VOLTAGE MONITOR/WATCHDOG TIMER CIRCUIT ICS9WDV3501B

General Description:

The 9WDV3501 contains 5 voltage monitoring (VMON) comparators and a watchdog timer circuit. The external voltage monitor inputs have a reset threshold of approximately 1.0V. Various power supplies can easily be monitored with these inputs by use of a simple resistor ladder to divide the supply rail down to 1.0V.

There are two RESET# outputs. RESET0# is typically connected to a microprocessor, while RESET1# is typically connected to peripheral components.
If any of the VMON inputs drops outside the desired operating range, both RESET# outputs will be asserted simultaneously. They will stay low as long as VMON is below the threshold. After VMON rises above the threshold, RESET0# will begin its timeout count down and return high after the count down expires. The count down period depends on the value on the RST0_DLY(1:0) pins. The minimum value is 50ms and the maximum value is 300ms. When RESET0# is de-asserted, the RESET1# output will continue to be asserted for an additional count down period.

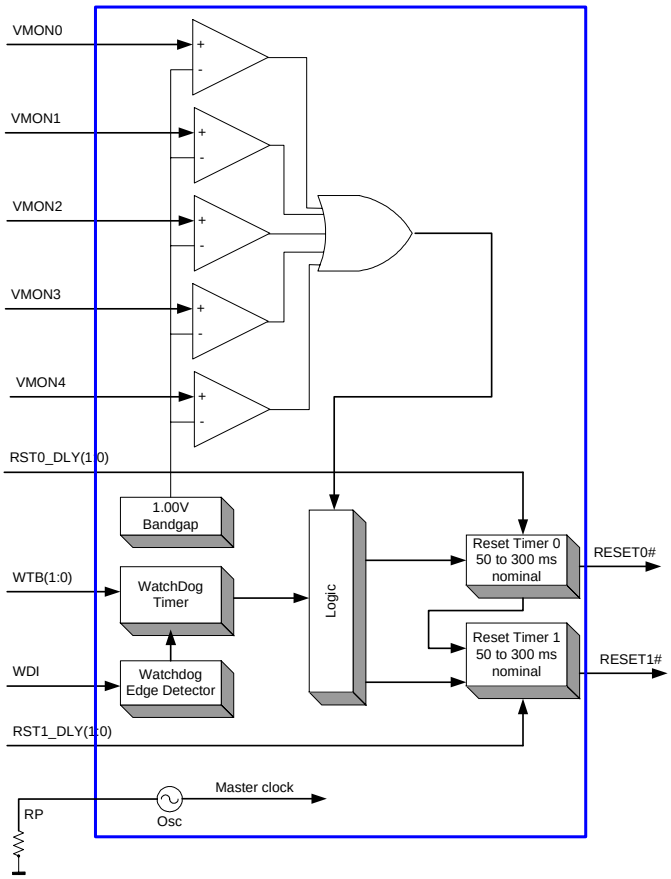
The RESET1# count down period is set by the RST1_DLY(1:0) inputs. The *additional* delay can range from 50ms to 300ms. This additional reset is designed to hold the peripheral circuits in reset after the microprocessor has been released from reset. The VMON circuitry can continue to operate until VDD drops below 2.3V.

The watchdog timer monitors transitions on the WDI input. This input is usually driven by a GPIO line from a microprocessor and is used to detect when the CPU has entered an infinite loop. If a transition on the WDI input is not detected within the watchdog time out period, both RESET# outputs will be asserted and will be as described in the previous paragraph. The watchdog timer is restarted when RESET1# goes inactive. The watchdog time out period is selectable using the WTB(1:0) inputs. The watchdog can be disabled by pulling the WDI_EN pin low.

The 9WDV3501 incorporates a precision RC oscillator that utilized an external trimming resistor for maximum accuracy. The recommend value for this resistor is 30KΩ.

The 9WDV3501 is available in both commercial and industrial temperature ranges. It is available in a 20-pin QFN or a 20-pin TSSOP package.

