

Description

ACE515A series are 300mA, positive voltage regulator ICs fabricated by CMOS process.

Each of these ICs is equipped with a voltage reference, an error amplifier, a resistor network for setting output voltage, a chip enable circuit, a current limit circuit and OTSD (over temperature shut down) circuit to prevent the IC from over current and over temperature.

The ACE515A series have features of high ripple rejection, low dropout voltage, low noise, high output voltage accuracy and low current consumption which make them ideal for use in various battery-powered apparatus.

The ACE515A have 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 4.15V and 4.2V fixed voltage versions.

These ICs are available in tiny SC-70-5 and SC-82 packages as well as industry standard SOT-23-3 and SOT-23-5 packages.

Features

- Excellent Ripple Rejection: 70dB Typical (1.8V Version)
- Low Dropout Voltage: 65mV ($I_{OUT}=100mA$, 3.3V Version)
- Low Standby Current: 0.01 μA Typical
- Low Quiescent Current: 60 μA Typical
- Extremely Low Noise: 50 μV_{rms} Typical
- Maximum Output Current: 300mA (Min.)
- High Output Voltage Accuracy: $\pm 2\%$
- Compatible with Low ESR Ceramic Capacitor
- Excellent Line/ Load Regulation

Application

- CDMA/ GSM Cellular Handsets
- Battery-powered Equipments
- Laptops, Palmtops, Notebook Computers
- Hand-held Instruments
- PCMCIA Cards
- Portable Information Appliances

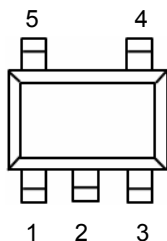
Absolute Maximum Ratings

Parameter	Symbol	Max	Unit
Input voltage	V _{IN}	6.5	V
Enable Input Voltage	V _{CE}	-0.3 to V _{IN} +0.3	V
Output Current	I _{OUT}	450	mA
Junction Temperature	T _J	150	°C
Storage Temperature Range	T _{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T _{LEAD}	260	°C
Thermal Resistance SOT-23-3 SOT-23-5 SC-70-5 SC-82	θ _{JA}	200 200 300 300	°C/W
ESD (Human Body Model)	ESD	6000	V
ESD (Machine Model)	ESD	400	V

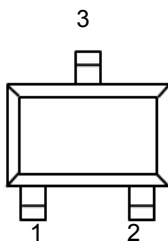
Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied.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

Packaging Type

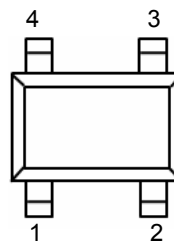
SOT-23-5 /SC-70-5



SOT-23-3



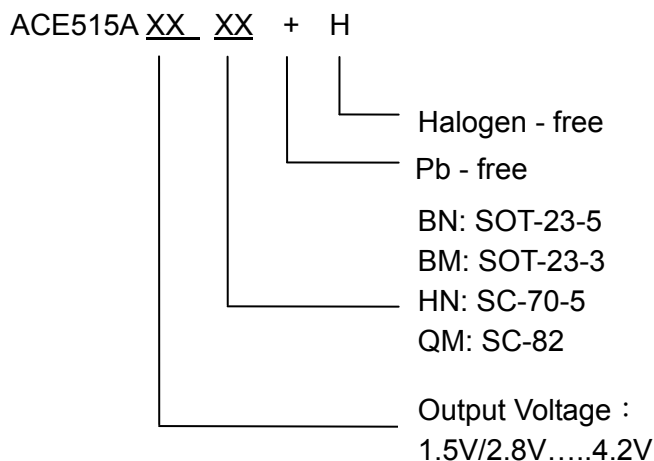
SC-82



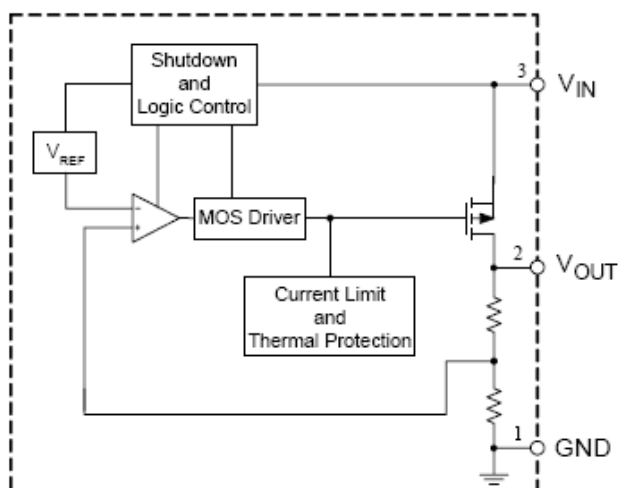
Pin Number			Symbol	Function
SOT-23-5 / SC-70-5	SOT-23-3	SC-82		
1	3	4	V _{IN}	Input voltage
2	1	2	GND	Ground
3		1	CE	Active high enable input pin, Logic high=enable, logic low=shutdown
4			NC	No connection
5	2	3	V _{OUT}	Regulated output voltage

Ordering information

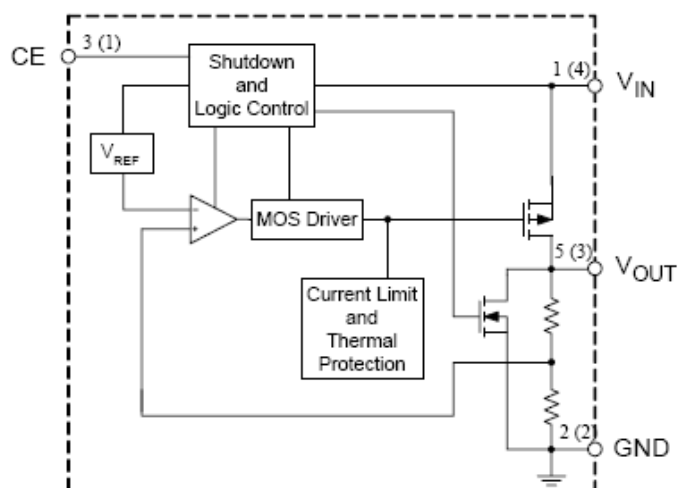
Selection Guide



Functional Block Diagram



SOT-23-3



A(B)
A SOT-23-5 / SC-70-5
B SC-82

Recommended Work Conditions

Item	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	$V_{OUT}+0.5V$	6	V
Operating Ambient Temperature	T_A	-40	85	°C

Electrical Characteristics

ACE515A-1.8 Electrical Characteristics

($V_{IN}=2.8V$, $T_A=25^{\circ}C$, $C_{IN}=1\mu F$, Bold typeface applies over $-40^{\circ}C \leq T_J \leq 85^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=2.8V$ $1mA \leq I_{OUT} \leq 30mA$	1.764	1.8	1.836	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT(Max.)}$	$V_{IN} * V_{OUT}=1A$, $V_{OUT}=1.76V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=2.8V$ $1mA \leq I_{OUT} \leq 300mA$		6		mV
Line Regulation	V_{RLINE}	$2.8V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		10 100 300	12 120 360	mV
Quiescent Current	I_Q	$V_{IN}=2.8V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=2.8V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=2.8V$	$f=100Hz$ $f=1KHz$	70 70		dB
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		± 100		ppm/ $^{\circ}C$
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE "High" Voltage		CE input voltage "High"	1.5			V
CE "Low" Voltage		CE input voltage "Low"			0.4	V
Thermal Shutdown				160		$^{\circ}C$
Thermal Shutdown Hysteresis				25		$^{\circ}C$

ACE515A-2.5 Electrical Characteristics

($V_{IN}=3.5V$, $T_A=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^{\circ}C \leq T_J \leq 85^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=3.5V$ $1mA \leq I_{OUT} \leq 30mA$	2.45	2.5	2.55	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT(Max.)}$	$V_{IN} * V_{OUT}=1A$, $V_{OUT}=2.45V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=3.5V$ $1mA \leq I_{OUT} \leq 300mA$		10		mV
Line Regulation	V_{RLINE}	$3.5V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		6.5 65 200	10 100 300	mV
Quiescent Current	I_Q	$V_{IN}=3.5V$, $I_{OUT}=0mA$		60	90	uA

