74LV4060-Q100

14-stage binary ripple counter with oscillator

Rev. 1 — 25 July 2014 | Product data sheet

1. General description

The 74LV4060-Q100 is a low-voltage Si-gate CMOS device and is pin and function compatible with the 74HC4060-Q100; 74HCT4060-Q100.

The 74LV4060-Q100 is a 14-stage ripple-carry counter/divider and oscillator with three oscillator terminals (RS, RTC and CTC). It has ten buffered outputs (Q3 to Q9 and Q11 to Q13) and an overriding asynchronous master reset (MR). The oscillator configuration allows design of either RC or crystal oscillator circuits. The oscillator can be replaced by an external clock signal at input RS. In this case, keep the oscillator pins (RTC and CTC) floating.

The counter advances on the negative-going transition of RS. A HIGH-level on MR resets the counter (Q3 to Q9 and Q11 to Q13 = LOW), independent of the other input conditions.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from –40 °C to +85 °C and from –40 °C to +125 °C
- Wide operating voltage range from 1.0 V to 5.5 V
- Optimized for low voltage applications from 1.0 V to 3.6 V
- Accepts TTL input levels between V_{CC} = 2.7 V and V_{CC} = 3.6 V
- Typical V_{OLP} (output ground bounce) < 0.8 V at V_{CC} = 3.3 V; T_{amb} = 25 °C
- Typical V_{OHV} (output V_{OH} undershoot) > 2 V at V_{CC} = 3.3 V; T_{amb} = 25 °C
- All active components on chip
- RC or crystal oscillator configuration
- Complies with JEDEC standard no. 7A
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

3. Applications

- Control counters
- Timers
- Frequency dividers
- Time-delay circuits

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4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LV4060D-Q100	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74LV4060PW-Q100	–40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

