

### Description

ACE504A series are positive voltage regulator IC fabricated by high voltage EPNP process.

The ACE504A has features of wide input voltage range and high accuracy, high ripple rejection, low dropout voltage, low noise, current limit and ultra-low quiescent current which make them ideal for use in various USB and portable device.

The IC consists of a voltage reference, an error amplifier, a resistor network for setting output voltage, a current limit circuit for current protection, and a chip enable circuit.

ACE504A has adjustable, 1.8V,3.3V,5.0V fixed voltage versions.

The ACE504A is available in space saving SOT-23-5 an SOT-89-3 packages.

### Features

- Wide Input Voltage Range: 2.3V to 24V
- Wide Output Voltage Range: 1.24V to 22V
- Excellent Ripple Rejection: 60dB@ f=1kHz
- Low Dropout Voltage:  $V_{DROPO} = 100\text{mV}@I_{OUT} = 100\ \mu\text{A}$
- Low Ground Current
- High Output Voltage Accuracy
- Compatible with Low ESR Ceramic Capacitor
- Excellent Line/ Load Regulation
- Thermal Shutdown Function

### Application

- Battery Powered equipment
- Laptop, Palmtops, Notebook Computers
- Portable Information Appliances

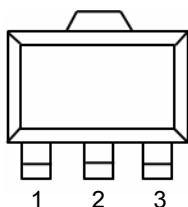
### Absolute Maximum Ratings

Parameter	Symbol	Max	Unit	
Supply Input voltage	$V_{IN}$	38	V	
Enable Input Voltage	$V_{CE}$	38	V	
Output Current	$I_{OUT}$	250	mA	
Lead Temperature (Soldering, 10sec)	$T_{LEAD}$	260	°C	
Operating Junction Temperature	$T_J$	150	°C	
ESD (Machine Mode)		275	V	
ESD (Human Body Mode)		2000	V	
Storage Temperature Range	$T_{LEAD}$	-60 to 150	°C	
Thermal Resistance (No Heatsink)	$\theta_{JA}$	SOT-23-5	250	°C/W
		SOT-89-3	165	

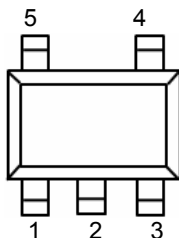
Note 1: Stressed greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

### Packaging Type

SOT-89-3



SOT-23-5

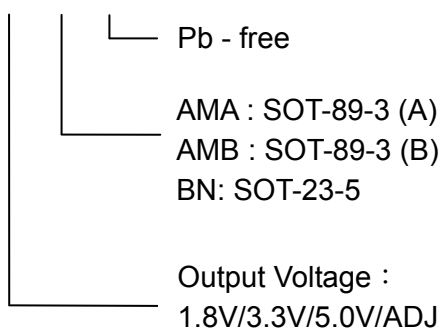


Pin	SOT-89-3(A)	SOT-89-3(B)	SOT-23-5	Function
V <sub>IN</sub>	2	1	1	Input voltage
GND	1	2	2	Grand
V <sub>OUT</sub>	3	3	5	Regulated output voltage
EN			3	Enable input
ADJ/NC			4	Adjust output for ADJ version/No connected for fixed version