Standby Current	I_{STD}	$V_{IN}=3.5V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=3.5V$	f=100Hz	65		dB
			f=1KHz	65		
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		±100		ppm/°C
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE “High” Voltage		CE input voltage “High”	1.5			V
CE “Low” Voltage		CE input voltage “Low”			0.4	V
Thermal Shutdown				160		°C
Thermal Shutdown Hysteresis				25		°C

ACE515A-2.8 Electrical Characteristics

($V_{IN}=3.8V$, $T_A=25^\circ C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^\circ C \leq T_J \leq 85^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=3.8V$ $1mA \leq I_{OUT} \leq 30mA$	2.744	2.8	2.856	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT}(Max.)$	$V_{IN} \cdot V_{OUT}=1A$, $V_{OUT}=2.74V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=3.8V$ $1mA \leq I_{OUT} \leq 300mA$		11		mV
Line Regulation	V_{RLINE}	$3.8V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$		6.5	10	mV
		$I_{OUT}=100mA$		65	100	
		$I_{OUT}=300mA$		200	300	
Quiescent Current	I_Q	$V_{IN}=3.8V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=3.8V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=3.8V$	f=100Hz	65		dB
			f=1KHz	65		
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		±100		ppm/°C
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE “High” Voltage		CE input voltage “High”	1.5			V
CE “Low” Voltage		CE input voltage “Low”			0.4	V
Thermal Shutdown				160		°C
Thermal Shutdown Hysteresis				25		°C

ACE515A-3.0 Electrical Characteristics

($V_{IN}=4.0V$, $T_A=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^{\circ}C \leq T_J \leq 85^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=4.0V$ $1mA \leq I_{OUT} \leq 30mA$	2.94	3.0	3.06	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT(Max.)}$	$V_{IN} * V_{OUT}=1A$, $V_{OUT}=2.94V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=4.0V$ $1mA \leq I_{OUT} \leq 300mA$		12		mV
Line Regulation	V_{RLINE}	$4.0V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		6.5 65 200	10 100 300	mV
Quiescent Current	I_Q	$V_{IN}=4.0V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=4.0V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=4.0V$	$f=100Hz$ $f=1KHz$	65 65		dB
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		± 100		ppm/ $^{\circ}C$
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE "High" Voltage		CE input voltage "High"	1.5			V
CE "Low" Voltage		CE input voltage "Low"			0.4	V
Thermal Shutdown				160		$^{\circ}C$
Thermal Shutdown Hysteresis				25		$^{\circ}C$

ACE515A-3.3 Electrical Characteristics

($V_{IN}=4.3V$, $T_A=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^{\circ}C \leq T_J \leq 85^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=4.3V$ $1mA \leq I_{OUT} \leq 30mA$	3.234	3.3	3.366	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT(Max.)}$	$V_{IN} * V_{OUT}=1A$, $V_{OUT}=3.23V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=4.3V$ $1mA \leq I_{OUT} \leq 300mA$		13		mV
Line Regulation	V_{RLINE}	$4.3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		6.5 65 200	10 100 300	mV
Quiescent Current	I_Q	$V_{IN}=4.3V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=4.3V$, V_{CE} in OFF mode		0.01	1.0	uA

Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=4.3V$	$f=100Hz$ $f=1KHz$	65 65		dB
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		± 100		ppm/°C
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE “High” Voltage		CE input voltage “High”	1.5			V
CE “Low” Voltage		CE input voltage “Low”			0.4	V
Thermal Shutdown				160		°C
Thermal Shutdown Hysteresis				25		°C

ACE515A-4.15 Electrical Characteristics

($V_{IN}=5.15V$, $T_A=25^\circ C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^\circ C \leq T_J \leq 85^\circ C$, unless otherwise specified.)

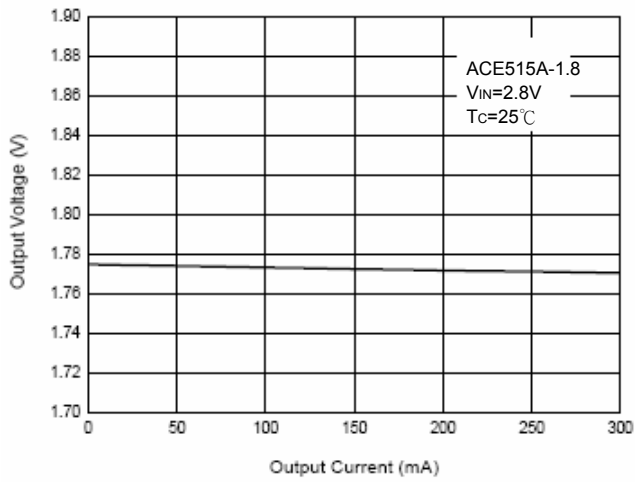
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=5.15V$ $1mA \leq I_{OUT} \leq 30mA$	4.067	4.15	4.233	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT}(Max.)$	$V_{IN} * V_{OUT}=1A$, $V_{OUT}=4.06V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=5.15V$ $1mA \leq I_{OUT} \leq 300mA$		13		mV
Line Regulation	V_{RLINE}	$5.15V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		6.5 65 200	10 100 300	mV
Quiescent Current	I_Q	$V_{IN}=5.15V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=5.15V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=5.15V$	$f=100Hz$ $f=1KHz$	65 65		dB
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		± 100		ppm/°C
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE “High” Voltage		CE input voltage “High”	1.5			V
CE “Low” Voltage		CE input voltage “Low”			0.4	V
Thermal Shutdown				160		°C
Thermal Shutdown Hysteresis				25		°C

ACE515A-4.2 Electrical Characteristics

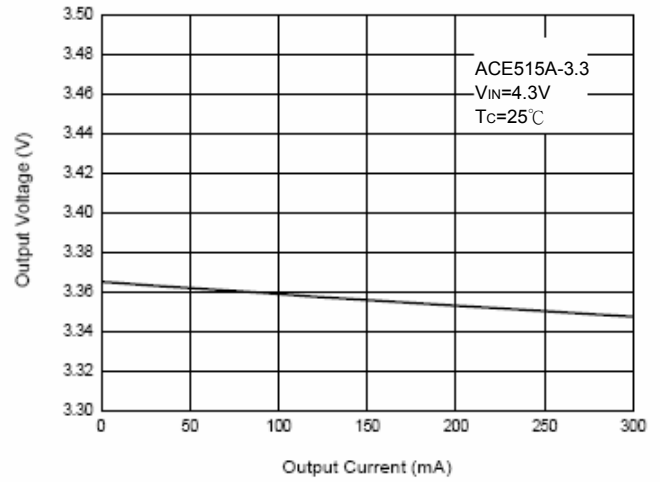
($V_{IN}=5.2V$, $T_A=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$ Bold typeface applies over $-40^{\circ}C \leq T_J \leq 85^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}	$V_{IN}=5.2V$ $1mA \leq I_{OUT} \leq 30mA$	4.116	4.2	4.284	V
Input Voltage	V_{IN}				6	V
Maximum Output Current	$I_{OUT(Max.)}$	$V_{IN} \cdot V_{OUT}=1A$, $V_{OUT}=4.12V$	300	360		mA
Load Regulation	V_{RLOAD}	$V_{IN}=5.2V$ $1mA \leq I_{OUT} \leq 300mA$		13		mV
Line Regulation	V_{RLINE}	$5.2V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		1		mV
Dropout Voltage	V_{DROP}	$I_{OUT}=10mA$ $I_{OUT}=100mA$ $I_{OUT}=300mA$		6.5 65 200	10 100 300	mV
Quiescent Current	I_Q	$V_{IN}=5.2V$, $I_{OUT}=0mA$		60	90	uA
Standby Current	I_{STD}	$V_{IN}=5.2V$, V_{CE} in OFF mode		0.01	1.0	uA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p $V_{IN}=5.2V$	$f=100Hz$ $f=1KHz$	65 65		dB
Output Voltage Temperature Coefficient	$(\Delta V_{OUT} / \Delta I_{OUT}) / \Delta T$	$I_{OUT}=30mA$		± 100		ppm/ $^{\circ}C$
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$		50		mA
RMS Output Noise	V_{NOISE}	$10Hz \leq f \leq 100kHz$		50		uVrms
CE "High" Voltage		CE input voltage "High"	1.5			V
CE "Low" Voltage		CE input voltage "Low"			0.4	V
Thermal Shutdown				160		$^{\circ}C$
Thermal Shutdown Hysteresis				25		$^{\circ}C$

