WS74241

1-Channel Rail-to-Rail Output High Current VCOM Buffer

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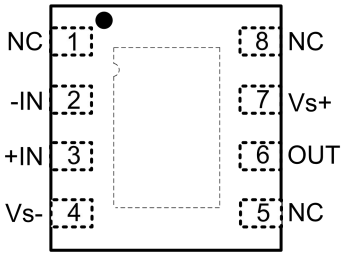
Descriptions

The WS74241 is a 1-channel high performance, high voltage rail-to-rail output buffer. It operates up to 20V. The device provides rail-to-rail output and common mode input capability beyond the negative rail, offering maximum dynamic range at any supply voltage.

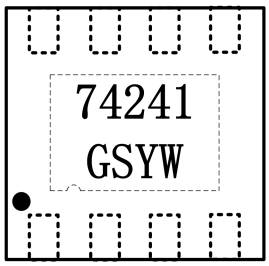
The WS74241 provides fast slew rate and settling times, and a high output drive capability of up to 2000mA peak output current. The WS74241 features Over Temperature Protection (OTP), Over Current Protection (OCP) and Output Short Circuit Protection functions, which provide maximum system protection for TFT-LCD panel applications.

The WS74241 is available in the thermally enhanced 8-pin DFN3x3 package. Standard products are Pb-Free and halogen-Free.

DFN3x3-8L



DFN3x3-8L
Pin configuration (Top view)



DFN3x3-8L

Marking

74241 = Device code
GS = Special code
Y = Year code
W = Week code

Applications

- TV TFT-LCD Panels
- TFT-LCD Monitors
- Notebooks and Netbooks
- Digital Signage
- Touch-Screen Displays
- ADC/DAC Buffers and Active Filters

Features

- Beyond the negative rails input capability
- 2000mA peak output current
- 35MHz – 3dB Bandwidth
- Rail-to-rail output swing
- Power supply range from 4V to 20V
- Low supply current per amplifier: 1.8mA
- High Slew Rate: 60V/μs
- Unity-gain stable
- Protection Function
  - Over Temperature Protection (OTP)
  - Over Current Protection (OCP)
  - Output Short Protection

Order information

Device	Package	Shipping
WS74241D-8/TR	DFN3x3-8L	3000/Reel &Tape

Pin Descriptions

Pin Number	Symbol	Descriptions
1, 5, 8	NC	No Connection
2	-IN	Inverting Input of Amplifier
3	+IN	Non-inverting Input of Amplifier
4	V_{S-}	Negative Power Supply
6	OUT	Output of Amplifier
7	V_{S+}	Positive Power Supply

Absolute Maximum Ratings(1)

Parameter	Symbol	Value	Unit
Supply Voltage, ([V_{S+}] - [V_{S-}])	V_S	22	V
Input Common Mode Voltage Range	V_{ICR}	(V_{S-})-0.3 to (V_{S+})+0.3	V
Operating Free-Air Temperature Range	T_A	-40 to 85	˚C
Operating Junction Temperature Range	T_J	-40 to 150	˚C
Storage Temperature Range	T_{STG}	-65 to 150	˚C
Junction to Ambient Thermal Resistance	θ_{JA} (3)	54	˚C / W
Junction to Board Thermal Resistance	θ_{JB} (3)	27.5	
Junction to Case (Top) Thermal Resistance	θ_{JCtop} (3)	28.2	
Junction to Case (Bottom) Thermal Resistance	θ_{JCbot} (3)	12.1	

Note:

1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are only stress ratings, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions are not implied.
2. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
3. Single component mounted on 2oz, 1.5*1.5 inch^2 FR4 PCB with 1.0*1.0 inch^2 Cu area.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum level	Unit
HBM	Human Body Model ESD	MIL-STD-883H Method 3015.8 JEDEC-EIA/JESD22-A114A	±6000	V
CDM	Charged Device Model ESD	JEDEC-EIA/JESD22-C101E	±2000	V
MM	Machine Model ESD	JEDEC-EIA/JESD22-A115	±400	V

