

ELM73xxxxxA CMOS Voltage detector with delay circuit and Manual Reset function

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■General description

ELM73xxxxxA is CMOS voltage detector IC with delay function; delay time is adjustable by external capacitor. It operates with very low current consumption; 260nA(typ.). The type with Manual Reset function is also available in ELM73xxxBxxA series; reset condition can be manually asserted at any time. There are two output forms available; N-ch opendrain and CMOS output. The output logic is positive, therefore, the output becomes low level when VDD is lower than detection voltage. The standard detection voltages are 2.2V, 2.7V, 3.0V and 4.0V; ELM73 series can also be made as semi-custom IC within the range of 1.4~5.0V by 0.1V step.

■Features

- Detection voltage range : 1.4V to 5.0V (by 0.1V step)
- Low power operation : Typ.260nA(Vdd=VdetN+1V)
- Accuracy of detection voltage : $\pm 30\text{mV}$ ($V_{detN} < 2.5\text{V}$)
 $\pm 1.2\%$ ($V_{detN} \geq 2.5\text{V}$)
- Accuracy of delay time : Typ.15% ($ExtC=4.7\text{nF}$)
- Hysteresis voltage : Typ. $V_{detN} \times 1.04$
- Manual reset input : MR pin (ELM73xxxBxxA only, Built-in pull-up resistor)
- Package : SC-70-5(SOT-353), SOT-25, WSON6-1.6×1.6

■Application

- Reset for microcomputers
- Voltage power shortage detectors
- Switch of back up power source
- Battery checkers

■Maximum absolute ratings

Parameter	Symbol	Limit	Unit
Power supply voltage	Vdd	Vss-0.3 to 7.0	V
Apply voltage to OUT pin	Vout	N-ch : Vss-0.3 to 7.0	V
		CMOS : Vss-0.3 to Vdd+0.3	
Apply voltage to ExtC pin	VExtC	Vss-0.3 to Vdd+0.3	V
Apply voltage to MR pin	Vmr	Vss-0.3 to Vdd+0.3	V
Output current	Iout	100	mA
Power dissipation	Pd	250 (SOT-25)	mW
		150 (SC-70-5 (SOT-353))	
		500 (WSON6-1.6×1.6)	
Operating temperature	Top	-40 to +85	°C
Storage temperature	Tstg	-55 to +125	°C

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■Selection guide

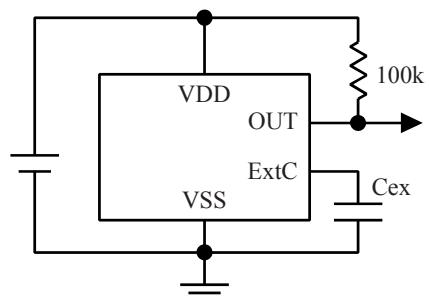
ELM73xxxxxA-x

Symbol		
a, b	Detection voltage	e.g. : 22: VdetN=2.2V, 27: VdetN=2.7V 30: VdetN=3.0V, 40: VdetN=4.0V
c	Output form	N: N-ch open-drain output C: CMOS output
d	Manual reset function	A : Without MR function B : With MR function
e	Package	B: SOT-25 C: SC-70-5(SOT-353) G: WSON6-1.6×1.6
f	Pin configuration type	1 : type1 2 : type2
g	Product version	A
h	Taping direction	S, N: Refer to PKG file

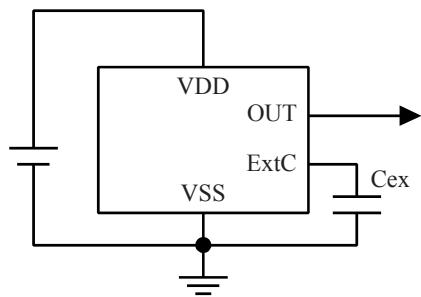
ELM73 x x x x x x A - x
 ↑↑↑↑↑↑↑↑
 a b c d e f g h

■Standard circuit

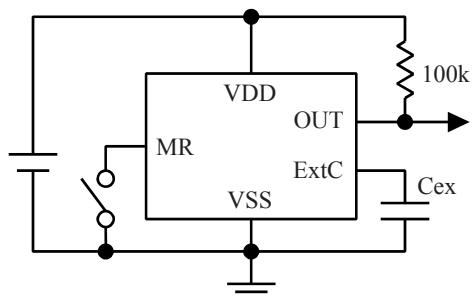
- ELM73xxNAxxA



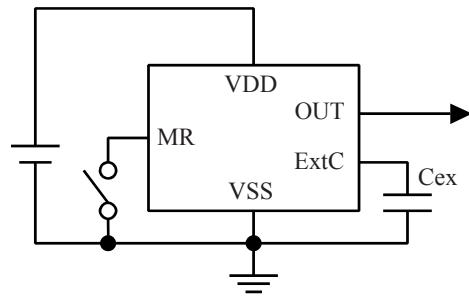
- ELM73xxCAxxA



- ELM73xxNBxxA



- ELM73xxCBxxA



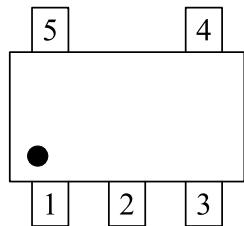
* If delay function is not required, Cex is not necessary.

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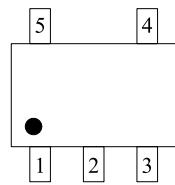
■Pin configuration

SOT-25(TOP VIEW)



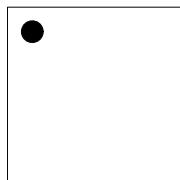
Pin No.	Pin name	
	(73xxxAB1A)	(73xxxBB2A)
1	OUT	MR
2	VDD	VSS
3	VSS	VDD
4	NC	ExtC
5	ExtC	OUT

SC-70-5(TOP VIEW)



Pin No.	Pin name	
	(73xxxBC1A)	(73xxxBC2A)
1	MR	ExtC
2	VSS	VSS
3	VDD	MR
4	ExtC	OUT
5	OUT	VDD

WSON6-1.6×1.6(TOP VIEW)
(TOP VIEW) BOTTOM VIEW



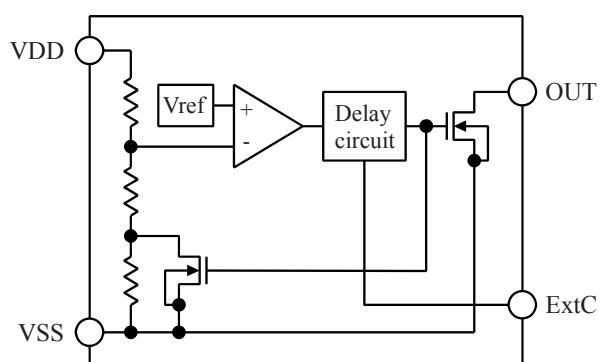
Pin No.	Pin name	
	(73xxxAG1A)	
1	OUT	
2	NC	
3	ExtC	
4	VSS	
5	NC	
6	VDD	

