

■ General Description

The AME8550 series are highly precise, low power consumption voltage detectors, manufactured using CMOS and fuse trimming technologies. Detect voltage is extremely accurate with minimal temperature drift.

Both CMOS and N channel open drain output configurations are available.

■ Features

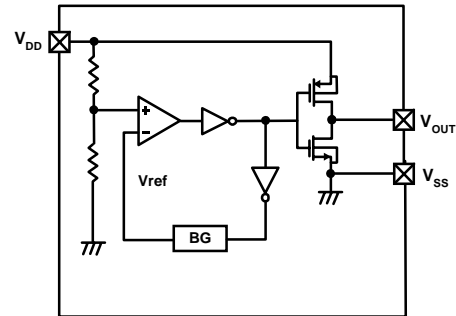
- Highly accurate: $\pm 2\%$
- Low power consumption: TYP $0.8\mu\text{A}$ ($V_{DD}=1.5\text{V}$)
- Detect voltage range: 1.6V to 6.0V in 0.1V increments
- Operating voltage range: 0.9V to 6.5V
- Detect voltage temperature characteristics: TYP $\pm 100\text{ppm}/^\circ\text{C}$
- Output configuration: N-channel open drain or CMOS
- Ultra small package :
 SOT-23 (150mW)
 SOT-25 (150mW)
 SOT-89 (500mW)
 SC-70 (100mW)
- Add an external capacitor to perform an μP reset.

■ Applications

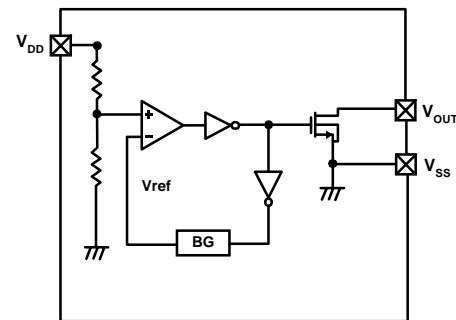
- Microprocessor reset circuitry
- Memory battery back-up circuits
- Power-on reset circuits
- Power failure detection
- System battery life and charge voltage monitors