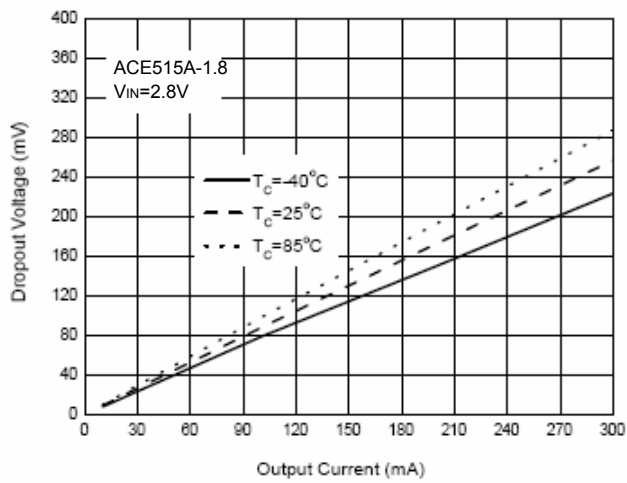
Typical Performance Characteristics



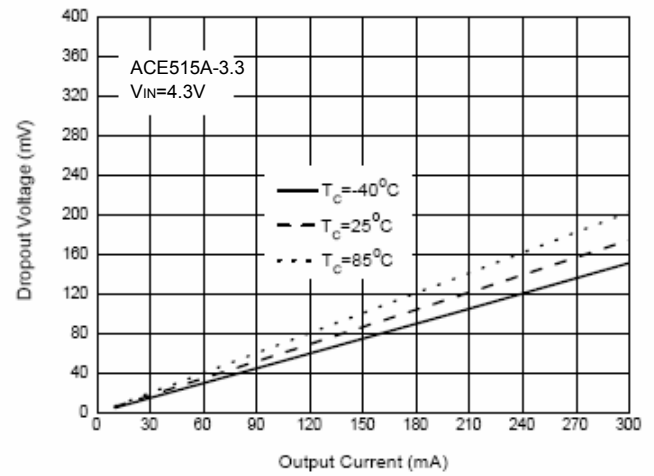
Output Voltage vs. Output Current



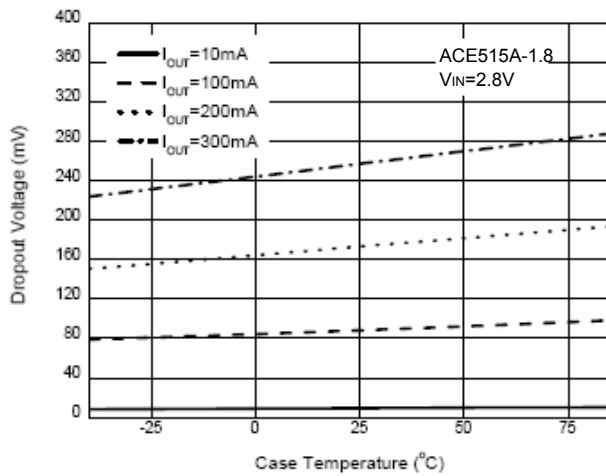
Output Voltage vs. Output Current



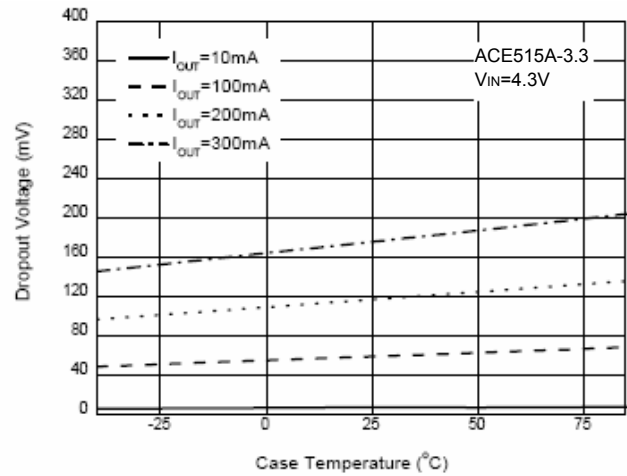
Dropout Voltage vs. Output Current



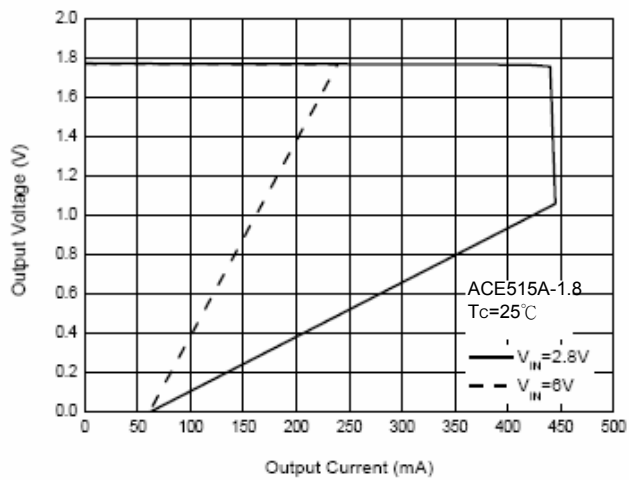
Dropout Voltage vs. Output Current



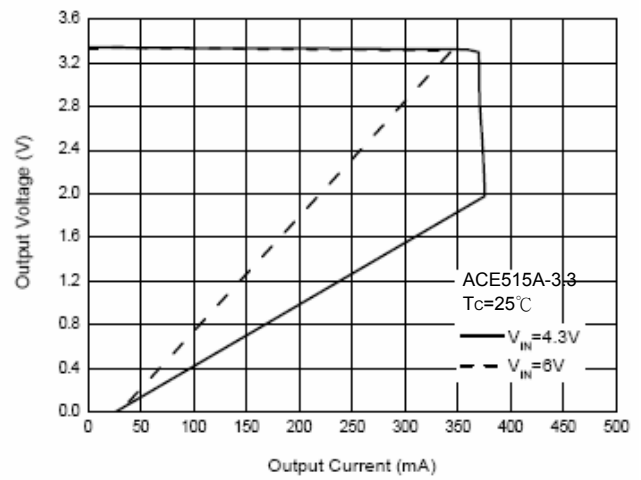
Dropout Voltage vs. Case Temperature



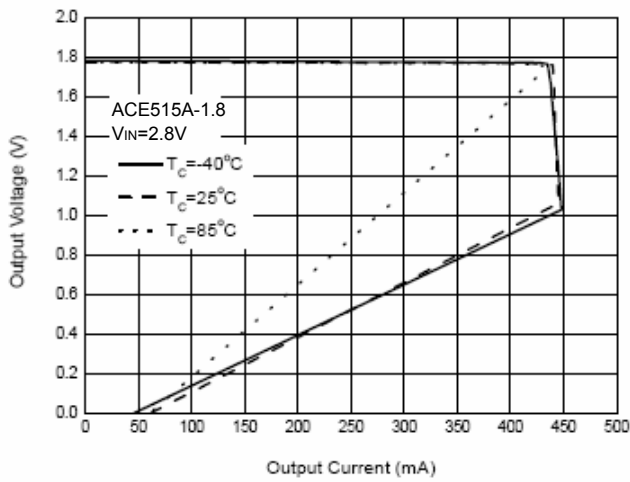
Dropout Voltage vs. Case Temperature



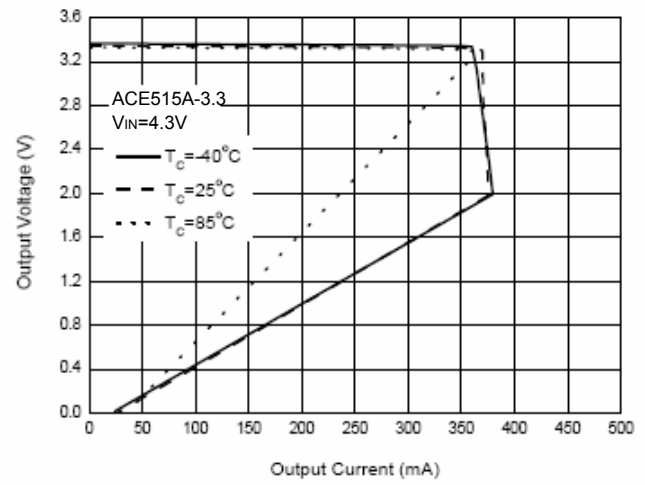
Current Limit



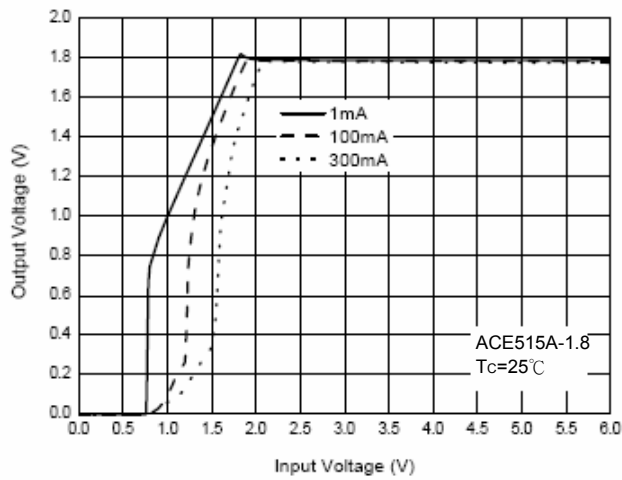
Current Limit