Functional Block Diagram



Features:

- 5 Precision Voltage Monitors:
- Watchdog Timer
- Selectable Watchdog and Reset Timing
- Two Active Low reset outputs
- Precision Timebase with external trim resistor

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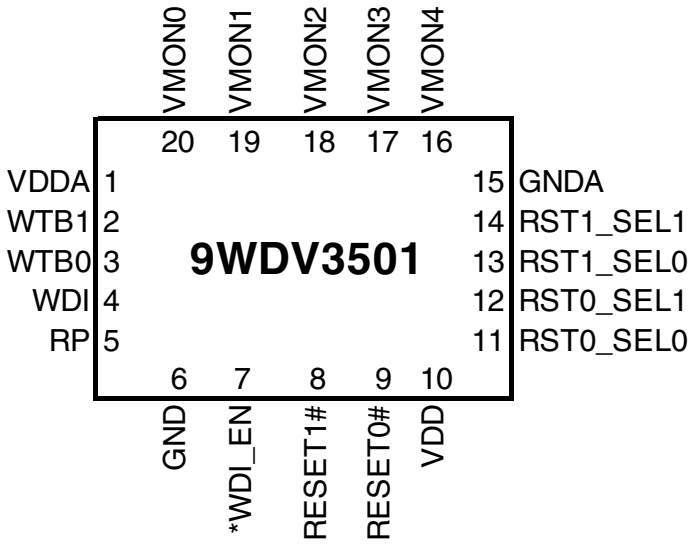
MLF Pin Configuration



20-pin MLF
pins preceded by '*' have 100kohm internal pull up.

MLF Pin Description

PIN # (MLF)	PIN NAME	PIN TYPE	DESCRIPTION
1	VDDA	PWR	3.3V Analog Power Supply
2	WTB1	IN	Watchdog timout select bit. (MSB)
3	WTB0	IN	Watchdog timout select bit. (LSB)
4	WDI	IN	Watchdog Input
5	RP	IN	Resistor connection for internal oscillator
6	GND	GND	Ground pin
7	*WDI_EN	IN	This input enables or disables the watchdog timer. 0 = Disable, 1 = Enable
8	RESET1#	OUT	RESET 1 output. Low = Reset, High = Normal Operation
9	RESET0#	OUT	RESET 0 output. Low = Reset, High = Normal Operation
10	VDD	PWR	3.3V Power Supply
11	RST0_SEL0	IN	RESET1 timeout period select (LSB)
12	RST0_SEL1	IN	RESET1 timeout period select (MSB)
13	RST1_SEL0	IN	RESET1 timeout period select (LSB)
14	RST1_SEL1	IN	RESET1 timeout period select (MSB)
15	GNDA	GND	Analog Ground
16	VMON4	IN	Voltage Monitor Input, nominal 1.0V threshold
17	VMON3	IN	Voltage Monitor Input, nominal 1.0V threshold
18	VMON2	IN	Voltage Monitor Input, nominal 1.0V threshold
19	VMON1	IN	Voltage Monitor Input, nominal 1.0V threshold
20	VMON0	IN	Voltage Monitor Input, nominal 1.0V threshold

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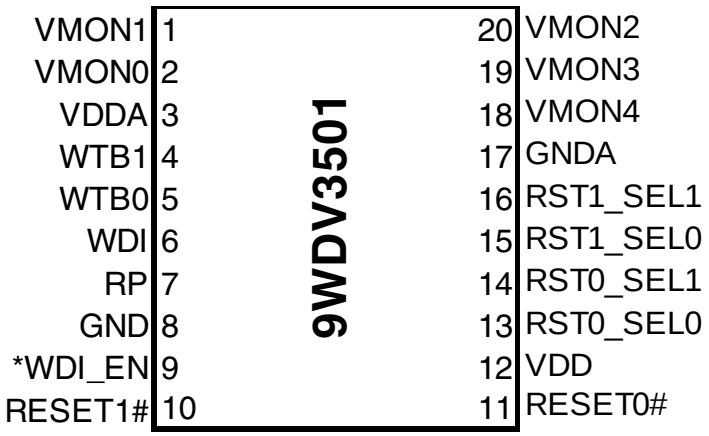
TSSOP Pin Configuration



20-pin TSSOP

pins preceded by '*' have 100kohm internal pull up.