5. Functional diagram

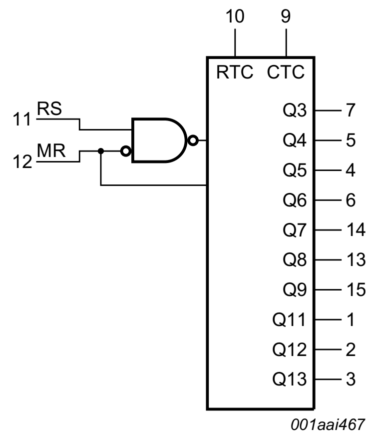


Fig 1. Logic symbol

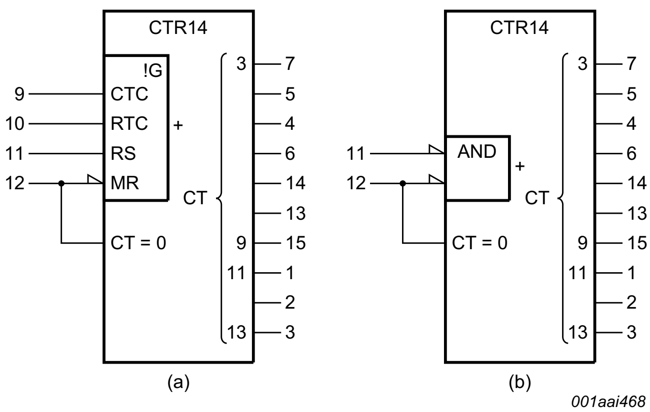


Fig 2. IEC logic symbol

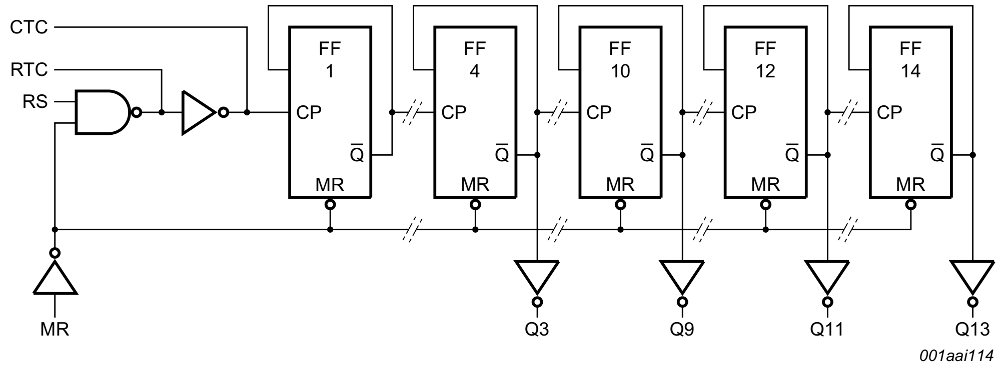


Fig 3. Logic diagram

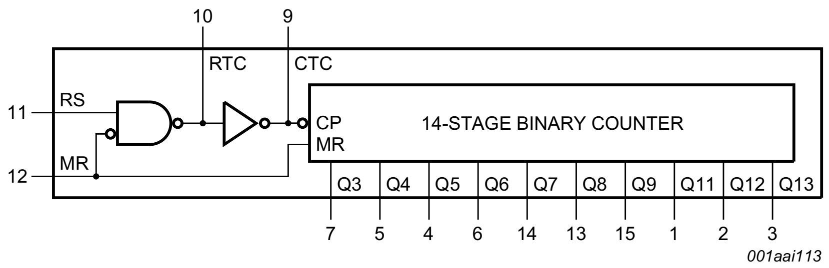


Fig 4. Functional diagram

6. Pinning information

6.1 Pinning

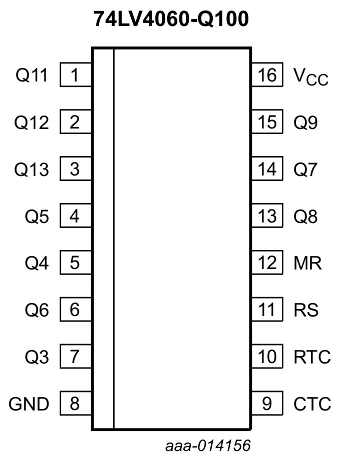


Fig 5. Pin configuration

6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
Q11 to Q13	1, 2, 3	counter output
Q3 to Q9	7, 5, 4, 6, 14, 13, 15	counter output
GND	8	ground (0 V)
CTC	9	external capacitor connection
RTC	10	external resistor connection
RS	11	clock input/oscillator pin
MR	12	master reset
V_{CC}	16	supply voltage