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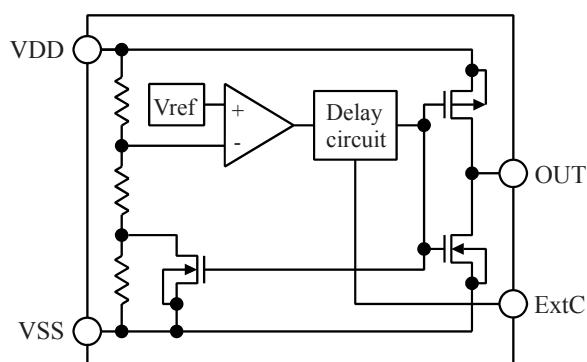
<https://www.elm-tech.com>

■ Block diagram

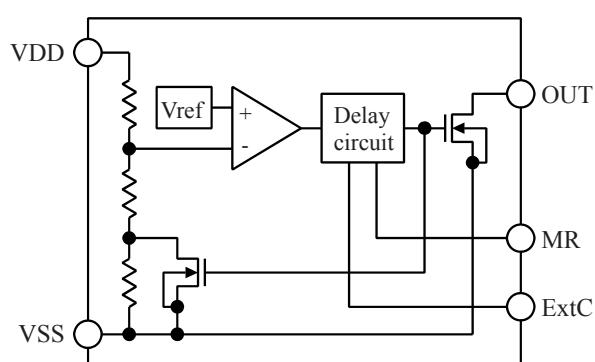
- ELM73xxNAXxA



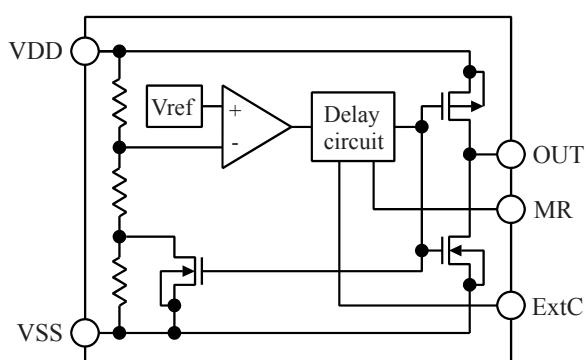
- ELM73xxCAxxA



- ELM73xxNBxxA



- ELM73xxCBxxA

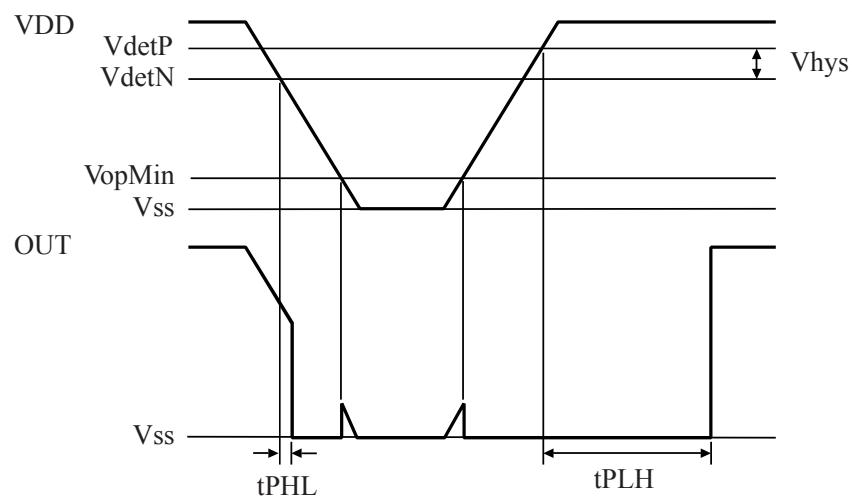


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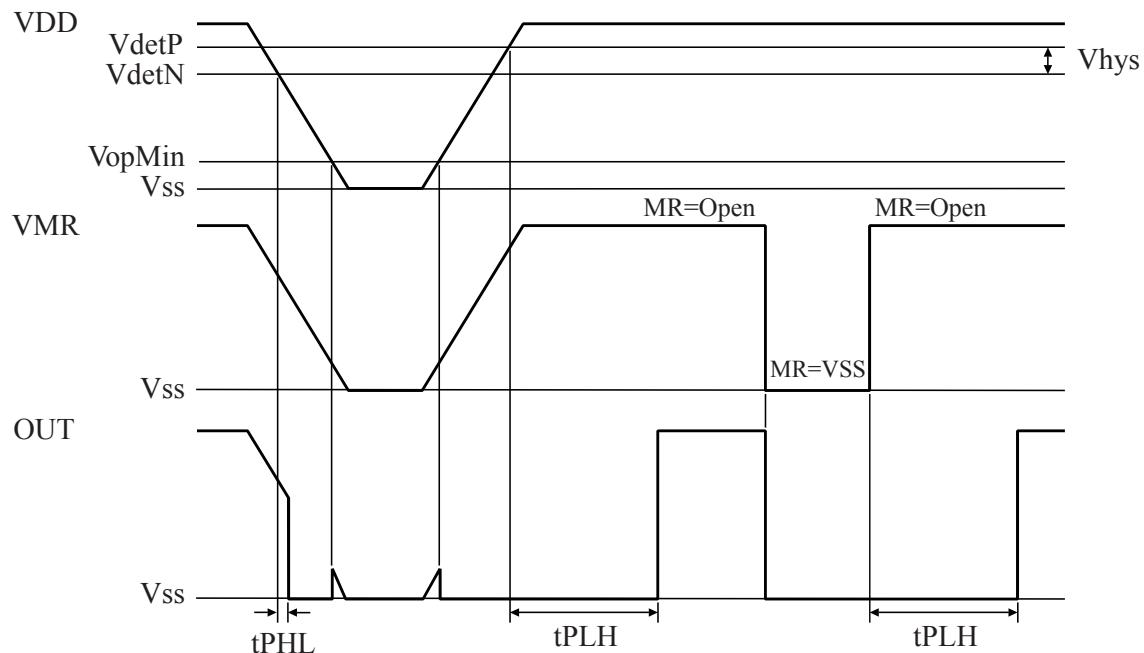
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■ Timing chart