TSSOP Pin Description

PIN # (TSSOP)	PIN NAME	PIN TYPE	DESCRIPTION
1	VMON1	PWR	Voltage Monitor Input, nominal 1.0V threshold
2	VMON0	IN	Voltage Monitor Input, nominal 1.0V threshold
3	VDDA	PWR	3.3V Analog Power Supply
4	WTB1	IN	Watchdog timout select bit. (MSB)
5	WTB0	IN	Watchdog timout select bit. (LSB)
6	WDI	IN	Watchdog Input
7	RP	IN	Resistor connection for internal oscillator
8	GND	GND	Ground pin
9	*WDI_EN	IN	This input enables or disables the watchdog timer. 0 = Disable, 1 = Enable
10	RESET1#	OUT	RESET 1 output. Low = Reset, High = Normal Operation
11	RESET0#	OUT	RESET 0 output. Low = Reset, High = Normal Operation
12	VDD	PWR	3.3V Power Supply
13	RST0_SEL0	IN	RESET1 timeout period select (LSB)
14	RST0_SEL1	IN	RESET1 timeout period select (MSB)
15	RST1_SEL0	IN	RESET1 timeout period select (LSB)
16	RST1_SEL1	IN	RESET1 timeout period select (MSB)
17	GNDA	GND	Analog Ground
18	VMON4	IN	Voltage Monitor Input, nominal 1.0V threshold
19	VMON3	IN	Voltage Monitor Input, nominal 1.0V threshold
20	VMON2	IN	Voltage Monitor Input, nominal 1.0V threshold

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Selectable WatchDog TimeOut
data latched at power on

WTB1	WTB0	Period (ms)
0	0	1.00
0	1	2.00
1	0	5.00
1	1	10.00

Selectable Reset 0 Assertion Period
data latched at power on

RST0_DLY1	RST0_DLY0	Assertion (ms)
0	0	50
0	1	100
1	0	200
1	1	300

Selectable Reset 1 Assertion Period
(Period AFTER Reset0 De-Asserts)
data latched at power on

RST1_DLY1	RST1_DLY0	Assertion (ms)
0	0	50
0	1	100
1	0	200
1	1	300

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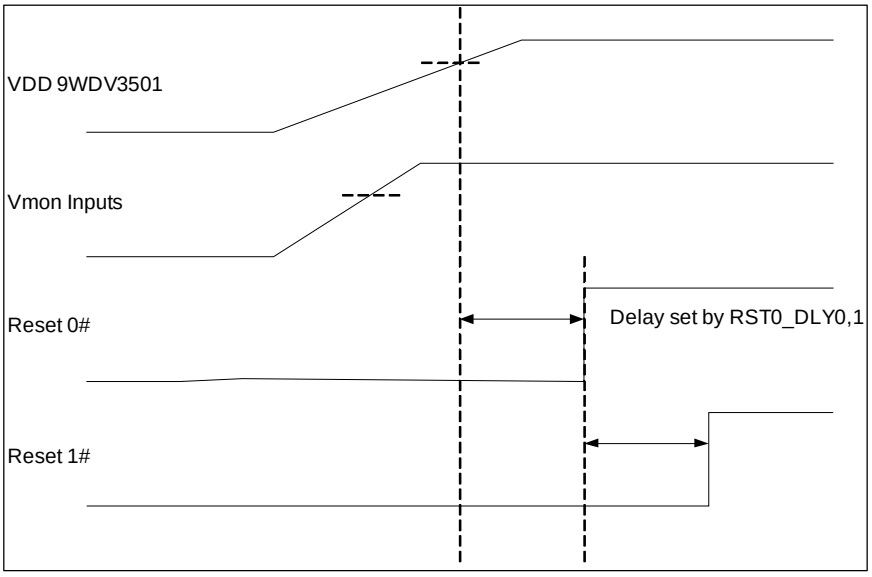

