DIO270X

High Voltage Rail-to-Rail Output Operational Amplifiers

Features

- Supply Voltage Range: 4.5V to 36V
- Low Supply Current:
  1.7mA/Channel @V_S=36V
  1.4mA/Channel @V_S=4.5V
- Input Voltage Range: -V_S ~ (+V_S)-1.5V
- Low Offset Voltage: 3.5mV(max)
- Rail-to-Rail Output: -V_S ~ +V_S
- 6MHz High Gain-Bandwidth Product
- High Slew Rate: 20V/μs
- Settling Time to 0.1% with 10V Step: 0.6μs
- Overload Recovery Time: 0.2μs
- Packages:
  DIO2701 Available in: SOT23-5/SOIC-8
  DIO2702 Available in:
  SOIC-8/MSOP-8/TSSOP-8
  DIO2704 Available in: TSSOP-14/SOIC-14

Applications

- Portable Equipment
- Active Filters
- Data Acquisition
- Test Equipment
- Broadband Communication
- Industrial Control
- Audio and Video Processing

Descriptions

The DIO2701 (single), DIO2702 (dual) and DIO2704 (quad) are amplifiers with very low noise, low voltage, and low power operational. The DIO2701/2/4 has a high gain-bandwidth product of 6MHz, a slew rate of 20V/μs, and a quiescent current of 1.4mA/amplifier at 4.5V typically.

The DIO2701/2/4 is designed to provide optimal performance in low voltage and low noise systems. All these chips provide rail-to-rail output swing into heavy loads. The input common-mode voltage range includes ground, and the maximum input offset voltage is 3.5mV for DIO2701/2/4.

They are specified over the extended industrial temperature range (-40°C to 125°C). The operating range is from 4.5V to 36V.

Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO2701ST5	YWBH	RoHS/Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO2701SO8	DIO71AH	RoHS/Green	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2702SO8	DIO72AH	RoHS/Green	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2702MP8	DIO72AH	RoHS/Green	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2702TP8	DIO72AH	RoHS/Green	-40 to 125°C	TSSOP-8	Tape & Reel, 3000
DIO2704SO14	DIO74AH	RoHS/Green	-40 to 125°C	SOIC-14	Tape & Reel, 2500
DIO2704TP14	DIO74AH	RoHS/Green	-40 to 125°C	TSSOP-14	Tape & Reel, 2500