- ELM73xxxAxxA



- ELM73xxxBxxA



ELM73xxxxxA CMOS Voltage detector with delay circuit and Manual Reset function

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■Electrical characteristics

ELM7322xxxxA

Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note*1
Detection voltage	VdetN		2.170	2.200	2.230	V	1
Hysteresis width	Vphys		VdetN× 0.02	VdetN× 0.04	VdetN× 0.08	V	1
Current consumption	Iss	Vdd=3.2V		0.26	0.80	μA	2
Power voltage	Vdd		0.8		6.0	V	1
Output current	IoutN1	Vdd=0.8V, Vds=0.4V	0.01	0.50		mA	3-(1)
	IoutN2	Vdd=1.0V, Vds=0.4V	0.50	2.50			
	IoutP*2	Vdd=3.0V, Vds=0.4V	0.60	1.90		mA	3-(2)
Leakage current	Ileak	Vdd=VLX=6.0V			0.1	μA	4
Delay time	tPLH	Vdd=1.0V to 3.2V, Cex=4.7nF	22.1	26.0*3	29.9	ms	5
	tPHL	Vdd=3.2V to 1.0V		30		μs	
MR voltage High	VmrH	Vdd=6.0V			1.2	V	6
MR voltage Low	VmrL	Vdd=2.7V	0.3				6
MR pull-up resistance	Rmr	Vdd=3.2V	1	3	6	MΩ	7
Temperature characteristic of VdetN	$\frac{\Delta V_{detN}}{\Delta Top}$			±30		ppm/°C	

* 1. Note: test circuit No.,

2. IoutP is only applied to CMOS output products.

3. tPLH(typ.) is derived by using Cex from the following formula: tPLH(typ.)[ms]=5.532×Cex[nF].

ELM7327xxxxA

Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note*1
Detection voltage	VdetN		2.668	2.700	2.732	V	1
Hysteresis width	Vphys		VdetN× 0.02	VdetN× 0.05	VdetN× 0.08	V	1
Current consumption	Iss	Vdd=3.7V		0.26	0.80	μA	2
Power voltage	Vdd		0.8		6.0	V	1
Output current	IoutN1	Vdd=0.8V, Vds=0.4V	0.01	0.50		mA	3-(1)
	IoutN2	Vdd=1.0V, Vds=0.4V	0.50	2.50			
	IoutP*2	Vdd=4.5V, Vds=0.4V	0.80	2.30		mA	3-(2)
Leakage current	Ileak	Vdd=VLX=6.0V			0.1	μA	4
Delay time	tPLH	Vdd=1.0V to 3.7V, Cex=4.7nF	22.1	26.0*3	29.9	ms	5
	tPHL	Vdd=3.7V to 1.0V		30		μs	
MR voltage High	VmrH	Vdd=6.0V			1.2	V	6
MR voltage Low	VmrL	Vdd=3.2V	0.3				6
MR pull-up resistance	Rmr	Vdd=3.7V	1	3	6	MΩ	7
Temperature characteristic of VdetN	$\frac{\Delta V_{detN}}{\Delta Top}$			±30		ppm/°C	

* 1. Note: test circuit No.,

2. IoutP is only applied to CMOS output products.

3. tPLH(typ.) is derived by using Cex from the following formula: tPLH(typ.)[ms]=5.532×Cex[nF].

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ELM7330xxxxA

Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note*1
Detection voltage	VdetN		2.964	3.000	3.036	V	1
Hysteresis width	Vhys		VdetN× 0.02	VdetN× 0.06	VdetN× 0.08	V	1
Current consumption	Iss	Vdd=4.0V		0.26	0.80	μA	2
Power voltage	Vdd		0.8		6.0	V	1
Output current	IoutN1	Vdd=0.8V, Vds=0.4V	0.01	0.50		mA	3-(1)
	IoutN2	Vdd=1.0V, Vds=0.4V	0.50	2.50			
	IoutP*2	Vdd=4.5V, Vds=0.4V	0.80	2.30		mA	3-(2)
Leakage current	Ileak	Vdd=VLX=6.0V			0.1	μA	4
Delay time	tPLH	Vdd=1.0V to 4.0V, Cex=4.7nF	22.1	26.0*3	29.9	ms	5
	tPHL	Vdd=4.0V to 1.0V		30		μs	
MR voltage High	VmrH	Vdd=6.0V			1.2	V	6
MR voltage Low	VmrL	Vdd=3.5V	0.3				6
MR pull-up resistance	Rmr	Vdd=4.0V	1	3	6	MΩ	7
Temperature characteristic of VdetN	$\frac{\Delta V_{detN}}{\Delta Top}$			±30		ppm/°C	

* 1. Note: test circuit No.,

2. IoutP is only applied to CMOS output products.

3. tPLH(typ.) is derived by using Cex from the following formula: tPLH(typ.)[ms]=5.532×Cex[nF].

ELM7340xxxxA

Top=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note*1
Detection voltage	VdetN		3.952	4.000	4.048	V	1
Hysteresis width	Vhys		VdetN× 0.02	VdetN× 0.06	VdetN× 0.08	V	1
Current consumption	Iss	Vdd=5.0V		0.26	0.80	μA	2
Power voltage	Vdd		0.8		6.0	V	1
Output current	IoutN1	Vdd=0.8V, Vds=0.4V	0.01	0.50		mA	3-(1)
	IoutN2	Vdd=1.0V, Vds=0.4V	0.50	2.50			
	IoutP*2	Vdd=4.5V, Vds=0.4V	0.80	2.30		mA	3-(2)
Leakage current	Ileak	Vdd=VLX=6.0V			0.1	μA	4
Delay time	tPLH	Vdd=1.0V to 5.0V, Cex=4.7nF	22.1	26.0*3	29.9	ms	5
	tPHL	Vdd=5.0V to 1.0V		30		μs	
MR voltage High	VmrH	Vdd=6.0V			1.2	V	6
MR voltage Low	VmrL	Vdd=4.5V	0.3				6
MR pull-up resistance	Rmr	Vdd=5.0V	1	3	6	MΩ	7
Temperature characteristic of VdetN	$\frac{\Delta V_{detN}}{\Delta Top}$			±30		ppm/°C	

* 1. Note: test circuit No.,

2. IoutP is only applied to CMOS output products.

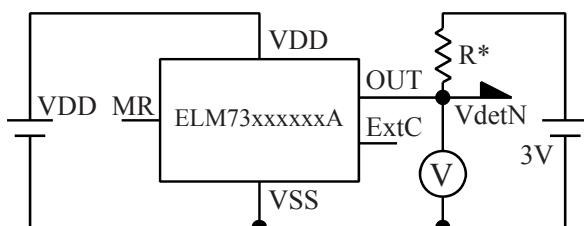
3. tPLH(typ.) is derived by using Cex from the following formula: tPLH(typ.)[ms]=5.532×Cex[nF].