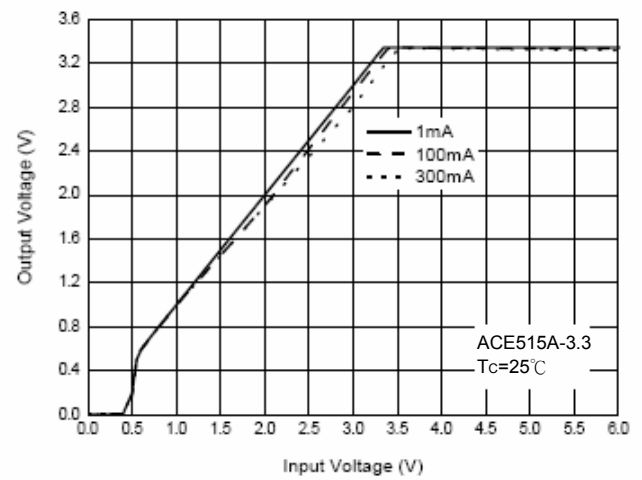
Current Limit



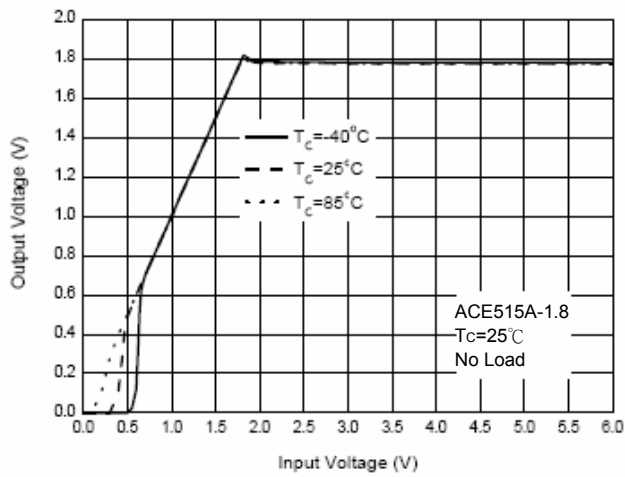
Current Limit



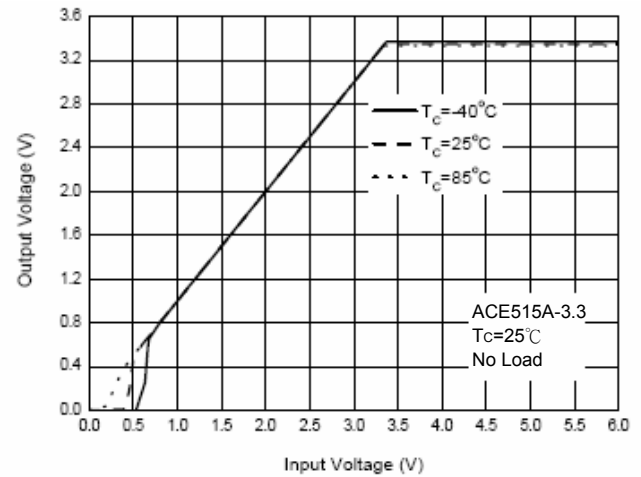
Output Voltage vs. Input Voltage



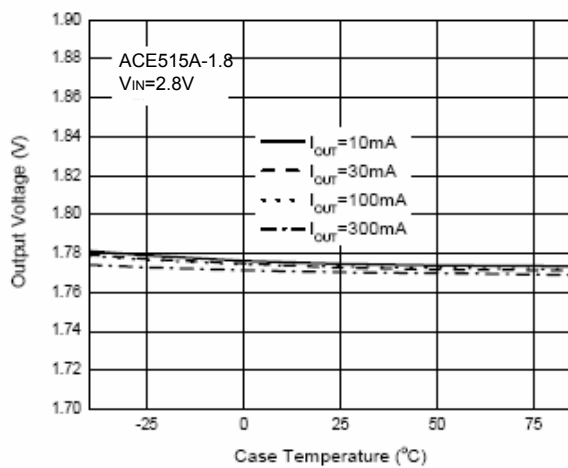
Output Voltage vs. Input Voltage



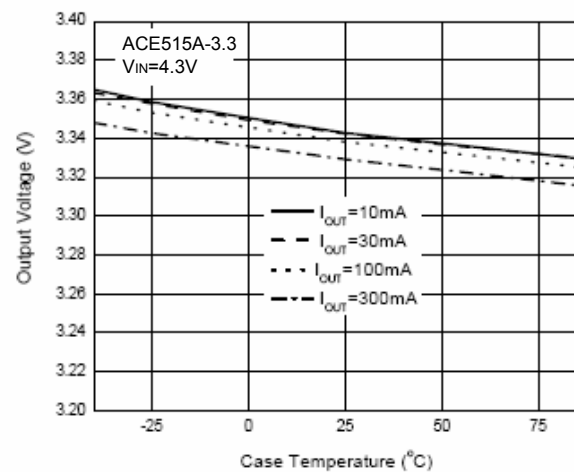
Output Voltage vs. Input Voltage



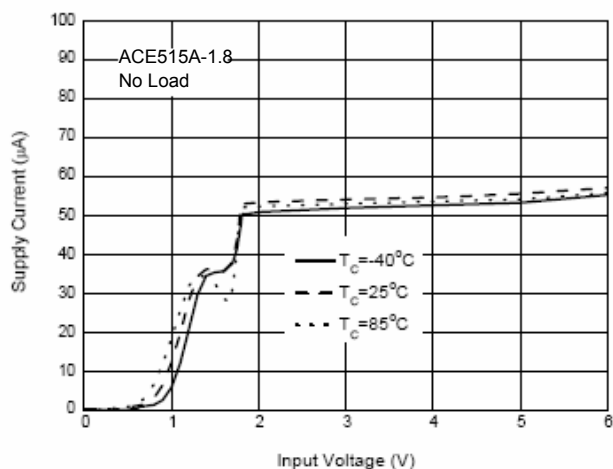
Output Voltage vs. Input Voltage



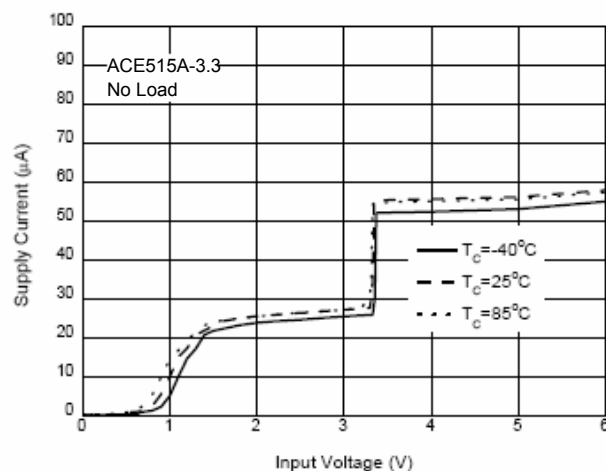
Output Voltage vs. Case Temperature



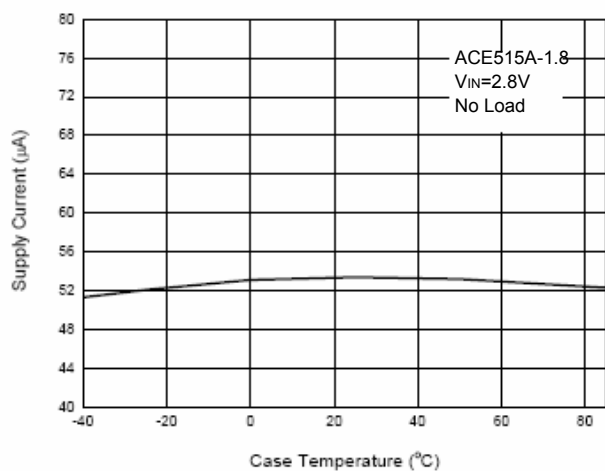
Output Voltage vs. Case Temperature



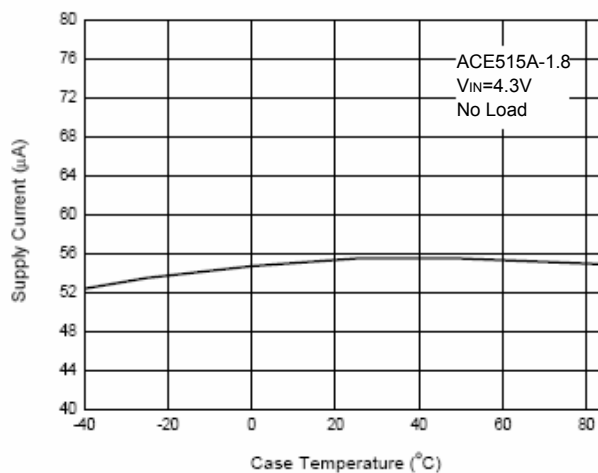
Supply Current vs. Input Voltage