■ Functional Block Diagram

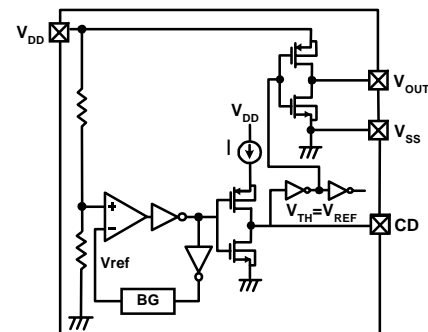
(1) CMOS Output without delay



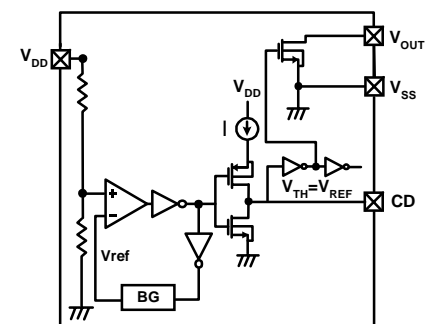
(2) Nch Open Drain Output without delay



(3) CMOS Output with delay

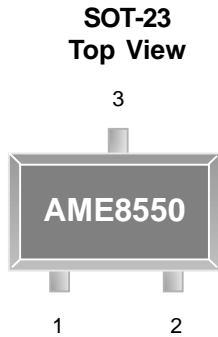


(4) Nch Open Drain Output with delay





■ Pin Configuration



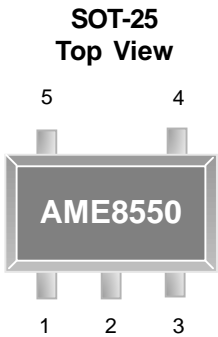
AME8550AEETXXXX

1. V_{OUT}
2. V_{SS}
3. V_{DD}



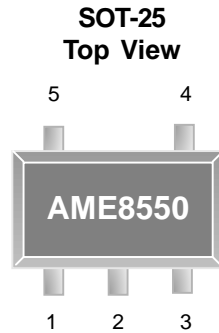
AME8550AEFTXXXX

1. V_{OUT}
2. V_{DD}
3. V_{SS}



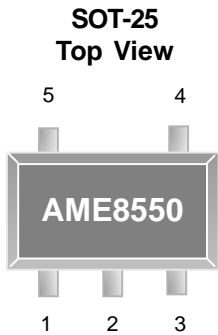
AME8550AEEVXXXX

1. V_{OUT}
2. V_{DD}
3. V_{SS}
4. CD
5. NC



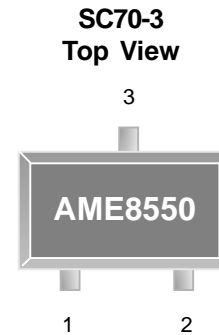
AME8550BEEVXXXX

1. V_{OUT}
2. V_{DD}
3. V_{SS}
4. NC
5. CD



AME8550CEEVXXXX

1. V_{OUT}
2. V_{DD}
3. V_{SS}
4. NC
5. NC



AME8550AEITXXXX

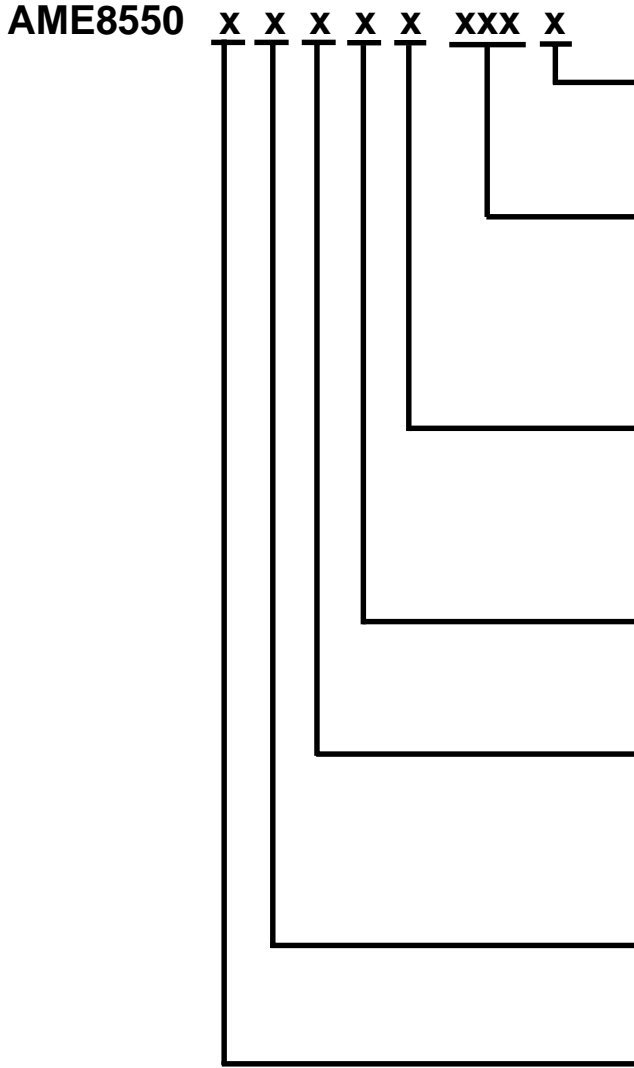
1. V_{SS}
2. V_{OUT}
3. V_{DD}

■ Pin Description

Pin Name	Pin Description
V_{IN}	Supply Voltage Input
V_{SS}	Ground
V_{OUT}	Output
NC	No Connection
CD	Connect an external capacitor when delay function is needed



■ Ordering Information



Special Feature

- L : Lead Free
- Y : Low Profile
- Z : Lead Free & Low Profile

Detect Voltage

190: V=1.9V	250: V=2.5V	360: V=3.6V
200: V=2.0V	260: V=2.6V	370: V=3.7V
220: V=2.2V	270: V=2.7V	420: V=4.2V
230: V=2.3V	280: V=2.8V	440: V=4.4V
240: V=2.4V	290: V=2.9V	460: V=4.6V

Output Options

- A: CMOS output without delay
- B: Open-Drain output without delay
- C: CMOS output with delay
- D: Open-Drain output with delay

Number of Pins

- T: 3
- V:5

Package Type

- F: SOT-89
- E: SOT-23
- E: SOT-25
- I: SC-70

Operating Temperature

- E: -40°C to 85°C

Pin Out Configuration

Please consult AME sales office or authorized Rep./Distributor for other voltage accuracy and package type availability.



■ Ordering Information

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8550AEEVC190	AXOww	1.9V	SOT-25	-40°C to +85°C
AME8550BEEVC190	AXPww	1.9V	SOT-25	-40°C to +85°C
AME8550AEETB210	AXQww	2.1V	SOT-23	-40°C to +85°C
AME8550AEFTB210	A8550A B210ww	2.1V	SOT-89	-40°C to +85°C
AME8550CEEVB210	AXRww	2.1V	SOT-25	-40°C to +85°C
AME8550AEETA220	AWHww	2.2V	SOT-23	-40°C to +85°C
AME8550AEFTA220	A8550A A220ww	2.2V	SOT-89	-40°C to +85°C
AME8550AEITA220	AXKw	2.2V	SC70-3	-40°C to +85°C
AME8550AEETB220	AWUww	2.2V	SOT-23	-40°C to +85°C
AME8550AEFTB220	A8550A B220ww	2.2V	SOT-89	-40°C to +85°C
AME8550CEEVB220	AXSww	2.2V	SOT-25	-40°C to +85°C
AME8550AEEVD230	AYTww	2.3V	SOT-25	-40°C to +85°C
AME8550BEEVD230	AYUww	2.3V	SOT-25	-40°C to +85°C
AME8550AEETA240	AXTww	2.4V	SOT-23	-40°C to +85°C
AME8550AEFTA240	A8550A A240ww	2.4V	SOT-89	-40°C to +85°C
AME8550CEEVA240	AXUww	2.4V	SOT-25	-40°C to +85°C

Note: w represents date code (A thru Z) : 2 work weeks per character.
Please contact AME for details