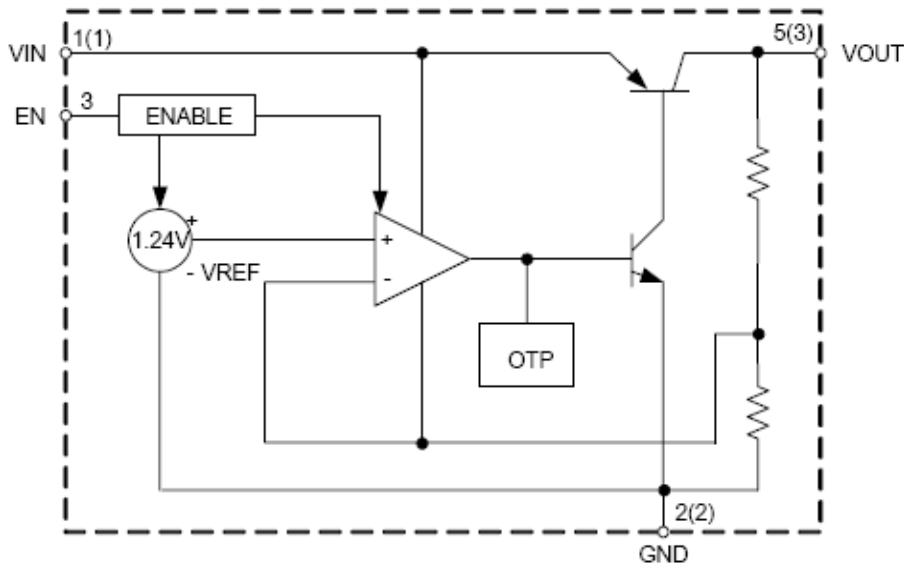
### Pin Description

#### Selection Guide

ACE504A XX XX +

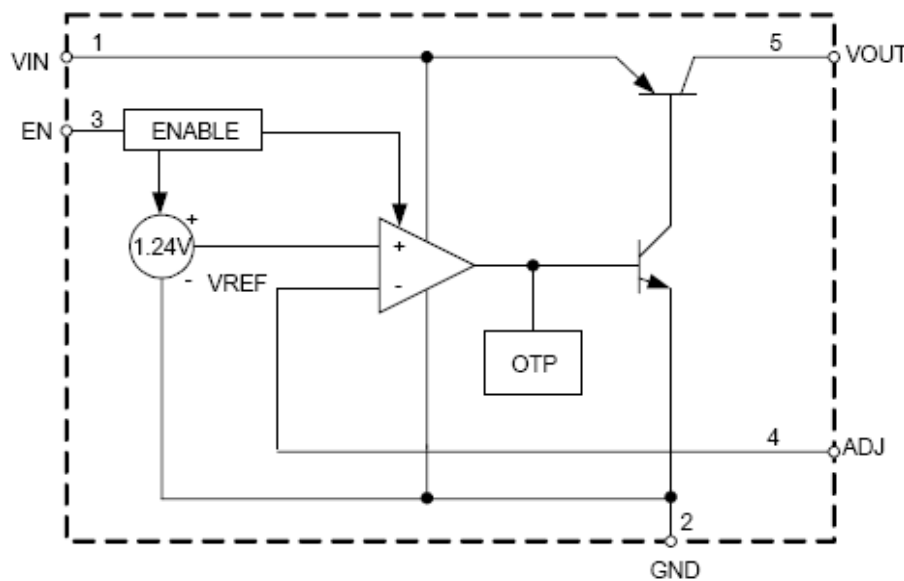


## Block Diagram



Fixed Output Voltage

A(B)  
 A for SOT-23-5  
 B for SOT-89



Adjustable Output Voltage

Functional Block Diagram of ACE504A

For SOT-23-5

## Recommended Work Conditions

Item	Symbol	Min	Max	Unit
Supply Input Voltage	$V_{IN}$	2.3	24	V
Operating Ambient Temperature	$T_A$	-40	125	°C

### Electrical Characteristics

$V_{IN}=V_{OUT}+1V$ ,  $T_A=25^{\circ}C$ ,  $I_{OUT}=100\mu A$ ,  $C_{IN}=1.0\mu F$ ,  $C_{OUT}=2.2\mu F$ , Bold typeface applies over  $-40^{\circ}C \leq T_J \leq 125^{\circ}C$ , unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	$V_{OUT}$	Variation from specified $V_{OUT}$	$V_{OUT} * 98\%$		$V_{OUT} * 102\%$	V
Reference Voltage	$V_{REF}$		1.215	1.24	1.265	V
Input Voltage	$V_{IN}$				24	V
Output Current (Max.)	$I_{OUT(max)}$	$V_{IN}-V_{OUT}=1V$ $V_{OUT}=98% * V_{OUT}$	150	200		mA
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN}$	$V_{OUT}+1V \leq V_{IN} \leq 24V$		0.05		%
Load Regulation	$\Delta V_{OUT} / \Delta V_{OUT}$	$1mA \leq I_{OUT} \leq 150mA$		0.5		%
Dropout Voltage	$V_{DROP}$	$I_{OUT}=100\mu A$		100	150	mV
		$I_{OUT}=50mA$		270	350	
		$I_{OUT}=100mA$		320	460	
		$I_{OUT}=150mA$		360	500	
Ground Current	$I_{GND}$	$I_{OUT}=100\mu A$		50		$\mu A$
		$I_{OUT}=50mA$		0.5		mV
		$I_{OUT}=100mA$		1.3		
		$I_{OUT}=150mA$		2.5		
Standby Current	$I_{STD}$	$V_{IN}=V_{OUT}+1V$ $V_{EN}$ in OFF mode		0.01	1.0	$\mu A$
Power Supply Rejection Ration	PSRR	Ripple $0.5V_{P-P}$ $V_{IN}=V_{OUT}+1V$	$f=100Hz$		60	dB
			$f=1kHz$		60	
Output Voltage Temperature Coefficient	$\Delta V_{OUT} / (\Delta V_{OUT} * \Delta T)$	$I_{OUT}=100\mu A$ , $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
RMS Output Noise	$V_{NOI}$	$T_A=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$
CE "High" Voltage		CE Input Voltage "High"	2.0			V
CE "Low" Voltage		CE Input Voltage "Low"			0.4	V
Thermal		SOT-23-5		43		$^{\circ}C/W$

Resistance		SOT-89		27	
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## Typical Performance Characteristics