Pin Assignments

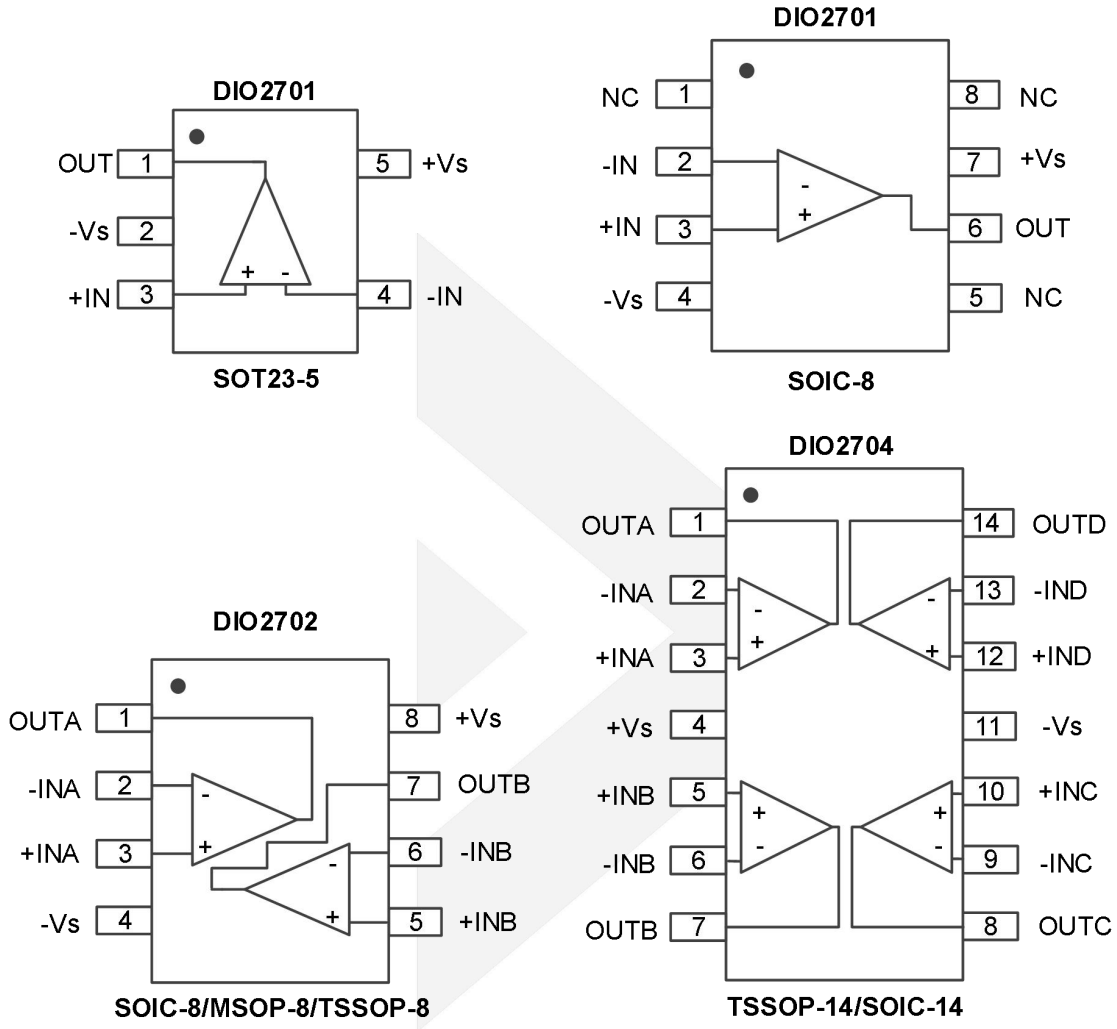


Figure 1 Pin assignment (Top View)

Pin Description

Pin name	Description
$+V_S$	Positive supply
$-V_S$	Negative supply
+IN (+INA/+INB/+INC/+IND)	Positive Input (channel A/B/C/D)
-IN (-INA/-INB/-INC/-IND)	Negative Input (channel A/B/C/D)
OUT (OUTA/OUTB/OUTC/OUTD)	Output (channel A/B/C/D)
NC	Not Connect

Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter		Rating	Unit
Supply Voltage		40	V
Input Voltage		$(-V_S)$-0.3 to $(+V_S)$+0.3	V
Storage Temperature Range		-65 to 150	°C
Junction Temperature		150	°C
Lead Temperature Range		260	°C
ESD	Human Body Model	4	kV
Latch up		200	mA

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Parameter	Rating	Unit
Supply Voltage	4.5 to 36	V
Input Voltage	0 to $(+V_S)$-1.5V	V
Operating Temperature Range	-40 to 125	°C

Electrical Characteristics

Typical value: T_A=25°C, +V_S=30V, -V_S=0V, R_L=10kΩ, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
POWER SUPPLY						
V_S	Operating Voltage Range		4.5		36	V
PSRR	Power Supply Rejection Ration			120		dB
I_Q	Supply Current per Channel/Amplifier	V_S=4.5V		1.4		mA
		V_S=36V		1.7		mA
INPUT CHARACTERISTICS						
V_{OS}	Input Offset Voltage	V_{CM} =+V_S /2, T_A=25°C	-3.5		3.5	mV
I_B	Input Bias Current	+V_S =4.5V to 36V		10		pA
I_{OS}	Input Offset Current	-40°C ≤ T_A ≤ 125°C, +V_S=2.5V to 36V		25		pA
V_{CM}	Common Mode Voltage Range		-V_S		(+V_S)-1.5	V
CMRR	Common Mode Rejection Ratio	-40°C ≤ T_A≤ 125°C, +V_S=36V, V_{CM}=0.5V to 28V		90		dB
A_{OL}	Open Loop Voltage Gain			155		dB
V_{OL},V_{OH}	Output Swing from Supply Rail	R_L =50kΩ		50		mV
ΔVOS/ΔT	Input Offset Voltage Drift	-40°C ≤ T_A≤ 125°C		5		μV/°C
OUTPUT CHARACTERISTICS						
I_{SC}	Output Short-Circuit Current	Sink current		15		mA
		Source current		17		mA
DYNAMIC PERFORMANCE						
GBP	Gain Bandwidth Product	f=1kHz		6		MHz
SR	Slew Rate	A_V=1, 10V Step		20		V/μs
t_S	Setting Time	A_V=-1,10V Step, 0.1%		0.6		μs
		A_V=-1,10V Step, 0.01%		0.9		
t_{OR}	Overload Recovery			200		ns
NOISE PERFORMANCE						
THD	Total Harmonic Distortion	f=1kHz, A_V=1V, R_L=10kΩ ,V_{OUT}=3.5V_{RMS}		0.0005		%
e_n	Input Voltage Noise Density	f=1kHz		30		nV/√Hz
V_n	Input Voltage Noise	f=0.1Hz to 10Hz		2.35		μV_{RMS}
X_{talk}	Channel Separation	f=1kHz, R_L=1kΩ		-100		dB

