

GENERAL DESCRIPTION

ASPL1701 series is a group of positive voltage output 3-terminal linear regulator, capable of delivering 150mA current and working under 40V input voltage. It also features extremely low standby current which is only 5uA, while still keeps very fast load transient response capability. With the extremely low 5uA standby current, ASPL1701 can greatly improve natural life of batteries.

ASPL1701 includes high accuracy voltage reference, error amplifier, and current limit circuit and output driver module. ASPL1701 has well load transient response and good temperature characteristic. And it uses trimming technique to guarantee output voltage accuracy within $\pm 2\%$. ASPL1701 can provide 3.0V, 3.3V, 3.6V, 5.0V, 9.0V, 12V output value. It also can be customized on command. ASPL1701 is housed in 2 different types of packages, which are SOT23-3 and SOT89-3.

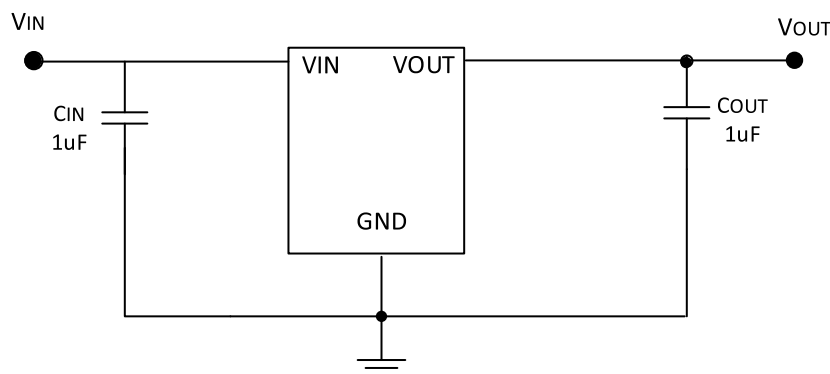
FEATURES

- Low Power Consumption: 5.0uA (Typ.)
- Maximum Output Current: 150mA
- Small Dropout Voltage
- 740mV@100mA (VOUT=3.3V)
- 1300mV@150mA (VOUT=3.3V)
- Input Voltage Range: 3V~40V
- Output Voltage Range: 3.0V, 3.3V, 3.6V, 5.0V, 9.0V, 12V
- Highly Accuracy: $\pm 2\%$
- Current Limit and Short Protection
- Over Temperature Protection

APPLICATION

- Wearables
- Toys
- Smart Home Application
- Battery Powered equipment

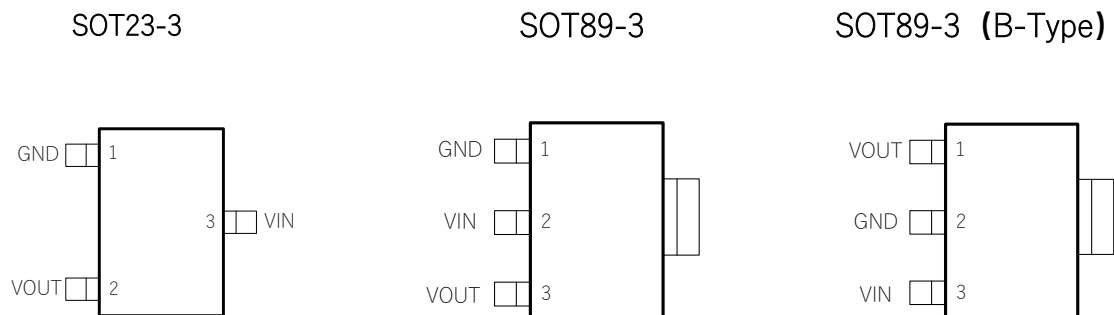
TYPICAL APPLICATION



Note:

- 1) Input capacitor ($C_{IN}=1\mu F$) and Output capacitor ($C_{OUT}\geq 1\mu F$) are recommended in all application circuit.