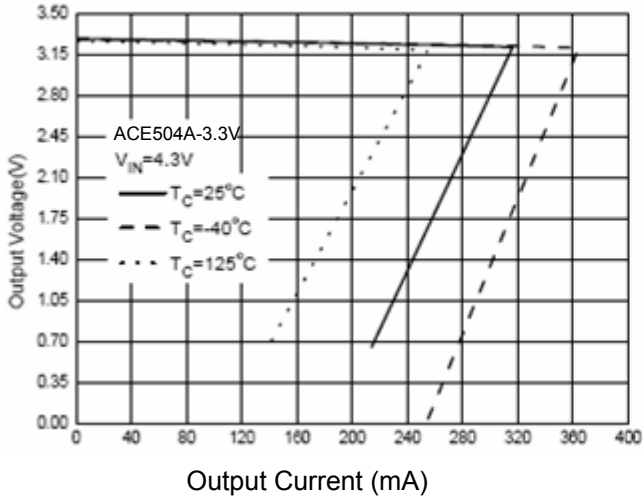


Figure 1. Output Voltage vs. Output Current

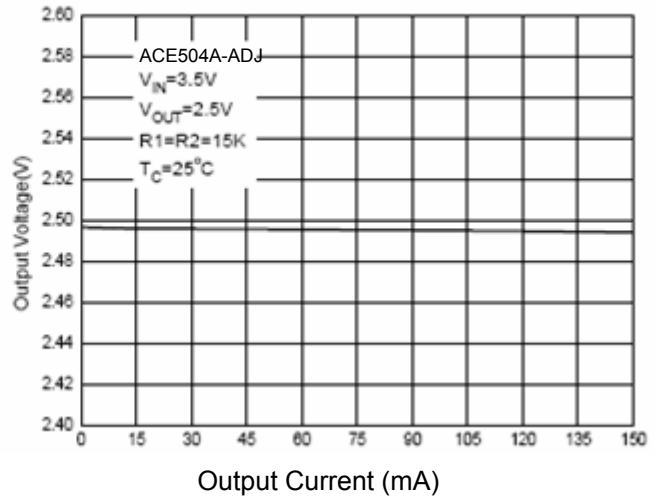


Figure 2. Output Voltage vs. Output Current

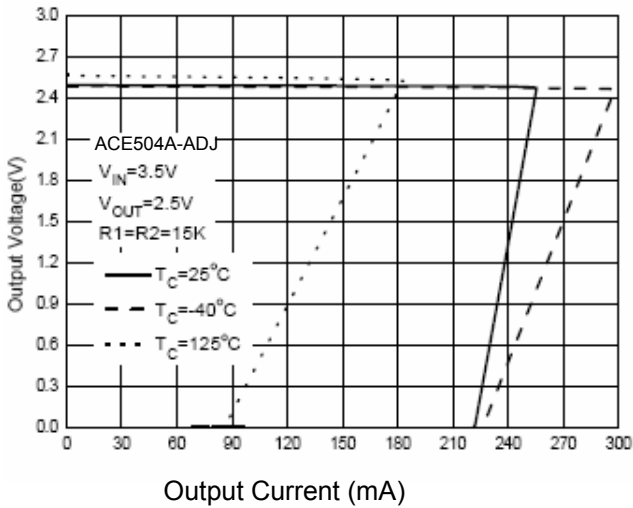


Figure 3. Output Voltage vs. Output Current

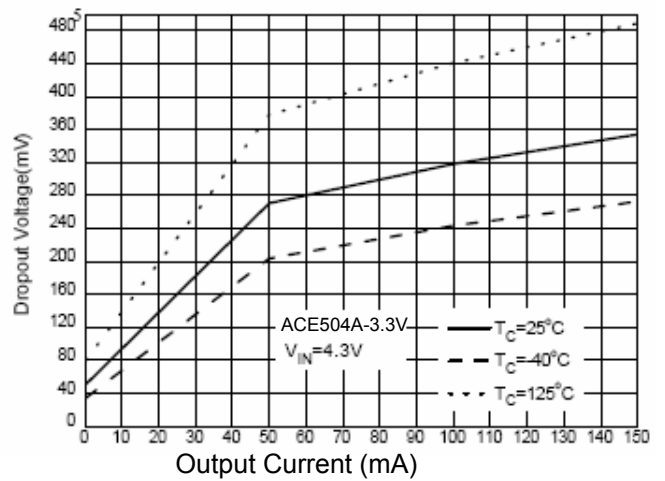


Figure 4. Dropout Voltage vs. Output Current

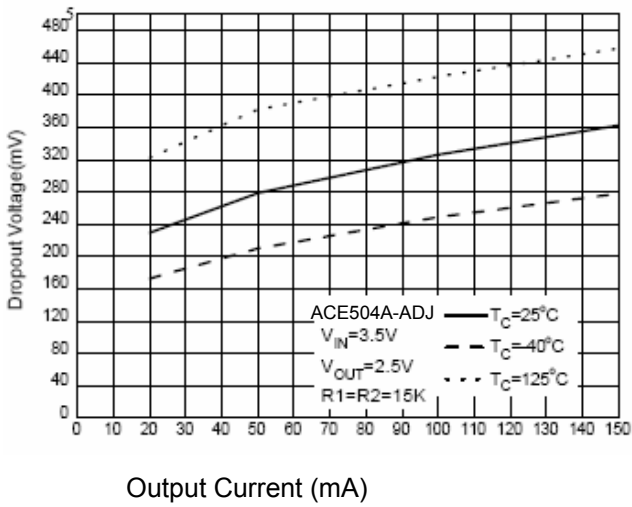


Figure 5. Dropout Voltage vs. Output Current

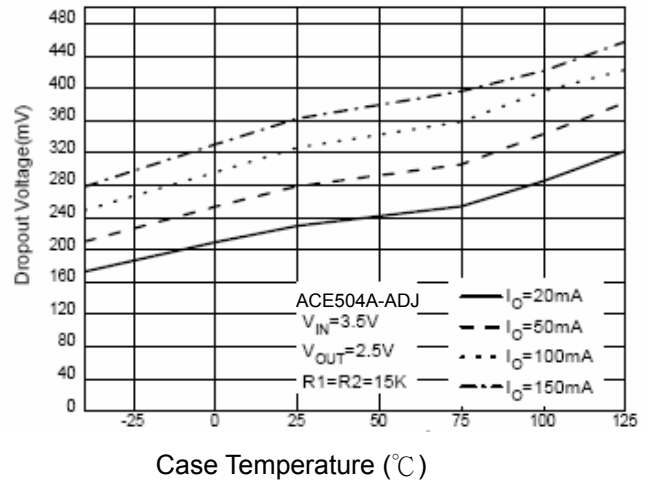