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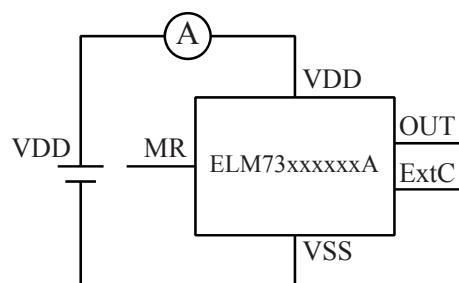
■ Test circuits

1) Detection voltage

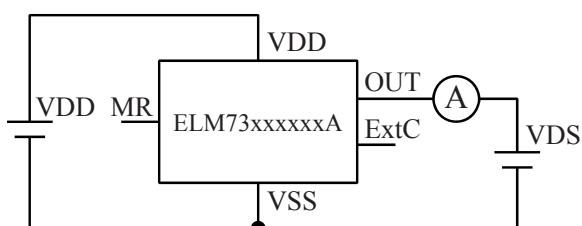


* Pull up circuit is necessary for N-ch output only.
 $R=100\text{k}\Omega$ ($R=1\text{M}\Omega$ for Vdd min measurement).

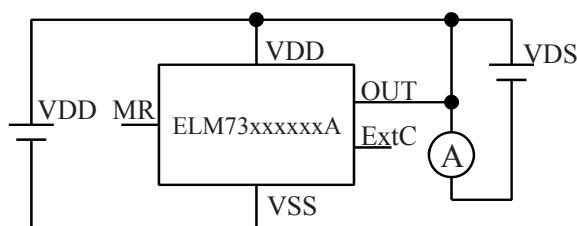
2) Current consumption



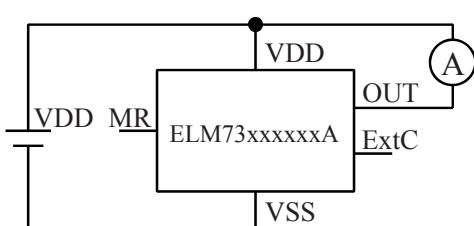
3)-(1) Output current (N-ch)



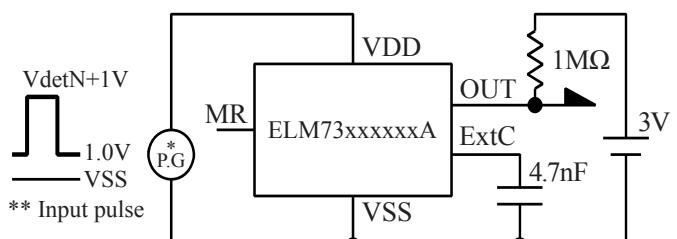
3)-(2) Output current (P-ch)



4) Leakage current

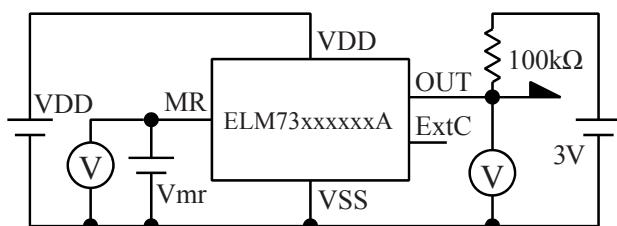


5) Delay time



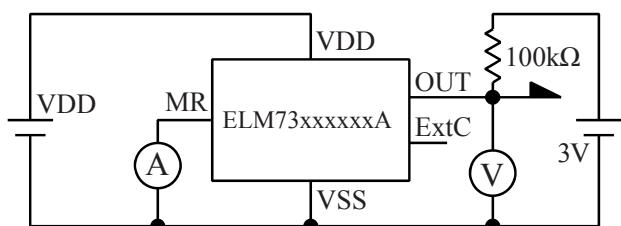
* Pull up circuit is necessary for N-ch output only.

6) MR voltage



* Pull up circuit is necessary for N-ch output only.

7) MR pull-up resistance



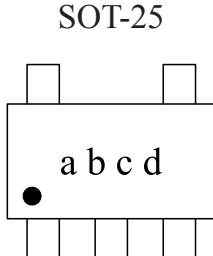
* Pull up circuit is necessary for N-ch output only.

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■Marking

- SOT-25 package



a, b : Represents “Output type”, “Manual Reset function” and “Detection voltage range”.

Symbol	Output type	Manual reset function	Vdet range(V)
78	CMOS	Without MR function	1.4 to 3.0
79			3.1 to 5.0
7A		With MR function	1.4 to 3.0
7B			3.1 to 5.0
7C	Nch	Without MR function	1.4 to 3.0
7D			3.1 to 5.0
7E		With MR function	1.4 to 3.0
7F			3.1 to 5.0

c : Represents “Detection voltage”.

Symbol	Detection voltage(V)	
1		3.1
2		3.2
3		3.3
4		3.4
5		3.5
6		3.6
7		3.7
8		3.8
9		3.9
0		4.0
A		4.1
B		4.2
C		4.3
D	1.4	4.4
E	1.5	4.5

Symbol	Detection voltage(V)	
F	1.6	4.6
G	1.7	4.7
H	1.8	4.8
J	1.9	4.9
K	2.0	5.0
L	2.1	
M	2.2	
N	2.3	
P	2.4	
Q	2.5	
R	2.6	
S	2.7	
T	2.8	
U	2.9	
V	3.0	

d : Represents “Assembly lot number”.

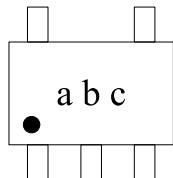
Symbol
0 to 9 and A to Z repeated (I, O, X excepted)

ELM73xxxxxA CMOS Voltage detector with delay circuit and Manual Reset function

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- SC-70-5, SC-82AB, WSON6-1.6×1.6 package

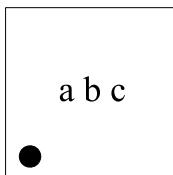
SC-70-5



a : Represents “Output type”, “Pin configuration type” and
“Detection voltage range”.

Symbol	Output type	Pin configuration type	Vdet range(V)
H	CMOS	Type 1	1.4 to 3.0
J			3.1 to 5.0
K			1.4 to 3.0
L			3.1 to 5.0
N	CMOS	Type 2	1.4 to 3.0
P			3.1 to 5.0
Q			1.4 to 3.0
R			3.1 to 5.0

WSON6-1.6×1.6



b : Represents “Detection voltage”.