7. Functional description

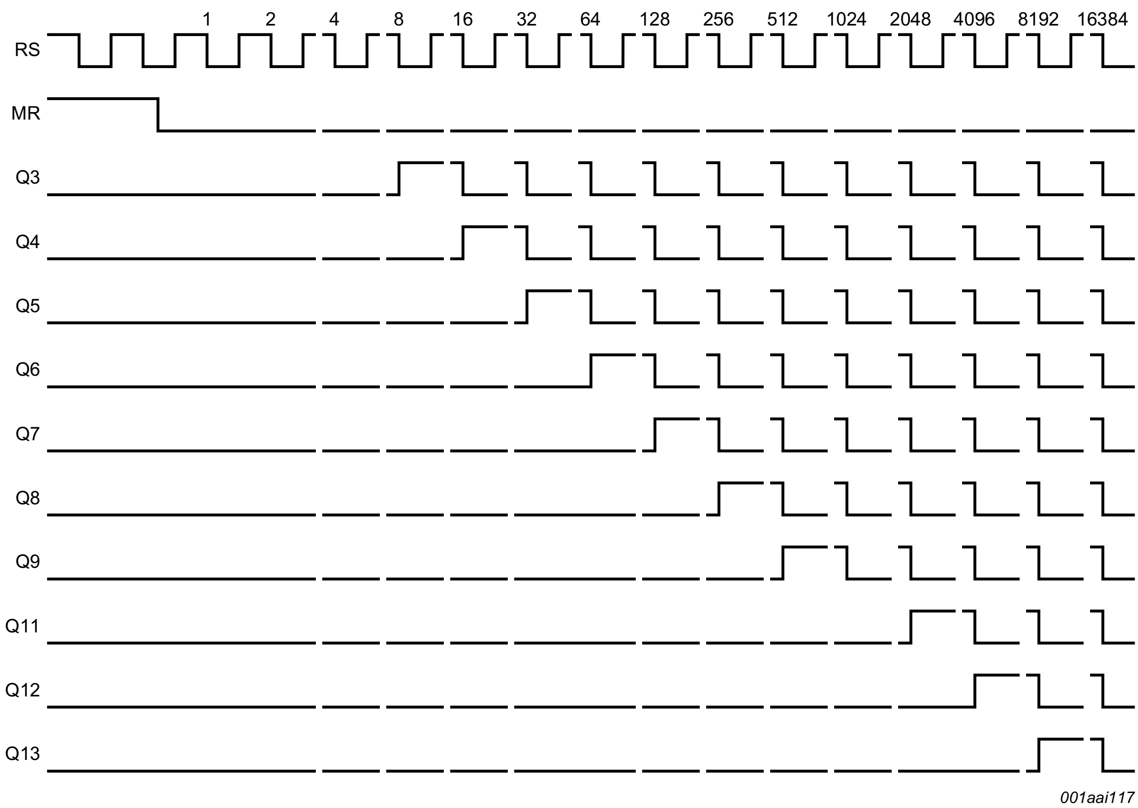


Fig 6. Timing diagram

8. Limiting values

Table 3. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			–0.5	+7.0	V
I_{IK}	input clamping current	$V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ V	[1]	-	±20	mA
I_{OK}	output clamping current	$V_O < –0.5$ V or $V_O > V_{CC} + 0.5$ V	[1]	-	±50	mA
I_O	output current	$–0.5$ V $< V_O < V_{CC} + 0.5$ V		-	±25	mA
I_{CC}	supply current			-	50	mA
I_{GND}	ground current			–50	-	mA
T_{stg}	storage temperature			–65	+150	°C
P_{tot}	total power dissipation	T_{amb} = –40 °C to +125 °C				
		SO16 package	[2]	-	500	mW
		TSSOP16 package	[3]	-	400	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] P_{tot} derates linearly with 8 mW/K above 70 °C.

[3] P_{tot} derates linearly with 5.5 mW/K above 60 °C.

9. Recommended operating conditions

Table 4. Recommended operating conditions

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	supply voltage		[1]	1.0	3.3	5.5	V
V_I	input voltage			0	-	V_{CC}	V
V_O	output voltage			0	-	V_{CC}	V
T_{amb}	ambient temperature	in free air		–40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 1.0 V to 2.0 V		-	-	500	ns/V
		V_{CC} = 2.0 V to 2.7 V		-	-	200	ns/V
		V_{CC} = 2.7 V to 3.6 V		-	-	100	ns/V
		V_{CC} = 3.6 V to 5.5 V		-	-	50	ns/V

[1] The 74LV4060-Q100 is guaranteed to function down to V_{CC} = 1.0 V (input levels GND or V_{CC}); DC characteristics are guaranteed from V_{CC} = 1.2 V to V_{CC} = 5.5 V.

10. Static characteristics

Table 5. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	–40 °C to +85 °C			–40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	MR input						
		V_{CC} = 1.2 V	0.9	-	-	0.9	-	V
		V_{CC} = 2.0 V	1.4	-	-	1.4	-	V
		V_{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V_{CC} = 4.5 V to 5.5 V	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
		RS input						
		V_{CC} = 1.2 V	1.0	-	-	1.0	-	V
		V_{CC} = 2.0 V	1.6	-	-	1.6	-	V
		V_{CC} = 2.7 V to 3.6 V	2.4	-	-	2.4	-	V
		V_{CC} = 4.5 V to 5.5 V	$0.8V_{CC}$	-	-	$0.8V_{CC}$	-	V
V_{IL}	LOW-level input voltage	MR input						
		V_{CC} = 1.2 V	-	-	0.3	-	0.3	V
		V_{CC} = 2.0 V	-	-	0.6	-	0.6	V
		V_{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V_{CC} = 4.5 V to 5.5 V	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
		RS input						
		V_{CC} = 1.2 V	-	-	0.2	-	0.2	V
		V_{CC} = 2.0 V	-	-	0.4	-	0.4	V
		V_{CC} = 2.7 V to 3.6 V	-	-	0.5	-	0.5	V
		V_{CC} = 4.5 V to 5.5 V	-	-	$0.2V_{CC}$	-	$0.2V_{CC}$	V
V_{OH}	HIGH-level output voltage	RTC output; RS = MR = GND						
		V_{CC} = 1.2 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –3.4 mA	2.40	2.82	-	2.20	-	V
		V_{CC} = 4.5 V; I_O = –3.4 mA	-	-	-	-	-	V
		RTC output; RS = MR = V_{CC}						
		V_{CC} = 1.2 V; I_O = –0.8 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = –0.8 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = –0.8 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –0.8 mA	2.40	2.82	-	2.20	-	V
		V_{CC} = 4.5 V; I_O = –0.8 mA	-	-	-	-	-	V