Figure 6. Dropout Voltage vs. Case Temperature

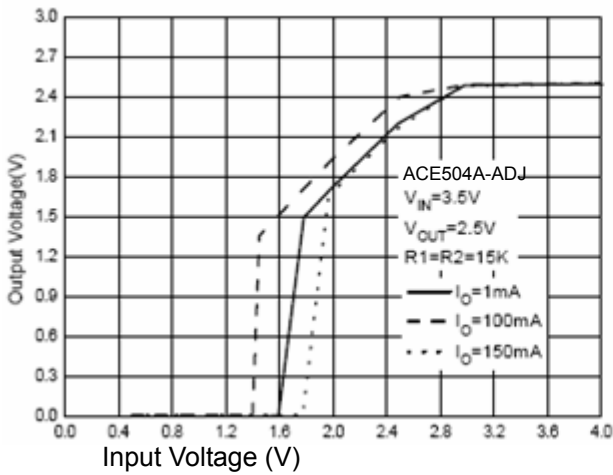


Figure 7. Output Voltage vs. Input Voltage

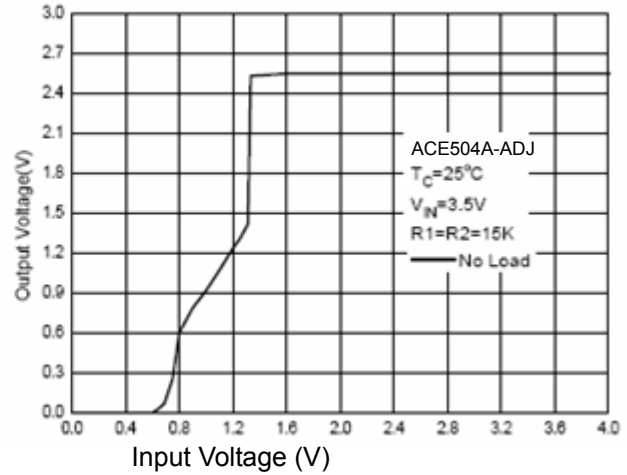


Figure 8. Output Voltage vs. Input Voltage

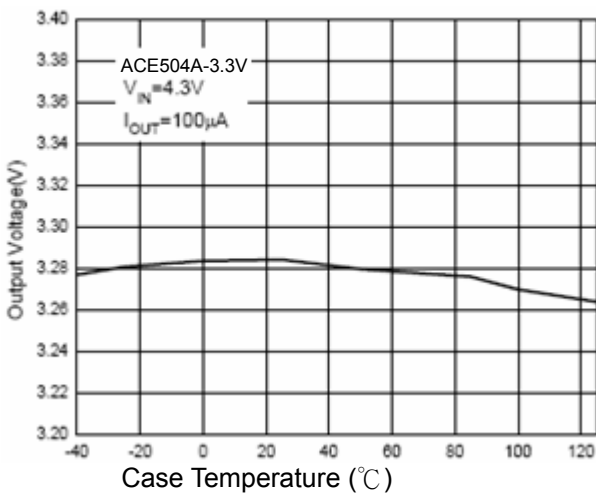


Figure 9. Output Voltage vs. Case Temperature

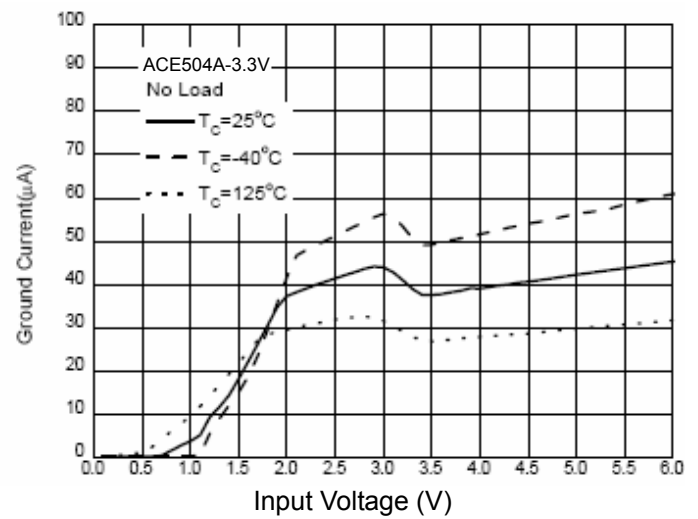


Figure 10. Supply Current vs. Input Voltage

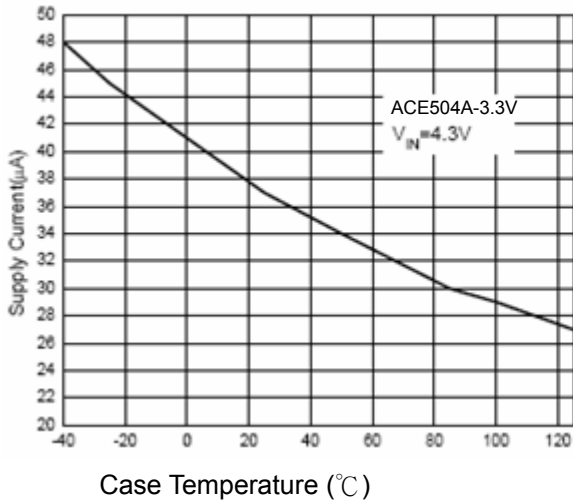


Figure 11. Supply Current vs. Case Temperature

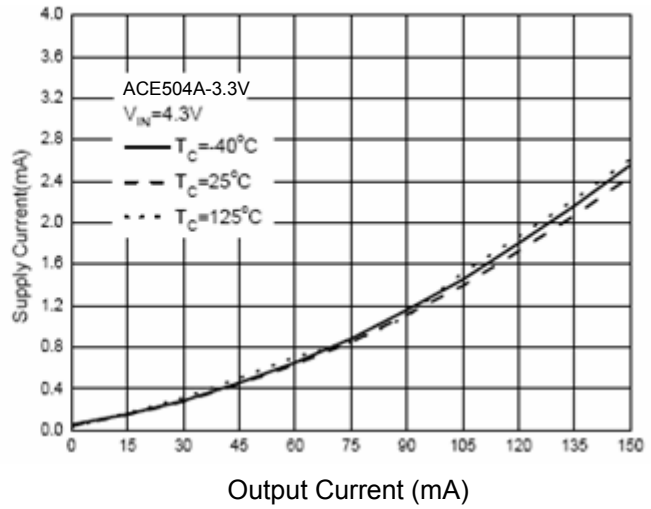


