

General Description

The D8541(single), D8542(dual) and D8544(quad) are rail-to-rail input and output voltage feedback amplifiers offering low cost. They have a wide input common-mode voltage range and output voltage swing, and take the minimum operating supply voltage down to 1.8V and the maximum recommended supply voltage is 5.5 V. All are specified over the extended -40°C to $+125^{\circ}\text{C}$ temperature range.

The D8541/2/4 provide 1MHz bandwidth at a low current consumption of 40 μ A per amplifier. Very low input bias currents of 10pA, enable D8541/2/4 to be used for integrators, photodiode amplifiers, and piezoelectric sensors. Rail-to-rail inputs and outputs are useful to designers buffering ASIC in single-supply systems.

Applications for the series amplifiers include safety monitor, portable equipment, battery and power supply control, and signal conditioning and interfacing for transducers in very low power systems

The D8541 is available in SOT23-5 and SOP8 package.

The D8542 is available in SOP8, MSOP8 and TSSOP8 package.

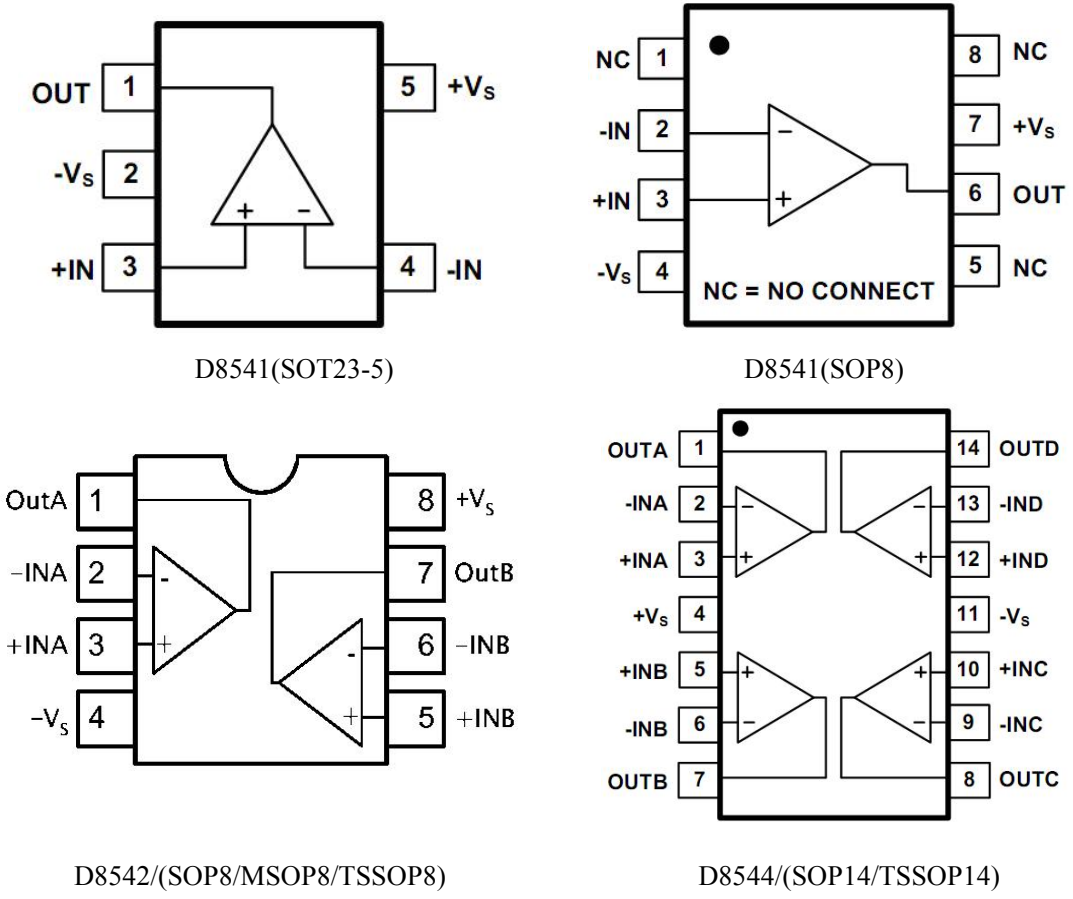
The D8544 is available in SOP14 and TSSOP14 package.



