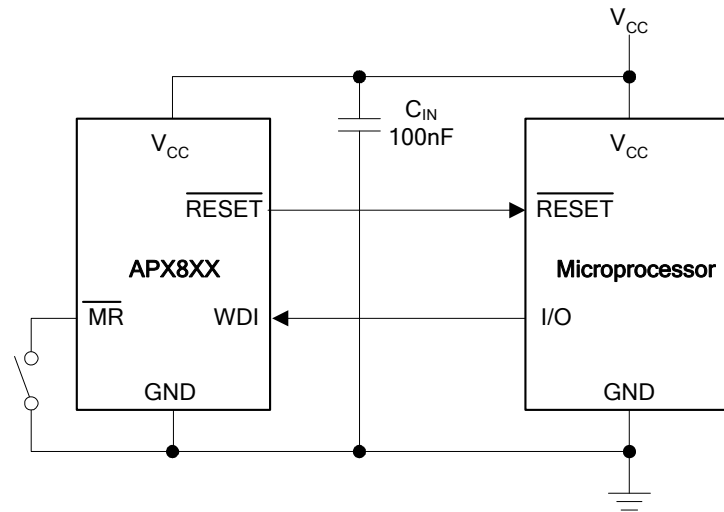


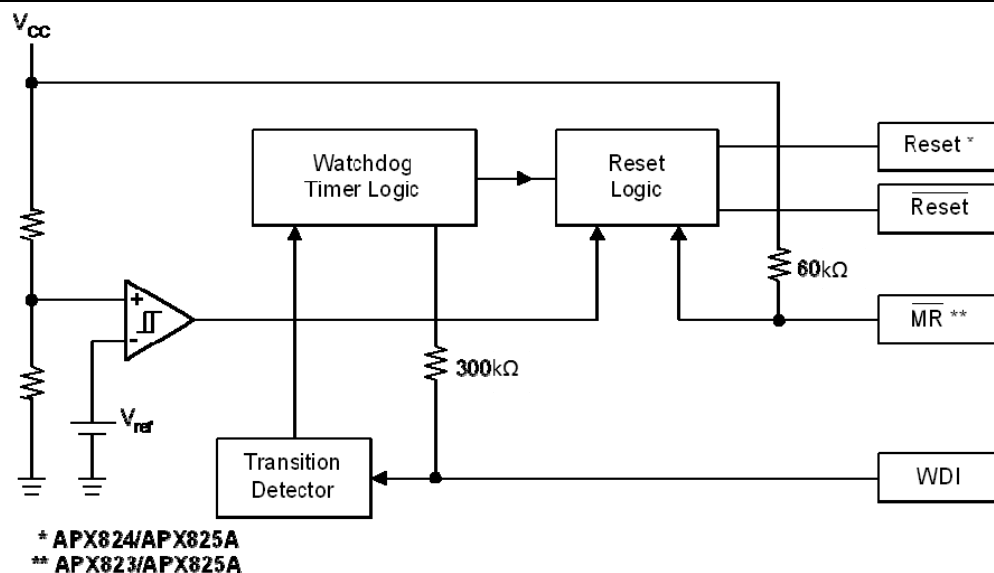
Typical Application Circuit



Pin Descriptions

Pin Name	Description
GND	Ground
RESET (RESET)	Reset output pin
V _{CC}	Operating voltage input
WDI	Watchdog input
MR	Manual reset

Functional Block Diagram



Absolute Maximum Ratings (Over operating ambient temperature range, unless otherwise noted)*