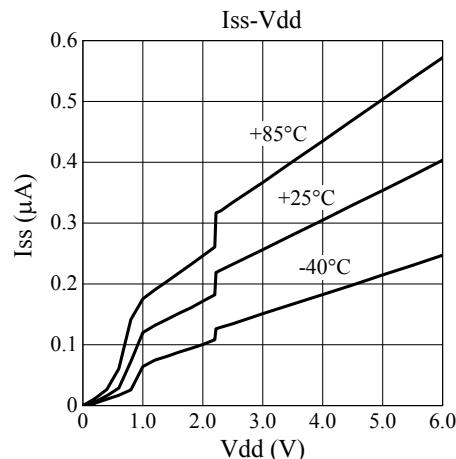
Symbol	Detection voltage(V)	Symbol	Detection voltage(V)
1	3.1	F	1.6
2	3.2	G	1.7
3	3.3	H	1.8
4	3.4	J	1.9
5	3.5	K	2.0
6	3.6	L	2.1
7	3.7	M	2.2
8	3.8	N	2.3
9	3.9	P	2.4
0	4.0	Q	2.5
A	4.1	R	2.6
B	4.2	S	2.7
C	4.3	T	2.8
D	4.4	U	2.9
E	4.5	V	3.0

c : Represents “Assembly lot number”.

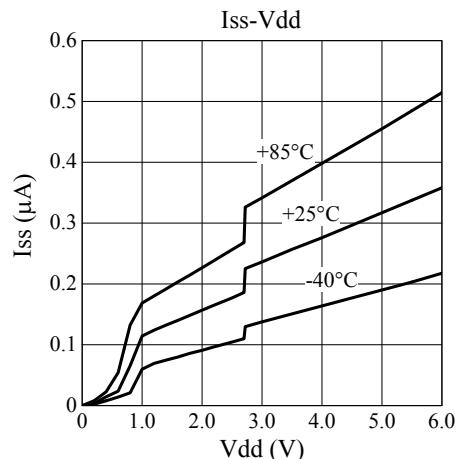
Symbol
0 to 9 and A to Z repeated (I, O, X excepted)

■ Current consumption characteristics

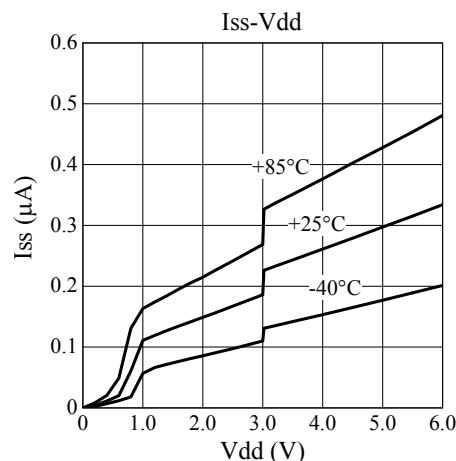
- VdetN=2.2V (ELM7322xxxxA)



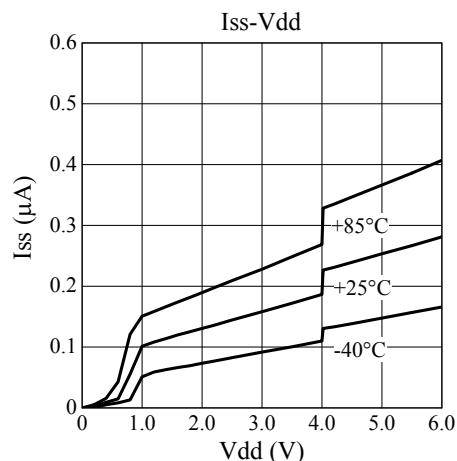
- VdetN=2.7V (ELM7327xxxxA)



- VdetN=3.0V (ELM7330xxxxA)

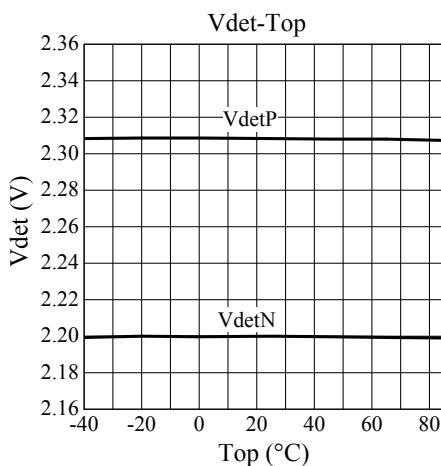


- VdetN=4.0V (ELM7340xxxxA)

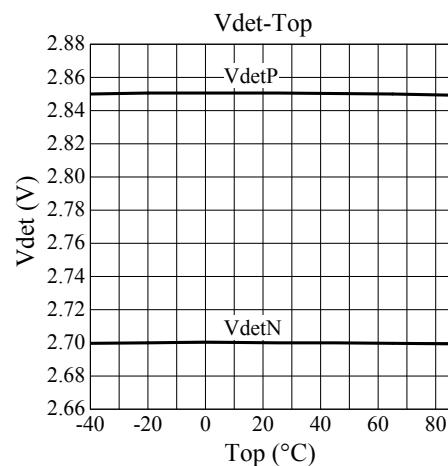


■ Detection voltage characteristics

- VdetN=2.2V (ELM7322xxxxA)



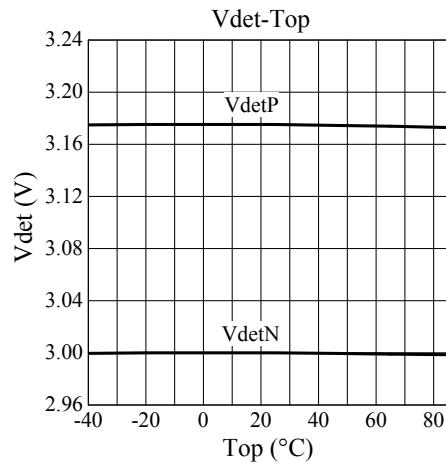
- VdetN=2.7V (ELM7327xxxxA)