Table 5. Static characteristics *…continued*

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	–40 °C to +85 °C			–40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V_{OH}	HIGH-level output voltage	RTC output; RS = MR = GND						
		V_{CC} = 1.2 V; I_O = –100 μA	1.0	1.2	-	1.0	-	V
		V_{CC} = 2.0 V; I_O = –100 μA	1.8	2.0	-	1.8	-	V
		V_{CC} = 2.7 V; I_O = –100 μA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –100 μA	2.8	3.0	-	2.8	-	V
		V_{CC} = 4.5 V; I_O = –100 μA	-	-	-	-	-	V
		RTC output; RS = MR = V_{CC}						
		V_{CC} = 1.2 V; I_O = –100 μA	1.0	1.2	-	1.0	-	V
		V_{CC} = 2.0 V; I_O = –100 μA	1.8	2.0	-	1.8	-	V
		V_{CC} = 2.7 V; I_O = –100 μA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –100 μA	2.8	3.0	-	2.8	-	V
		V_{CC} = 4.5 V; I_O = –100 μA	-	-	-	-	-	V
		CTC output; RS = V_{IH} and MR = V_{IL}						
		V_{CC} = 1.2 V; I_O = –3.8 mA	-	1.2	-	-	-	V
		V_{CC} = 2.0 V; I_O = –3.8 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = –3.8 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –3.8 mA	2.40	2.82	-	2.20	-	V
		V_{CC} = 4.5 V; I_O = –3.8 mA	-	-	-	-	-	V
		except RTC output; V_I = V_{IH} or V_{IL}						
		V_{CC} = 1.2 V; I_O = –100 μA	1.0	1.2	-	1.0	-	V
		V_{CC} = 2.0 V; I_O = –100 μA	1.8	2.0	-	1.8	-	V
		V_{CC} = 2.7 V; I_O = –100 μA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –100 μA	2.8	3.0	-	2.8	-	V
		V_{CC} = 4.5 V; I_O = –100 μA	-	-	-	-	-	V
		except RTC and CTC outputs; V_I = V_{IH} or V_{IL}						
		V_{CC} = 1.2 V; I_O = –6 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = –6 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = –6 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –6 mA	2.40	2.82	-	2.20	-	V
		V_{CC} = 4.5 V; I_O = –6 mA	-	-	-	-	-	V
V_{OL}	LOW-level output voltage	RTC output; RS = V_{CC} and MR = GND						
		V_{CC} = 1.2 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = –3.4 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = –3.4 mA	-	0.25	0.40	-	0.50	V
		V_{CC} = 4.5 V; I_O = –3.4 mA	-	-	-	-	-	V