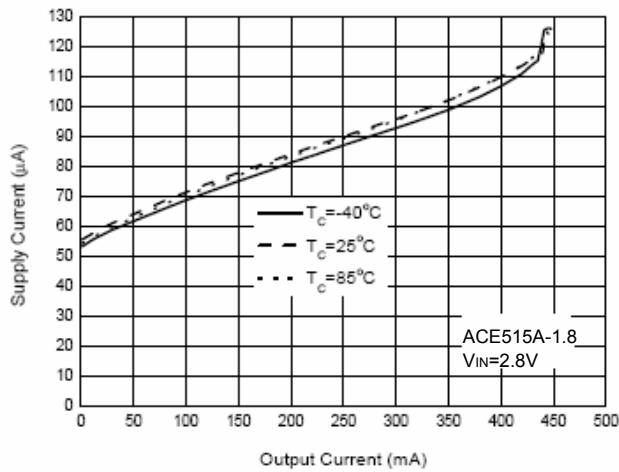
Supply Current vs. Input Voltage



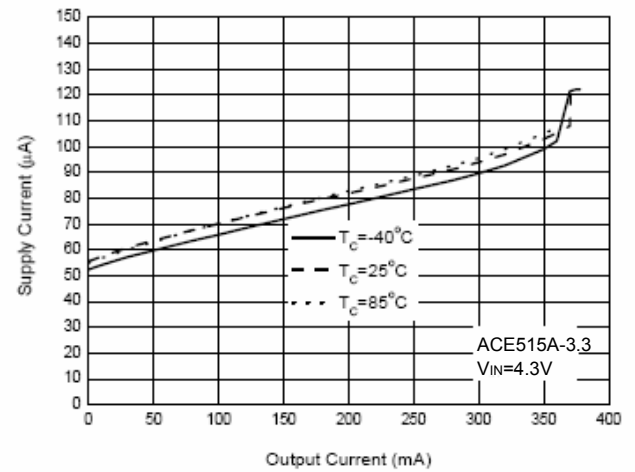
Supply Current vs. Case Temperature



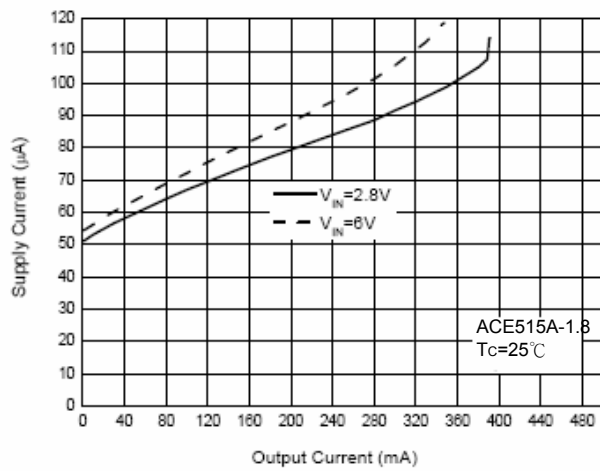
Supply Current vs. Case Temperature



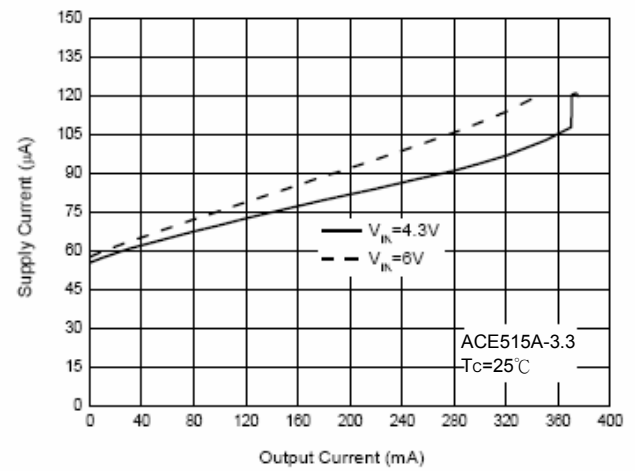
Supply Current vs. Output Current



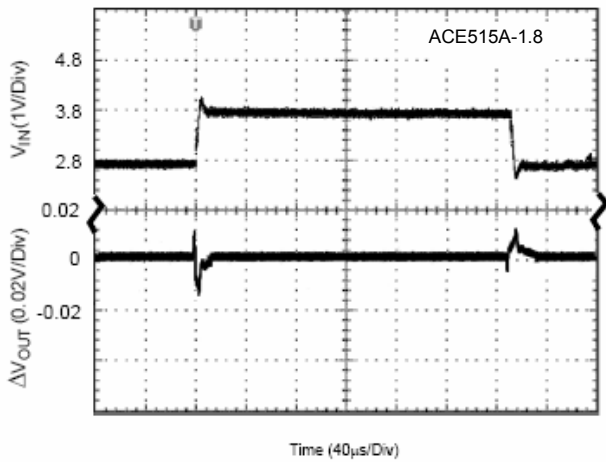
Supply Current vs. Output Current



Supply Current vs. Output Current

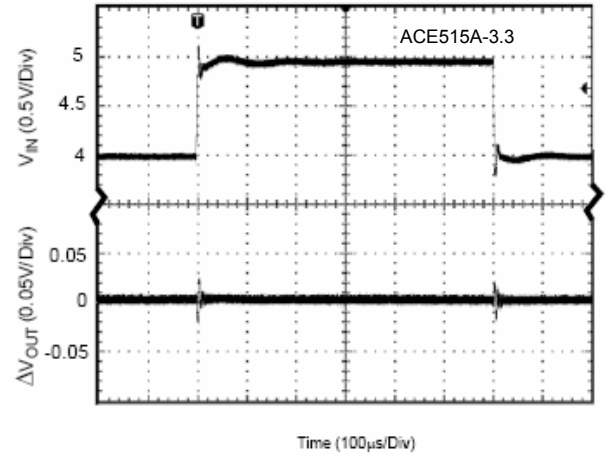


Supply Current vs. Output Current



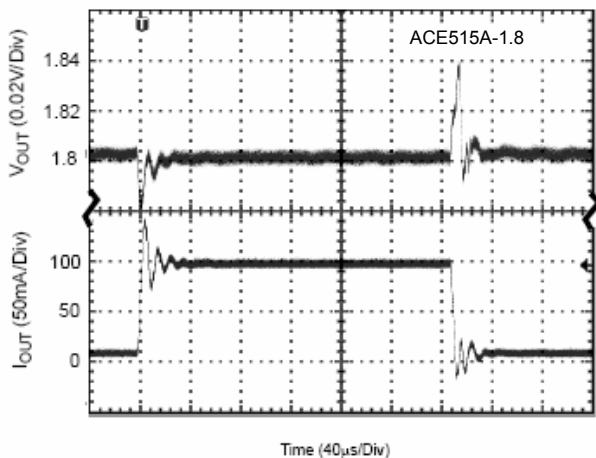
Line Transient

Conditions: $I_{OUT}=30\text{mA}$, $C_{OUT}=1\mu\text{F}$, $V_{IN}=2.8$ to 3.8V



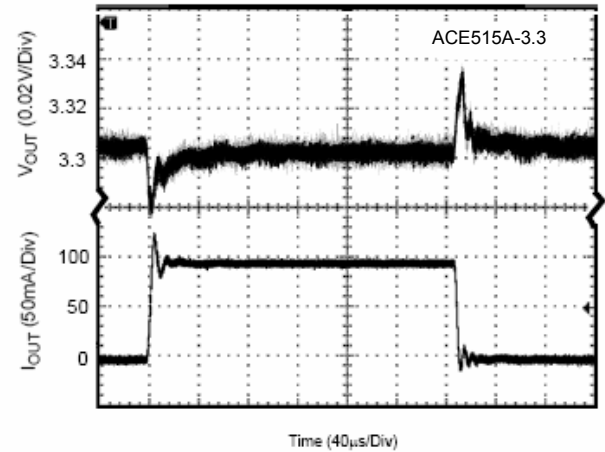
