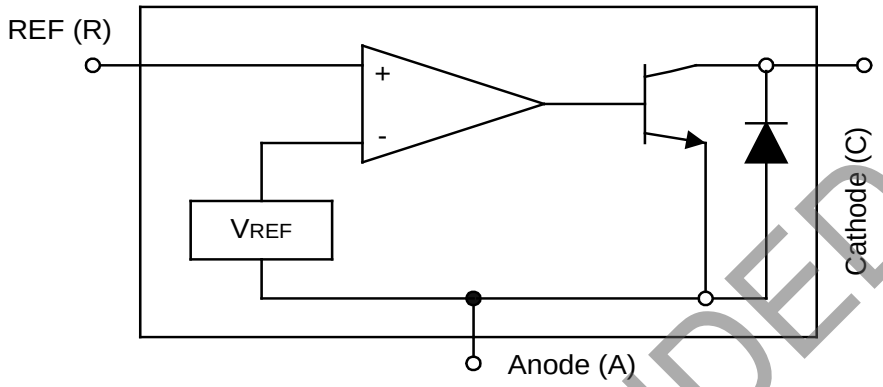
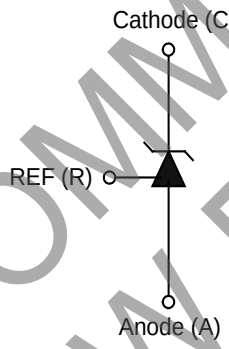
Functional Block Diagram



Functional Block Diagram



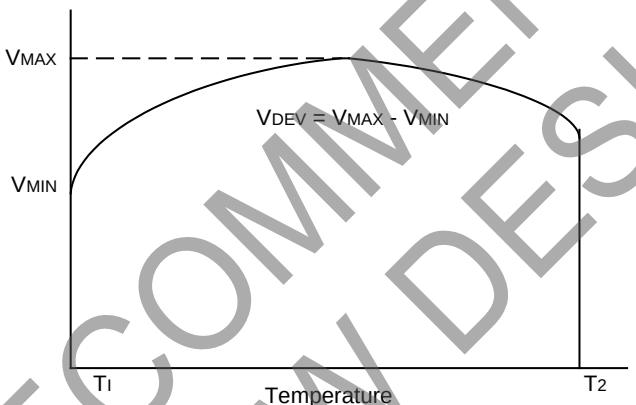
Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter		Rating	Unit
V_{CV}	Cathode Voltage		20	V
I_{CC}	Continuous Cathode Current		-10 to +250	mA
I_{REF}	Reference Input Current		10	mA
T_{OP}	Operating Temperature		-20 to +85	°C
T_{ST}	Storage Temperature		-65 to +150	°C
P_D	Power Dissipation (Notes 4, 5)	SOT23(R)	400	mW
		SOT25	550	mW
		SC59(R)	400	mW
		SO-8	600	mW
		SOT89-3	800	mW

Notes: 4. T_J, max = +150°C.
5. Ratings apply to ambient temperature at +25°C.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{REF}	Reference voltage	V_{KA} = V_{REF}, I_{KA} = 10mA (Figure 1)	AP432 AP432A	1.227 1.233	1.24	1.252 1.246	V
V_{REF}	Deviation of reference input voltage over temperature (Note 4)	V_{KA} = V_{REF}, I_{KA} = 10mA, Ta = Full range (Figure 1)		—	3.0	20	mV
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of the change in reference voltage to the change in cathode voltage	I_{KA} = 10mA (Figure 2)	V_{KA} = 20 ~ V_{REF}	—	-1.4	-2.0	mV/V
I_{REF}	Reference input current	R1 = 10KΩ,R2 = ∞ I_{KA}= 10mA (Figure 2)		—	1.4	3.5	μA
αI_{REF}	Deviation of reference input current over temperature	R1 = 10KΩ,R2 = ∞ I_{KA} = 10mA T_A = Full range (Figure 2)		—	0.4	1.2	μA
$I_{KA(MIN)}$	Minimum cathode current for regulation	V_{KA} = V_{REF} (Figure 1)		—	0.15	0.3	mA
$I_{KA(OFF)}$	Off-state current	V_{KA} = 36V, V_{REF} = 0V (Figure 3)		—	0.1	1.0	μA
$\|Z_{KA}\|$	Dynamic output impedance (Note 5)	V_{KA} = V_{REF} V_{KA} = V_{REF} ΔI_{KA} = 0.1mA ~ 15mA Frequency ≤ 1KHz (Figure 1)		—	0.2	0.5	Ω