Figure 12. Supply Current vs. Output Current

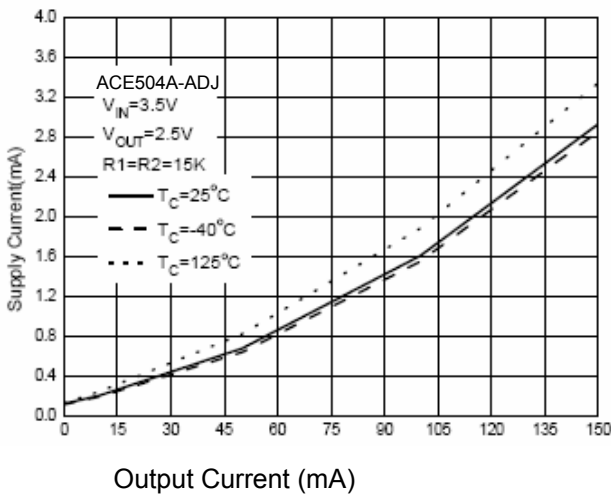


Figure 13. Supply Current vs. Output Current

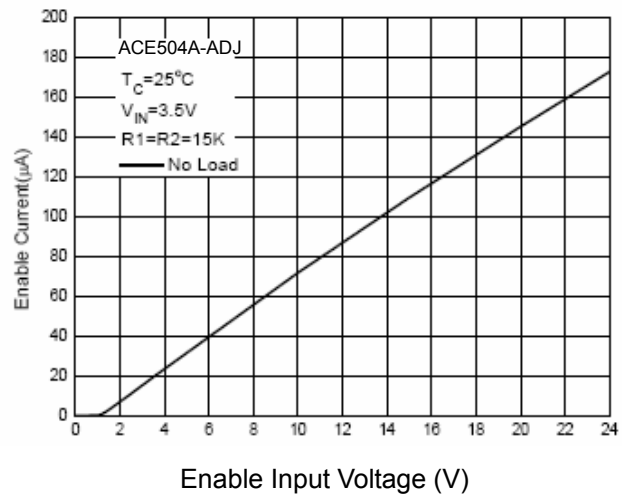


Figure 14. Enable Current vs. Enable Input Voltage

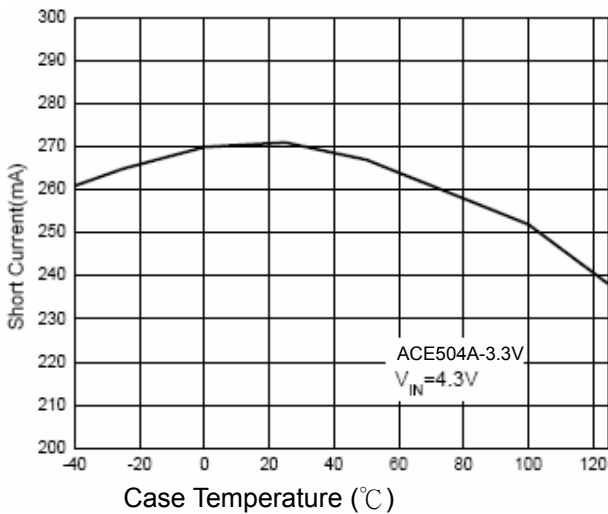


Figure 15. Short Current vs. Case Temperature

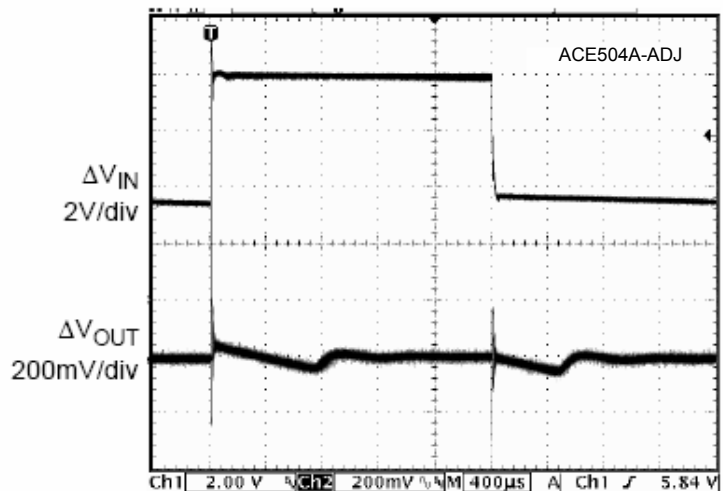


Figure 16. Line Transient (Conditions:  $V_{IN}=V_{EN}=3.5V$  to  $8V$ ,  $C_{IN}=1.0\mu F$ ,  $C_{OUT}=2.2\mu F$ ,  $I_{OUT}=1mA$ )

