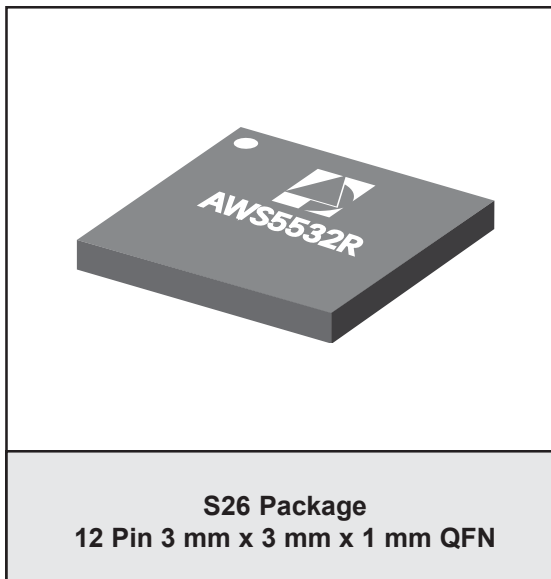


**FEATURES**

- Low Insertion Loss: 0.4 dB at 2 GHz
- High Isolation: >25 dB
- High Input P0.1 dB: +40.5 dBm
- Low Control Voltage Operation
- Low Profile Surface Mount Package
- RoHS Compliant Package, 260 °C MSL-1

**APPLICATIONS**

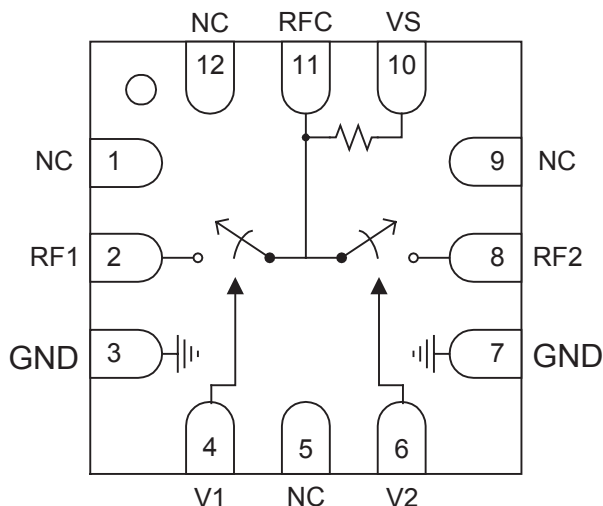
- Automotive Telematic Applications
- GSM Wireless Handsets and Front-end Modules
- CDMA Wireless Handsets and Front-end Modules



**PRODUCT DESCRIPTION**

The AWS5532R is a single pole, double throw (SPDT) RF switch developed for applications requiring very low distortion at high input drive levels. Manufactured in ANADIGICS's state-of-the-art pHEMT process, the device uses patented circuit topologies

to provide low insertion loss, high port-to-port isolation, and high linearity performance. The AWS5532R is offered in a 12-lead 3 mm x 3 mm x 1 mm QFN package.



**Figure 1: Block Diagram**

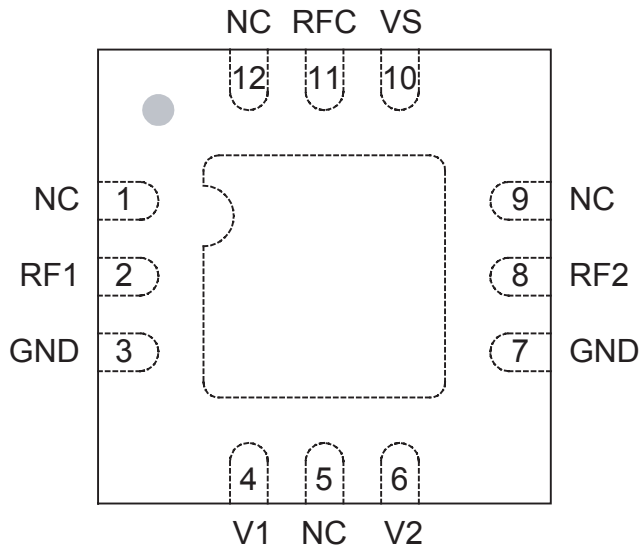


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION
2	RF1	RF Port, Path 1
4	V1	Control Voltage, RF Path 1
6	V2	Control Voltage, RF Path 2
8	RF2	RF Port, Path 2
10	VS	Common Port Bias Voltage (logic high)
11	RFC	RF Common Port
3,7	GND	Ground
1, 5, 9, 12	NC	No Connection <sup>(1)</sup>