Line Transient

Conditions: $I_{OUT}=30\text{mA}$, $C_{OUT}=1\mu\text{F}$, $V_{IN}=4$ to 5V



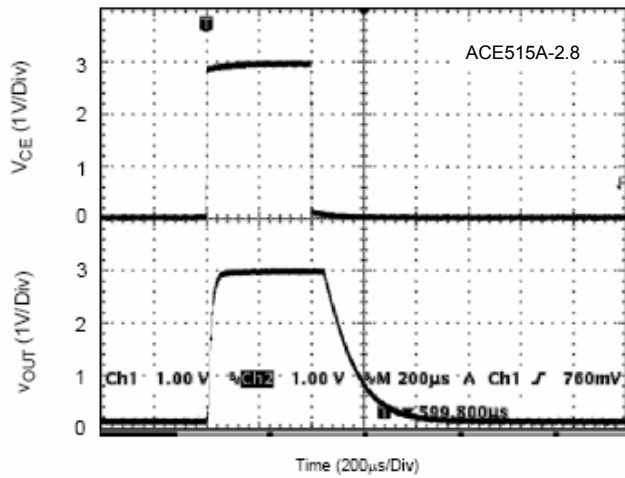
Load Transient

Conditions: $I_{OUT}=10\text{mA}$ to 100mA , $C_{IN}=1\mu\text{F}$,
 $C_{OUT}=1\mu\text{F}$, $V_{IN}=2.8\text{V}$



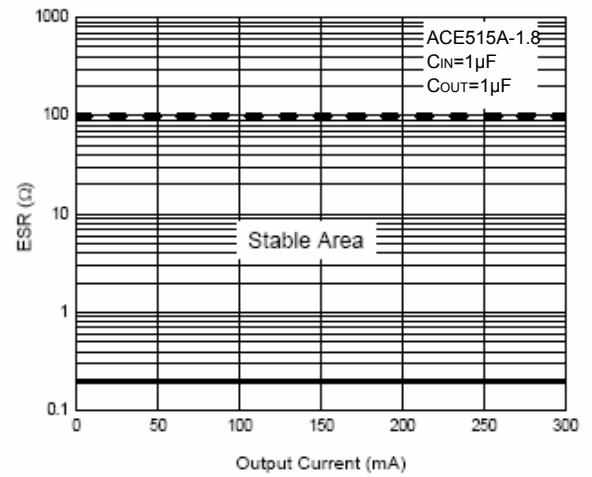
Line Transient

Conditions: $I_{OUT}=10\text{mA}$ to 100mA , $C_{IN}=1\mu\text{F}$,
 $C_{OUT}=1\mu\text{F}$, $V_{IN}=4.3\text{V}$

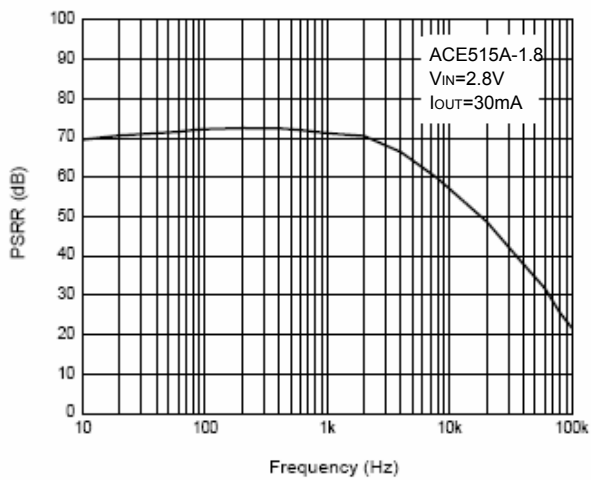


Enable Input Response and Auto-discharge

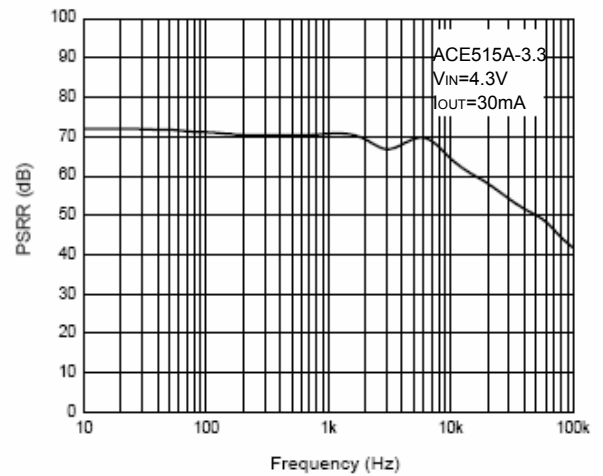
Conditions: $V_{CE}=0$ to 3V, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, $V_{IN}=3V$, no load