Symbol	Parameter			Rating	Unit
ESD HBM	Human Body Model ESD Protection			5	KV
ESD MM	Machine Model ESD Protection			200	V
V _{CC}	Supply Voltage			6.0	V
V _{RESET}	RESET, $\overline{\text{RESET}}$, $\overline{\text{MR}}$, WDI			-0.3 to (V _{CC} +0.3)	V
I _{CC}	Input Current V _{CC}			20	mA
I _O	Maximum High Output Current			20	mA
P _D	Continuous Total Power Dissipation	Derating Factor Above T _A = 25°C	SOT25	6.2	mW/°C
			SOT26	5.8	
		T _A = 25°C Power Rating	SOT25	500	mW
			SOT26	470	
		T _A = 70°C Power Rating	SOT25	220	mW
			SOT26	210	
		T _A = 85°C Power Rating	SOT25	125	mW
			SOT26	120	
T _{OP}	Operating Junction Temperature Range			-40 to 105	°C
T _{ST}	Storage Temperature Range			-65 to 150	°C

* Stresses beyond 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-rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	Supply Voltage	1.1	5.5	V
V _{IN}	Input Voltage	0	(V _{CC} +0.3)	V
V _{IH}	High-level Input Voltage at MR and WDI	0.7 × V _{CC}	-	V
V _{IL}	Low-level Voltage	-	0.3 × V _{CC}	V
Δt/ΔV	Input Transition Rise and Fall Rate at MR or WDI	-	100	ns/V
T _A	Operating Ambient Temperature Range	-40	85	°C
T _R	V _{CC} Rising Time (V _{CC} = 0~V _T)	-	100	V/ μS

Electrical Characteristics (Over recommended operating ambient temperature range, unless otherwise noted)

Symbol	Parameter			Test Conditions	Min	Typ.	Max	Unit
V _{OH}	High-level Output Voltage		APX823/APX824/APX825A - 29/26/23	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OH} =-20μA	0.8×V _{CC}	-	-	V
			APX823/APX824/APX825A - 40/31	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OH} =-30μA				
			APX823/APX824/APX825A -46/44	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OH} =-120μA	V _{CC} -1.5V	-	-	V
			APX824/APX825A -29/26/23	V _{CC} ≥ 1.8V, I _{OH} = -100μA	0.8×V _{CC}	-	-	V
			APX824/APX825A - 46/44/40/31	V _{CC} ≥ 1.8V, I _{OH} = -150μA				
V _{OL}	Low-level Output Voltage		APX824/APX825A -29/26/23	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OL} =1mA	-	-	0.4	V
			APX824/APX825A -40/31	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OL} =1.2mA				
			APX824/APX825A -46/44	V _{CC} = $\underline{V_{TH}}$ +0.2V I _{OL} =3mA				
			APX823/APX824/APX825A - 29/26/23	V _{CC} = $\underline{V_{TH}}$ -0.2V I _{OL} =1mA	-	-	0.4	V
			APX823/APX824/APX825A - 40/31	V _{CC} = $\underline{V_{TH}}$ -0.2V I _{OL} =1.2mA				
			APX823/APX824/APX825A - 46/44	V _{CC} = $\underline{V_{TH}}$ -0.2V I _{OL} =3mA				
V _{RESET}	Power-up Reset Voltage (see Note 2)			V _{CC} ≥ 1.1V, I _{OL} =20μA	-	-	0.4	V
V _{TH-}	Negative-going Input Threshold Voltage (see Note 3)	APX823/APX824/APX825A -23		T _A = 0°C -85°C	2.21	2.25	2.30	V
		APX823/APX824/APX825A -26			2.59	2.63	2.69	
		APX823/APX824/APX825A -29			2.88	2.93	3.00	
		APX823/APX824/APX825A -31			3.02	3.08	3.15	
		APX823/APX824/APX825A -40			3.93	4.00	4.08	
		APX823/APX824/APX825A -44			4.31	4.38	4.47	
		APX823/APX824/APX825A -46			4.56	4.63	4.72	
		APX823/APX824/APX825A -23		T _A = -40°C -85°C	2.20	2.25	2.30	V
		APX823/APX824/APX825A -26			2.57	2.63	2.69	
		APX823/APX824/APX825A -29			2.86	2.93	3.00	
		APX823/APX824/APX825A -31			3.00	3.08	3.15	
		APX823/APX824/APX825A -40			3.92	4.00	4.08	
		APX823/APX824/APX825A -44			4.29	4.38	4.47	
		APX823/APX824/APX825A -46			4.54	4.63	4.72	

Note: 2. The lowest supply voltage at which RESET becomes active. T_R , $V_{CC} \geq 15\mu s/V$.