Features

- Low Cost
- Rail-to-Rail Input and Output
- Input Offset Voltage: 0.8mV(Type)
- Unity Gain Stable
- Gain Bandwidth Product: 1MHz
- Very Low Input Bias Currents: 10pA
- Operates on 1.8 V to 5.5 V Supplies
- Input Voltage Range: -0.1 V to +5.6 V with $V_S = 5.5\text{ V}$
- Low Supply Current: 40 μ A/Amplifier

Block Diagram and Pin Configuration



Package Information

Part No.	Package Description	Package Marking	Package Option
D8541	SOT23-5	D8541 SXXXX	3000/Reel
D8541	SOP8	CHMC D8541 SXXXX	4000/Reel 100/Tube
D8542	SOP8/MSOP8/TSSOP8	CHMC D8542 SXXXX	4000/Reel 100/Tube
D8544	SOP14	CHMC SXXXX D8544	50/Tube 4000/Reel
D8544	TSSOP14	CHMC D8544 SXXXX	60/Tube 3000/Reel

CHMC:Trademark D8541/D8542/D8544:Part NO. SXXXX:Lot NO.

Recommended Operating Conditions

Parameter	Min	Max	Unit
Operating Temperature Range	-40	+125	°C
Power Supply Operating Range	1.8	5.5	V

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power Supply Voltage	0	+7.5	V
Maximum Junction Temperature		+160	°C
Input Voltage Range	-V _S -0.5	+V _S +0.5	V
Operating Temperature Range	-40	+125	°C
Storage Temperature Range	-65	+150	°C
Lead Temperature, 10 seconds		+260	°C

Electrical Characteristics (V_S=5V, R_L=100kΩ to V_S/2, V_{Out}=V_S/2; unless otherwise noted)

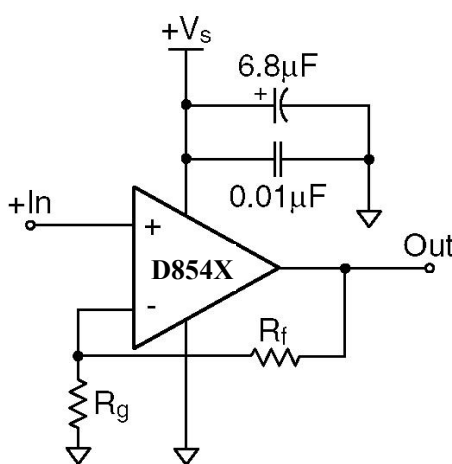
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
AC Performance						
Gain Bandwidth Product	GBP	C _L =100pF		1.0		MHz
Phase Margin	PM			52		Deg
Gain Margin	GM			17		dB
Slew Rate	SR	V _O =1V _{pp}		0.52		V/μs
Input Voltage Noise	e _n	>50kHz		36		nV/Hz
DC Performance						
Input Offset Voltage	V _{OS}			±0.8	±3.0	mV
Input Bias Current	I _B			10		pA
Input Offset Current	I _{OS}			10		pA
Power Supply Rejection Ratio	PSRR	V _S =+2.5V~+5.5V	60	82		dB
Supply Current (per)	I _Q			40	90	μA
Input Characteristics						
Input Common Mode Voltage Range	V _{CM}	V _S =5.5V	-0.1		5.6	V
Common Mode Rejection Ratio	CMRR	V _S =5.5V V _O =0.1~4.9V	56	68		dB
Output Characteristics						
Output Voltage Swing from Rail	V _O	R _L =100kΩ		0.008		V
Output Current	I _S	R _L =100kΩ	20	23		mA

Application Summary

Data Sheet

The D8541/2/4 family are single supply, general purpose, voltage-feedback amplifiers that are pin-for-pin compatible and drop in replacements with other industry standard D8541/2/4 amplifier. The D8541/2/4 is fabricated on a CMOS process, features a rail-to-rail output, and is unity gain stable.

The typical non-inverting circuit schematic is shown in Figure below:



Typical Non-inverting configuration

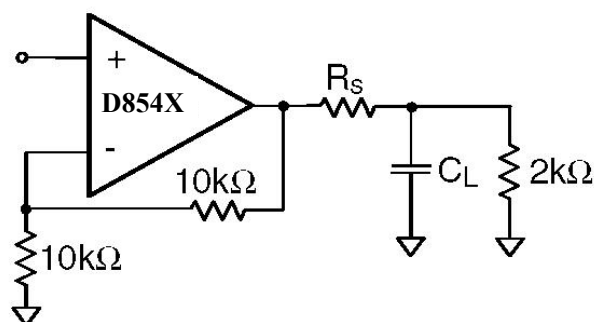
Power Dissipation

The maximum internal power dissipation allowed is directly related to the maximum junction temperature. If the maximum junction temperature exceeds 150°C , some performance degradation will occur. If the maximum junction temperature exceeds 175°C for an extended time, device failure may occur.