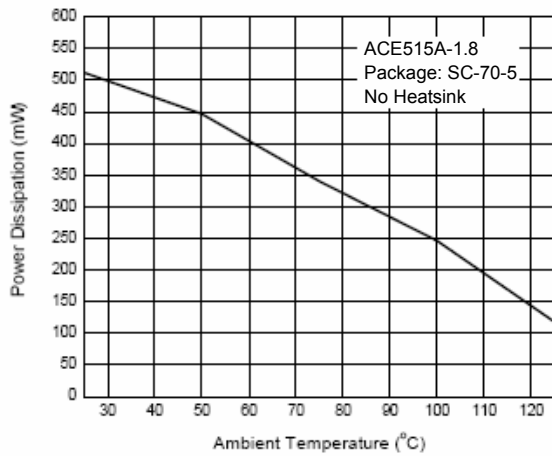
ESR vs. Output Current



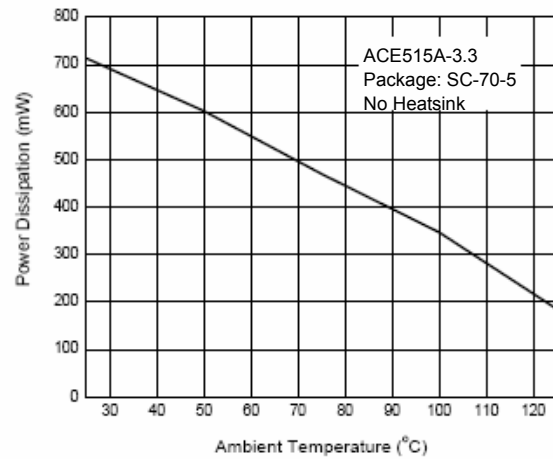
PSRR



PSRR

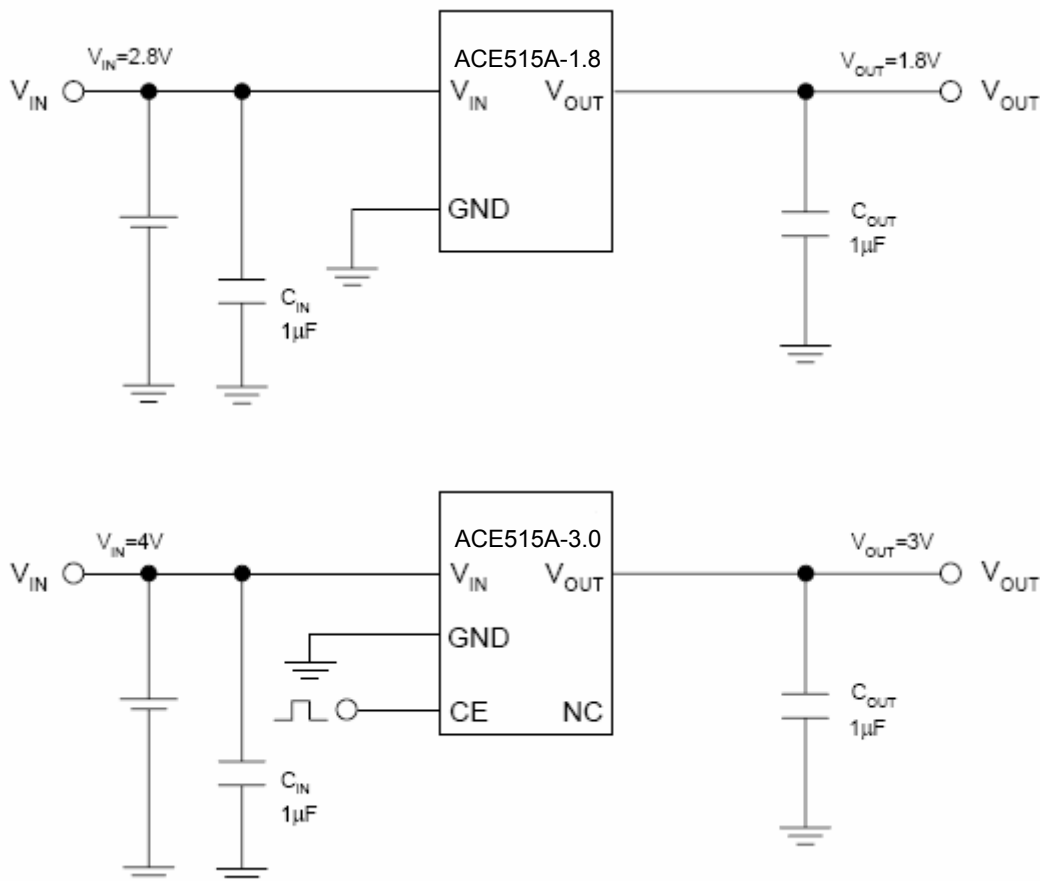


Power Dissipation vs. Ambient Temperature



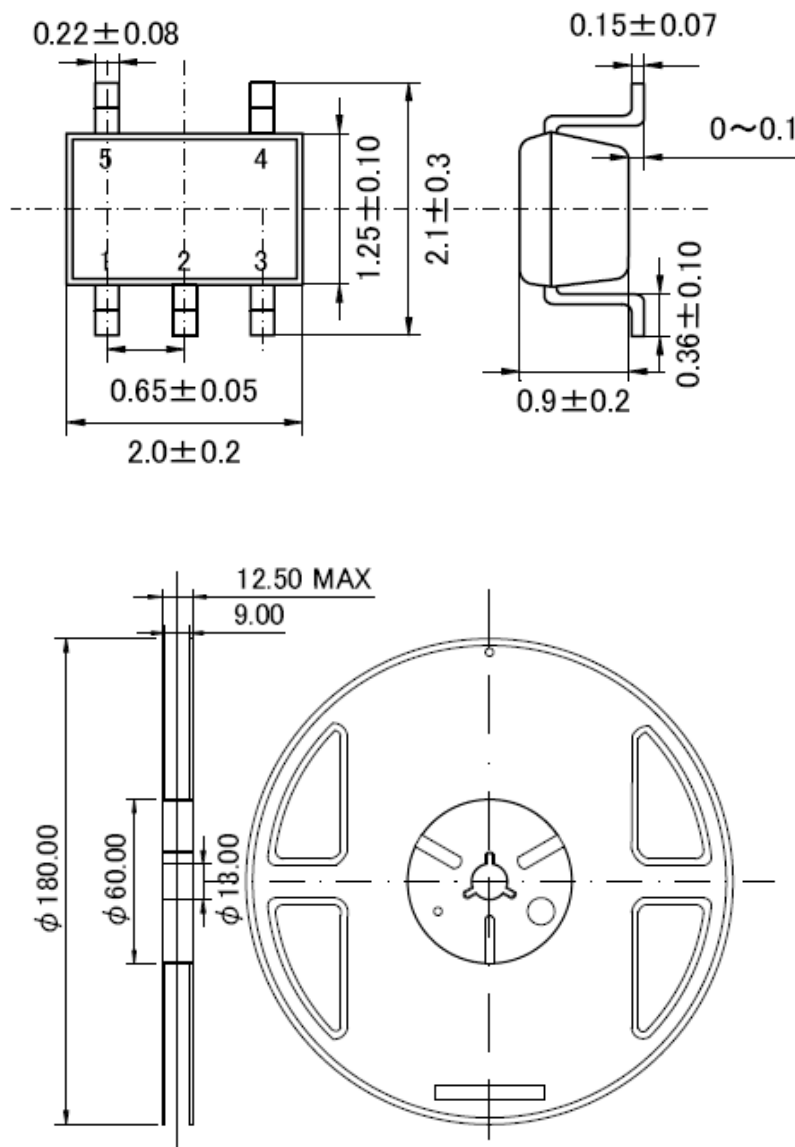
Power Dissipation vs. Ambient Temperature