■ Ordering Information

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8550AEETB240	AXVww	2.4V	SOT-23	-40°C to +85°C
AME8550AEFTB240	A8550A B240ww	2.4V	SOT-89	-40°C to +85°C
AME8550CEEVB240	AXWww	2.4V	SOT-25	-40°C to +85°C
AME8550AEEVD240	AXXww	2.4V	SOT-25	-40°C to +85°C
AME8550BEEVD240	AXYww	2.4V	SOT-25	-40°C to +85°C
AME8550AEETB250	AXZww	2.5V	SOT-23	-40°C to +85°C
AME8550AEFTB250	A8550A B250ww	2.5V	SOT-89	-40°C to +85°C
AME8550CEEVB250	AYAww	2.5V	SOT-25	-40°C to +85°C
AME8550AEEVD260	AYVww	2.6V	SOT-25	-40°C to +85°C
AME8550BEEVD260	AYWww	2.6V	SOT-25	-40°C to +85°C
AME8550AEETA270	AWlww	2.7V	SOT-23	-40°C to +85°C
AME8550AEFTA270	A8550A A270ww	2.7V	SOT-89	-40°C to +85°C
AME8550AEITA270	AXNw	2.7V	SC70-3	-40°C to +85°C
AME8550AEETB270	AWVww	2.7V	SOT-23	-40°C to +85°C
AME8550AEFTB270	A8550A B270ww	2.7V	SOT-89	-40°C to +85°C
AME8550CEEVB270	AYSww	2.7V	SOT-25	-40°C to +85°C



■ Ordering Information

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8550AEEVD270	AYXww	2.7V	SOT-25	-40°C to +85°C
AME8550BEEVD270	AYYww	2.7V	SOT-25	-40°C to +85°C
AME8550AEETB280	AYBww	2.8V	SOT-23	-40°C to +85°C
AME8550AEFTB280	A8550A B280ww	2.8V	SOT-89	-40°C to +85°C
AME8550CEEVB280	AYCww	2.8V	SOT-25	-40°C to +85°C
AME8550AEEVC290	AYDww	2.9V	SOT-25	-40°C to +85°C
AME8550BEEVC290	AYEww	2.9V	SOT-25	-40°C to +85°C
AME8550AEETA300	AYFww	3.0V	SOT-23	-40°C to +85°C
AME8550AEFTA300	A8550A A300ww	3.0V	SOT-89	-40°C to +85°C
AME8550CEEVA300	AYGww	3.0V	SOT-25	-40°C to +85°C
AME8550AEETB340	AYHww	3.4V	SOT-23	-40°C to +85°C
AME8550AEFTB340	A8550A B340ww	3.4V	SOT-23	-40°C to +85°C
AME8550CEEVB340	AYIww	3.4V	SOT-25	-40°C to +85°C
AME8550AEEVD360	AYJww	3.6V	SOT-25	-40°C to +85°C
AME8550BEEVD360	AYKww	3.6V	SOT-25	-40°C to +85°C
AME8550AEETB440	AYLww	4.4V	SOT-23	-40°C to +85°C



■ Ordering Information

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8550AEFTB440	A8550A B440ww	4.4V	SOT-89	-40°C to +85°C
AME8550CEEVB440	AYMww	4.4V	SOT-25	-40°C to +85°C
AME8550AEEVC460	AYNww	4.6V	SOT-25	-40°C to +85°C
AME8550BEEVC460	AYOww	4.6V	SOT-25	-40°C to +85°C



■ Absolute Maximum Ratings

Parameter		Symbol	Maximum	Unit
Input Voltage		V_{DD}	7	V
Output Current		I_{OUT}	50	mA
Output Voltage	CMOS	V_{OUT}	$V_{SS} - 0.3$ to $V_{DD} + 0.3$	V
	Nch open drain		$V_{SS} - 0.3$ to 7	
Power Dissipation	SOT-23		150	mW
	SOT-25		150	
	SOT-89		500	
	SC-70		100	
Operating Ambient Temperature Range		T_{opr}	-40 to +85	°C
Storage Temperature Range		T_{STG}	- 40 to +125	

Caution: Stress above the listed absolute rating may cause permanent damage to the device



■ Electrical Specifications

TA = 25°C, V_{DF}(T)=1.6 to 6.0V ± 2%

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Detect Voltage	V _{DF}		V _{DF} x0.98	V _{DF}	V _{DF} x1.02	V
Hysteresis Range	V _{HYS} / V _{DF}		2		8	%
Supply Current	I _{SS}	V _{DD} =1.5V		0.8	2.3	μA
		V _{DD} =2.0V		0.9	2.7	
		V _{DD} =3.0V		1.0	3.0	
		V _{DD} =4.0V		1.1	3.2	
		V _{DD} =5.0V		1.2	3.6	
Operating Voltage	V _{DD}	V _{DF} (T)=1.6V to 6.0V	0.9		6.5	V
Output Current	I _{OUT}	Nch V _{DS} =0.5V				mA
		V _{DD} =1.0V	1.0	2.2		
		V _{DD} =2.0V	3.0	7.7		
		V _{DD} =3.0V	5.0	10.1		
		V _{DD} =4.0V	6.0	11.5		
		V _{DD} =5.0V	7.0	13.0		
	Pch V _{DS} =2.1V			-10.0	-2.0	
	V _{DD} =7V (with CMOS output)					
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta \text{Topr.} V_{DF}}$	-40°C ≤ Topr ≤ 85°C		-100		ppm/°C
Propagation Time (V _{DR} → V _{OUT} inversion)	tDLY				0.2	ms