Fig 1. Power on Timing

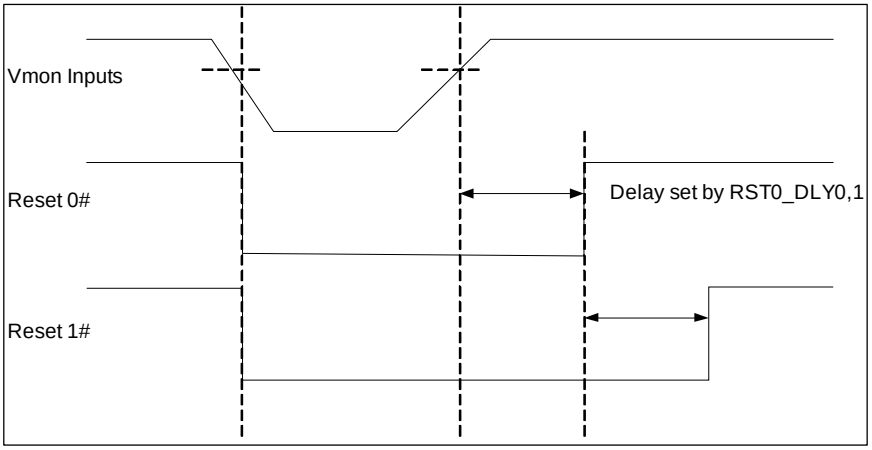

Fig. 2. Vmon Reset Event Timing

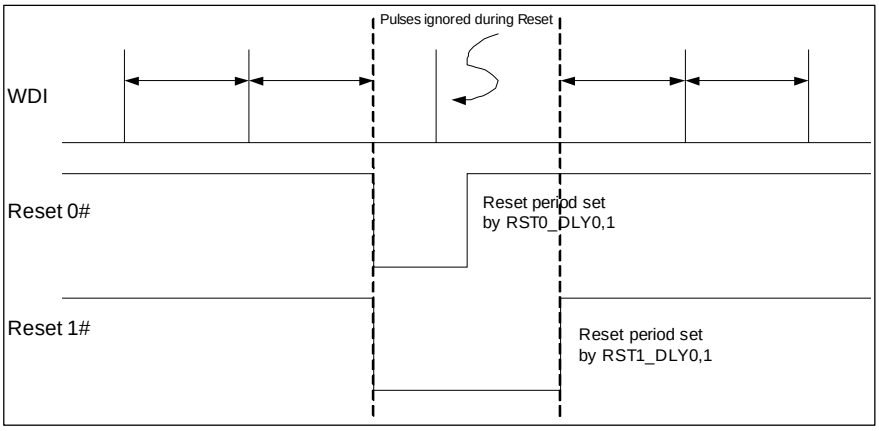

Fig. 3. Watch Dog Timer Reset Event Timing

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Absolute Maximum Ratings

(@ 25°C unless otherwise indicated)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
Maximum Supply Voltage	VDD	Supply Voltage			4.6	V	
Maximum Input Voltage	V_{MON}	3.3V LVCMOS Inputs	-0.3		VDD + 0.3	V	
Maximum Input Current	I_{IMAX}	VDD or GND			200	mA	
Maximum Output Current	I_{OMAX}	Digital Output			200	mA	
Maximum Power Dissipation Current	P_{DMAX}	Digital Output			500	mW	
Storage Temperature	Ts	-	-65		150	°C	
ESD protection	ESD prot	Human Body Model	2000			V	

Electrical Characteristics - Input/Supply/Common Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
Ambient Operating Temp	$T_{ambientC}$	Standard Part	0		70	°C	
	$T_{ambientI}$	Industrial Temp Version	-45		85	°C	
Operating Voltage	VDD	Supply Voltage	2.97	3.30	3.63	V	
Operating Supply Current	$I_{DD_3.3V}$	Iout = 1mA			2500	µA	
Input High Voltage	V_{IHSE}	All inputs except VMON	2		V_{DD} + 0.3	V	1
Input Low Voltage	V_{ILSE}	All inputs except VMON	GND - 0.3		0.8	V	1
Input Leakage Current	I_{IN}	$V_{IN} = V_{DD}$, V_{IN} = GND	-5		5	µA	