Notes:

(1) Pins 1, 5, 9 and 12 are not connected in the package. Recommend pins be grounded, but is not necessary.

## ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Control Voltages ( $V_1$ , $V_2$ , $V_S$ ) <sup>(1)</sup>	-	+10.0	V
RF Input Power ( $P_{IN}$ ) <sup>(2)</sup>	-	15	W
Storage Temperature ( $T_{STG}$ )	-65	+150	°C

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Notes:

(1)  $V_S$  port may remain open without damage to the device.

(2) at RF1, RF2, and RFC

Table 3: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
RF Frequency (f)	0.5	-	2.5	GHz	
Common Port Bias Voltage ( $V_S$ )	-	<sup>(1)</sup>	-	-	applied at VS port (Pin 10)
Control Voltages ( $V_1$ , $V_2$ )	-0.2 +2.5	- -	+0.2 +5	V	RF path OFF state RF path ON state
Ambient Temperature ( $T_A$ )	-40	-	+85	°C	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Notes:

(1) The Common Port Bias Voltage ( $V_S$ ) is not required for normal operation, and can be left open. To operate the switch in an "all off" state (both  $V_1$  and  $V_2$  set to logic **LOW**), the logic **HIGH** voltage should be applied to this port. Under no circumstances should this port be grounded.

Table 4: ESD Ratings

PARAMETER	METHOD	RATING	UNIT
ESD Threshold Voltage (All Pins)	CDM <sup>(1)</sup>	1000 <sup>(2)</sup>	V
ESD Threshold Voltage (Supply pins only)	HBM <sup>(3)</sup>	400 <sup>(4)</sup>	V
ESD Threshold Voltage (Supply-Signal pins)	HBM	400	V
ESD Threshold Voltage (RF Signal pins only)	HBM	450	V
ESD Threshold Voltage (Antenna Common Port)	HBM <sup>(5)</sup>	12000 <sup>(6)</sup>	V

**Notes:**

- (1) Tested in conformance with JEDEC specification JESD22-C101-A
- (2) A CDM ESD threshold of this voltage classifies the device as a Class IV component per JEDEC JESD22-C101-A
- (3) Tested in conformance with ESD/EOS Society specification STM5.1-2001
- (4) A HBM ESD threshold at these voltages classifies the device as a Class 1A component per ESD/EOS Society Specification STM5.1-2001
- (5) This test was done in conformance with ESD/EOS Society HBM specification STM5.1-2001. 3000 ESD strikes were applied using multiple groups of 100 strikes each where the interval between strikes within a group is 1 second and the interval between groups is 30 seconds.
- (6) This voltage rating **REQUIRES** the use of an inductor as an RF choke as defined in Note #3 in the application circuit information. This rating has been tested with inductor values of 47nH and 100nH.

**Table 5: Electrical Specifications**

( $T_A = +25\text{ }^\circ\text{C}$ , RF ports terminated with  $50\ \Omega$ ,  $V_n = +3.0\ \text{V}$  and is the Control Voltage for the ON path, RFC-RF $_n$ ;  $V_x = 0\ \text{V}$  and is the Control Voltage for the other OFF path, RFC-RF $_x$ )

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Insertion Loss 1 GHz 2 GHz	- -	0.30 0.40	0.5 0.6	dB	RFC port to selected RF $_n$ port
Return Loss <sup>(1)</sup> 1 GHz 2 GHz	- -	24 22	20 18	dB	RFC port and selected RF $_n$ port
Isolation 1 GHz 2 GHz	27 25	30 27	- -	dB	RFC port to isolated RF $_x$ port
Input Third Order Intercept <sup>(2)</sup> 824 - 849 MHz	+68	+71	-	dBm	RFC port to selected RF $_n$ port
Input Power for 0.1 dB Compression 824 - 849 MHz	+39	+40.5	-	dBm	
Current Consumption	-	-	50	$\mu\text{A}$	each $V_n$ port

Notes:

(1) Isolated RF $_x$  ports have a return loss of approximately -3 dB.

