220V applications，no need change resistors
* SCR can be trigged even voltage lower than 45VAC
* SO-8 high density package，can provide more small package if needed
* Wild work temperature range（Ta = -45 to +125°C）



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | VDD(V) | IO(SCR drive current) | Tp(mS) | Ttrip(mS) | Temp Range (°C) | Vref(V) | Leakage type | Package |
| TPA4128-SR | 4.8 | 310uA | 5 | 30 | -40~125℃ | 1.15 | A/AC type | SOIC-8 |

### 12- / 14- / 16bit high-precision, low-power, 2.7 ~ 5.5V, SPI Interface DAC TPC116S1

* Ultra-Low Power（maximum 80 μA quiescent current）
* Differential nonlinearity : ± 1 LSB（max）. No missing code at 16bit resolution guaranteed
* Low glitch energy: 0.1 nV-s
* Integrated power-on reset circuit to ensure zero output
* Power Supply: 2.7 V to 5.5 V
* On-chip output buffer stage ensures rail-to-rail output
* 30 MHz data clock rate, three-wire SPI / QSPI / MICROWIRE bus compatible
* Schmidt input stage, compatible with optical coupling interface
* Synchronous interrupt capability

**(VREF) GND**

**VDD**

**Output Buffer**

**REF(+) REF(-)**

**16-/14-/12-BIT DAC**

**Power-Down Control Logic**

**Input Logic Control**

**Resistor Network**

**Power-On Reset**

**DAC**

**Register**

**(FB)**

**VOUT**

**SYNC SCLK DIN**

### High Precision Low Power, SPI Interface DAC Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Resolution | VDD (V) | CH | INL (LSB,Max) | DNL (LSB,Max) | Offset Error (mV, Max) | IDD (uA/CH,Max) | Gain Error (% of FSR, Max) | Voltage Output Range (V) | D to A Glitch Impulse (nV- sec) | Temp Range (°C) | Package |
| TPC112S1 | 12 | 2.7~5.5 | 1 | ±1 | ±0.3 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC114S1 | 14 | 2.7~5.5 | 1 | ±8 | ±0.5 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC116S1 | 16 | 2.7~5.5 | 1 | ±12 | ±1 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC112S2 | 12 | 2.7~5.5 | 2 | ±1 | ±0.3 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC114S2 | 14 | 2.7~5.5 | 2 | ±8 | ±0.5 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC116S2 | 16 | 2.7~5.5 | 2 | ±12 | ±1 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC112S4 | 12 | 2.7~5.5 | 4 | ±1 | ±0.3 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC114S4 | 14 | 2.7~5.5 | 4 | ±8 | ±0.5 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC116S4 | 16 | 2.7~5.5 | 4 | ±12 | ±1 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC112S8 | 12 | 2.7~5.5 | 8 | ±1 | ±0.3 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC114S8 | 14 | 2.7~5.5 | 8 | ±8 | ±0.5 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |
| TPC116S8 | 16 | 2.7~5.5 | 8 | ±12 | ±1 | ±4 | 80 μA | ±0.15 | 0~Vref | 0.1 | -40~125 | 8-Pin MSOP |

**High-Speed DAC Selection Guide**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Resolu-tion | Update Rate(MSPS) | Ch | Datum | INL(LSB) | DNL(LSB) | SFDR(dB) | VDD(V) | Power(mW) | Package | Compatible Products |
| 3PD9708E | 8 | 200 | 1 | Internal, 1.10V | 0.25 | 0.25 | 70 | 2.7~5.5 | 170 | SSOP-28, TSSOP-28 | AD9708, DAC908, THS5641A |
| 3PD5602E | 8 | 100 | 1 | External | 0.25 | 0.25 | 67 | 2.7~5.5 | 80 | SOIC-20 | TLC5602, MB40778 |
| 3PD5660 | 8 | 125 | 1 | Internal, 1.10V | 0.25 | 0.25 | 68 | 2.7~5.5 | 165 | TSSOP-28 | HI5660 |
| 3PD9709 \* | 8 | 125 | 2 | Internal, 1.2V | 0.1 | 0.1 | 66 | 2.7~5.5 | 200 | QFP-48 | AD9709 |
| 3PD5651E | 10 | 125 | 1 | Internal, 1.10V | 0.5 | 0.25 | 79 | 2.7~5.5 | 175 | TSSOP-28, SOIC-28 | THS5651A, DAC900, AD9760, AD9750 |
| 3PD5757 | 10 | 260 | 1 | Internal, 1.10V | 0.1 | 0.1 | 72 | 2.7~5.5 | 100 | TSSOP-28 | ISL5757, ISL5761, HI5760 |
| 3PD9763 \* | 10 | 125 | 2 | Internal, 1.2V | 0.1 | 0.1 | 75 | 2.7~5.5 | 200 | QFP-48 | AD9763 |
| 3PD5661 | 12 | 200 | 1 | Internal, 1.10V | 0.75 | 0.5 | 82 | 2.7~5.5 | 170 | TSSOP-28 | THS5661A, DAC902 |
| 3PD9765 \* | 12 | 125 | 2 | Internal, 1.2V | 0.1 | 0.1 | 75 | 2.7~5.5 | 200 | QFP-48 | AD9765 |
| 3PD5957 \* | 14 | 260 | 1 | Internal, 1.2V | 2.5 | 1.5 | 79 | 2.7~5.5 | 110 | TSSOP-28 | ISL5957, ISL5961, HI5960 |

Note: with mark “\*” product, the sample and delivery time is about 3 month

**High-Speed Pipeline ADC**

### 3PA1030

Buffer

 +2.7V to +5.5V single power supply, 84mW power dissipation (3V, Typ.)