Table 5. Static characteristics *...continued*

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	−40 °C to +85 °C			−40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V_{OL}	LOW-level output voltage	RTC output; RS = V_{CC} and MR = GND						
		V_{CC} = 1.2 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 2.0 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 2.7 V; I_O = −100 μA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 4.5 V; I_O = −100 μA	-	-	-	-	-	V
		CTC output; RS = V_{IH} and MR = V_{IL}						
		V_{CC} = 1.2 V; I_O = −3.8 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = −3.8 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = −3.8 mA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = −3.8 mA	-	0.25	-	0.40	0.50	V
		V_{CC} = 4.5 V; I_O = −3.8 mA	-	-	-	-	-	V
		except RTC output; V_I = V_{IH} or V_{IL}						
		V_{CC} = 1.2 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 2.0 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 2.7 V; I_O = −100 μA	-	-	-	-	-	V
		V_{CC} = 3.0 V; I_O = −100 μA	-	0	0.2	-	0.2	V
		V_{CC} = 4.5 V; I_O = −100 μA	-	-	-	-	-	V
		except RTC and CTC output; V_I = V_{IH} or V_{IL}						
		V_{CC} = 1.2 V; I_O = −6 mA	-	-	-	-	-	V
		V_{CC} = 2.0 V; I_O = −6 mA	-	-	-	-	-	V
		V_{CC} = 2.7 V; I_O = −6 mA	-	0.25	0.40	-	0.50	V
		V_{CC} = 3.0 V; I_O = −6 mA	-	-	-	-	-	V
		V_{CC} = 4.5 V; I_O = −6 mA	-	-	-	-	-	V
I_I	input leakage current	V_{CC} = 5.5 V; V_I = V_{CC} or GND	-	-	1.0	-	1.0	μA
I_{CC}	supply current	V_{CC} = 3.6 V; V_I = V_{CC} or GND; I_O = 0 A	-	-	20	-	160	μA
		V_{CC} = 5.5 V; V_I = V_{CC} or GND; I_O = 0 A	-	-	-	-	80	μA
ΔI_{CC}	additional supply current	V_{CC} = 2.7 V to 3.6 V; V_I = V_{CC} − 0.6 V; I_O = 0 A	-	-	500	-	850	μA
C_I	input capacitance		-	3.5	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C.

11. Dynamic characteristics

Table 6. Dynamic characteristics

GND = 0 V; for test circuit, see Figure 10.

Symbol	Parameter	Conditions		−40 °C to +85 °C			−40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	RS to Q3; see Figure 7 and Figure 9	[2]						
		V_{CC} = 1.2 V		-	180	-	-	-	ns
		V_{CC} = 2.0 V		-	52	84	-	105	ns
		V_{CC} = 2.7 V		-	42	66	-	83	ns
		V_{CC} = 3.3 V; C_L = 15 pF		-	29	-	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	-	33	53	-	66	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	-	24	39	-	49	ns
		Qn to Qn+1; see Figure 8 and Figure 9							
		V_{CC} = 1.2 V		-	40	-	-	-	ns
		V_{CC} = 2.0 V		-	14	23	-	29	ns
		V_{CC} = 2.7 V		-	10	16	-	20	ns
		V_{CC} = 3.3 V; C_L = 15 pF		-	6	-	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	-	8	13	-	16	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	-	6	9	-	11	ns
t_{PHL}	HIGH to LOW propagation delay	MR to Qn; see Figure 8 and Figure 9							
		V_{CC} = 1.2 V		-	100	-	-	-	ns
		V_{CC} = 2.0 V		-	29	46	-	58	ns
		V_{CC} = 2.7 V		-	24	39	-	49	ns
		V_{CC} = 3.3 V; C_L = 15 pF		-	16	-	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	-	19	31	-	39	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	-	14	23	-	29	ns
t_W	pulse width	RS HIGH or LOW; see Figure 7							
		V_{CC} = 2.0 V		34	9	-	38	-	ns
		V_{CC} = 2.7 V		25	6	-	30	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	20	5	-	24	-	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	16	4	-	20	-	ns
		MR HIGH; see Figure 9							
		V_{CC} = 2.0 V		34	10	-	38	-	ns
		V_{CC} = 2.7 V		25	8	-	30	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	20	6	-	24	-	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	16	4	-	20	-	ns

Table 6. Dynamic characteristics
GND = 0 V; for test circuit, see Figure 10.