(2) Two tones with PIN = +27 dBm each, 1 MHz channel spacing.

**Table 6: Switch Control Truth Table**

CONTROL VOLTAGE		RF PATH SELECTION	
$V_1$	$V_2$	RFC - RF1	RFC - RF2
+2.5 to +5 V	-0.2 to +0.2 V	ON	OFF
-0.2 to +0.2 V	+2.5 to +5 V	OFF	ON

PERFORMANCE DATA

Figure 3: Insertion Loss vs. Frequency  
(ON Path,  $V_n = +3.0\text{ V}$ ,  $V_x = 0\text{ V}$ )

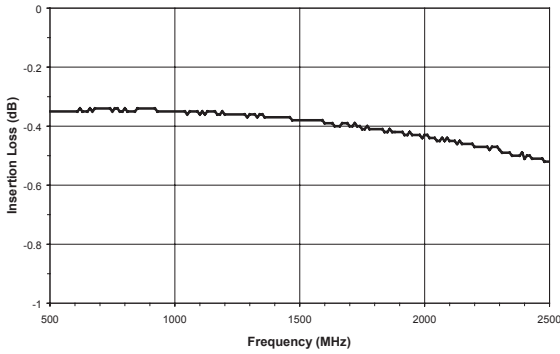


Figure 4: Insertion Loss vs. Temperature  
( $V_n = 3.0\text{ V}$ ,  $F = 836\text{ MHz}$ )

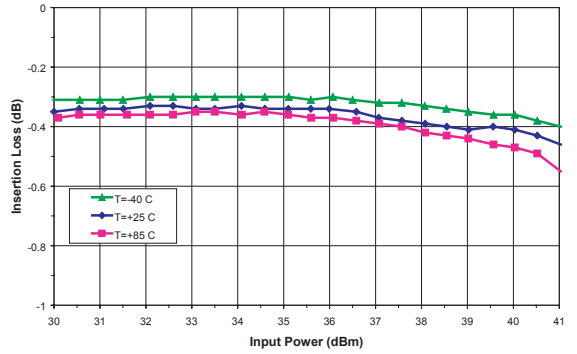


Figure 5: Return Loss vs. Frequency  
(ON Path,  $V_n = +3.0\text{ V}$ ,  $V_x = 0\text{ V}$ )

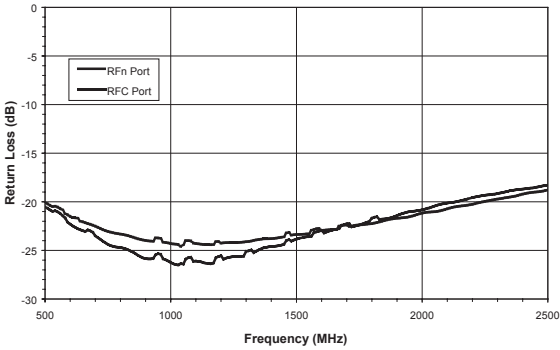


Figure 6: Compression vs. Temperature  
( $V_n = 3.0\text{ V}$ ,  $F = 836\text{ MHz}$ )

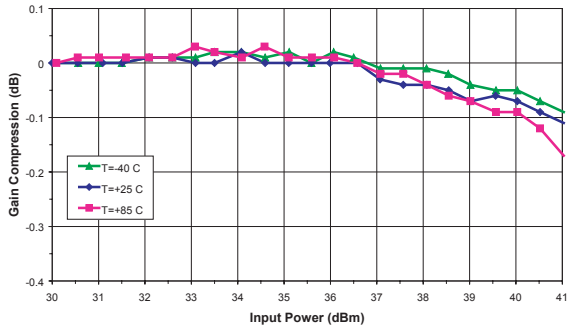


Figure 7: Isolation vs. Frequency  
(OFF Path,  $V_n = +3.0\text{ V}$ ,  $V_x = 0\text{ V}$ )