* DNL: ±0.3LSB
* Internal S/H circuit, no missing code
* Integrated adjustable voltage reference
* Internal voltage clamp circuit
* SINAD: 56.5 dB (Nyquist frequency)
* SFDR: 66 dB (Nyquist frequency)
* OTR indication, power saving mode(Sleep, Power-down)
* TSSOP-28 package, pin compatible with THS1030, AD9200 and AD876

### High Speed Pipeline ADC Selection Guide

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Part Number | Resolu- tion | Update Rate (MSPS) | Ch | Inter- face | VIN (V) | Datum | DNL (LSB) | SINAD (dB) | VDD (V) | power (mW) | Package | Compatible Products |
| 3PA9280 | 8 | 32 | 1 | Parallel | 0~2 | Internal | 0.2 | 49 | 2.7~5.5 | 85 | SSOP-28 | AD9280 |
| 3PA5510 | 8 | 20 | 1 | Parallel | 1~2 | Internal | 0.5 | 46 | 2.7~5.5 | 85 | TSSOP-24 | TLC5510, TLC5540 |
| 3PA931 \* | 8 | 60 | 1 | Parallel | 1~2 | External | 0.5 | 48 | 2.7~5.5 | 70 | SSOP-28 | ADS931, ADS930, ADS830 |
| 3PA9281 \* | 8 | 40 | 2 | Parallel | 1, 2 | Internal | 0.1 | 50 | 2.7~5.5 | 170 | SSOP-28 | AD9281 |
| 3PA1030 | 10 | 50 | 1 | Parallel | 1~2 | Internal | 0.3 | 56.5 | 2.7~5.5 | 84 | TSSOP-28,SOP-28 | THS1030, THS1040, AD9200, AD9203 |
| 3PA826 \* | 10 | 60 | 1 | Parallel | 1~2 | Internal | 0.25 | 59 | 2.7~5.5 | 84 | SSOP-28 | ADS820, ADS821, ADS822, ADS823, ADS825, ADS826, ADS900, ADS901 |
| 3PA9216 \* | 10 | 105 | 2 | Parallel | 2 | Internal | 0.3 | 58.5 | 2.7~5.5 | 170 | SSOP-28,QFP-48, CSP-64 | AD9201, AD9216, ADS5203 |
| 3PA9236 \* | 12 | 80 | 1 | Parallel | 1~4 | Internal | 0.4 | 71.2 | 2.7~5.5 | 90 | TSSOP-28, CSP-32 | AD9235, AD9236, AD9237 |
| 3PA9238 \* | 12 | 65 | 2 | Parallel | 1~2 | External | 0.3 | 70.2 | 2.7~5.5 | 190 | QFP-64, CSP-64 | AD9238, ADS2807, ADS2806 |

Note: with mark “\*” product, the sample and delivery time is about 3 month

**AGND DVDD**

**(LSB) D-0**

**D-1**

**D-2**

**D-3**

**D-4**

**D-5**

**D-6**

**D-7**

**D-8**

**(MSB) D-9**

**OVR**

**MODE DGND**

ADC

Band-

Gap

0.5V

**AVDD AIN**

**CLAMPIN**

Clamp Circuit

T&H

**CLAMP**

**REFBF REFBS REFTF REFTS VREF**

**REFSENSE STBY**

**OE CLK**

TPA8801B is an analog front end sensor conditioning product mainly used for the detection of PM2.5 dust. With its high integration level, a dust detection system such as PM2.5 detection can be easily implemented with an external photodiode, an infrared light-emitting diode and a few capacitors and resistors. Compared to traditional dust detection systems, TPA8801B has higher precision, lower power and significantly reduced total system cost.



**2**

**1**

**7**

**6**

**5**

2M Ohm

Vcc

**11**

**3**

**vref**

TIA

Filter

Slope Control

Gnd

**4**

Vout

TP

**8**

INA

Filter

Noise Reduction

**14**

**9**

**10**

**12**

**13**

Trans-conductance amplifier of TPA8801B converts weak current signal into voltage signal. Combining signal amplification with various filter- ing techniques, low-frequency noise is minimized while preserving the original signal, thus improving system’s Signal to Noise Ratio.

TP8801B output can be directly processed by a general-purpose MCU. Supply voltage is between 2.1V and 5.5V while working temperature is

-40 ℃ to + 125 ℃. Both TSSOP14 and DFN-14 packages are available.

Waveform in clean air Waveform in dusty air

（Y:LED Switch 2V/DIV G:Vout 200mV/DIV） （Y:LED Switch 2V/DIV G:Vout 2V/DIV）



\*\*Oscilloscope Sampling Average=2(To average the Thermal Noise)

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