Electrical Characteristics - Reset, WDI and Watchdog Timer Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
VMON Input Threshold	V_{VMON}	VMON input	0.96	1.00	1.04	V	
VMON Input Hysteresis	$V_{VMONHYST}$	VMON input		50		mV	
Reset 0 & Reset 1 Timeout Delay	t_{RESET0}, t_{RESET1}	RST0_DLY(1:0) = 00	40	50	60	ms	3
		RST0_DLY(1:0) = 01	80	100	120	ms	3
		RST0_DLY(1:0) = 10	160	200	240	ms	3
		RST1_DLY(1:0) = 11	240	300	360	ms	3
Watchdog Timeout	WDT_{OUT}	WTB(1:0) = 00	0.80	1.00	1.20	ms	3
		WTB(1:0) = 01	1.60	2.00	2.40	ms	3
		WTB(1:0) = 10	4.00	5.00	6.00	ms	3
		WTB(1:0) = 11	8.00	10.00	12.00	ms	3
WDI Input Pulse Width	WDI_{PW}	V_{IL}= 0.4V, V_{IH} = 2.8V	100			ns	
Output High Voltage	V_{OH}	RESET outputs, Iout = 1mA	2,4			V	
Output Low Voltage	V_{OL}	RESET outputs, Iout = 16mA			0.7	V	
Input Leakage Current	I_{IN}	$V_{IN} = V_{DD}$, V_{IN} = GND	-5		5	µA	
TimeBase Frequency	F_{osc}	V_{DD} = 3.3 V, Rp = 30kΩ	0.8	1	1.2	MHz	3

1. WDI pulse width limited to 150ns with these input thresholds
2. VMON Falling
3. Values over the entire industrial temp range -40°C to +80°C

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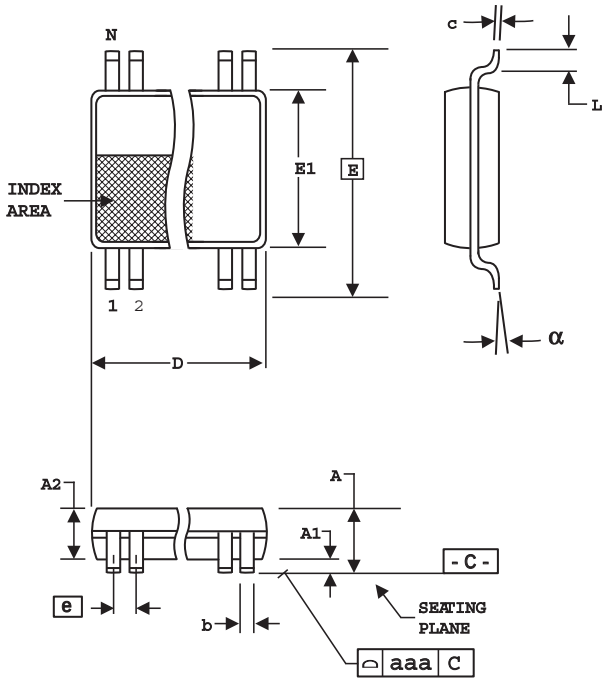

20-Lead, 4.40 mm. Body, 0.65 mm. Pitch TSSOP
(173 mil) (25.6 mil)

SYMBOL	In Millimeters COMMON DIMENSIONS		In Inches COMMON DIMENSIONS	
	MIN	MAX	MIN	MAX
A	--	1.20	--	.047
A1	0.05	0.15	.002	.006
A2	0.80	1.05	.032	.041
b	0.19	0.30	.007	.012
c	0.09	0.20	.0035	.008
D	SEE VARIATIONS		SEE VARIATIONS	
E	6.40 BASIC		0.252 BASIC	
E1	4.30	4.50	.169	.177
e	0.65 BASIC		0.0256 BASIC	
L	0.45	0.75	.018	.030
N	SEE VARIATIONS		SEE VARIATIONS	
a	0°	8°	0°	8°
aaa	--	0.10	--	.004

VARIATIONS

N	D mm.		D (inch)	
	MIN	MAX	MIN	MAX
20	6.40	6.60	.252	.260

Reference Doc.: JEDEC Publication 95, MO-153

10-0035

Ordering Information

9WDV3501BGLFT

Example:

XXXX B G LF T

- **Designation for tape and reel packaging**
- **Lead Free, RoHS Compliant**
- **Package Type**
  G = TSSOP
- **Revision Designator** (will not correlate with datasheet revision)
- **Device Type**

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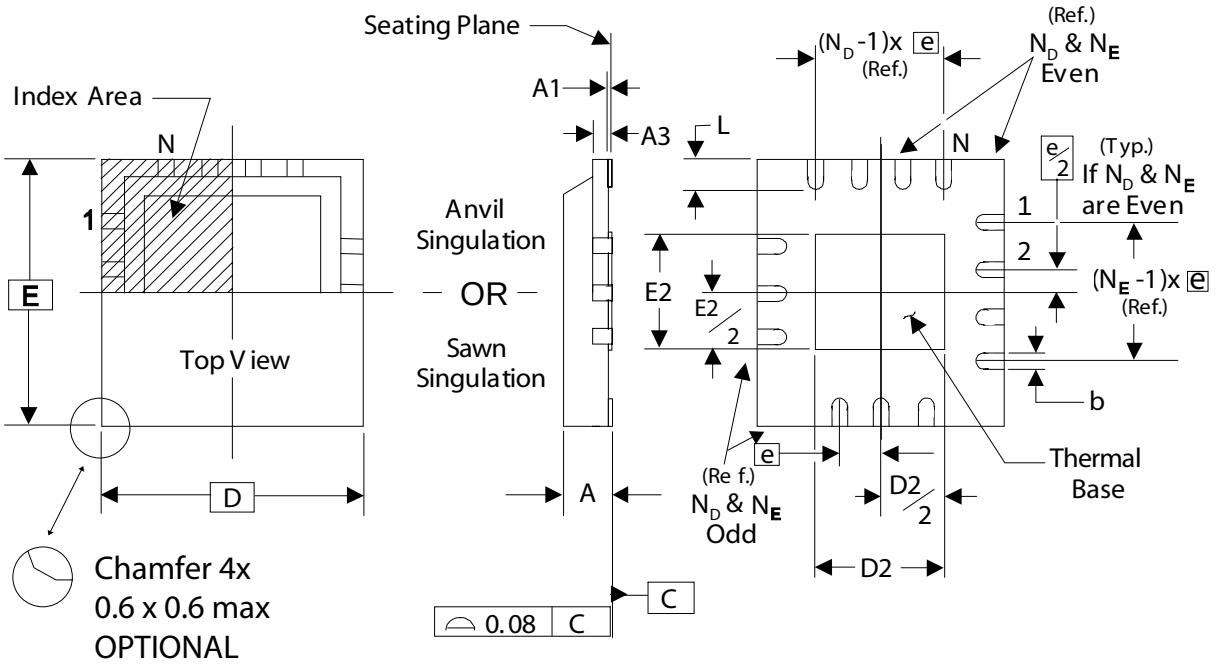

THERMALLY ENHANCED, VERY THIN, FINE PITCH
QUAD FLAT / NO LEAD PLASTIC PACKAGE

DIMENSIONS

SYMBOL	MIN.	MAX.
A	0.8	1.0
A1	0	0.05
A3	0.20 Reference	
b	0.18	0.3
e	0.50 BASIC	

DIMENSIONS

SYMBOL	ICS 20L TOLERANCE
N	20
N_D	5
N_E	5
D x E BASIC	4.00 x 4.00
D2 MIN. / MAX.	2.00 / 2.25
E2 MIN. / MAX.	2.00 / 2.25
L MIN. / MAX.	0.45 / 0.65

Ordering Information

9WDV3501BKLFT

Example:

XXXX B K LF T

- **Designation for tape and reel packaging**
- **Lead Free, RoHS Compliant**
- **Package Type**
  K = MLF
- **Revision Designator** (will not correlate with datasheet revision)
- **Device Type**

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Revision History

Rev.	Issue Date	Description	Page #
x.1	5/30/2008	Rev B to change times to match customer specs	-

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