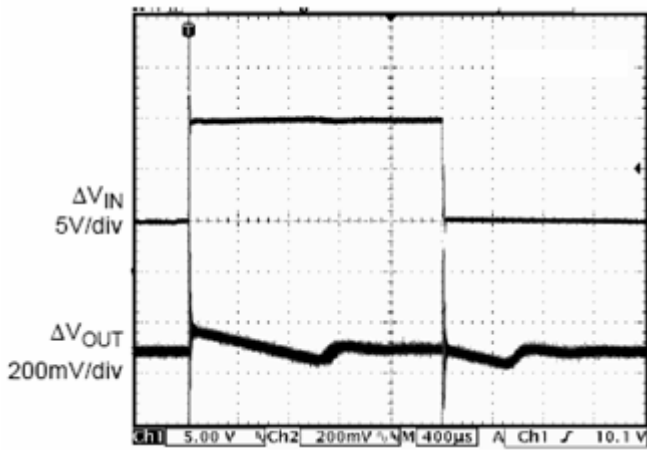


Figure 17. Line Transient  
 (Conditions:  $V_{IN}=V_{EN}=5V$  to  $15V$ ,  $C_{IN}=1.0\mu F$ ,  $C_{OUT}=2.2\mu F$ ,  $I_{OUT}=1mA$ )

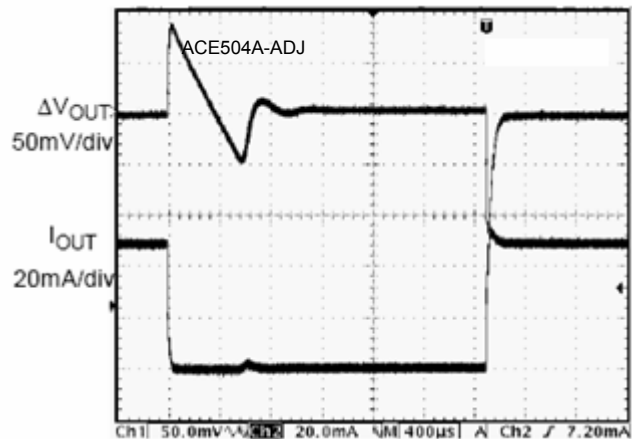


Figure 18. Line Transient  
 (Conditions:  $V_{IN}=V_{EN}=5V$ ,  $C_{IN}=1.0\mu F$ ,  $C_{OUT}=2.2\mu F$ ,  $I_{OUT}=1mA$  to  $50mA$ )

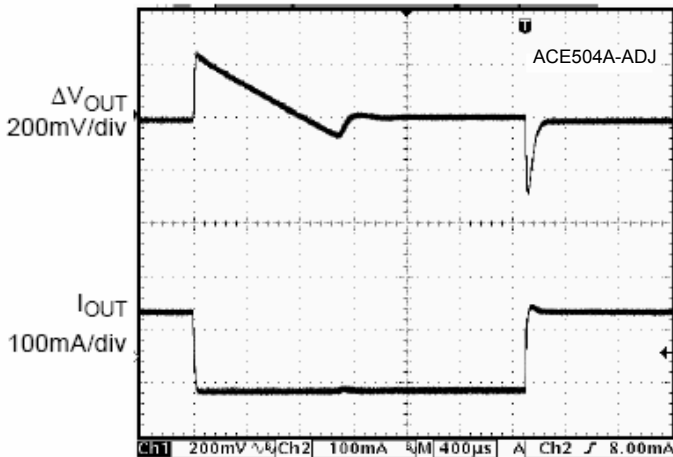


Figure 19. Load Transient  
 (Conditions:  $V_{IN}=5V$ ,  $C_{IN}=1.0\mu F$ ,  $C_{OUT}=2.2\mu F$ ,  $I_{OUT}=1mA$  to  $150mA$ )