Electronics Characteristics

V_{S+} = 19V, V_{S-} = 0V, V_{INx}+ = 9.5V, unity gain (V_{INx}- = V_{OUTx}), unless otherwise specified. Typical values are tested at +25°C ambient temperature.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
(V_{S+})-(V_{S-})	Supply Voltage Range		4	-	20	V
I_S	Supply Current		-	1.8	3	mA
V_{OS}	Input Offset Voltage		-15	+3	+15	mV
I_B	Input Bias Current		-0.1	-	+0.1	nA
V_{OL}	Output Swing Low	V_{INx}+ = 0V, I_L=-5mA	-	14	25	mV
V_{OH}	Output Swing High	V_{INx}+ = 18V, I_L=+5mA	-	22	30	mV
I_O	Continue Output Current	Before OTP	-	±440	-	mA
I_{Peak}	Peak Output Current		-	±2000	-	mA
SR	Slew Rate	20% to 80%	-	60	-	V/μs
BW	Bandwidth	-3dB	-	35	-	MHz
A_{VOL}	Open-Loop Gain	R_L = 10kΩ	-	100	-	dB
PSRR	Power Supply Rejection Ration	4V < (V_{S+})-(V_{S-}) < 19V	84	97	-	dB
CMIR	Common-Mode Input Range		V_{S-}-0.1	-	V_{S+}-1.5	V
CMRR	Common-Mode Rejection Ration	R_L = 10kΩ	-	85	-	dB
T_{SD}	Thermal Shutdown		-	150	-	˚C

Applications Information

Unused Amplifiers

It is strongly recommended to configure any unused amplifiers as unity gain buffer and directly tie the non-inverting input to the ground plane.

Protection Functions

The WS74241 features over temperature protection (OTP), over current protection (OCP), and output short circuit protection functions. These features provide maximum system protection for demanding TFT LCD panel applications.

The WS74241 limits the peak output current to ±2000mA and the continue output current to ±440mA for normal operation. If the output of the WS74241 is shorted to V_{S-} or V_{S+}, the over current protection (OCP) mechanism will be activate to regulate the power dissipation to prevent over-stressing of the power bus.

The over temperature protection (OTP) function of the WS74241 monitors the silicon junction temperature. When the junction temperature exceeds 150°C, the OTP protection circuit disables normal operation to lower the chip operating temperature.

The synergistic operation of the OTP, OCP, peak output current limit and continue output current limit functions provides maximum output short protection for the WS74241.

Power Dissipation

The WS74241 design is optimized to deliver maximum output current driving capability for TFT LCD panel applications. Due to its robust protection features, the WS74241 can endure a momentary output short to ground (or Vs-).

Due to its high current driving capability, it is possible for the junction temperature to exceed 150°C under certain output current load conditions. Therefore, it is very important to calculate the WS74241's maximum junction temperature and maximum power dissipation for the application to make sure that the junction temperature does not exceed 150°C nor maximum package power rating to ensure the device stays in the safe operating region.

Driving Capacitive Loads

The strong output current driving capability of the WS74241 allows for a high slew rate even with large capacitive loads. Sometimes there is output peaking for certain application loads and application configurations. If less output peaking is desired for these applications, a small damping resistor (usually between 2Ω and 15Ω) can be connected in series between the output of WS74241 and the load. However, this topology will reduce the gain slightly.

Another method of reducing output peaking is to add a snubber circuit at the output. A snubber circuit consists of a resistor (such as 100Ω - 200Ω) in series with a capacitor (such as 10nF), which improves output settling time and reduces peaking. The advantage of this topology is that it draws no DC current nor does it reduce the gain.

Bypass Capacitors

For stability while driving load transients, and to minimize the noise to the system, use a 10μF capacitor for the V_{S+} supply. Connect this bypass capacitor as close as possible to the input V_{S+}.