3. To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1μF) should be placed near the supply terminals.

Electrical Characteristics (cont.)

Symbol	Parameter		Test Conditions	Min	Typ.	Max	Unit
V _{hys}	Hysteresis at V _{CC} Input	APX823/APX824/APX825A -23		-	50	-	mV
		APX823/APX824/APX825A -26					
		APX823/APX824/APX825A -29					
		APX823/APX824/APX825A -31		-	50	-	
		APX823/APX824/APX825A -40					
		APX823/APX824/APX825A -44					
		APX823/APX824/APX825A -46					
T _S	Set-up Time	V _{CC} = V _{TH} to (V _{TH} – 100mV)			20		μs
I _{IH(AV)}	Average High-level Input Current	WDI	WDI=V _{CC} , Time average (dc=88%)	-	120	-	μA
I _{IL(AV)}	Average Low-level Input Current		WDI=0.3V, V _{CC} =5.5V time average (dc=12%)	-	-15	-	μA
I _{IH}	High-level Input Current	WDI	WDI=V _{CC}	-	120	160	μA
I _{IL}	Low-level Input Current	WDI	WDI=0.3V, V _{CC} =5.5V	-	120	160	μA
I _{CC}	Supply Current	WDI and MR Unconnected, Outputs unconnected	V _{CC} = <u>V_{TH}</u> +0.2V	-	30	40	μA
	Internal Pull-up Resistor at <u>MR</u>			-	60	-	kΩ
TC	V _{OUT} Temperature Coefficient				50	-	ppm/°C
C _i	Input Capacitance at <u>MR</u> , WDI		V _I = 0V to 5.5V	-	5	-	pF
θ _{JA}	Thermal Resistance Junction-to-Ambient		SOT25 (Note 4)		161		°C/W
			SOT26 (Note 4)		169		
θ _{JC}	Thermal Resistance Junction-to-Case		SOT25 (Note 4)		27		°C/W
			SOT26 (Note 4)		28		

Note: 4. Test condition for SOT25 and SOT26: Devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