PIN ASSIGNMENT



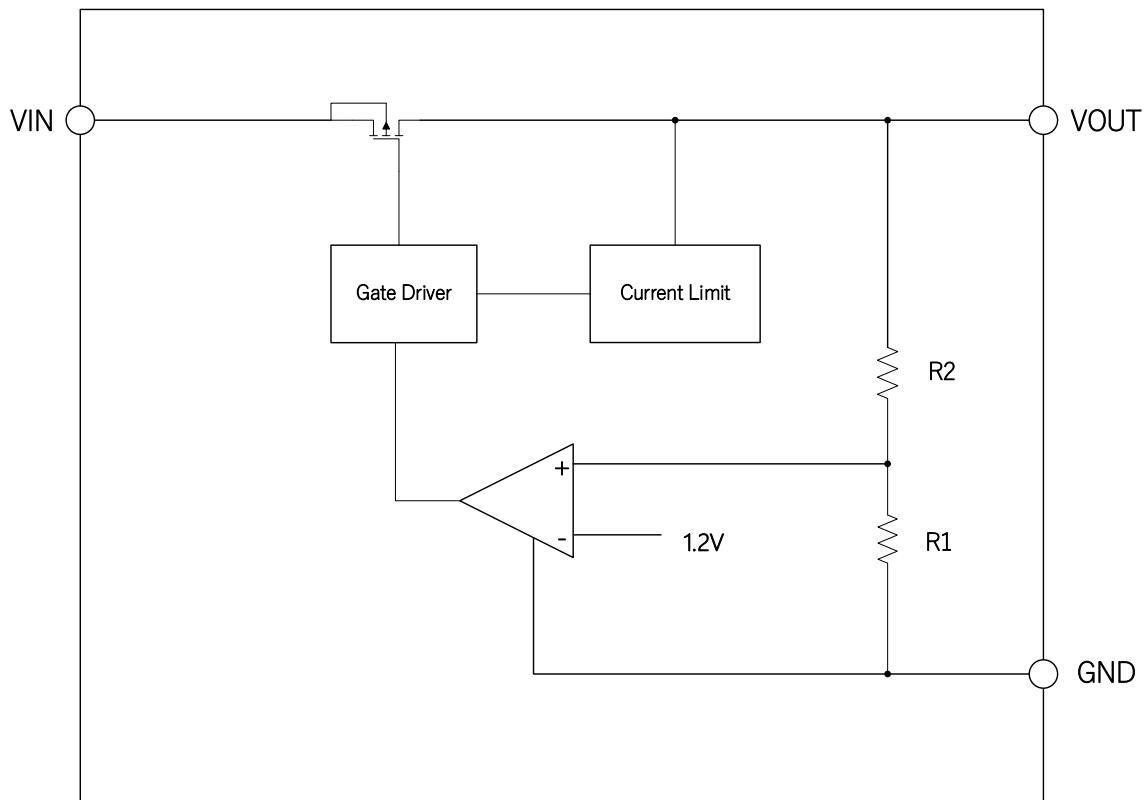
The package of ASPL1701 is SOT23-3 or SOT89-3, the pin assignment is given by:

Pin No			Name	Description
SOT23-3	SOT89-3	SOT89-3 (B-Type)		
1	1	2	GND	Ground
2	3	1	VOUT	Output of the regulator
3	2	3	VIN	Power Supply Input.

ORDER INFORMATION

Part No	Package	Voltage option	Making	Tape & Reel
ASPL1701-30ZB-R	SOT23-3	3.0V	30YW	3K/Reel
ASPL1701-33ZB-R	SOT23-3	3.3V	33YW	3K/Reel
ASPL1701-36ZB-R	SOT23-3	3.6V	36YW	3K/Reel
ASPL1701-50ZB-R	SOT23-3	5.0V	50YW	3K/Reel
ASPL1701-90ZB-R	SOT23-3	9.0V	90YW	3K/Reel
ASPL1701-120ZB-R	SOT23-3	12.0V	12YW	3K/Reel
ASPL1701-30DI-R	SOT89-3	3.0V	30YW	1K/Reel
ASPL1701-33DI-R	SOT89-3	3.3V	33YW	1K/Reel
ASPL1701-36DI-R	SOT89-3	3.6V	36YW	1K/Reel
ASPL1701-50DI-R	SOT89-3	5.0V	50YW	1K/Reel
ASPL1701-90DI-R	SOT89-3	9.0V	90YW	1K/Reel
ASPL1701-120DI-R	SOT89-3	12.0V	12YW	1K/Reel
ASPL1701-30DI-B-R	SOT89-3(B-Type)	3.0V	30BYW	1K/Reel
ASPL1701-33DI-B-R	SOT89-3(B-Type)	3.3V	33BYW	1K/Reel
ASPL1701-36DI-B-R	SOT89-3(B-Type)	3.6V	36BYW	1K/Reel
ASPL1701-50DI-B-R	SOT89-3(B-Type)	5.0V	50BYW	1K/Reel
ASPL1701-90DI-B-R	SOT89-3(B-Type)	9.0V	90BYW	1K/Reel
ASPL1701-120DI-B-R	SOT89-3(B-Type)	12.0V	12BYW	1K/Reel