Notes: 6. Deviation of reference input voltage, V_{DEV}, is defined as the maximum variation of the reference over the full temperature range. The average temperature coefficient of the reference input voltage αV_{REF} is defined as:

$$|\alpha V_{REF}| = \frac{(\frac{V_{DEV}}{V_{REF}(25°C)}) \cdot 10^6}{T_2 - T_1} \quad \text{..... } (\text{ppm}/°\text{C})$$

Where:

T2 – T1 = full temperature change.
αV_{REF} can be positive or negative depending on whether the slope is positive or negative.

Notes: 7. The dynamic output impedance, R_Z, is defined as:

$$|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_{KA}}$$

When the device is programmed with two external resistors R1 and R2 (see Figure 2.), the dynamic output impedance of the overall circuit, is defined as:

$$|Z_{KA}'| = \frac{\Delta v}{\Delta i} \approx |Z_{KA}| \quad (1 + \frac{R1}{R2})$$

Test Circuits

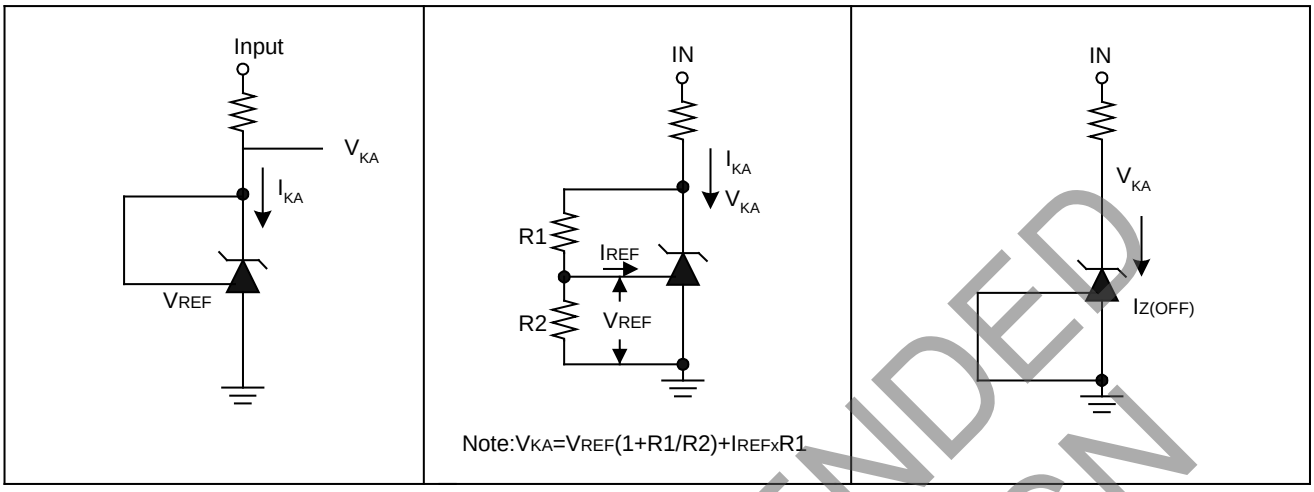
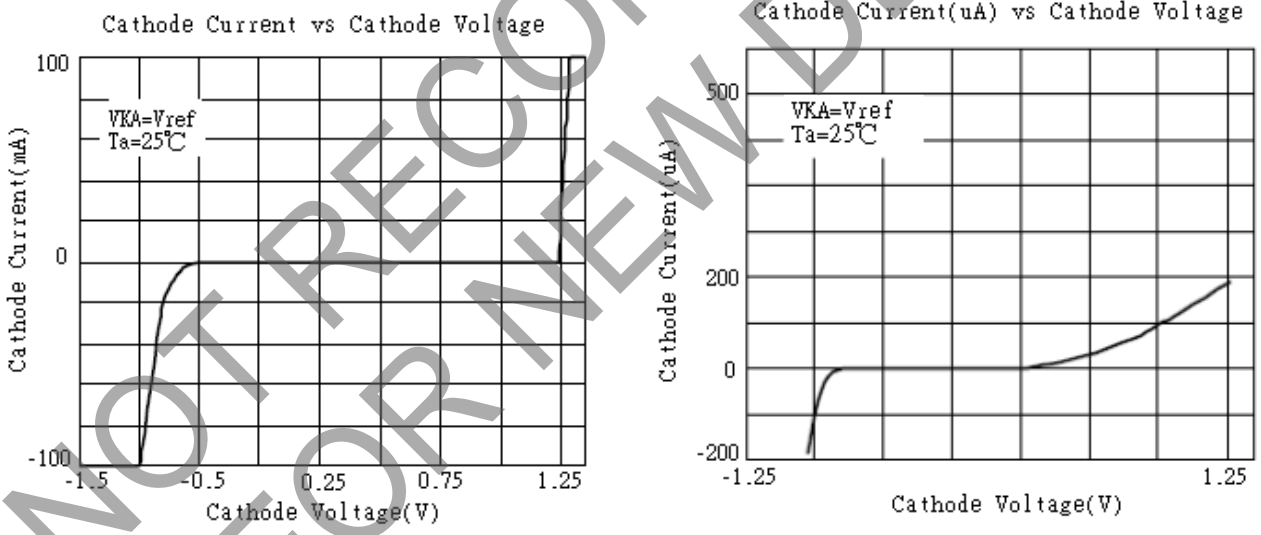