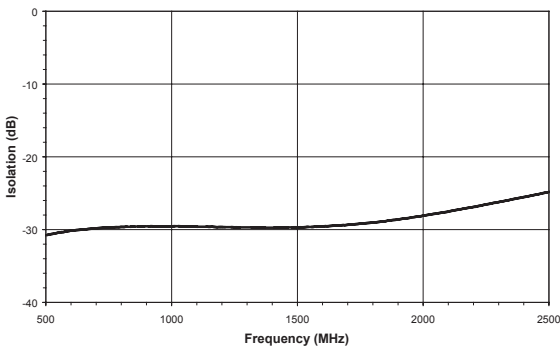
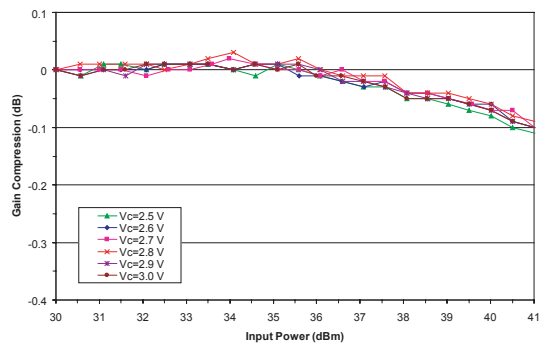


Figure 8: Compression vs.  $V_{\text{CONTROL}}$   
( $V_S = V_n$ ,  $F = 836\text{ MHz}$ )



## APPLICATION INFORMATION

## Circuit Applications

External component requirements for the AWS5532R are shown in Figure 9. Application details are listed in the following notes:

1.  $C_b$  are DC blocking capacitors external to the device. A value of 100 pF is sufficient for operation to 500 MHz. The values may be tailored to provide specific electrical responses.
2. The RF Ground connections should be kept as short as possible and tied directly to a good RF ground for best broadband performance.
3.  $L_{ESD}$  provides a means to increase the ESD protection on a specific RF port, typically the port attached to the antenna. By using  $L_{ESD}$  as an RF choke on an RF port, an ESD protection to  $\pm 12$  kV contact discharge has been demonstrated.
4. The VS pin provides a fixed voltage potential to the common port of the switch, and is not required for normal operation (can be left open). To operate the switch in an "all off" state ( $V1 = V2 =$  logic low), VS should be tied to the logic high voltage potential (not the power supply). Current draw on this pin is less than 5  $\mu$ A.