BLOCK DIAGRAM



ASPL1701 Block diagram

ABSOLUTE MAXIMUM RATINGS

$V_{IN}^{(1)}$	42V
Out Voltage.....	-0.3V to +20V
Operating Junction Temperature(T_j).....	125°C
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-55°C to 125°C
ESD Human body mode	2KV
Lead Temperature & Time	260° C,10S

Notes:

(1) Exceeding these ratings may damage the device.

ELECTRICAL CHARACTERISTICS

All typical values are at Tj=25°C (unless otherwise noted)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage range		3		40	V
Output Voltage range		3		12	V
Output Accuracy		-2		2	%
Ground supply current	No load		5	10	μA
Max output current	Vin-Vout=2V	150			mA
Line regulation	Iload=1mA		0.01	0.1	%/V
Load regulation	Iload=1-100mA		2	4	%
Dropout Voltage	Iload=100mA, Vout>3V		740	1000	mV
Current Limit			200		mA
Short current			200		mA
PSRR@100Hz	Vin=Vout+0.5V, Iload=1mA		65		dB
Startup time			500		μS
OTP			165		°C
OTP hysteresis			30		°C

Note1: All tests are conducted under ambient temperature 25° C and within a short period of time 20ms

FUNCTION DESCRIPTIONS

A minimum of 1uF capacitor must be connected from Vout to ground to insure stability. Input capacitor of 1uF is recommended to ensure the input voltage does not sag below the minimum dropout voltage during load transient event. Vin pin must always be dropout voltage higher than Vout in order for the device to regulate properly.

APPLICATION INFORMATION

Like any low-dropout regulators, ASPL1701 requires input and output decoupling capacitors. These capacitors must be correctly selected for good performance. Both input and output capacitors are recommended to be placed as close to chip pin as possible.

Capacitor Selection

Normally, use a 1uF capacitor on the input and a 1uF capacitor on the output of the ASPL1701. Larger input capacitor values and lower ESR (X5R, X7R) provide better supply noise rejection and transient response.

Input-Output (Dropout) Voltage

A regulator's minimum input-to-output voltage differential (dropout voltage) determines the lowest usable supply voltage. In battery-powered systems, this determines the useful end-of-life battery voltage. Because the device uses a PMOS, its dropout voltage is a function of drain to source on resistance, RDS (on), multiplied by the load current:

$$V_{\text{dropout}} = V_{\text{in}} - V_{\text{out}} = R_{\text{DS (on)}} \times I_{\text{out}}$$

Current Limit and Thermal Shutdown Protection

In order to prevent overloading or thermal condition from damaging the device, ASPL1701 has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

Thermal Considerations

The ASPL1701 series can deliver a current of up to 150mA over the full operating junction temperature range. However, the maximum output current must be controlled at higher ambient temperature to ensure the junction temperature does not exceed 150° C. With all possible conditions, the junction temperature must be within the range specified under operating conditions. Power dissipation can be calculated based on the output current and the voltage drop across regulator.

$$P_d = (V_{in} - V_{out}) \times I_{out}$$

The final operating junction temperature for any set of conditions can be estimated by the following thermal equation:

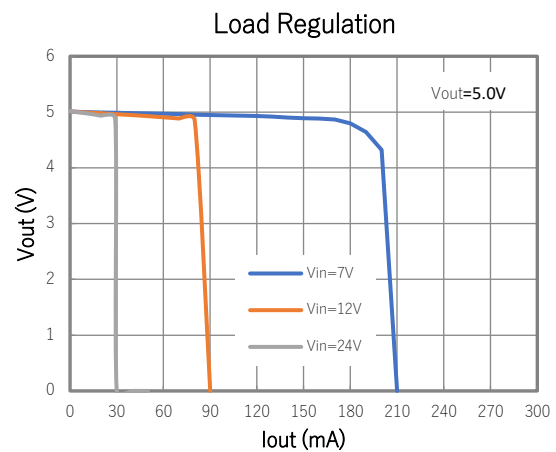
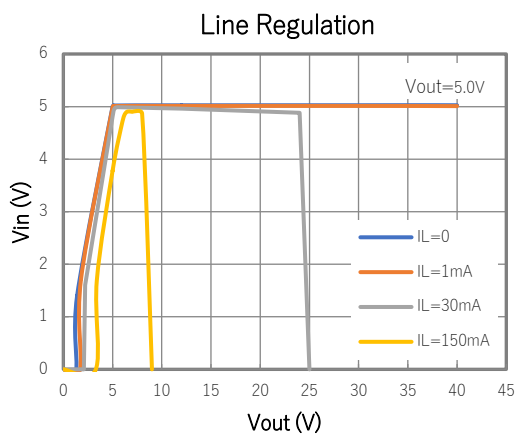
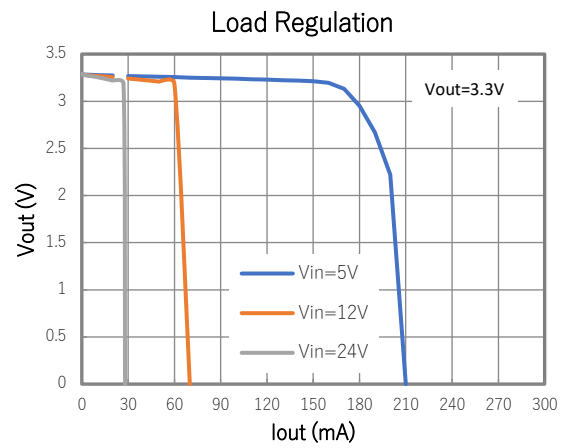
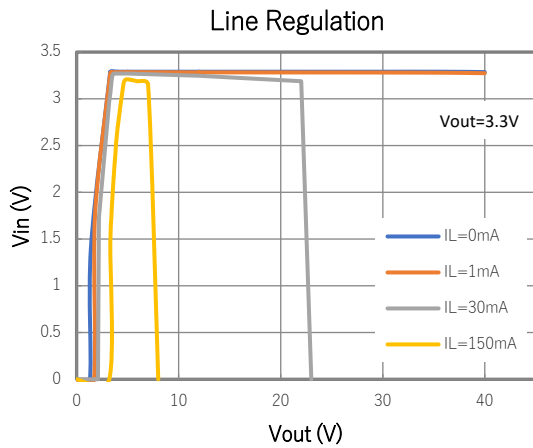
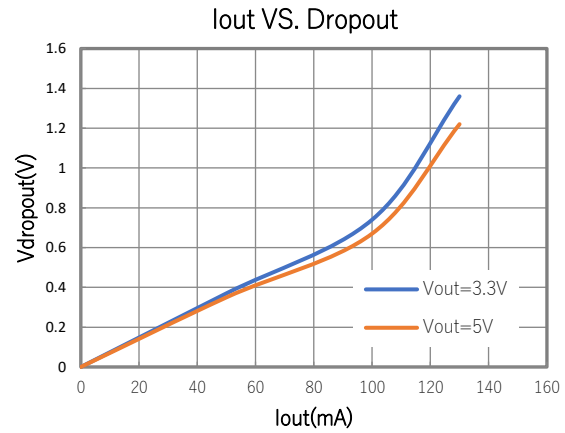
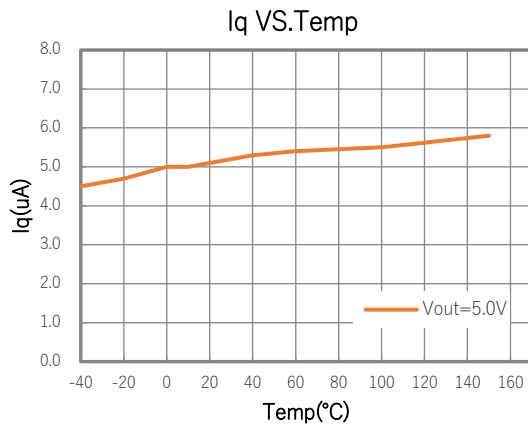
$$P_d (\text{max}) = (T_j (\text{max}) - T_a) / \theta_{ja}$$

Where $T_j (\text{max})$ is the maximum junction temperature of the die (150° C) and T_a is the maximum ambient temperature.