Driving Capacitive Loads

The Frequency Response vs C_L plot illustrates the response of the D8541/2/4. A small series resistance (R_s) at the output of the amplifier, illustrated in Figure below, will improve stability and settling performance. R_s values in the Frequency Response vs C_L plot were chosen to achieve maximum bandwidth with less than 1dB of

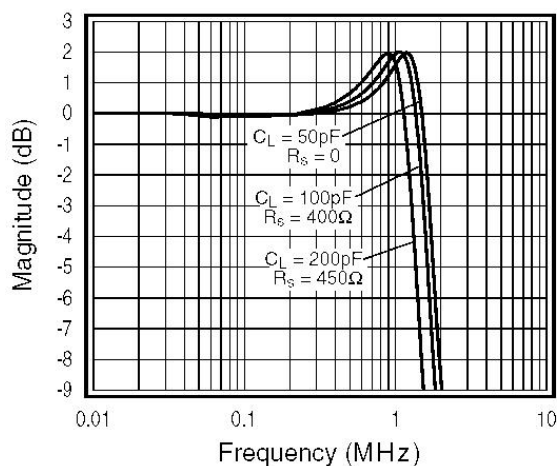
peaking. For maximum flatness, use a larger R_s . As the plot indicates, the D8541/2/4 family can easily drive a



200pF capacitive load without a series resistance.

Driving a capacitive load introduces phase-lag into the output signal, which reduces phase margin in the amplifier. The unity gain follower is the most sensitive configuration.

The response is illustrated in Figure below:



Frequency Response vs C_L for unity gain configuration

Layout Considerations

General layout and supply bypassing play major roles in high frequency performance. Follow the steps below as a basis for high frequency layout:

- Include 6.8 μF and 0.01 μF ceramic capacitors
- Place the 6.8 μF capacitor within 0.75 inches of the power pin
- Place the 0.01 μF capacitor within 0.1 inches of the power pin
- Remove the ground plane under and around the part, especially near the input and output pins to reduce parasitic capacitance
- Minimize all trace lengths to reduce series inductances

Outline Dimensions

SOT23-5

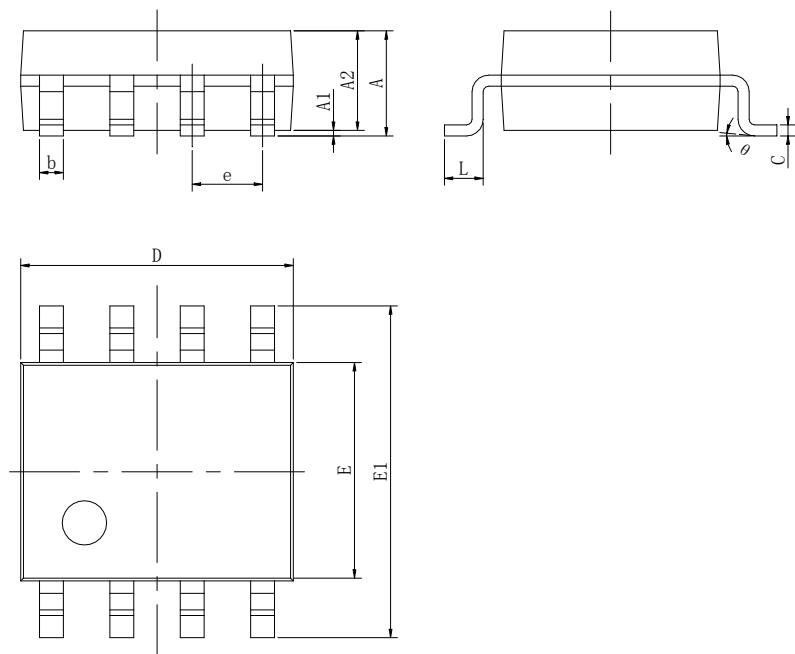
Unit: mm

The diagram illustrates the SOT23-5 package dimensions in three views: top, side, and front. The top view shows a rectangular package with a central square pad and four corner pads. Dimensions include D (total width), E (total height), E1 (height to the top of the corner pads), b (width of the corner pads), e (pitch between pads), and e1 (pitch between pads including the central pad). The side view shows the package profile with dimensions A (maximum height), A1 (height of the central pad), A2 (height of the corner pads), L (length of the lead), H (height of the lead), and C (width of the lead). The front view shows the package with a central square pad and four corner pads, with dimensions D, E, and E1.