Symbol	Parameter	Conditions		−40 °C to +85 °C			−40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
t_{rec}	recovery time	MR to RS; see Figure 9							
		V_{CC} = 2.0 V		29	18	-	37	-	ns
		V_{CC} = 2.7 V		26	16	-	32	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	18	11	-	23	-	ns
		V_{CC} = 4.5 V to 5.5 V	[4]	12	7	-	15	-	ns
f_{max}	maximum frequency	RS; see Figure 7							
		V_{CC} = 2.0 V		14	40	-	9	-	MHz
		V_{CC} = 2.7 V		19	70	-	12	-	MHz
		V_{CC} = 3.3 V; C_L = 15 pF		-	99	-	-	-	MHz
		V_{CC} = 3.0 V to 3.6 V	[3]	24	90	-	15	-	MHz
		V_{CC} = 4.5 V to 5.5 V	[4]	30	100	-	19	-	MHz
C_{PD}	power dissipation capacitance	V_I = GND to V_{CC}	[5]	-	40	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C.

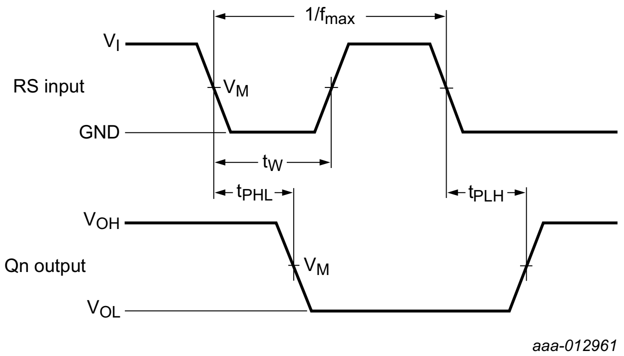
[2] t_{pd} is the same as t_{PLH} and t_{PHL}.

[3] Typical value measured at V_{CC} = 3.3 V.

[4] Typical value measured at V_{CC} = 5.0 V.

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = output load capacitance in pF;
V_{CC} = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

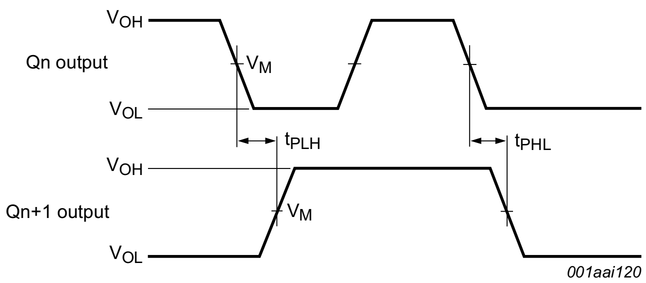
12. Waveforms



Measurement points are given in Table 7.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

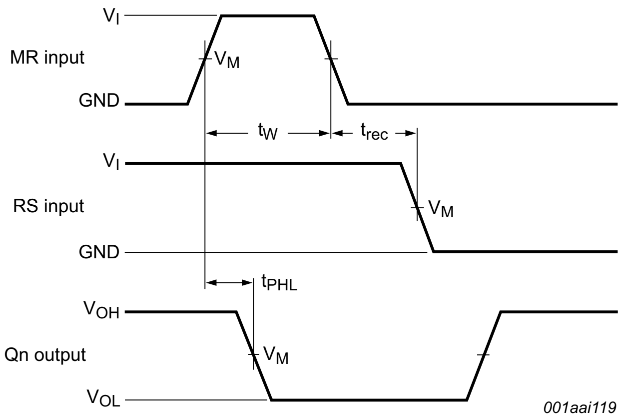
Fig 7. Waveforms showing the clock (RS) to output (Qn) propagation delays, the clock pulse width, the output transition times and the maximum frequency



Measurement points are given in Table 7.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 8. Waveforms showing the output Qn to output Qn+1 propagation delays



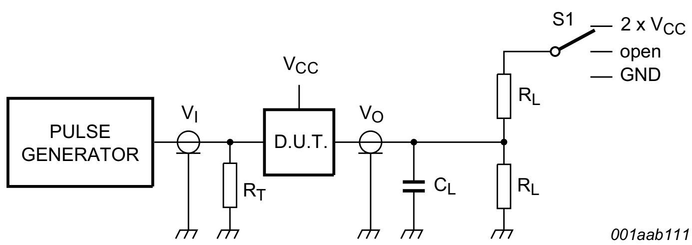
Measurement points are given in Table 7.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 9. Waveforms showing the master reset (MR) pulse width, the master reset to output (Qn) propagation delays and the master reset to clock (RS) recovery time

Table 7. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
< 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$
2.7 V to 3.6 V	1.5 V	1.5 V
≥ 4.5 V	$0.5V_{CC}$	$0.5V_{CC}$



Test data is given in Table 8.