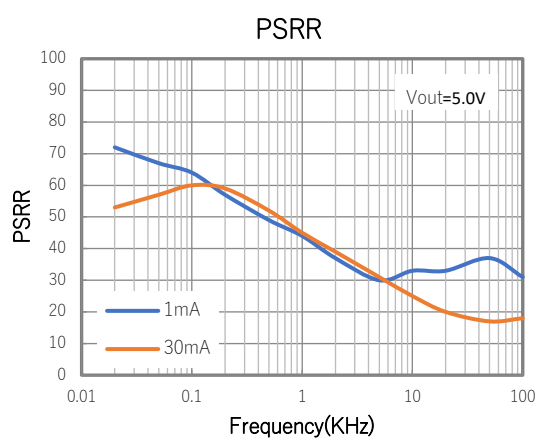
When junction temperature exceeds 150° C, over temperature protection may be triggered to prevent device from over heat.

PCB Layout

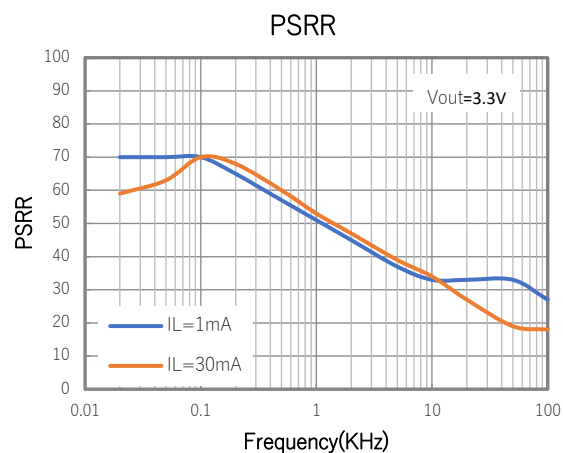
An input capacitance of 1uF is required between the ASPL1701 input pin and ground (the amount of the capacitance may be increased without limit), this capacitor must be located a distance of not more than 1cm from the input and return to a clean analog ground. Input capacitor can filter out the input voltage spikes caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire. Otherwise, the actual voltage at the Vin pin may exceed the absolute maximum rating. The output capacitor also must be located a distance of not more than 1cm from output to a clean analog ground. Because it can filter out the output spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire.

TYPICAL CHARACTERISTICS
 $C_{IN}=C_{OUT}=1\mu F$, $T_A = 25^\circ C$, unless otherwise specified


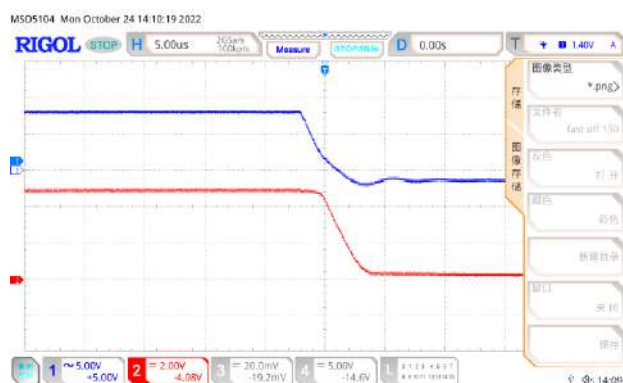
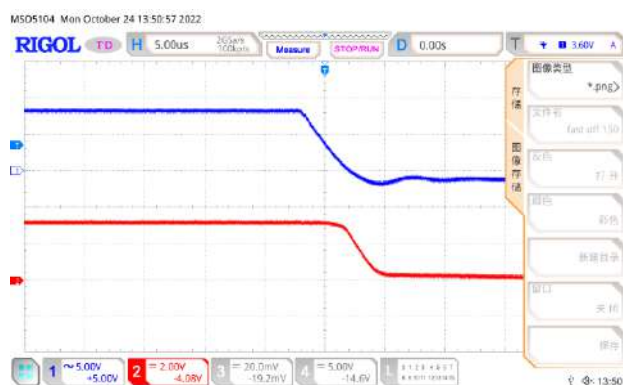
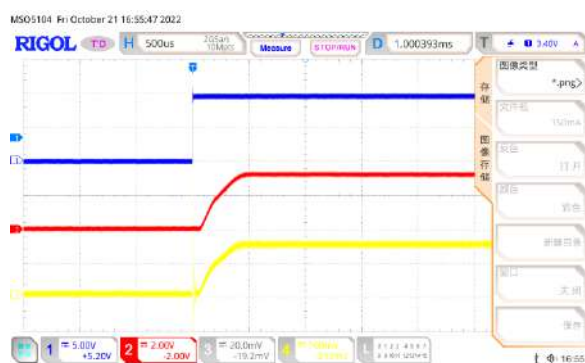
TYPICAL CHARACTERISTICS (Continued)