Note:

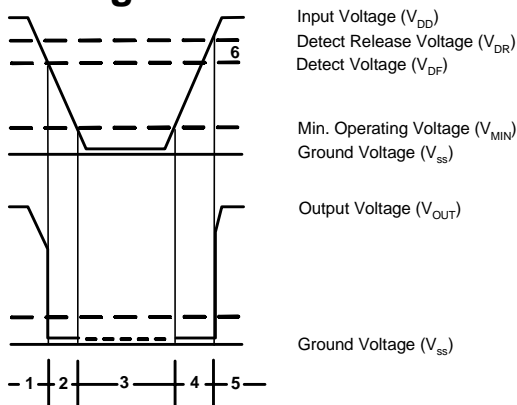
V_{DF}(T) : Established Detect Voltage Value

Release Voltage : V_{DR} = V_{DF} + V_{HYS}

■ Functional Description (CMOS output without delay)

1. When input voltage (V_{DD}) rises above detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to V_{DD} .
(A condition of high impedance exists with Nch open drain output configurations.)
2. When input voltage (V_{DD}) falls below detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to the ground voltage (V_{SS}) level.
3. When input voltage (V_{DD}) falls to a level below that of the minimum operating voltage (V_{MIN}), output will become unstable. In this condition, V_{DD} will equal the pulled-up output (should output be pulled-up.)
4. When input voltage (V_{DD}) rises above the ground voltage (V_{SS}) level, output will be unstable at levels below the minimum operating voltage (V_{MIN}). Between the V_{MIN} and detect release voltage (V_{DR}) levels, the ground voltage (V_{SS}) level will be maintained.
5. When input voltage (V_{DD}) rises above detect release voltage (V_{DR}), output voltage (V_{OUT}) will be equal to V_{DD} .
(A condition of high impedance exists with Nch open drain output configurations.)
6. The difference between V_{DR} and V_{DF} represents the hysteresis range.

■ Timing Chart



■ Functional Description (CMOS output with delay)

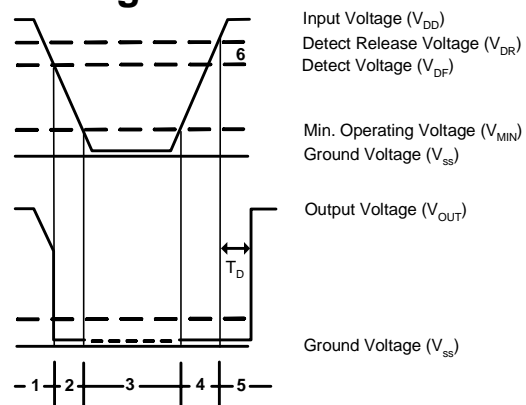
1. When input voltage (V_{DD}) rises above detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to V_{DD} .
(A condition of high impedance exists with Nch open drain output configurations.)
2. When input voltage (V_{DD}) falls below detect voltage (V_{DF}), output voltage (V_{OUT}) will be equal to the ground voltage (V_{SS}) level.
3. When input voltage (V_{DD}) falls to a level below that of the minimum operating voltage (V_{MIN}), output will become unstable. In this condition, V_{DD} will equal the pulled-up output (should output be pulled-up.)
4. When input voltage (V_{DD}) rises above the ground voltage (V_{SS}) level, output will be unstable at levels below the minimum operating voltage (V_{MIN}). Between the V_{MIN} and detect release voltage (V_{DR}) levels, the ground voltage (V_{SS}) level will be maintained.
5. When input voltage (V_{DD}) rises above detect release voltage (V_{DR}), output voltage (V_{OUT}) will be equal to V_{DD} after T_D delay time.

$$Q = V \times C = I \times T_D$$

$$T = \frac{V \times C}{I} \quad V = V_{REF}$$

For Example, $T_D = \frac{V_{REF} * 1nF}{75nA}$
6. The difference between V_{DR} and V_{DF} represents the hysteresis range.

■ Timing Chart



■ Notes on Use

1. When a resistor is connected between the V_{DD} pin and the input with CMOS output configurations, oscillation may occur as a result of voltage drops at R_{IN} if load current (I_{OUT}) exists. (refer to 5 - (1) below)
2. When a resistor is connected between the V_{DD} pin and the input with CMOS output configurations, irrespective of Nch output configurations, oscillation may occur as a result of through current at the time of voltage release even if load current (I_{OUT}) does not exist.(refer to 5 - (1)(2) below)
3. With a resistor connected between the V_{DD} pin and the input, detect and release voltage will rise as a result of the IC's supply current flowing through the V_{DD} pin.
4. In order to stabilise the IC's operations, please ensure that V_{DD} pin's input frequency's rise and fall times are more than several μ sec / V.
5. Oscillation

(1) Output current oscillation with the CMOS output configuration

When the voltage applied at IN rises, release operations commence and the detector's output voltage increases. Load current (I_{OUT}) will flow at R_L . Because a voltage drop ($R_{IN} \times I_{OUT}$) is produced at the R_{IN} resistor, located between the input (IN) and the V_{DD} pin, the load current will flow via the IC's V_{DD} pin. The voltage drop will also lead to a fall in the voltage level at the V_{DD} pin. When the V_{DD} pin voltage level falls below the detect voltage level, detect operations will commence. Following detect operations, load current flow will cease and since voltage drop at R_{IN} will disappear, the voltage level at the V_{DD} pin will rise and release operations will begin over again.