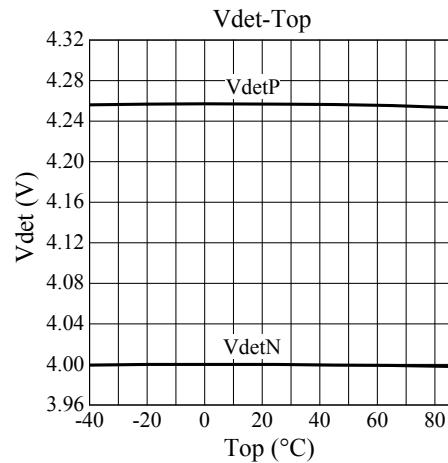
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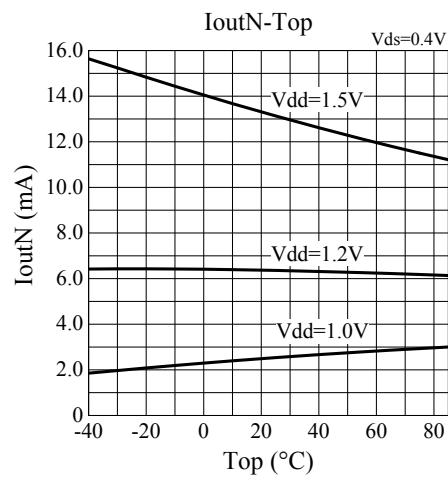
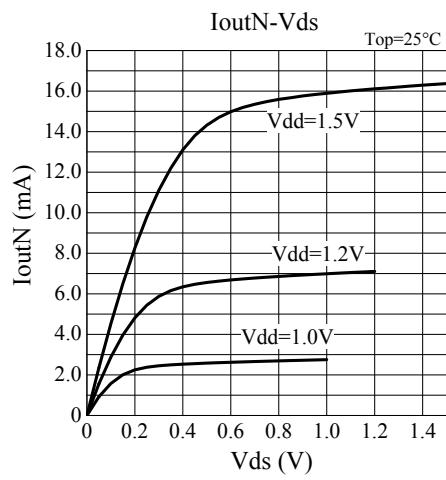
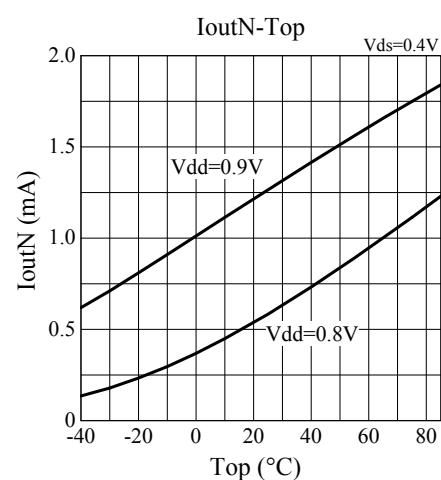
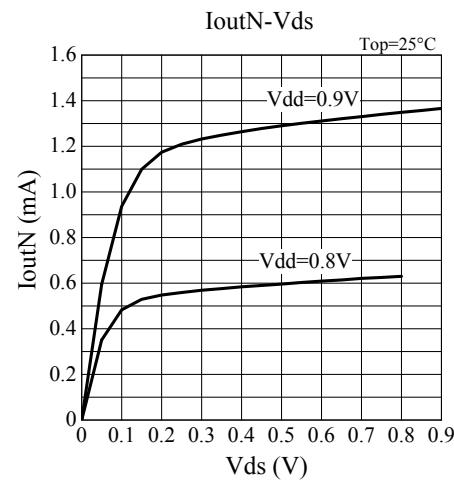
- VdetN=3.0V (ELM7330xxxxA)



- VdetN=4.0V (ELM7340xxxxA)



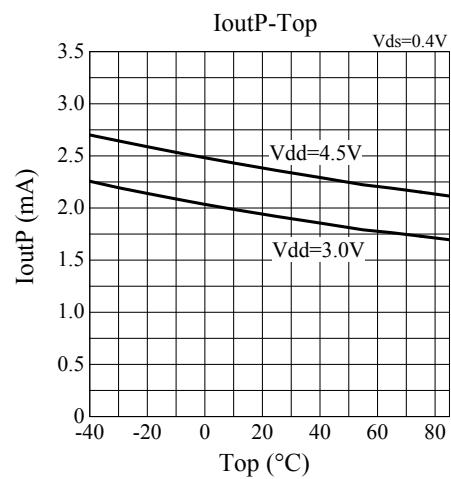
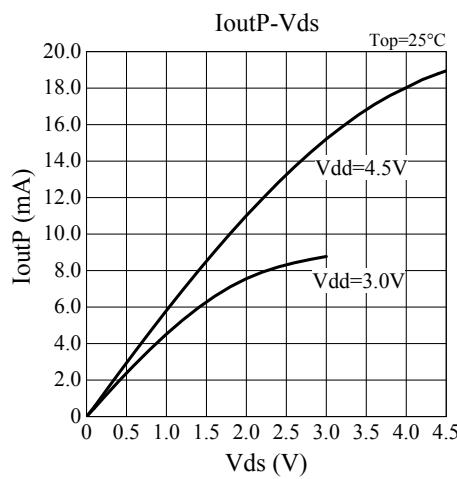
■ N-ch output current characteristics



ELM73xxxxxA CMOS Voltage detector with delay circuit and Manual Reset function

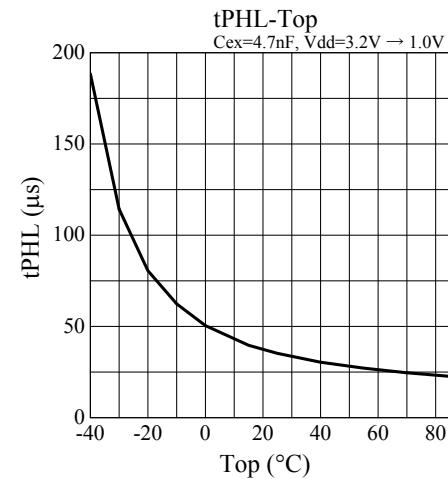
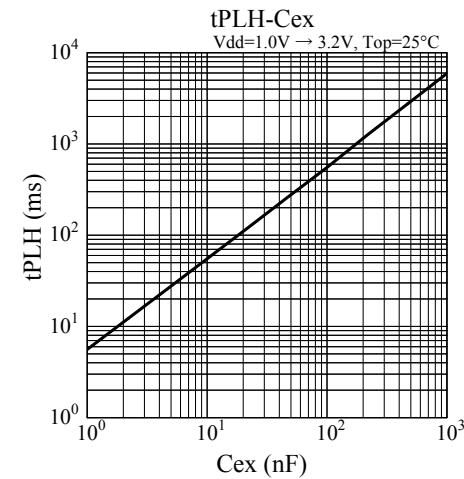
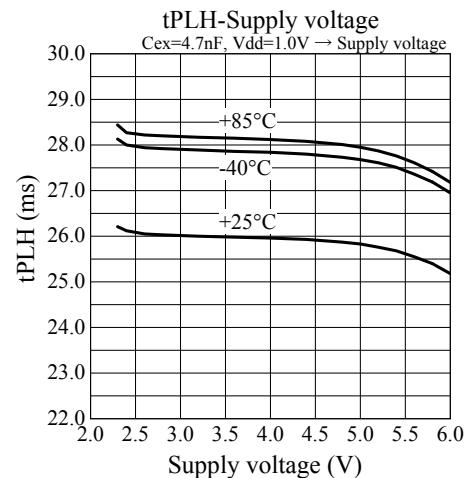
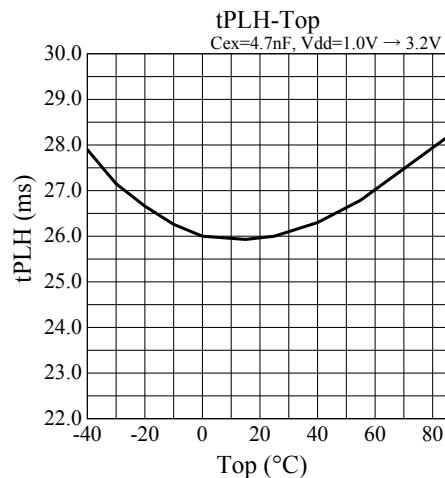
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■P-ch output current characteristics (ELM73xxCxxxA)