Vin fast on 150mA, Vout=3.3V



Vin fast off 150mA, Vout=3.3V



40V 150mA, 5uA Low Iq, LDO

Vin slow on/off 150mA, Vout=3.3V



Vin slow on/off 150mA, Vout=5.0V



Line transient Vout=3.3V, Iout=1mA



Line transient Vout=5.0V, Iout=1mA



Load transient Vout=3.3V, Iout=1mA-50mA



Load transient Vout=5.0V, Iout=1mA-40mA

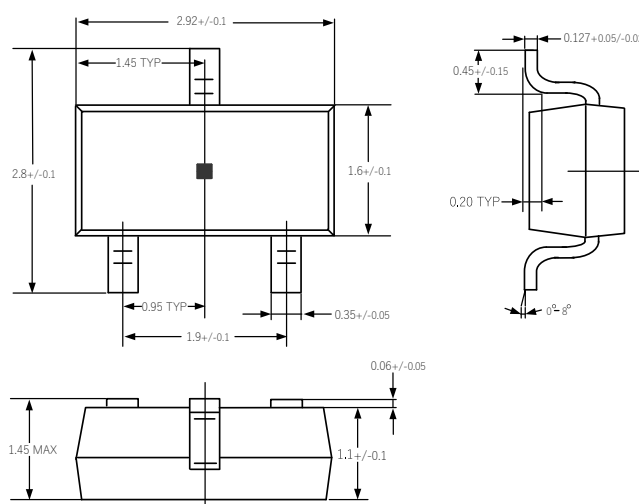


PACKAGE OUTLINE

Package SOT23-3

Devices per reel 3000 pcs

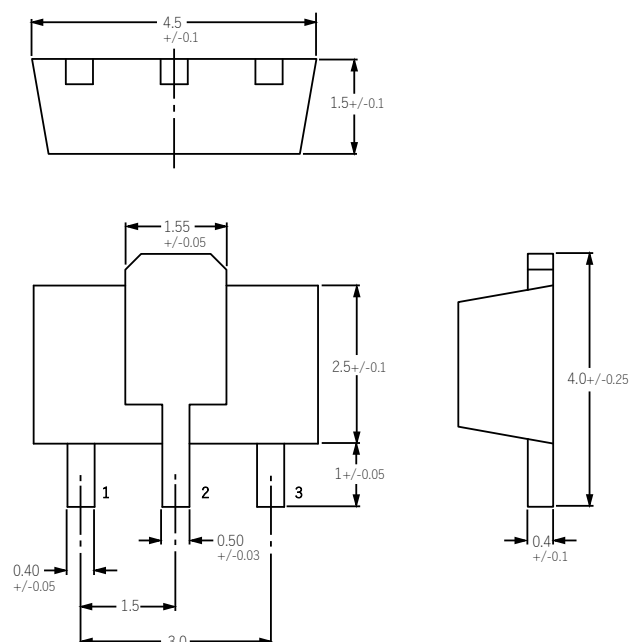
Package dimension (mm):



Package SOT89-3

Devices per reel 1000 pcs

Package dimension (mm):



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