Oscillation may occur with this " release - detect - release " repetition.

Further, this condition will also appear via means of a similar mechanism during detect operations.

(2) Oscillation as a result of through current

Since the AME8550 series are CMOS ICs, through current will flow when the IC's internal circuit switching operates(during release and detect operations).Consequently, oscillation is liable to occur as a result of drops in voltage at the through current's resistor (R_{IN}) during release voltage operations. (refer to diagram 2)

Since hysteresis exists during detect operations, oscillation is unlikely to occur.

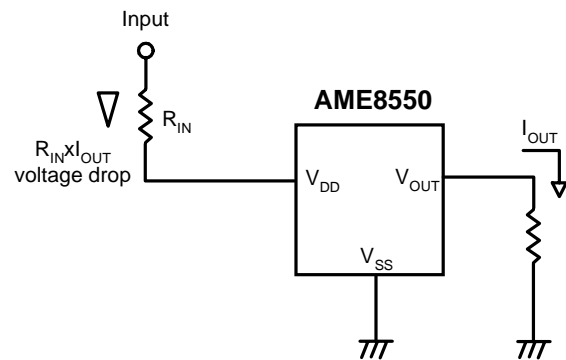


Diagram1

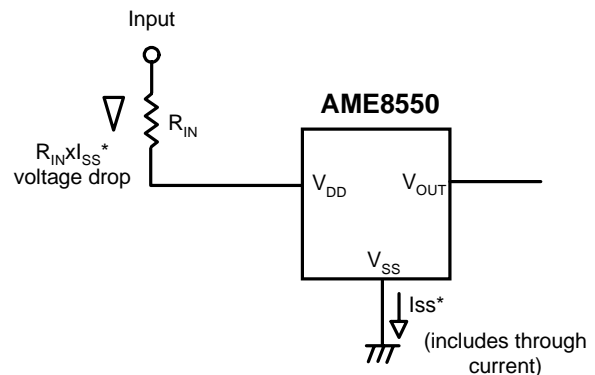
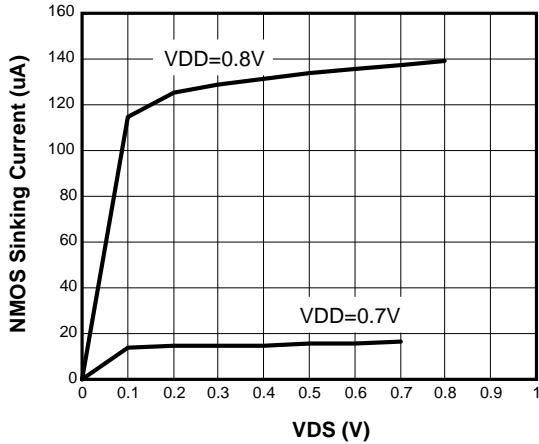