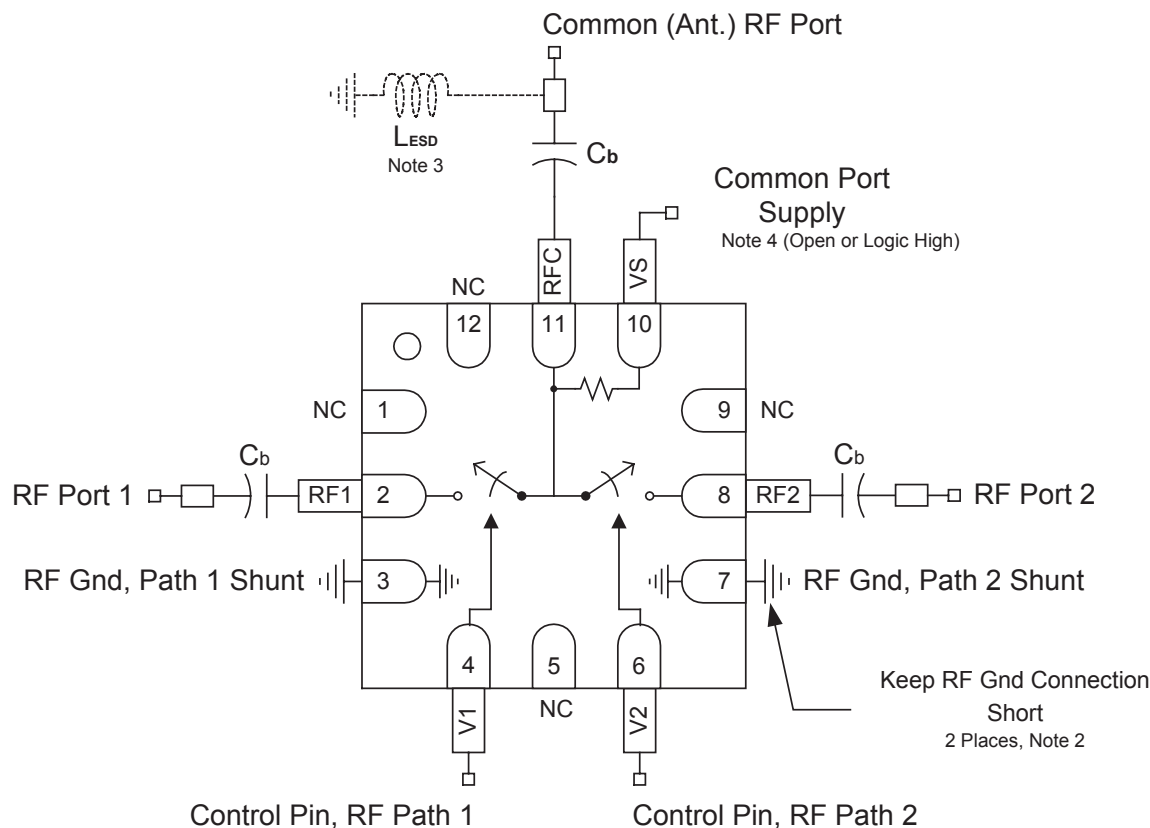
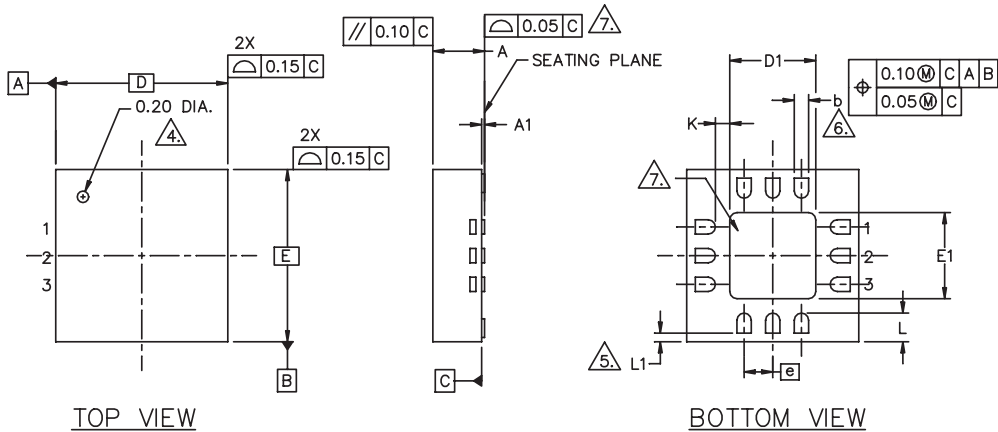
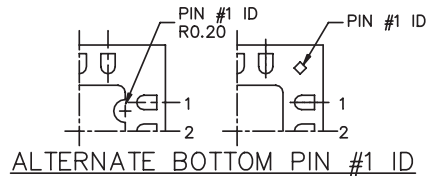


Figure 9: Application Schematic

PACKAGE OUTLINE



NOTES :