Fig 1. Test Circuit for $V_{KA}= V_{REF}$

Fig 2. Test Circuit for $V_{KA} > V_{REF}$

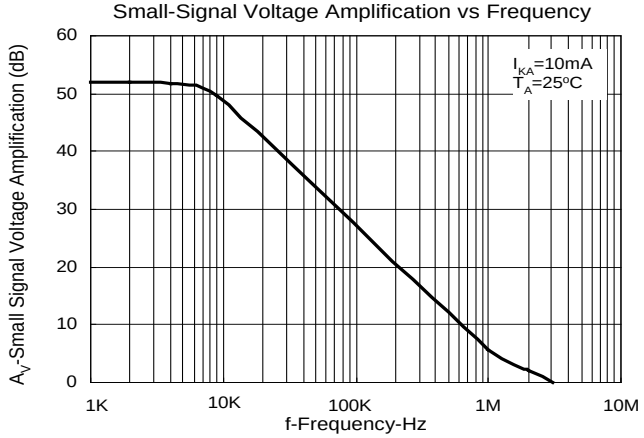
Fig 3. Test Circuit for Off-State Current

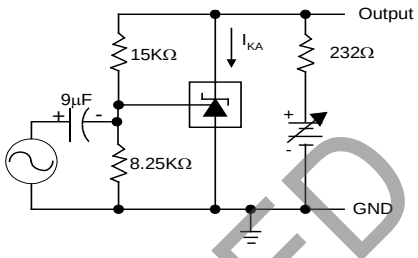
Typical Performance Characteristics



Typical Performance Characteristics (cont.)