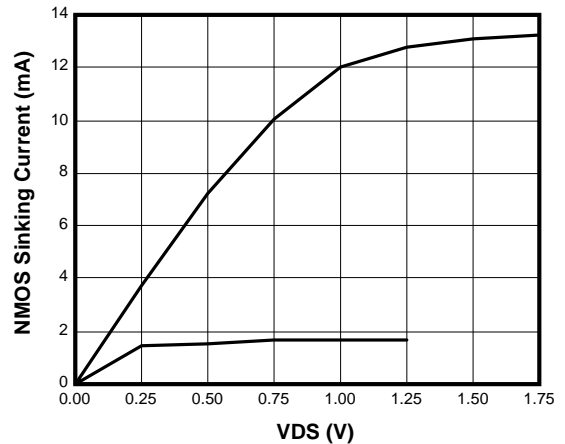
Diagram2



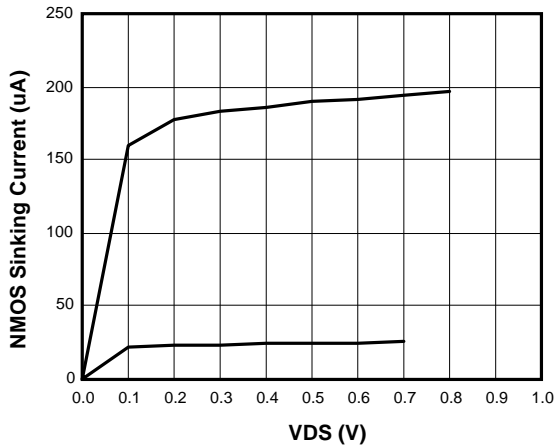
AME8550-1.9V



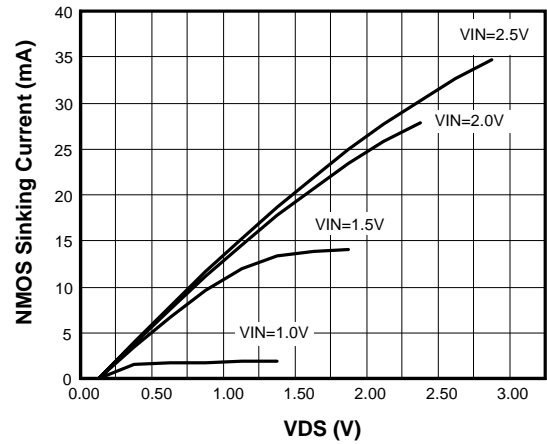
AME8550-1.9V



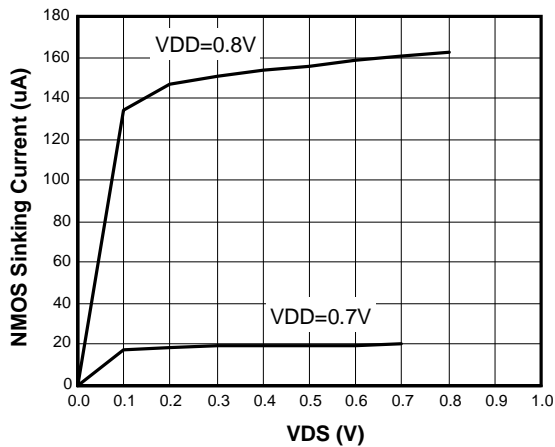
AME8550-2.7V



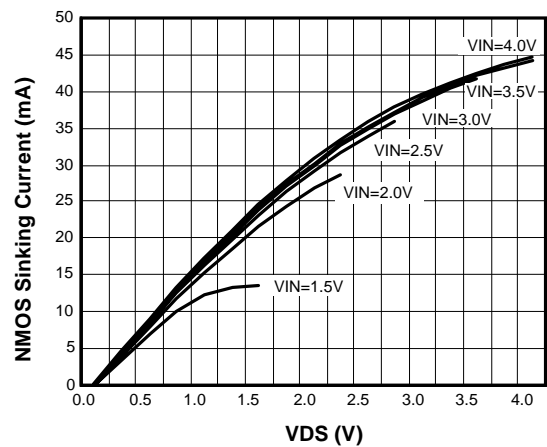
AME8550AEETA270



AME8550-4.6V

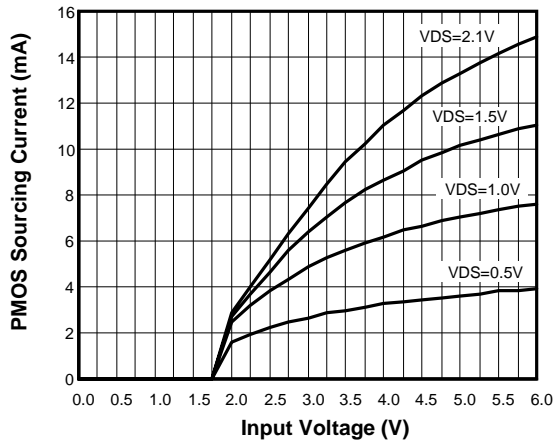


AME8550-4.6V

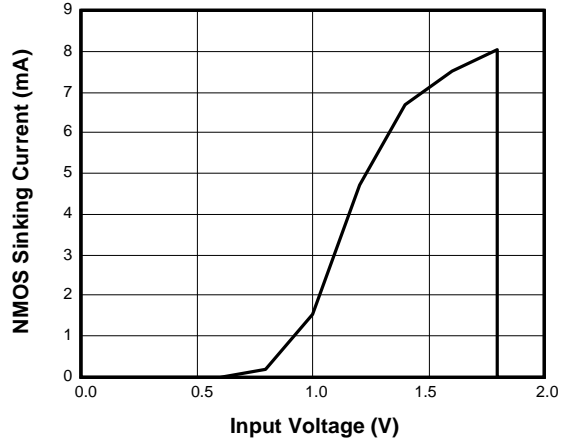




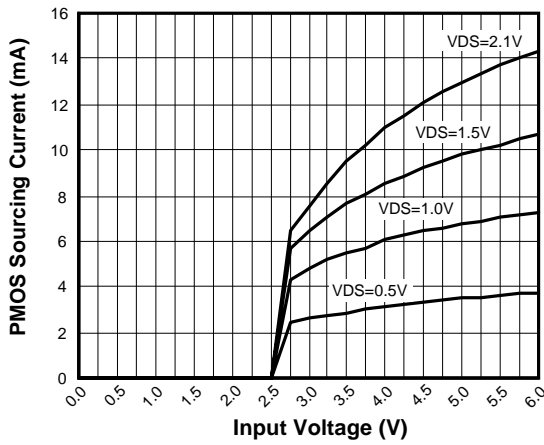