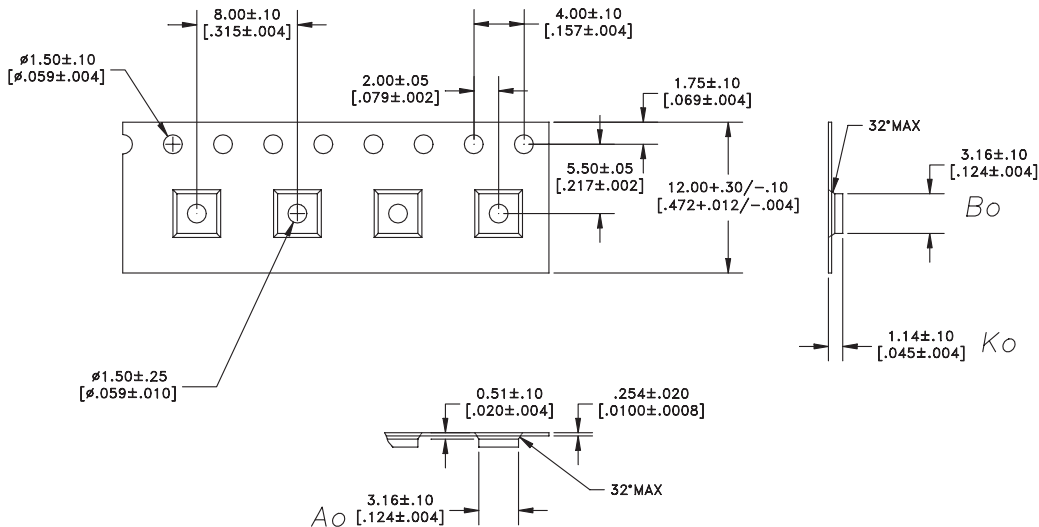
1. ALL DIMENSIONS ARE IN MILLIMETERS.
  2. MAX. PACKAGE WARPAGE IS 0.05 mm.
  3. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
- ④ PIN #1 ID ON TOP WILL BE LASER MARKED.
  - ⑤ A MAXIMUM 0.15mm PULL BACK (L1) MAYBE PRESENT. L MINUS L1 TO BE EQUAL TO OR GREATER THAN 0.30mm.
  - ⑥ DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
  - ⑦ BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
  - 8. REFERENCE JEDEC OUTLINE MO-220.

SYMBOL	DIMENSIONS—MM		SYMBOL	DIMENSIONS—INCHES	
	MIN.	MAX.		MIN.	MAX.
A	0.80	1.00	A	0.031	0.039
A1	0.00	0.05	A1	0.000	0.001
b	0.18	0.30	b	0.007	0.011
D	3.00 BSC		D	0.118 BSC	
D1	1.30	1.70	D1	0.051	0.067
E	3.00 BSC		E	0.118 BSC	
E1	1.30	1.70	E1	0.051	0.067
ⓐ	0.50 BSC		ⓐ	0.019 BSC	
K	0.20 MIN.		K	0.007 MIN.	
L	0.35	0.55	L	0.014	0.022
L1	0.15 MAX.		L1	0.006 MAX.	

Figure 10: S26 Package Outline - 12 Pin 3 mm x 3 mm x 1 mm QFN



COMPONENT PACKAGING



NOTES:

1. MATERIAL: 3000 (CARBON FILLED POLYCARBONATE)  
100% RECYCLABLE.

Figure 11: Tape & Reel Packaging

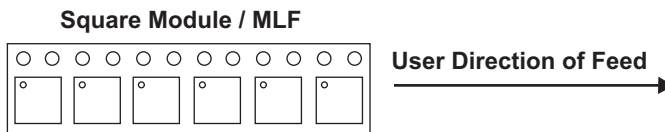


Figure 12: Tape & Reel Package Orientation

Table 7: Tape & Reel Dimensions

PACKAGE TYPE	TAPE WIDTH	POCKET PITCH	REEL CAPACITY	MAX REEL DIA
3 mm x 3 mm x 1 mm	12 mm	8 mm	1000	7"



NOTES

## ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AWS5532RS26Q1	-40 °C to +85 °C	RoHS Compliant 12 Pin QFN 3 mm x 3 mm x 1 mm	Tape and Reel, 1000 pieces per Reel

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