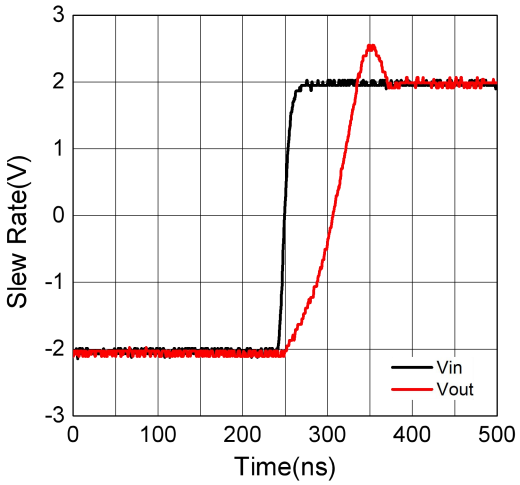
Layout

Connect the exposed pad of the device to the V_{S-} or GND plane for best thermal dissipation performance, or low thermal resistance. In typical application, V_{S-} is connected to ground.

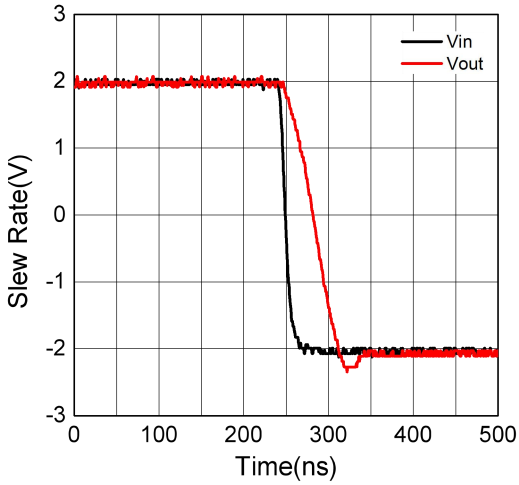
Typical Characteristics

T_A=25°C, V_S=19V, V_{CM}=V_S/2, unless otherwise noted

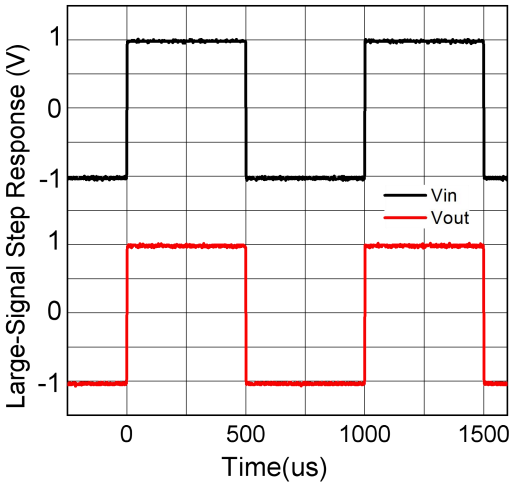
Slew Rate



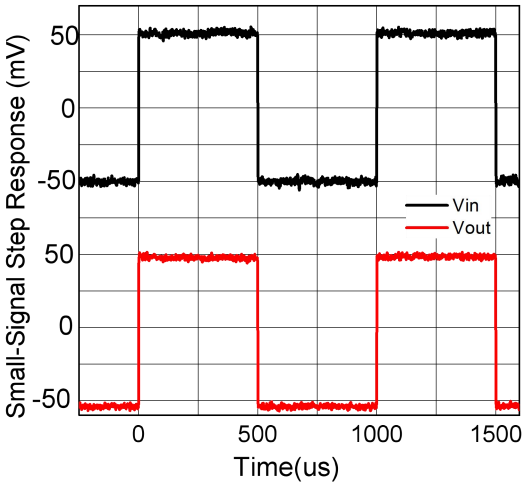
Slew Rate



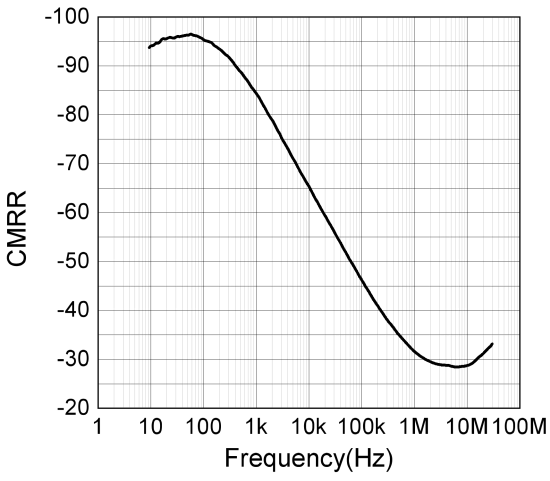
Large-Signal Step Response