Specifications subject to change without notice.

Typical Application

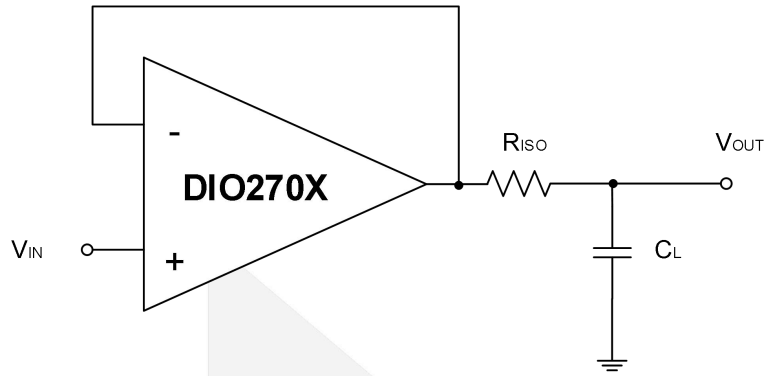


Figure 2 Indirectly Driving Heavy Capacitive Load

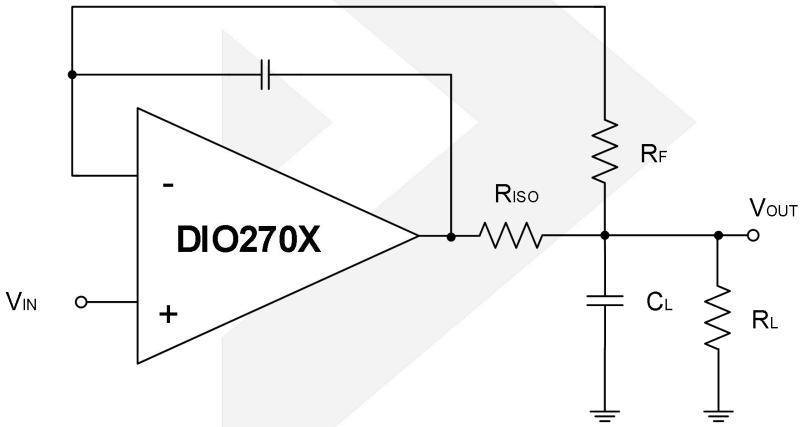


Figure 3 Indirectly Driving Heavy Capacitive Load with DC Accuracy

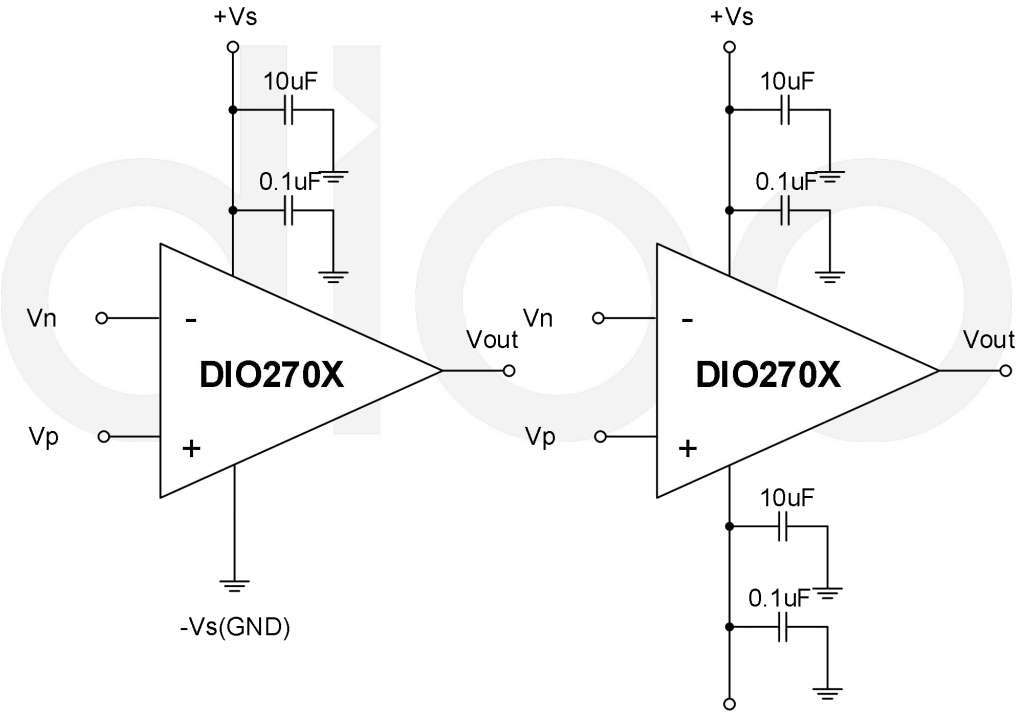