Definitions test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

Fig 10. Test circuit for measuring switching times

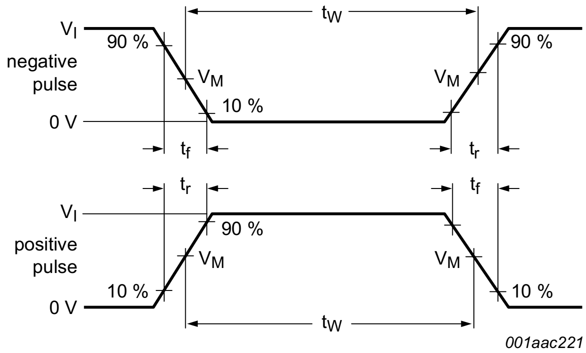
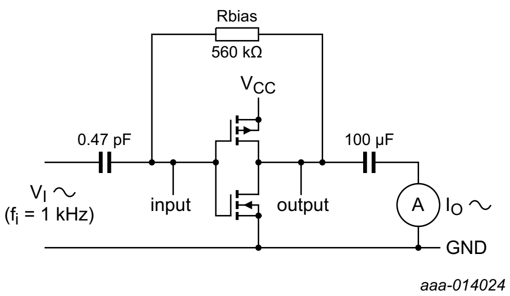


Fig 11. Input pulse definition

Table 8. Test data

Supply voltage	Input		Load		S1
V_{CC}	**V_I**	**t_r, t_f**	**C_L**	**R_L**	**t_{PLH}, t_{PHL}**
< 2.7 V	V_{CC}	2.5 ns	50 pF	1 kΩ	open
2.7 V to 3.6 V	2.7 V	2.5 ns	15 pF, 50 pF	1 kΩ	open
≥ 4.5 V	V_{CC}	2.5 ns	50 pF	1 kΩ	open

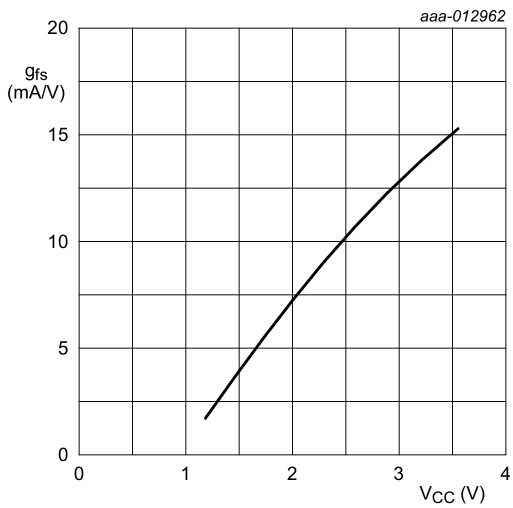
13. Typical forward transconductance



$g_{fs} = \Delta I_O / \Delta V_I$ at V_O is constant; MR = LOW.

See Figure 13.