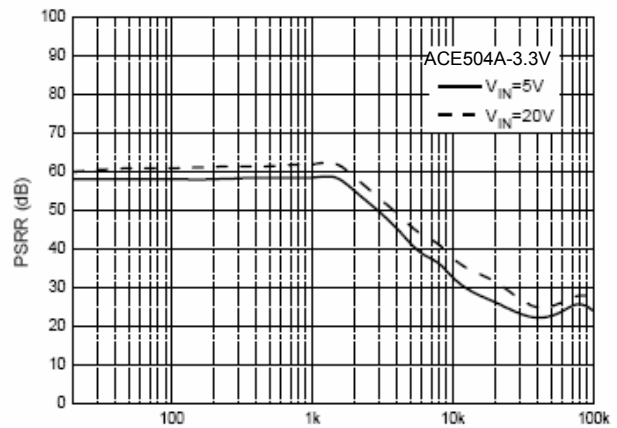
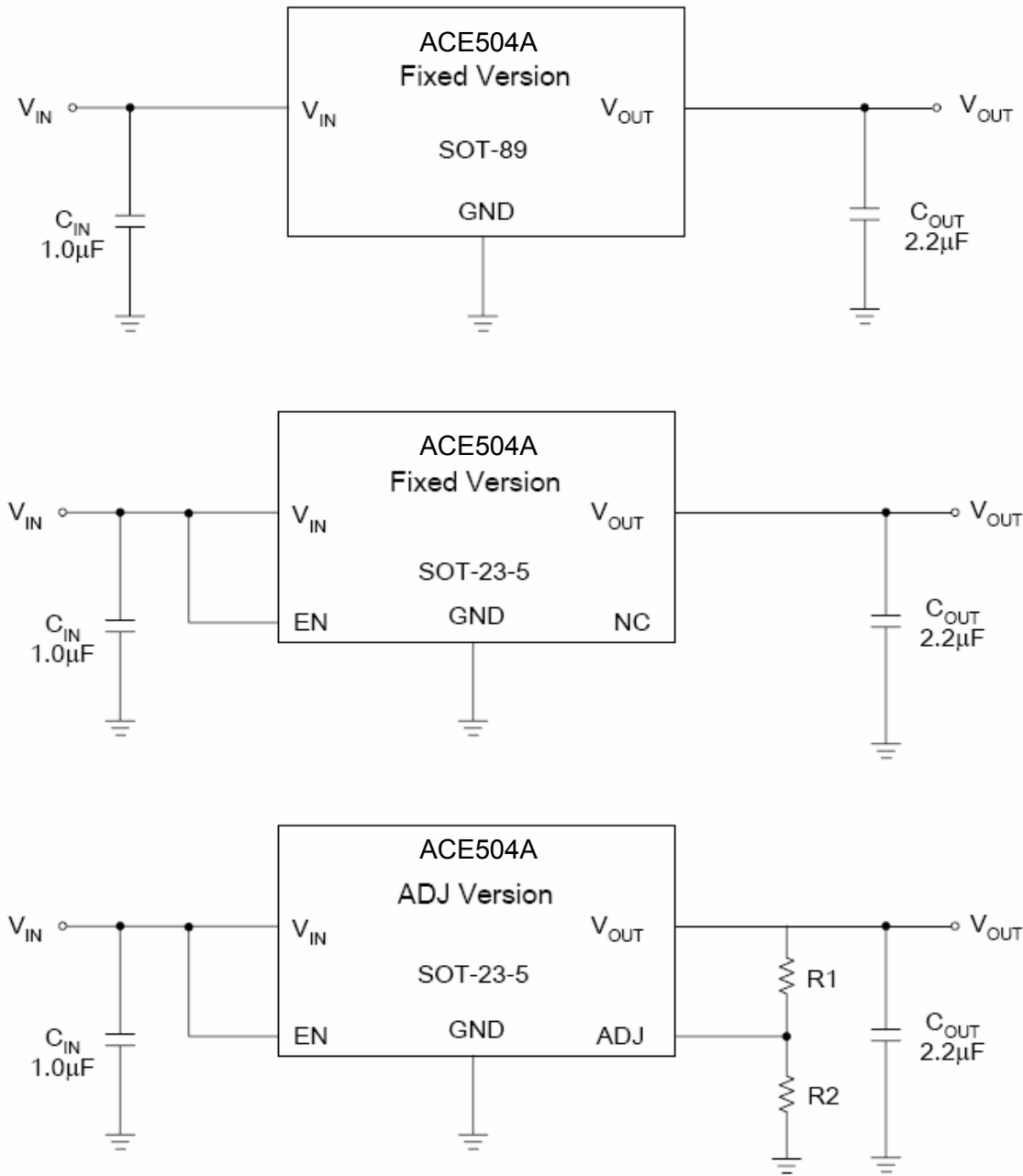


Figure 20. PSRR vs. Frequency  
 (Conditions:  $V_{IN}=5V$  and  $20V$ ,  $V_{PP}=2V$ ,  $I_O=10mA$ )