Figure 4 Amplifier with Bypass Capacitors

Typical Performance Characteristics

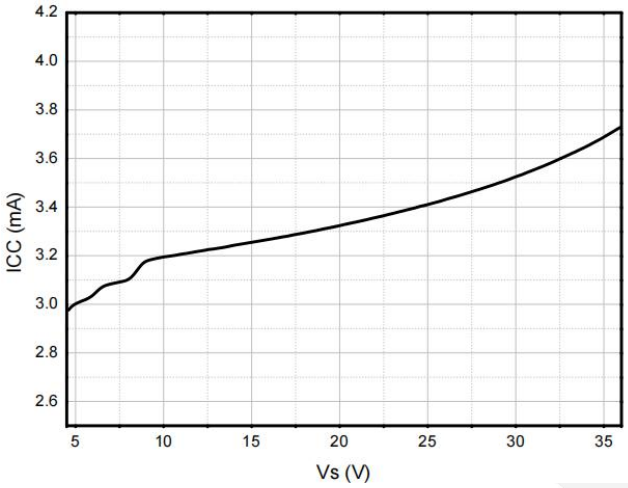


Figure 5 Quiescent Current vs. Supply Voltage

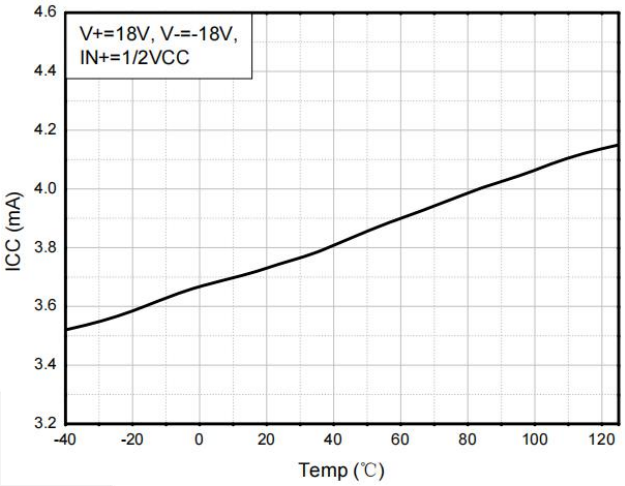


Figure 6 Quiescent Current vs. Temperature