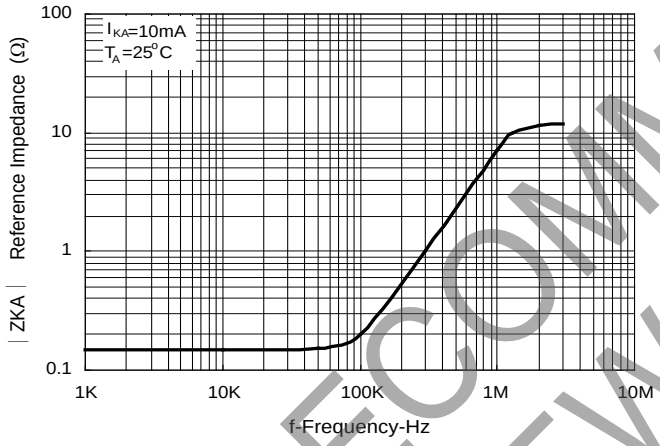
Small-Signal Voltage Amplification vs Frequency

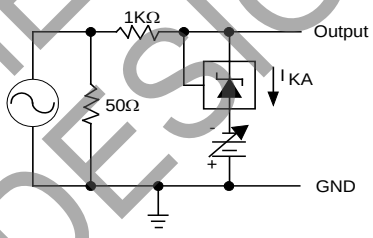




Test Circuit for Voltage Amplification

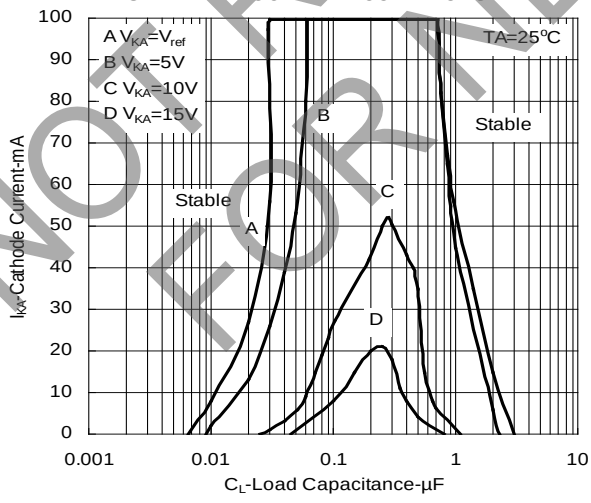
Reference Impedance vs Frequency

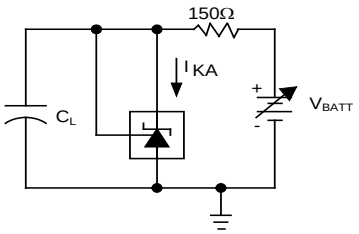




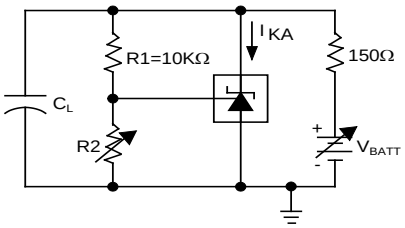
Test Circuit for Reference Impedance

STABILITY BOUNDARY CONDITIONS†





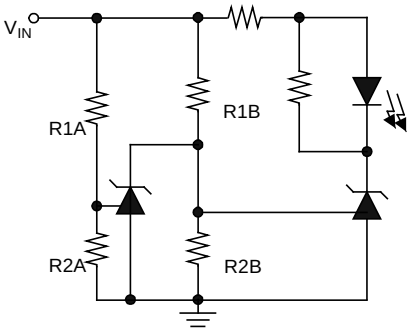
Test Circuit for Curve A



Test Circuit for Curve B, C, and D

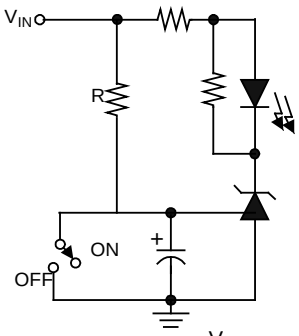
+The areas under the curves represent conditions that may cause the device to oscillate. For curves B, C, and D, R2 and V+ were adjusted to establish the initial V_{KA} and I_{KA} conditions with C_L=0.V_{BATT} and C_L were then adjusted to determine the ranges of stability.