AME8550-1.9V



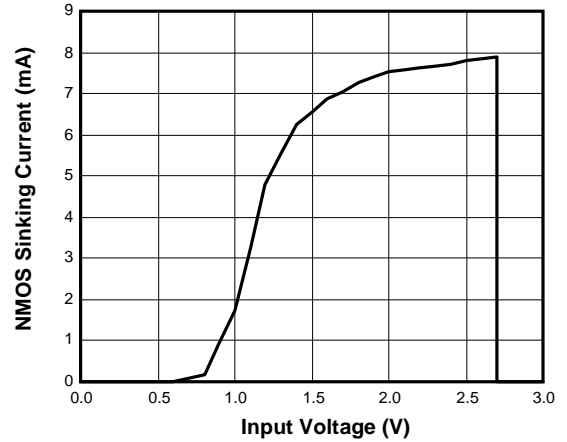
AME8550-1.9V



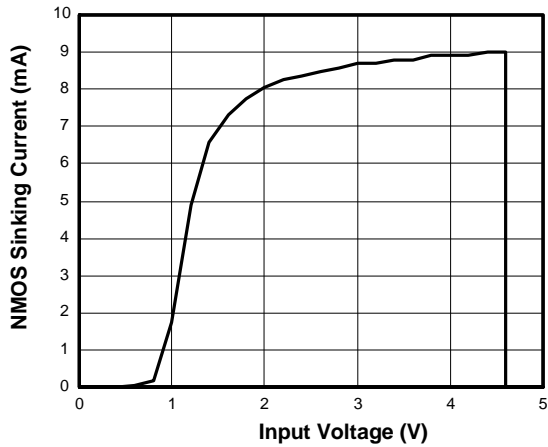
AME8550AEETA270



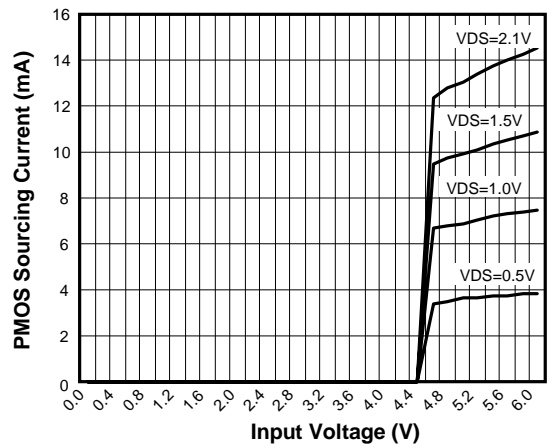
AME8550-2.7V



AME8550-4.6V

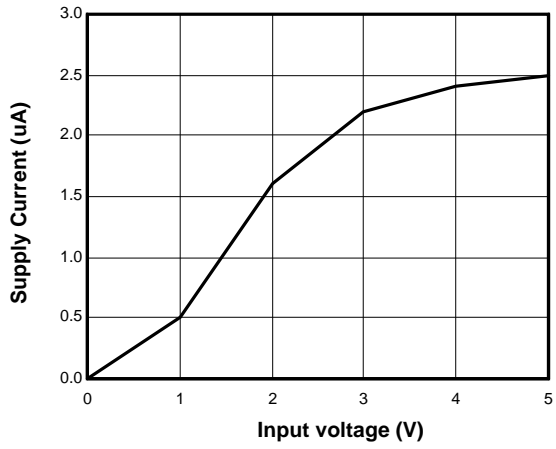


AME8550-4.6V

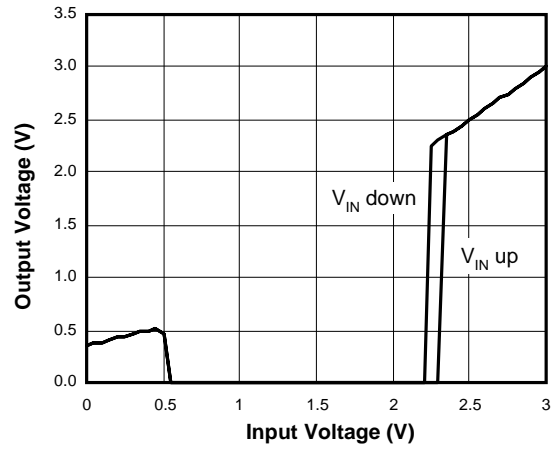




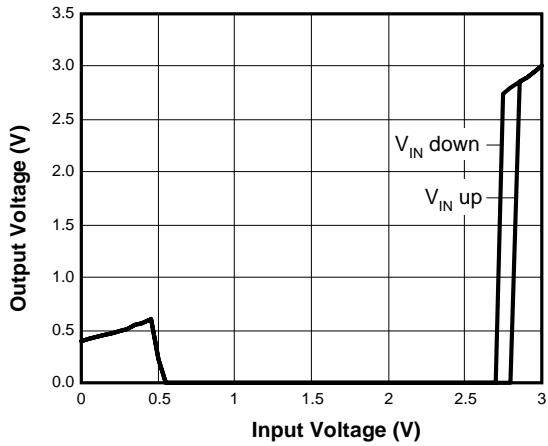
Supply Current vs. Input Voltage (2.7V)



Output Voltage vs. Input Voltage (2.2V)