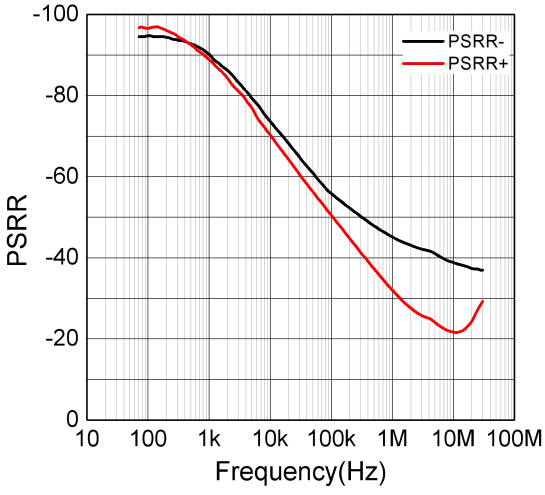
Small-Signal Step Response



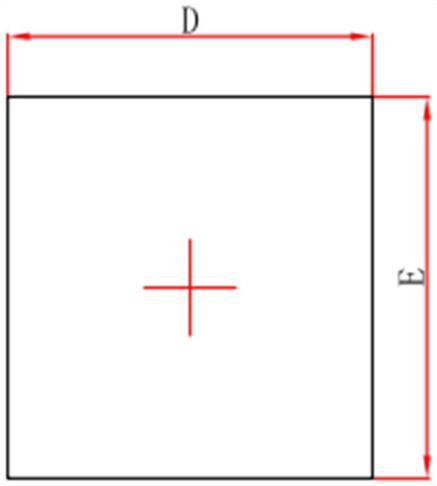
CMRR vs. Frequency



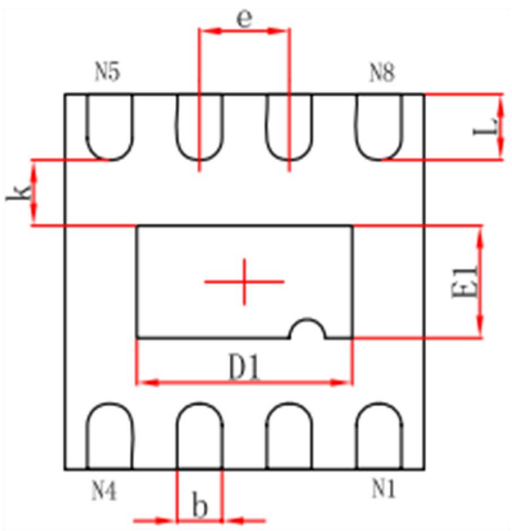
PSRR vs. Frequency



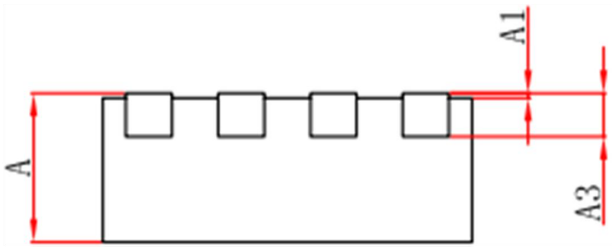
PACKAGE OUTLINE DIMENSIONS



TOP VIEW



BOTTOM VIEW

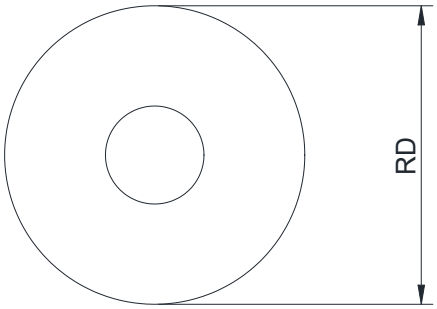


SIDE VIEW

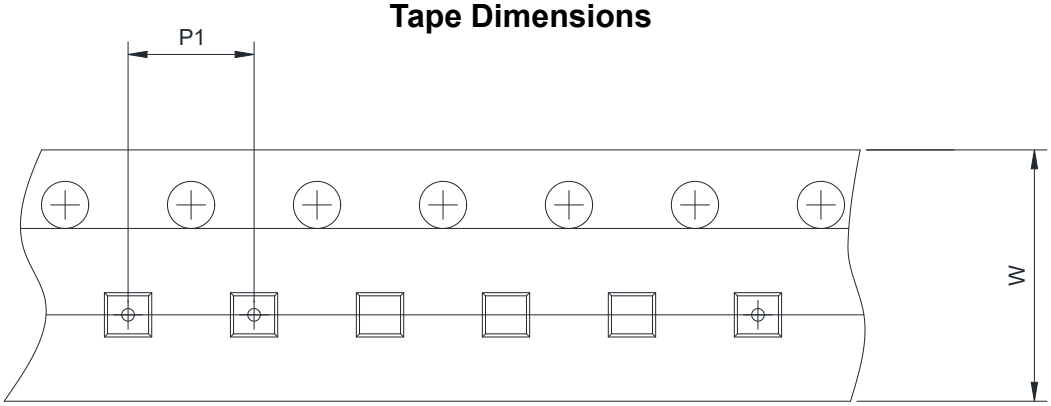
Symbol	Dimensions In Millimeters (mm)		
	Min.	Typ.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.20REF.		