Application Examples



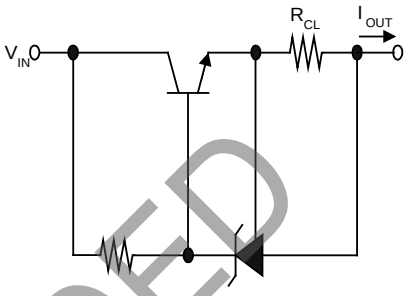
LED on when Low Limit<V_{IN} <High Limit
Low Limit ≈V_{REF} (1+R1B/R2B)
High Limit ≈V_{REF} (1+R1A/R2A)

Fig. 4 Voltage Monitor



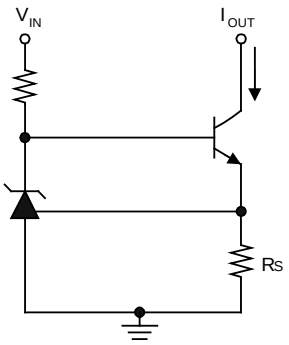
Delay = RC x ln ($\frac{V_{IN}}{V_{IN}-V_{REF}}$)

Fig. 5 Delay Timer



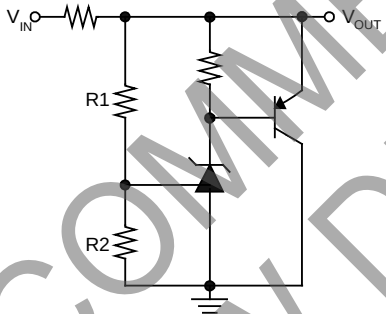
$I_{OUT} = V_{REF} / R_{CL}$

Fig. 6 Current Limiter or Current Source



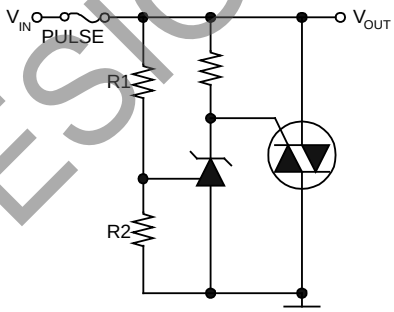
$I_{OUT} = V_{REF} / R_S$

Fig. 7 Constant-Current Sink



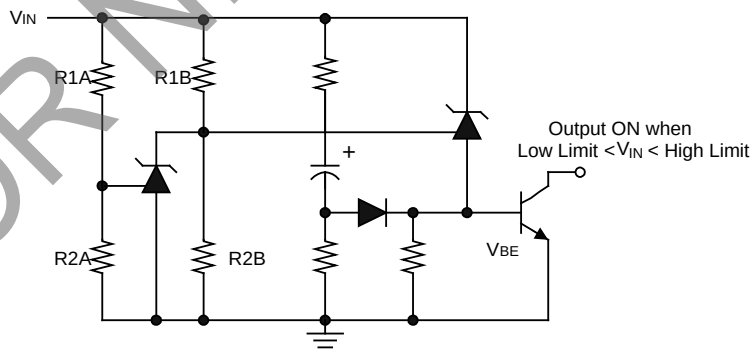
$V_{OUT} = (1 + R1/R2) \times V_{REF}$

Fig. 8 Higher-Current Shunt Regulator



LIMIT ≈ $(1 + R1/R2) \times V_{REF}$

Fig. 9 Crow Bar



Low Limit ≈ V_{REF} (1 + R1B/R2B) +V_{BE}
High Limit ≈ V_{REF} (1 + R1A/R2A)