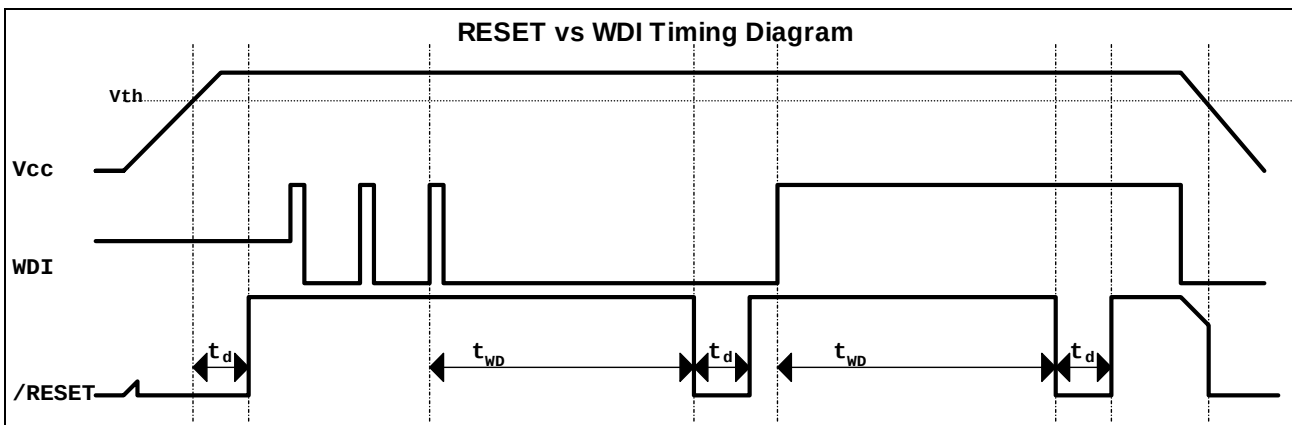
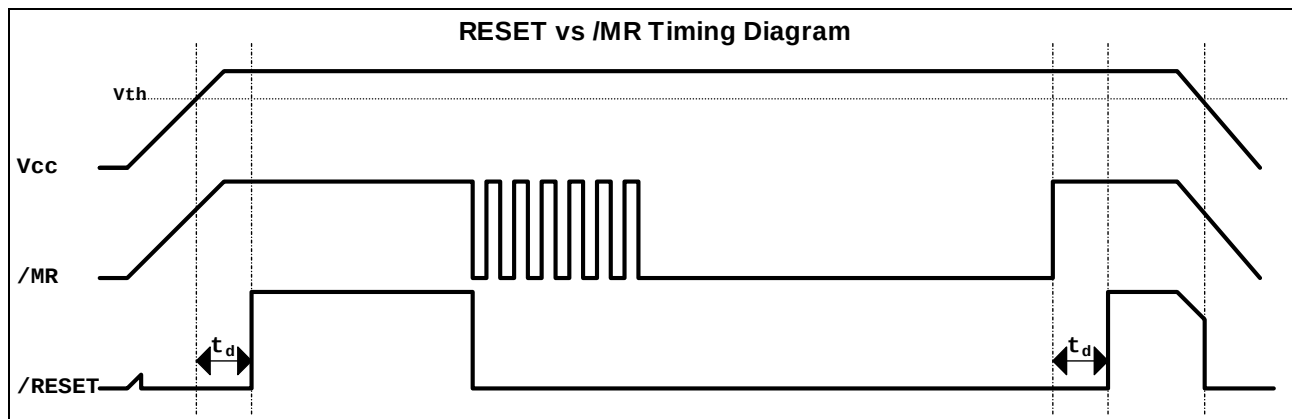
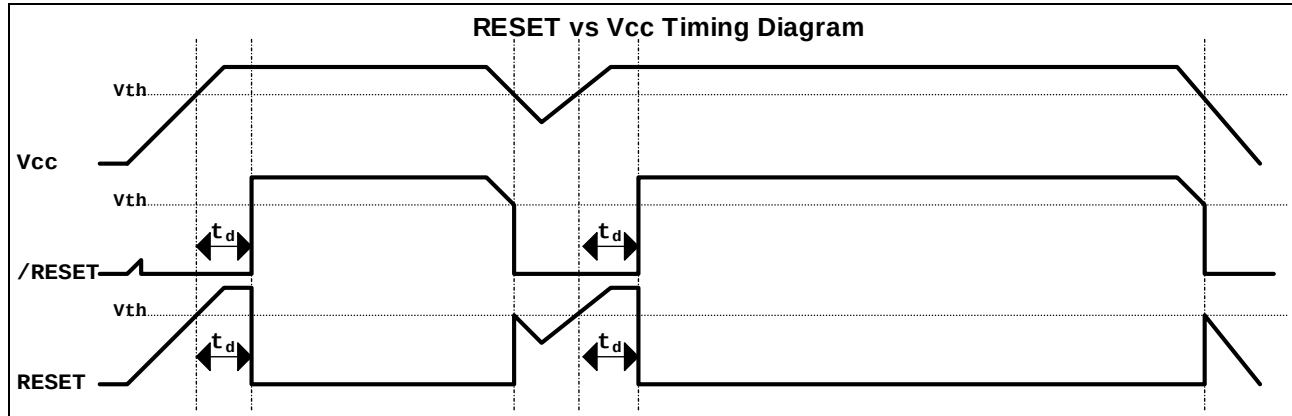
Timing Requirements (@ $R_L = 1\text{m}\Omega$, $C_L = 50\text{pF}$, $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
t_w	Pulse Width	at $\overline{\text{MR}}$ $V_{CC} \geq \underline{V_{TH}} + 0.2\text{V}$, $V_{IL} = 0.3 \times V_{CC}$, $V_{IH} = 0.7 \times V_{CC}$	<u>100</u>	-	-	ns
		at $\overline{\text{WDI}}$ $V_{CC} \geq \underline{V_{TH}} + 0.2\text{V}$, $V_{IL} = 0.3 \times V_{CC}$, $V_{IH} = 0.7 \times V_{CC}$	<u>50</u>	-	-	ns