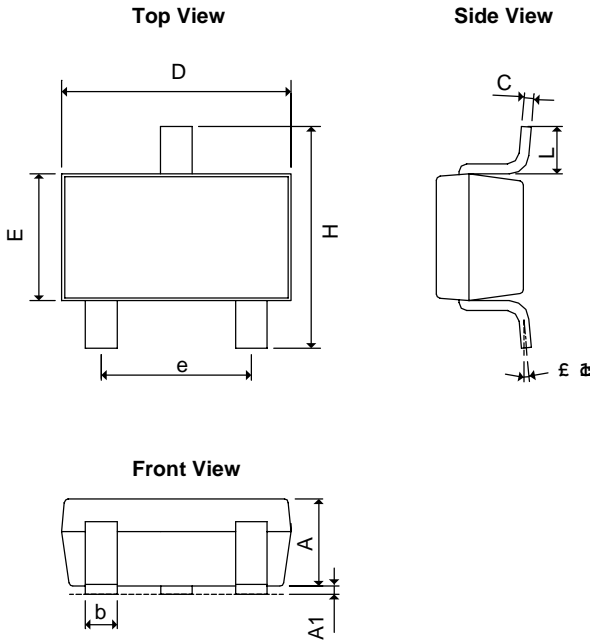
Output Voltage vs. Input Voltage (2.7V)





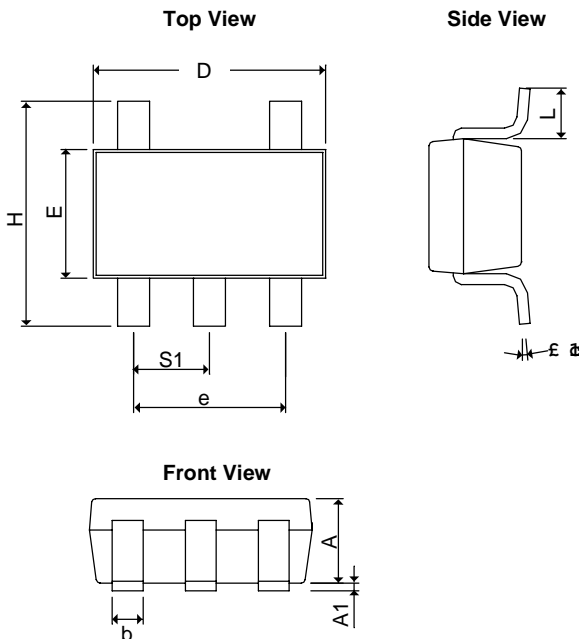
■ Package Dimension

SOT-23

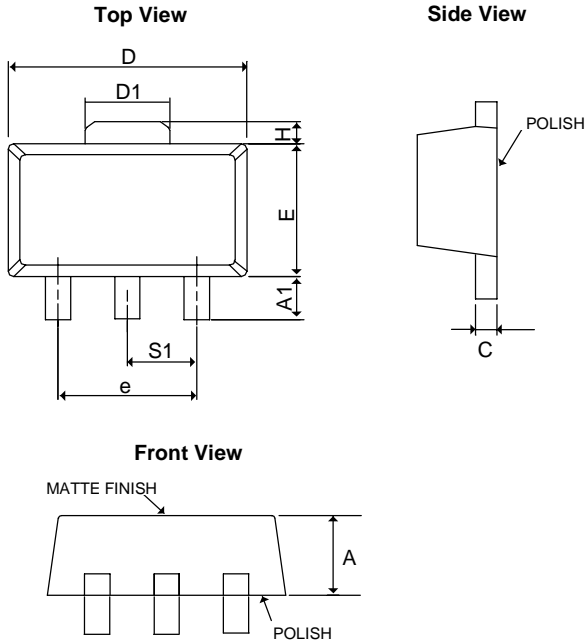


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.00	1.40	0.0394	0.0551
A ₁	0.00	0.15	0.0000	0.0059
b	0.35	0.50	0.0138	0.0197
C	0.09	0.25	0.0035	0.0098
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.0748 BSC	
H	2.40	3.00	0.09449	0.11811
L	0.35BSC		0.0138BSC	
θ1	0°	10°	0°	10°

SOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.20REF		0.0472REF	
A ₁	0.00	0.15	0.0000	0.0059
b	0.30	0.55	0.0118	0.0217
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.07480 BSC	
H	2.60	3.00	0.10236	0.11811
L	0.37BSC		0.0146BSC	
θ1	0°	10°	0°	10°
S ₁	0.95BSC		0.0374BSC	

■ Package Dimension
SOT-89


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.39	1.60	0.05472	0.06299
A₁	0.8REF		0.0315REF	
C	0.35	0.44	0.01378	0.01732
D	4.39	4.60	0.17283	0.1811
D₁	1.35	1.83	0.05315	0.07205
E	2.28	3.60	0.08976	0.14173
e	3.00REF		0.1181REF	
H	0.70REF		0.0276REF	
S₁	1.50REF		0.0590REF	



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Life Support Policy:

These products of AME, Inc. are not authorized for use as critical components in life-support devices or systems, without the express written approval of the president of AME, Inc.

AME, Inc. reserves the right to make changes in the circuitry and specifications of its devices and advises its customers to obtain the latest version of relevant information.

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