Fig.10 Over-Voltage / Under-Voltage Protection Circuit

Ordering Information

AP432 X XX X X

Reference Voltage Tolerance	Package	Leadframe	Packing
Blank : ± 1% A : ± 0.5%	SA : SOT23 SR : SOT23R Q : SOT25 W : SC59 R : SC59R Blank : SO-8 Y : SOT89-3	L : Lead Free G : Green (Note 8)	7 : Tape & Reel 13 : Tape & Reel 13R : Tape & Reel

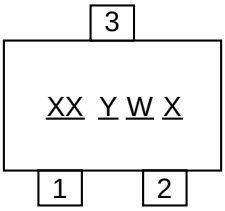
Part Number (Note 10)	Package Code	Packaging	7"/13 Tape and Reel		Ammo Box	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AP432(A)SAG-7	SA	SOT23	3000/Tape & Reel	-7	NA	NA
AP432(A)SRG-7	SR	SOT23R	3000/Tape & Reel	-7	NA	NA
AP432(A)QL-7	Q	SOT25	3000/Tape & Reel	-7	NA	NA
AP432(A)QG-7	Q	SOT25	3000/Tape & Reel	-7	NA	NA
AP432(A)WL-7	W	SC59	3000/Tape & Reel	-7	NA	NA
AP432(A)WG-7	W	SC59	3000/Tape & Reel	-7	NA	NA
AP432(A)RL-7	R	SC59R	3000/Tape & Reel	-7	NA	NA
AP432(A)RG-7	R	SC59R	3000/Tape & Reel	-7	NA	NA
AP432(A)G-13		SO-8	2500/Tape & Reel	-13	NA	NA
AP432(A)YL-13	Y	SOT89-3	2500/Tape & Reel	-13	NA	NA
AP432(A)YG-13	Y	SOT89-3	2500/Tape & Reel	-13	NA	NA
AP432(A)YG-13R	Y	SOT89-3	2500/Tape & Reel	-13R	NA	NA

Notes: 8. SO-8, SOT23 and SOT23R are available in "Green" products only.
9. Suffix "A" denotes AP432A device.

Marking Information

(1) SC59 and SC59R

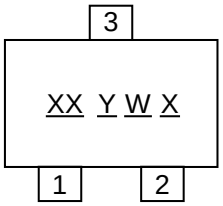
(Top View)



XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : A~Z : Green
a~z : Lead Free

(2) SOT23 and SOT23R

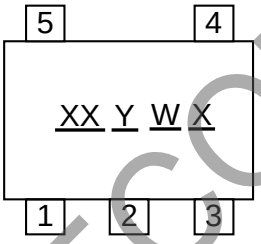
(Top View)



XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : A~Z : Green

(3) SOT25

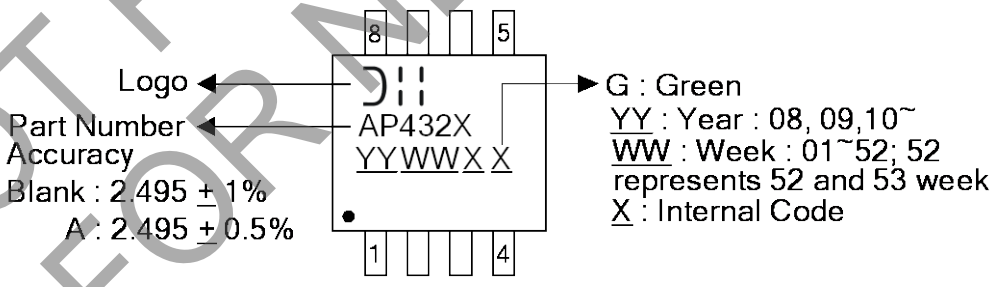
(Top View)



XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : A~Z : Green
a~z : Lead Free

(4) SO-8

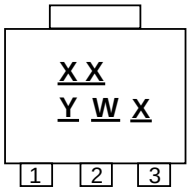
(Top View)



Marking Information (cont.)