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	2.20	2.30	2.40
E1	1.40	1.50	1.60
k	0.175	0.275	0.375
b	0.20	0.25	0.30
e	0.55	0.65	0.75
L	0.375	0.475	0.575

TAPE AND REEL INFORMATION

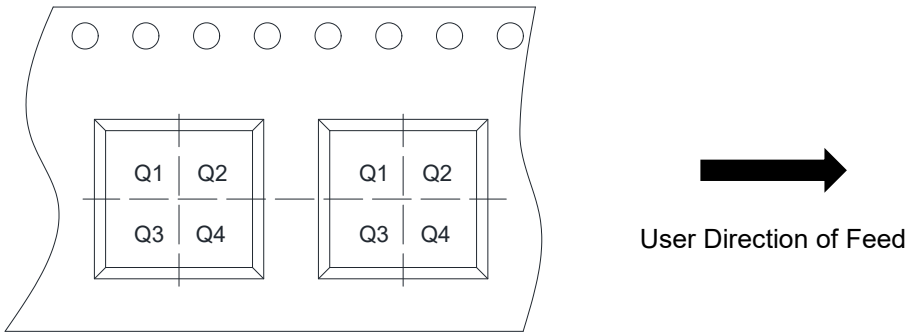
Reel Dimensions



Tape Dimensions



Quadrant Assignments For PIN1 Orientation In Tape



RD	Reel Dimension	☐ 7inch ☑ 13inch
W	Overall width of the carrier tape	☐ 8mm ☑ 12mm
P1	Pitch between successive cavity centers	☐ 2mm ☐ 4mm ☑ 8mm
Pin1	Pin1 Quadrant	☑ Q1 ☐ Q2 ☐ Q3 ☐ Q4

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