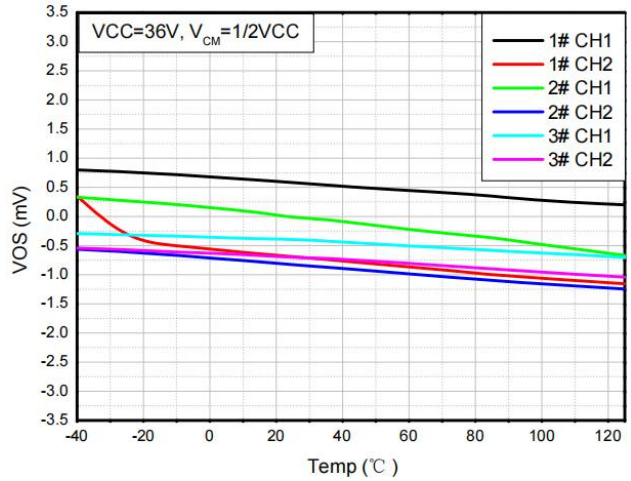


Figure 7 VOS vs. Temperature

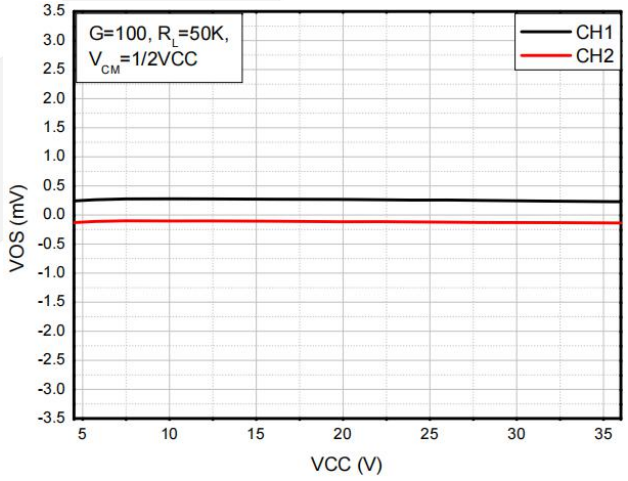
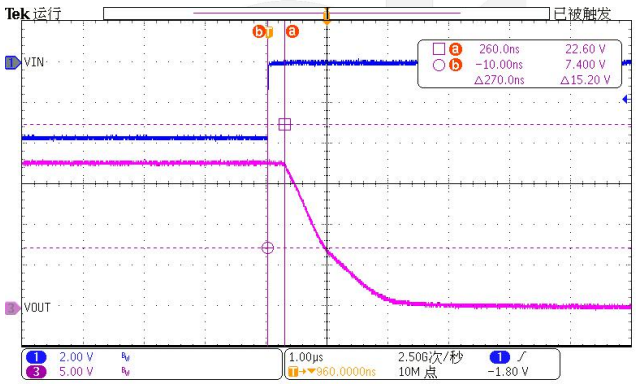
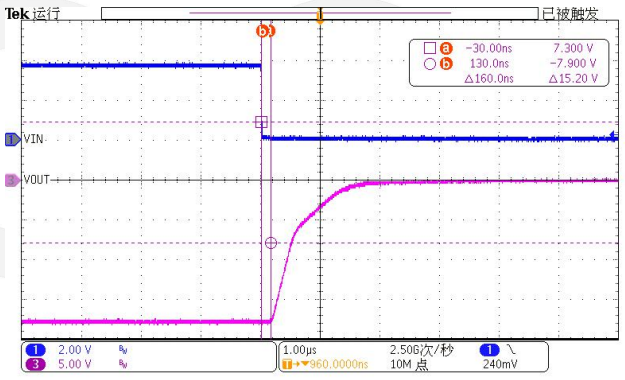


Figure 8 VOS vs. VCC



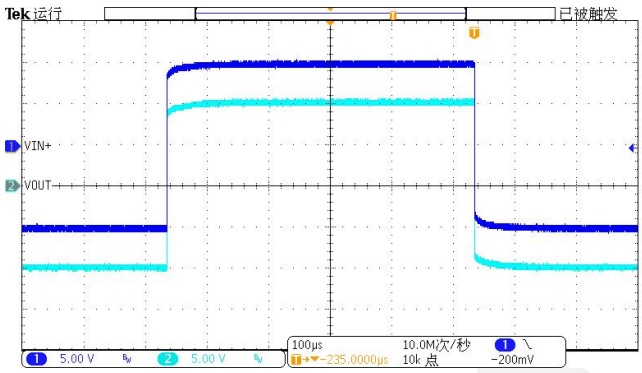
V+=18V, V-=-18V, G=10,RL=2K, CL=100pF, VIN=3.8Vpp@1.9V