(5) SOT89-3

(Top View)



XX : Identification code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week;
z represents 52 and 53 week
X : Internal code
A~Z : Green
a~z : Lead Free

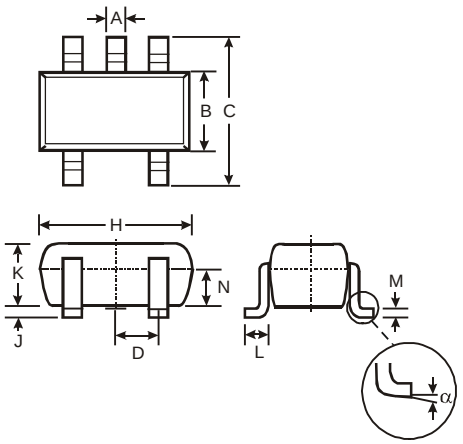
Device	Package (Note 11)	Identification Code	Date Code
AP432SA	SOT23	D3	YM
AP432ASA	SOT23	D4	YM
AP432SR	SOT23R	D7	YM
AP432ASR	SOT23R	D8	YM
AP432Q	SOT25	B7	YM
AP432AQ	SOT25	B8	YM
AP432W	SC59	B3	YM
AP432AW	SC59	B4	YM
AP432R	SC59R	B5	YM
AP432AR	SC59R	B6	YM
AP432Y	SOT89	B1	YM
AP432AY	SOT89	B2	YM

Notes: 10. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Package Outline Dimensions (All dimensions in mm.)

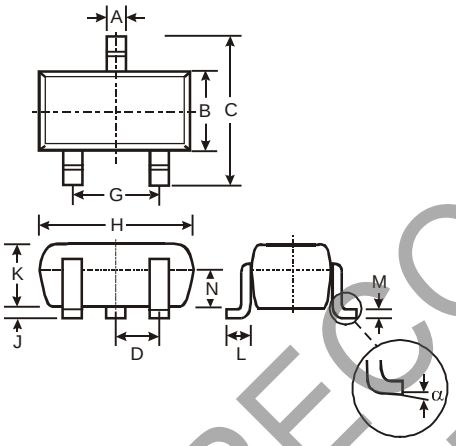
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(1) SOT25



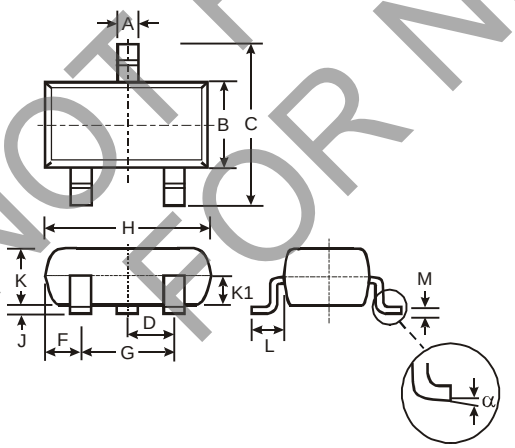
SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	
All Dimensions in mm			