■Delay time characteristics

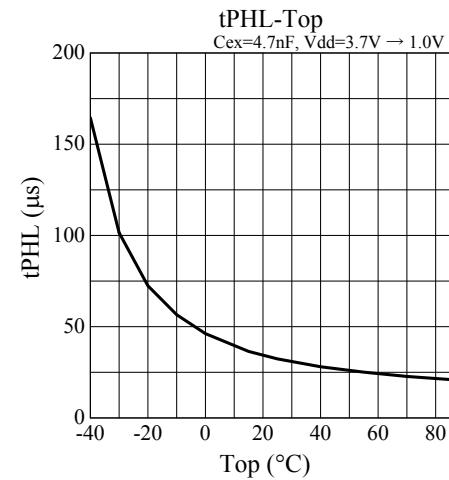
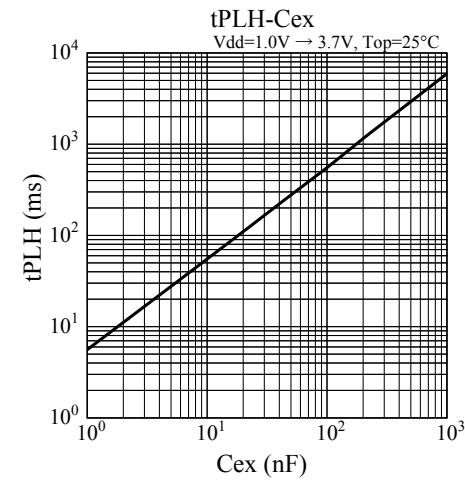
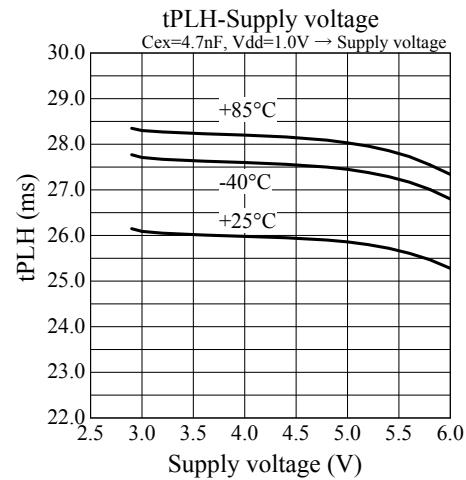
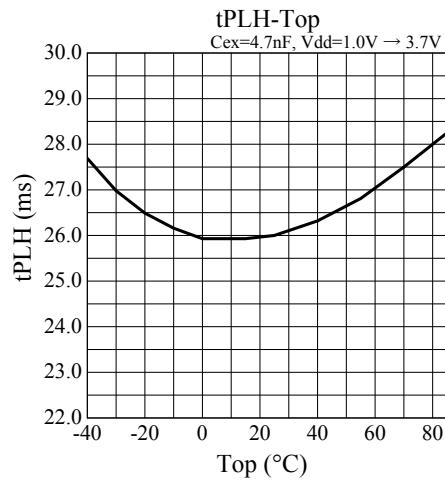
- $V_{detN}=2.2V$ (ELM7322xxxxA)



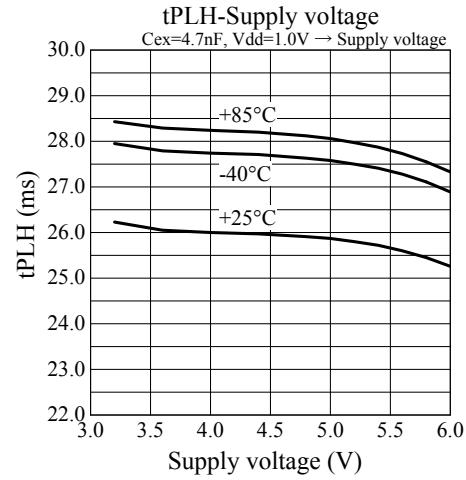
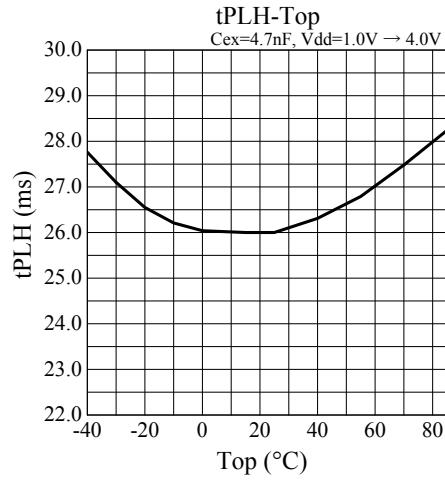
ELM73xxxxxA CMOS Voltage detector with delay circuit and Manual Reset function

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- V_{detN}=2.7V (ELM7327xxxxA)

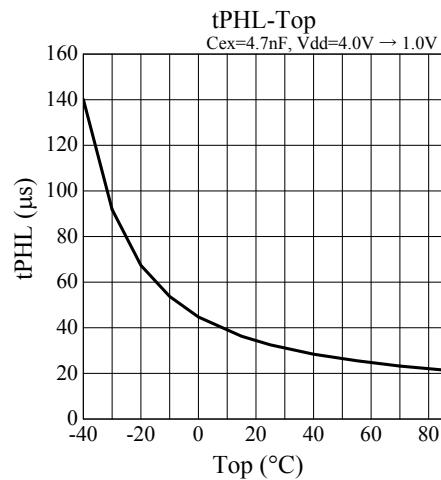
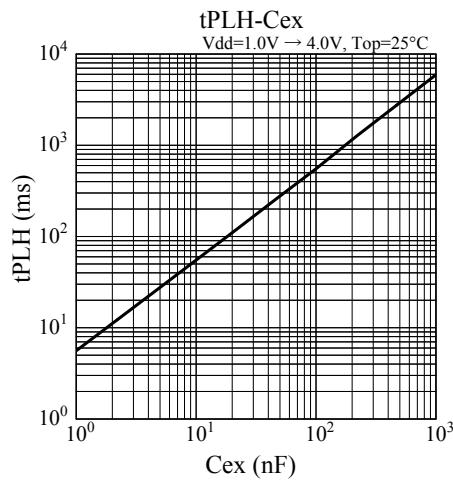


- V_{detN}=3.0V (ELM7330xxxxA)