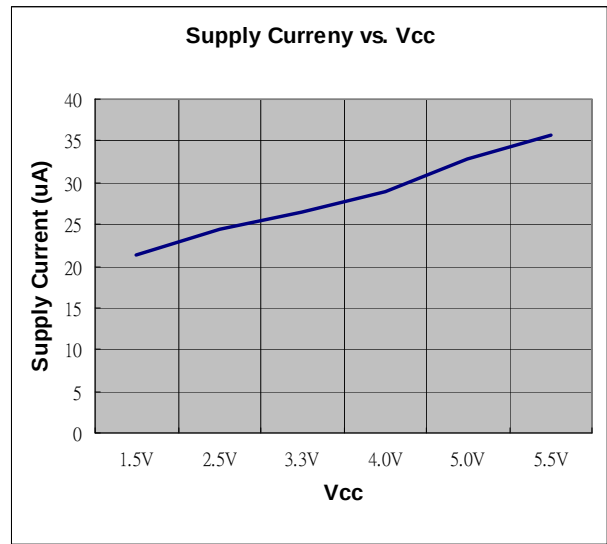
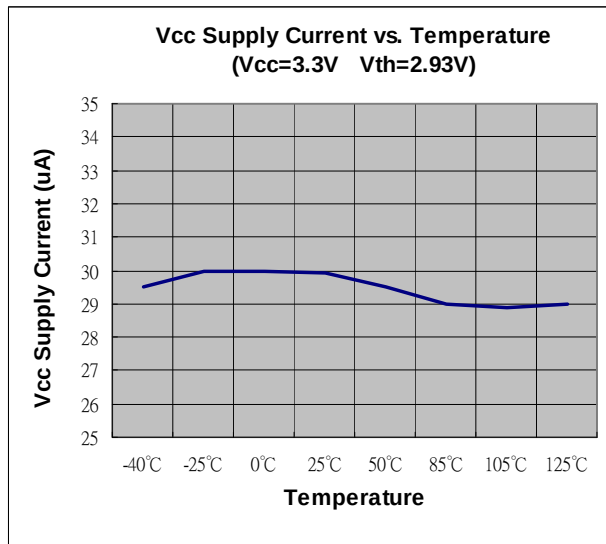
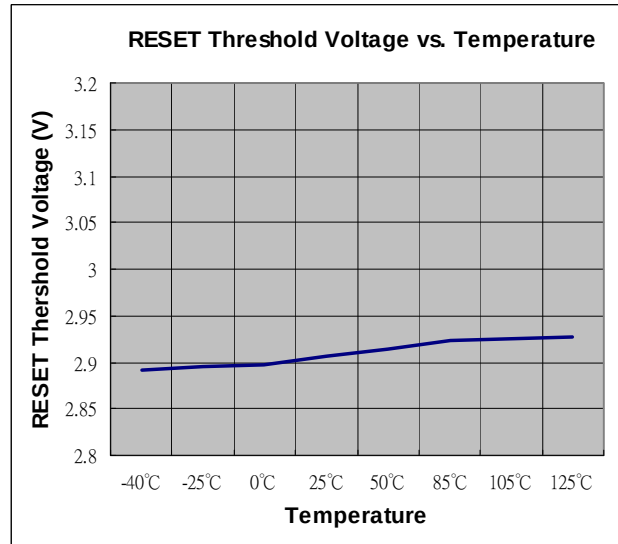
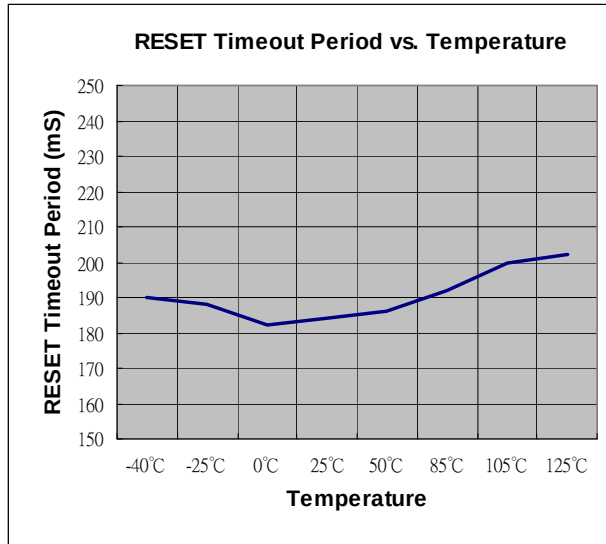
Switching Characteristics (@ $R_L = 1\text{m}\Omega$, $C_L = 50\text{pF}$, $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
t_{out}	Watchdog Time Out	APX823/APX824/APX825A $V_{CC} \geq \underline{V_{TH}} + 0.2\text{V}$, See timing diagram	<u>1.12</u>	1.6	<u>2.4</u>	s
t_d	Delay Time	APX823/APX824/APX825A $V_{CC} \geq \underline{V_{TH}} + 0.2\text{V}$, See timing diagram	140	200	280	ms
t_{PHL}	Propagation (Delay) Time, High-to-low-level Output	$\overline{\text{MR}}$ to $\overline{\text{RESET}}$ delay (APX823/APX825A) $V_{CC} > \underline{V_{TH}} + 0.2\text{V}$, $V_{IL} = 0.3 \times V_{CC}$, $V_{IH} = 0.7 \times V_{CC}$	-	-	0.1	μs
		V_{CC} to $\overline{\text{RESET}}$ delay $V_{IL} = \underline{V_{TH}} - 0.2\text{V}$, $V_{IH} = \underline{V_{TH}} + 0.2\text{V}$	-	-	25	μs
t_{PLH}	Propagation (Delay) Time, Low-to-high-level Output	$\overline{\text{MR}}$ to $\overline{\text{RESET}}$ delay (APX824/APX825A) $V_{CC} > \underline{V_{TH}} + 0.2\text{V}$, $V_{IL} = 0.3 \times V_{CC}$, $V_{IH} = 0.7 \times V_{CC}$	-	-	0.1	μs
		V_{CC} to $\overline{\text{RESET}}$ delay (APX824/APX825A) $V_{IL} = \underline{V_{TH}} - 0.2\text{V}$, $V_{IH} = \underline{V_{TH}} + 0.2\text{V}$	-	-	25	μs