(2) SC59 and SC59R



SC59			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

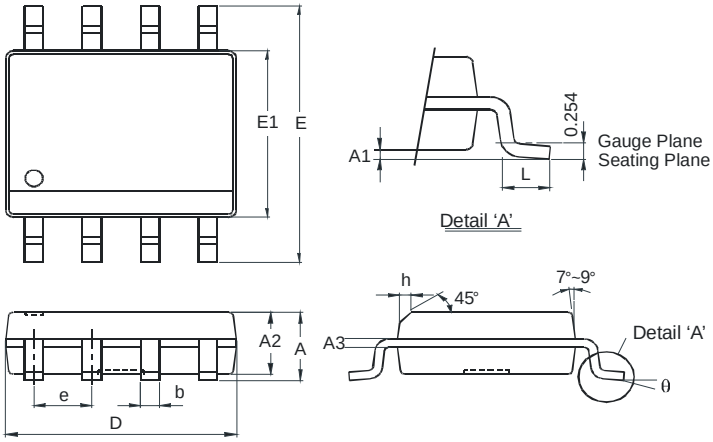
(3) SOT23 and SOT23R



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

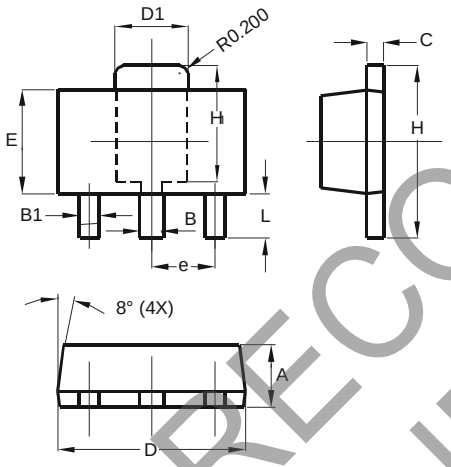
Package Outline Dimensions (cont.) (All dimensions in mm.)

(4) SO-8



SO-8		
Dim	**Min**	**Max**
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

(5) SOT89-3

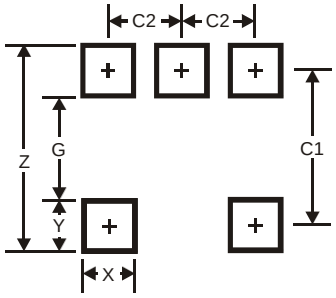


SOT89		
Dim	**Min**	**Max**
A	1.40	1.60
B	0.44	0.62
B1	0.35	0.54
C	0.35	0.44
D	4.40	4.60
D1	1.62	1.83
E	2.29	2.60
e	1.50 Typ	
H	3.94	4.25
H1	2.63	2.93
L	0.89	1.20
All Dimensions in mm		

Package Outline Dimensions (cont.) (All dimensions in mm.)

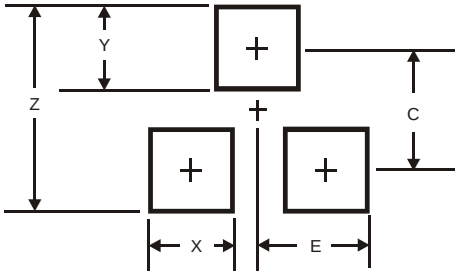
Suggested Pad Layout

(1) SOT25



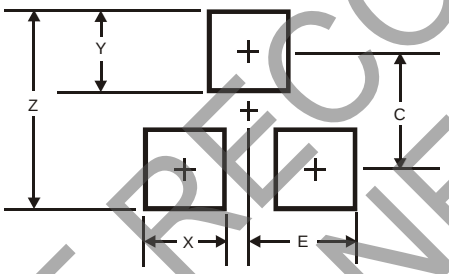
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) SC59 and SC59R



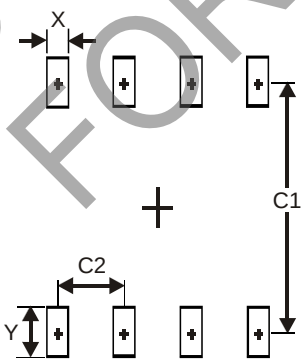
Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

(3) SOT23 and SOT23R



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

(4) SO-8

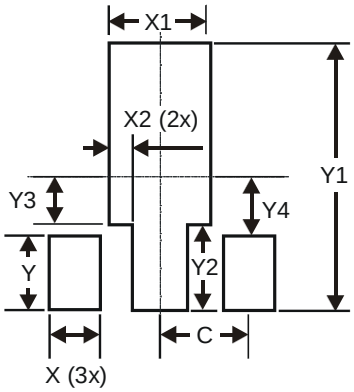


Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

Suggested Pad Layout (cont.)

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(5) SOT89-3



Dimensions	Value (in mm)
X	0.900
X1	1.733
X2	0.416
Y	1.300
Y1	4.600
Y2	1.475
Y3	0.950
Y4	1.125
C	1.500

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