Figure 9 Positive Overload Recovery



V+=18V, V-=-18V, G=10, RL=2K, CL=100pF, VIN=3.8Vpp@-1.9V

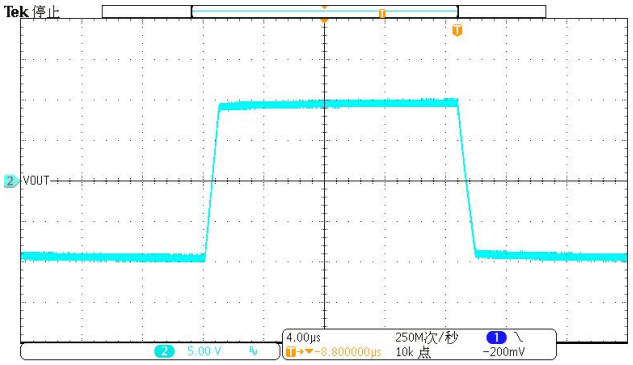
Figure 10 Negative Overload Recovery



V+=18V, V-=-18V, G=1, R_L=2K, C_L=100pF

VIN=20Vpp@1kHz 0VBias

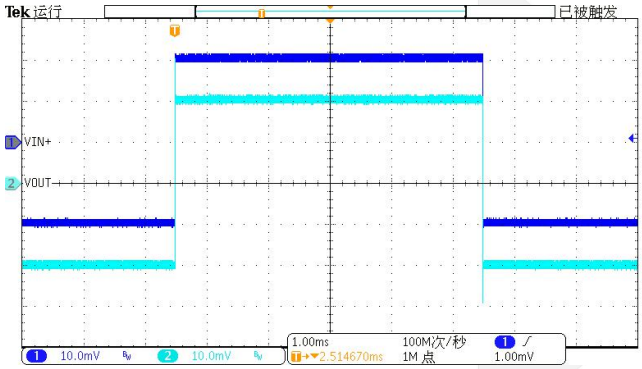
Figure 11 Signal Step Response



V+=18V, V-=-18V, G=1, R_L=2K, C_L=100pF

VIN=20Vpp@30kHz 0VBias

Figure 12 Signal Step Response



V+=18V, V-=-18V, G=1, C_L=100pF, R_L=2K to GND,

40mVpp@0V bias, 100Hz

Figure 13 Small-signal response

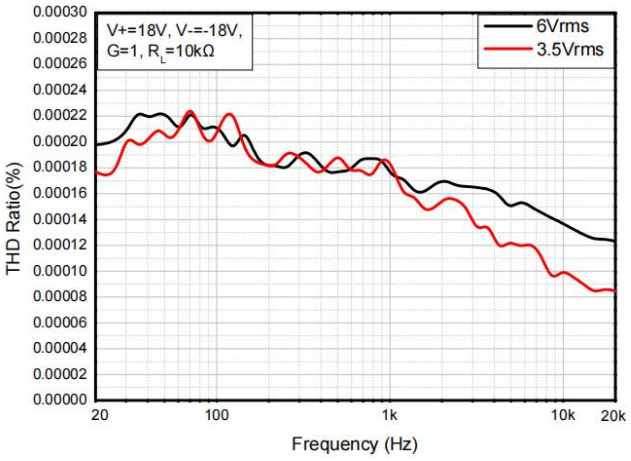


Figure 14 THD Ratio vs. Frequency

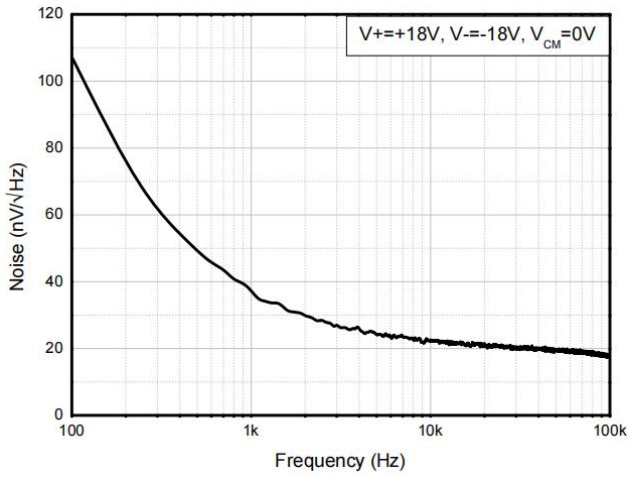


Figure 15 Voltage Noise Spectral Density vs. Frequency

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipment and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to http://www.dioo.com for a complete list of Dioo product families.

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