## Typical Application

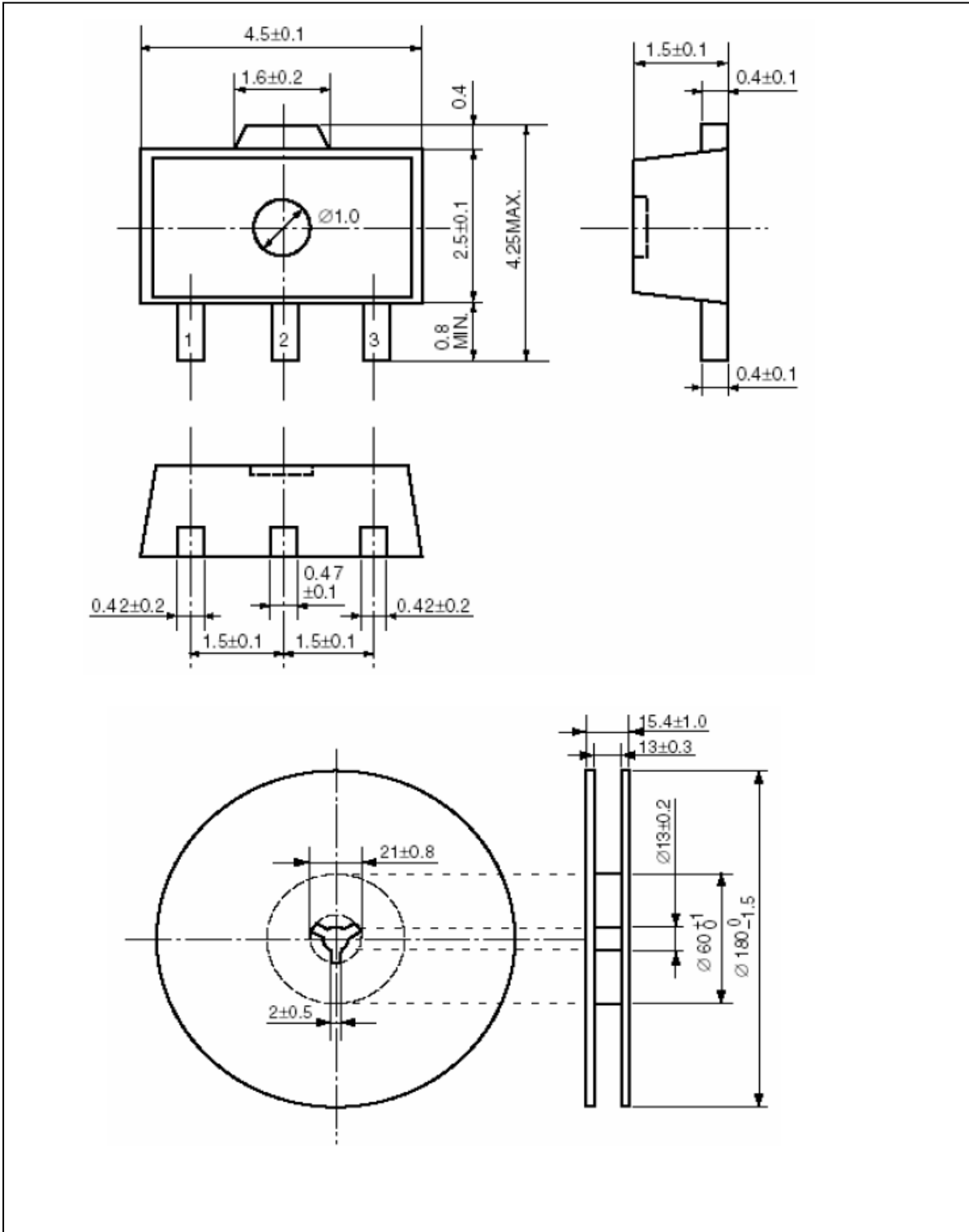


$$V_{OUT} = V_{REF} (1 + (R1/R2))$$

Figure 24. Typical Application of ACE504A

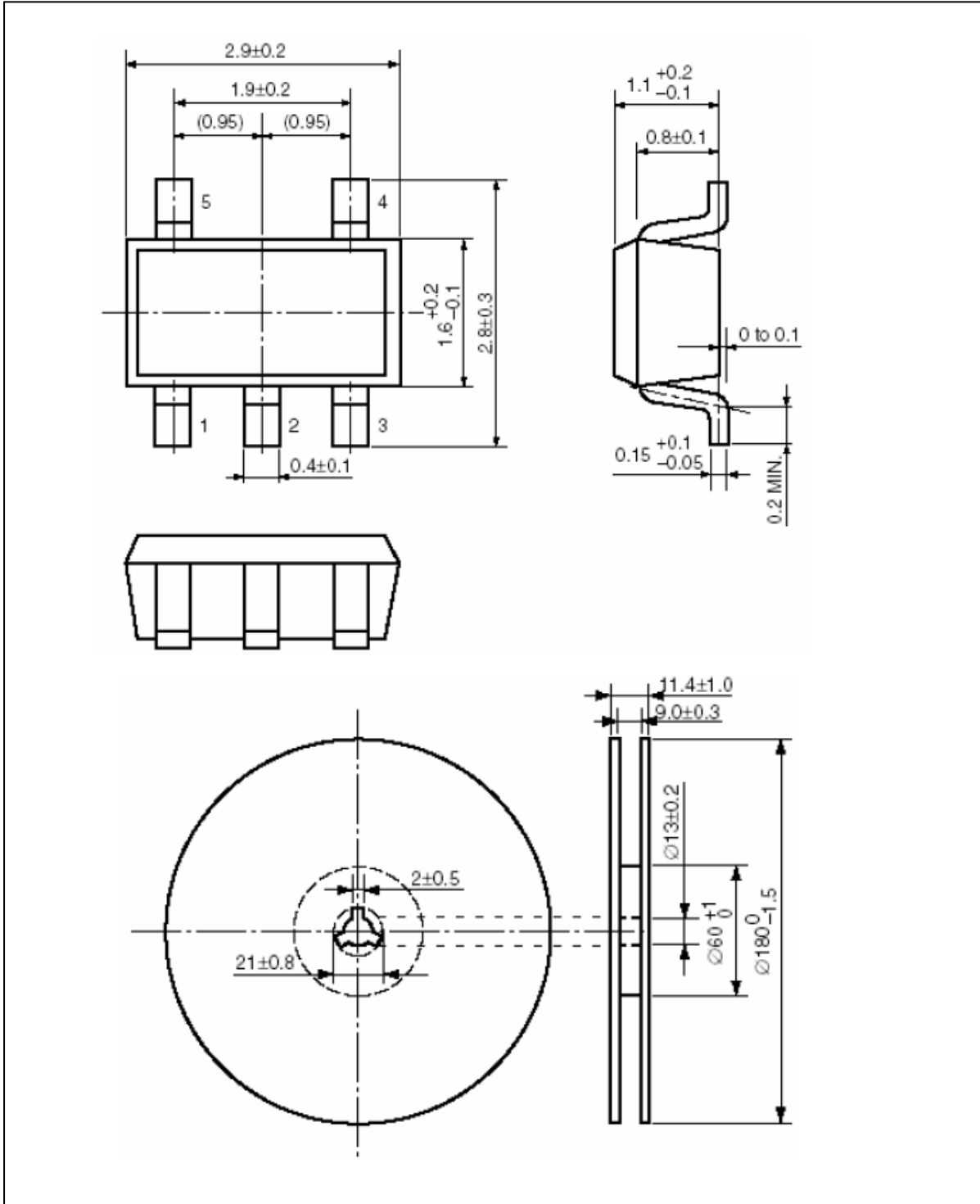
## Packing Information

### SOT-89-3



## Packing Information

### SOT-23-5



## Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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