Timing Diagram



Typical Characteristics



Ordering Information

APX82 XX - XX XX G - Z

Part No.	Voltage	Package	Green	Packing
3 : APX823	46 : 4.63	W5 : SOT25	G : Green	7 : Tape & Reel
4 : APX824	44 : 4.38	W6 : SOT26		
5A : APX825A	40 : 4.00			
	31 : 3.08			
	29 : 2.93			
	26 : 2.63			
	23 : 2.25			

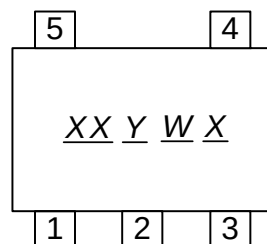
Device	Package Code	Packaging (Note 5)	7" Tape and Reel	
			Quantity	Part Number Suffix
APX823-XXW5G-7	W5	SOT25	3000/Tape & Reel	-7
APX824-XXW5G-7	W5	SOT25	3000/Tape & Reel	-7
APX825A-XXW6G-7	W6	SOT26	3000/Tape & Reel	-7

Notes: 5. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Marking Information

(1) SOT25

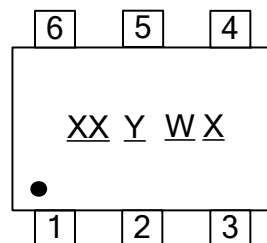
(Top View)