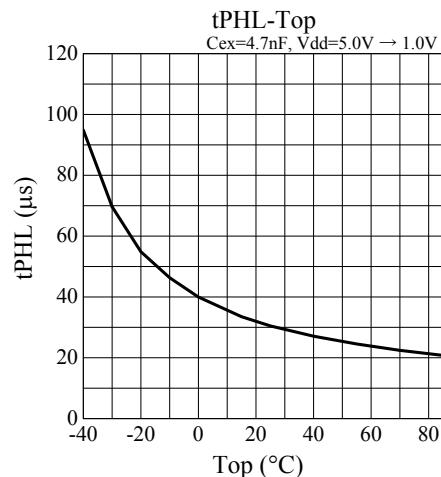
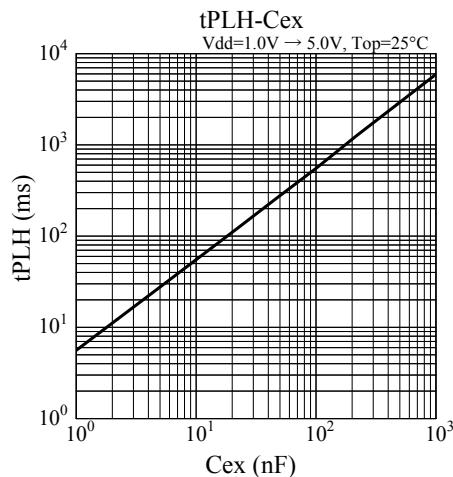
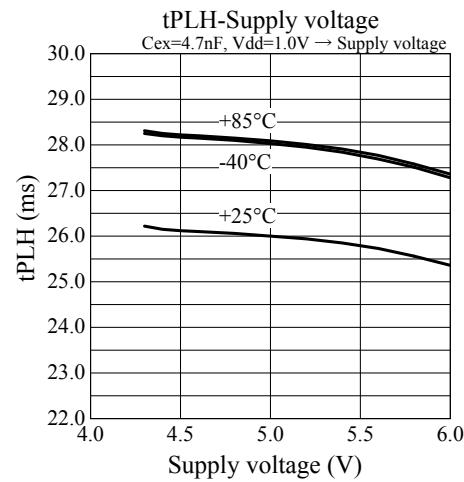
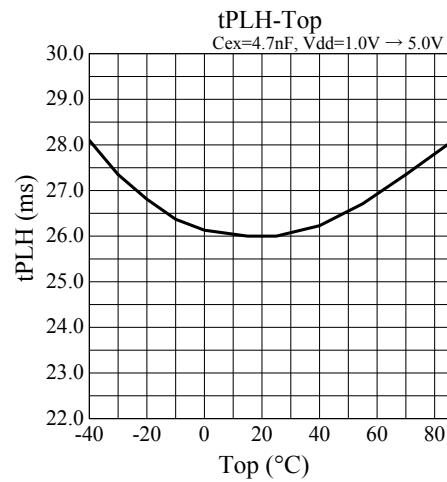


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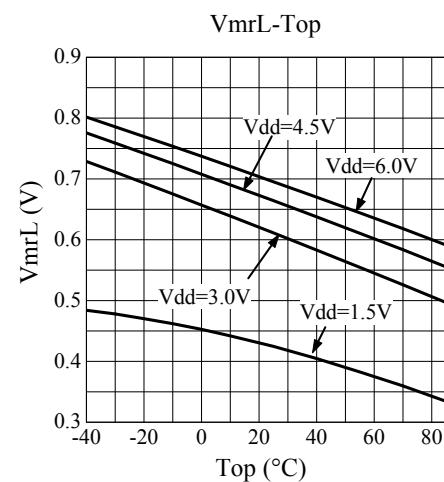
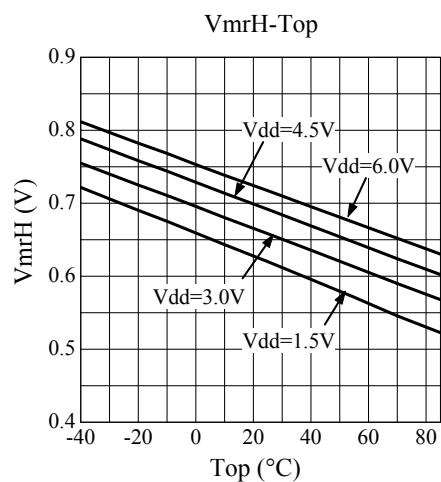
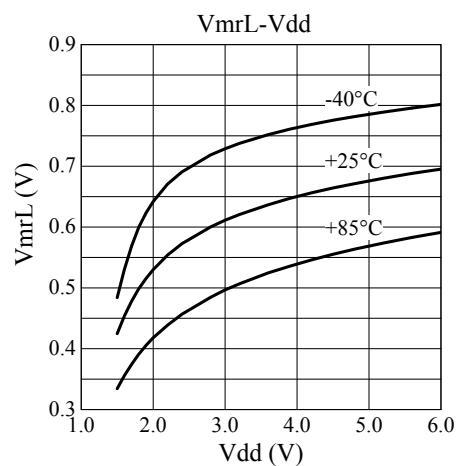
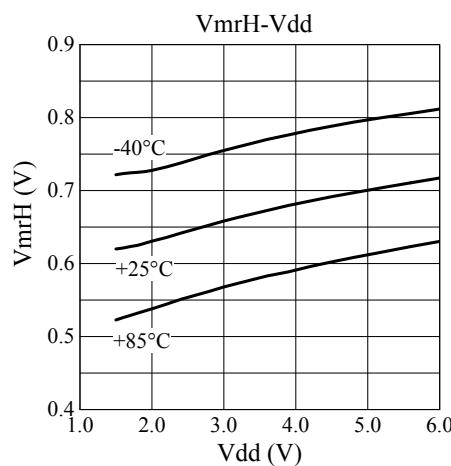
- VdetN=4.0V (ELM7340xxxxA)



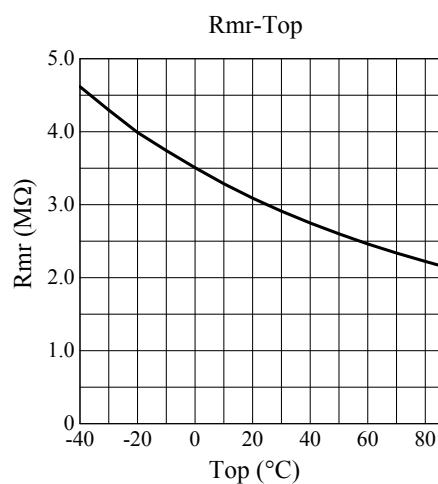
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■MR voltage characteristics (ELM73xxxBxxA)



■MR pull-up resistance characteristics (ELM73xxxBxxA)



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■N-ch output leakage current characteristics (ELM73xxNxxxA)