Typical Application



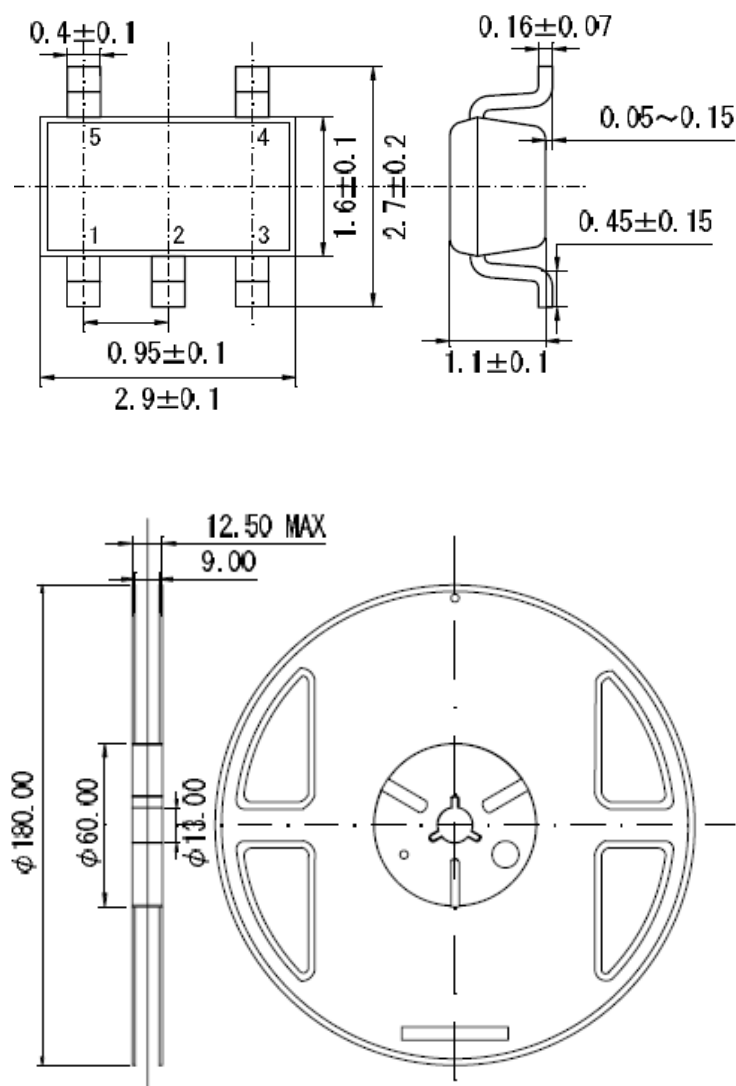
Packing Information

SC-70-5



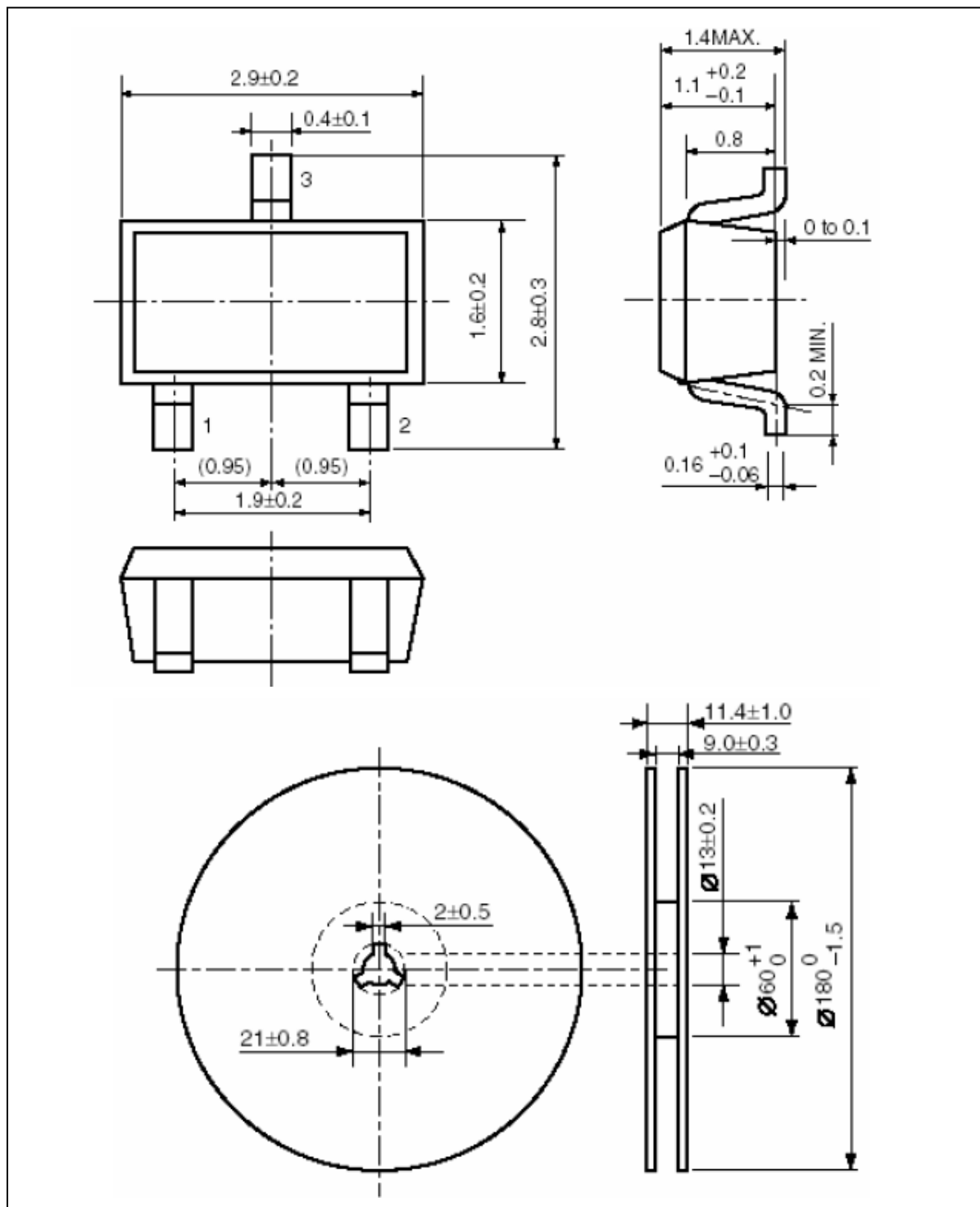
Packing Information

SOT-23-5



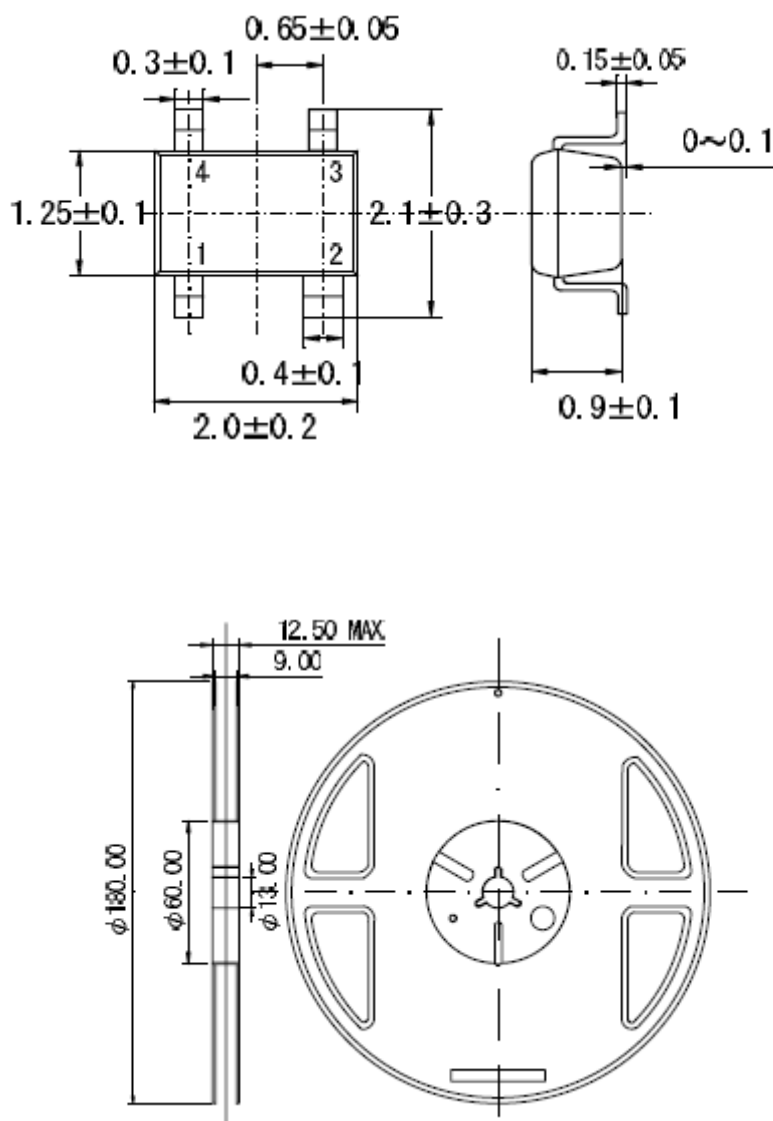
Packing Information

SOT-23-3



Packing Information

SC-82



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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