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.130	0.000	0.005
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.95 (BSC)		0.037(BSC)	
e1	1.90 (BSC)		0.075(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOP8

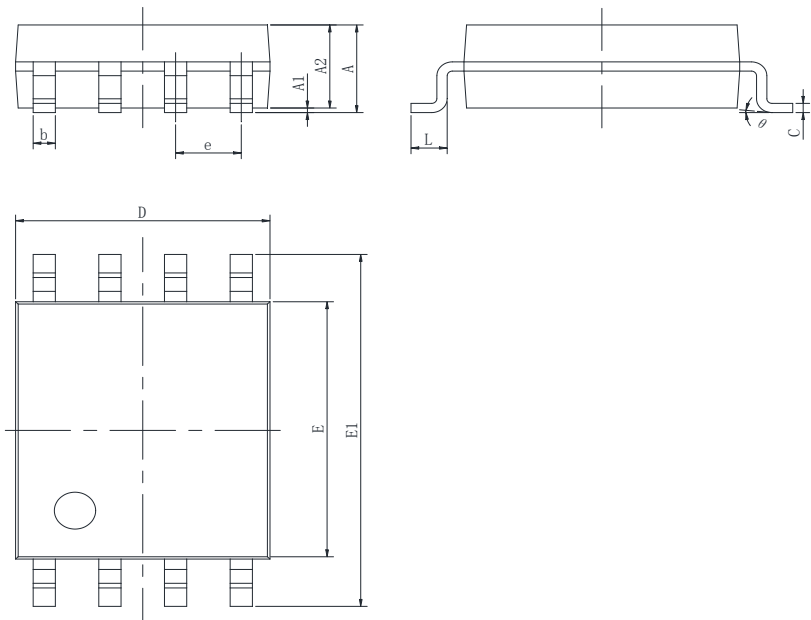
Unit: mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.000	0.250	0.000	0.010
A2	1.250	1.550	0.053	0.061
b	0.300	0.510	0.011	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

MSOP8

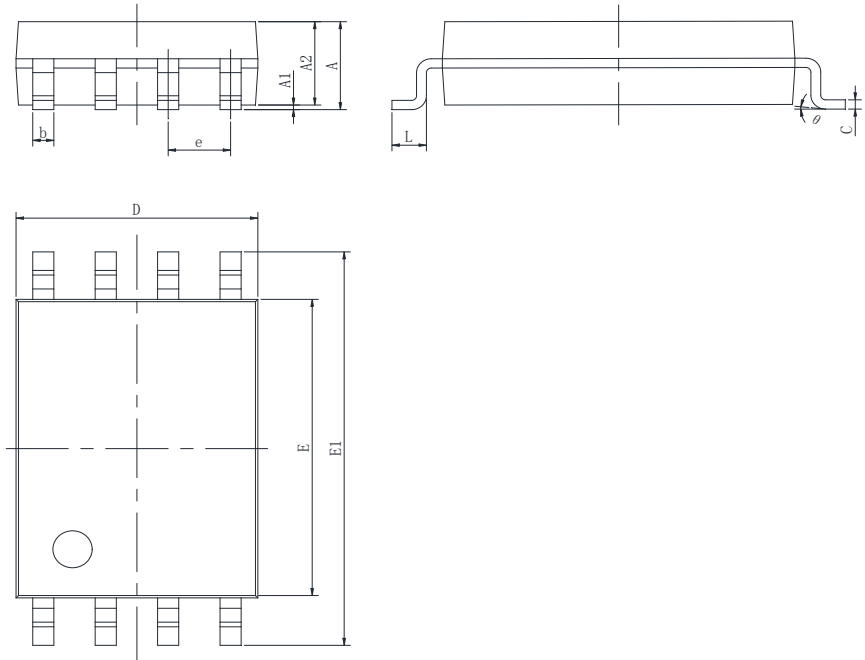
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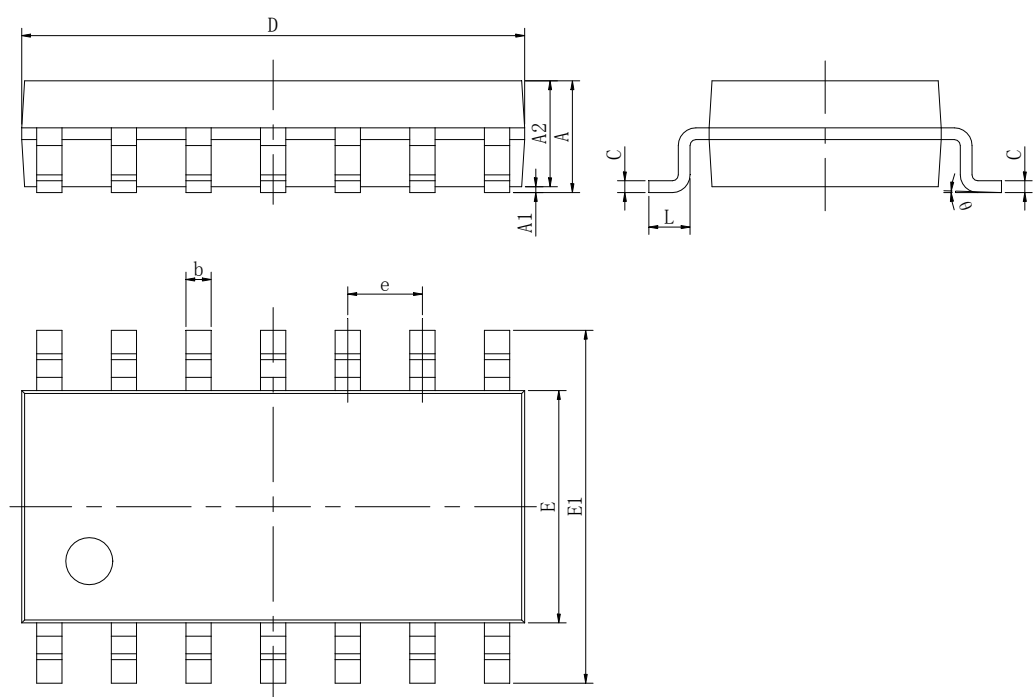
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650(BSC)		0.026(BSC)	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