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

(2) SOT26

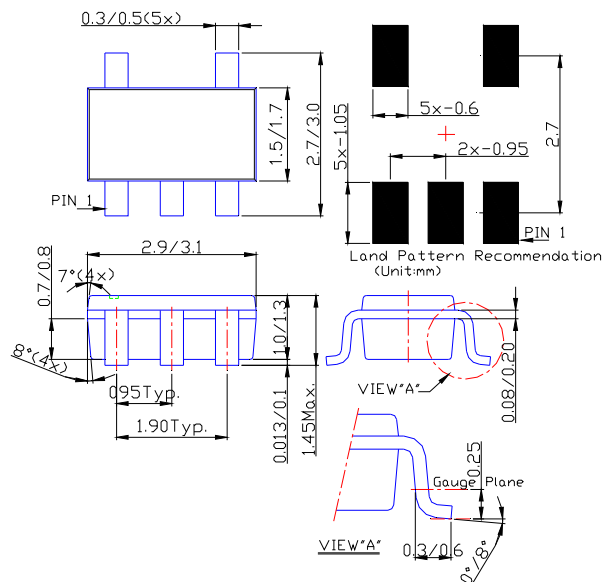
(Top View)



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

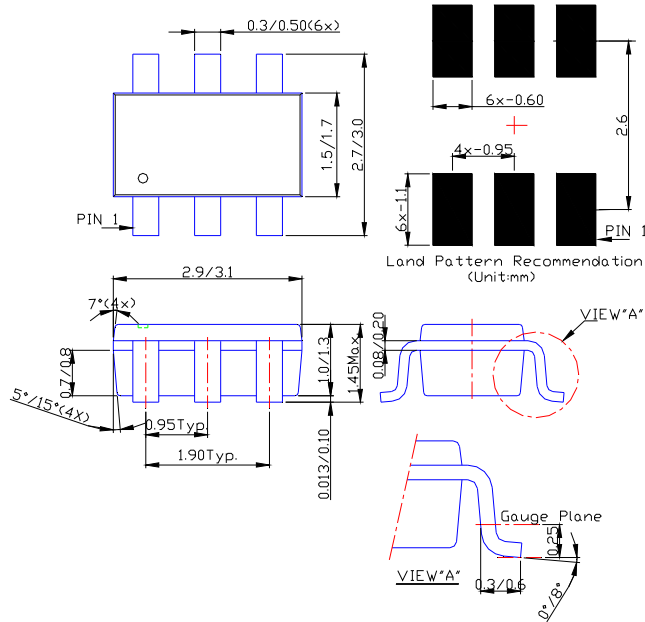
Marking Information (cont.)
Marking Table

Device	Package Type	Identification Code
APX823-46W5	SOT25	W1
APX823-44W5	SOT25	W2
APX823-40W5	SOT25	W3
APX823-31W5	SOT25	W4
APX823-29W5	SOT25	W5
APX823-26W5	SOT25	W6
APX823-23W5	SOT25	W7
APX824-46W5	SOT25	T2
APX824-44W5	SOT25	T3
APX824-40W5	SOT25	T4
APX824-31W5	SOT25	T5
APX824-29W5	SOT25	T6
APX824-26W5	SOT25	T7
APX824-23W5	SOT25	T8
APX825A-46W6	SOT26	T9
APX825A-44W6	SOT26	TA
APX825A-40W6	SOT26	TB
APX825A-31W6	SOT26	TC
APX825A-29W6	SOT26	TD
APX825A-26W6	SOT26	TE
APX825A-23W6	SOT26	TF

Package Outline Dimensions (All Dimensions in mm)
(1) Package Type: SOT25


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

(2) Package Type: SOT26



Notes: 6. Package outline dimensions as shown on Diodes Inc. package outline dimensions document AP02002, which can be found on our website at <http://www.diodes.com/datasheets/ap02002.pdf>

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