TSSOP8

Unit: mm



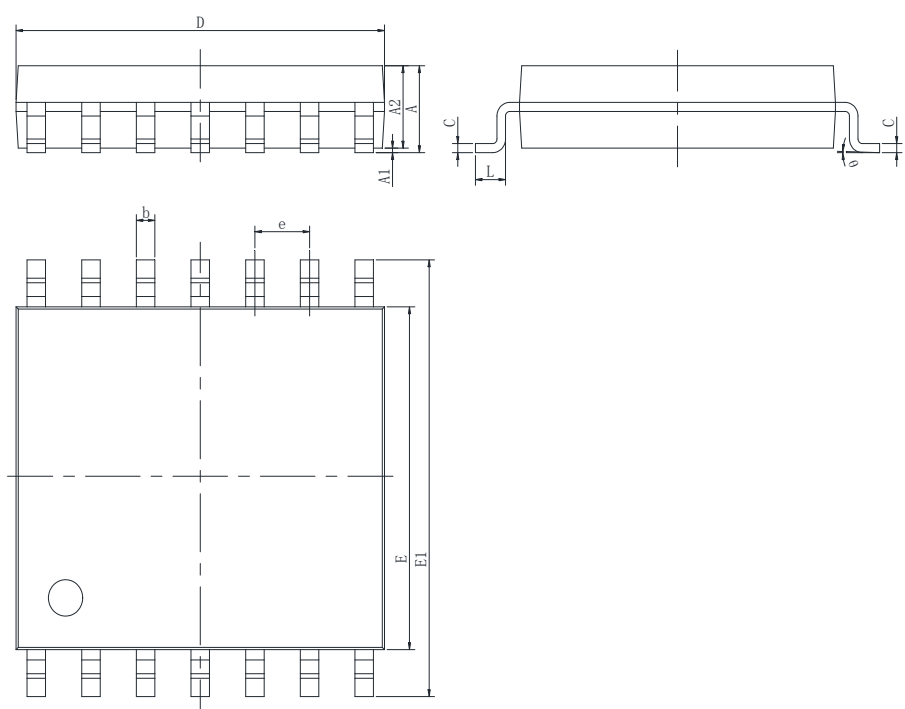
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.100		0.043
A1	0.020	0.150	0.001	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	2.900	3.100	0.114	0.122
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
θ	0°	8°	0°	8°



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	8.360	8.760	0.329	0.345
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TSSOP14

Unit: mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.900	1.050	0.035	0.041
b	0.200	0.280	0.007	0.011
c	0.130	0.170	0.005	0.006
D	4.900	5.100	0.192	0.200
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.259
e	0.650(BSC)		0.025(BSC)	
L	0.450	0.750	0.017	0.029
θ	0°	8°	0°	8°

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