Fig 12. Test setup for measuring forward transconductance



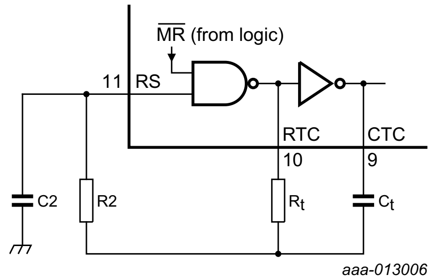
$T_{amb} = 25$ °C

Fig 13. Typical forward transconductance as function of the supply voltage

14. RC oscillator

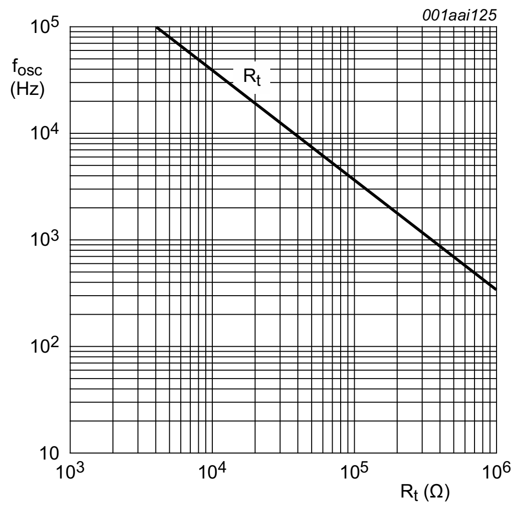
14.1 Timing component limitations

The oscillator frequency is mainly determined by $R_t \times C_t$, provided $R2 \approx 2R_t$ and $R2 \times C2$ is much less than $R_t \times C_t$. The function of R2 is to minimize the influence of the forward voltage across the input protection diodes on the frequency. The stray capacitance C2 should be kept as small as possible. In consideration of accuracy, C_t must be larger than the inherent stray capacitance. R_t must be larger than the 'ON' resistance in series with it, which typically is 280 Ω at V_{CC} = 1.2 V, 130 Ω at V_{CC} = 2.0 V and 100 Ω at V_{CC} 3.0 V. The recommended values for these components to maintain agreement with the typical oscillation formula are: C_t > 50 pF, up to any practical value, 10 kΩ < R_t < 1 MΩ. In order to avoid start-up problems, $R_t \geq$ 1 kΩ.



Typical formula for oscillator frequency: $f_{osc} = \dfrac{1}{2.5 \times R_t \times C_t}$

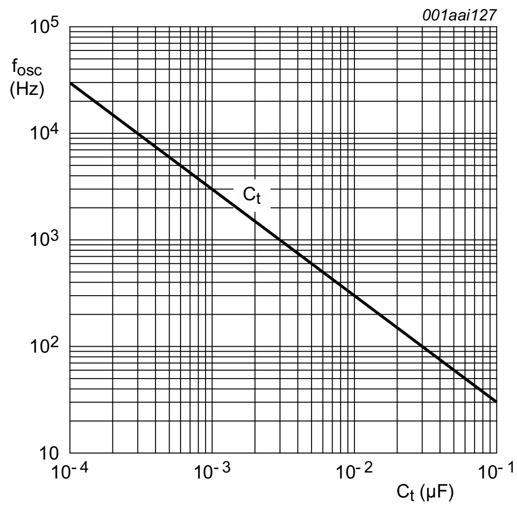
Fig 14. Example of an RC oscillator



V_{CC} = 1.2 V to 3.6 V; T_{amb} = 25 °C

R_t curve: C_t = 1 nF; R2 = 2 × R_t

Fig 15. RC oscillator frequency as a function of R_t



V_{CC} = 1.2 V to 3.6 V; T_{amb} = 25 °C

C_t curve: R_t = 100 kΩ; R2 = 200 kΩ

Fig 16. RC oscillator frequency as a function of C_t

14.2 Typical crystal oscillator circuit

In Figure 17, R2 is the power limiting resistor. For starting and maintaining oscillation, a minimum transconductance is necessary, so R2 must not be too large. A practical value for R2 is 2.2 kΩ.

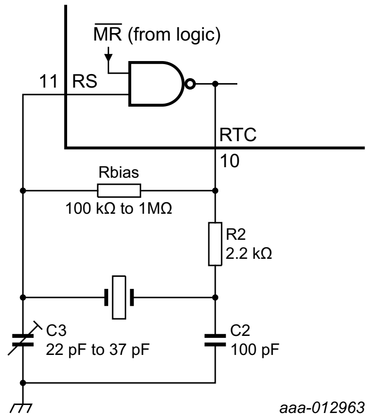
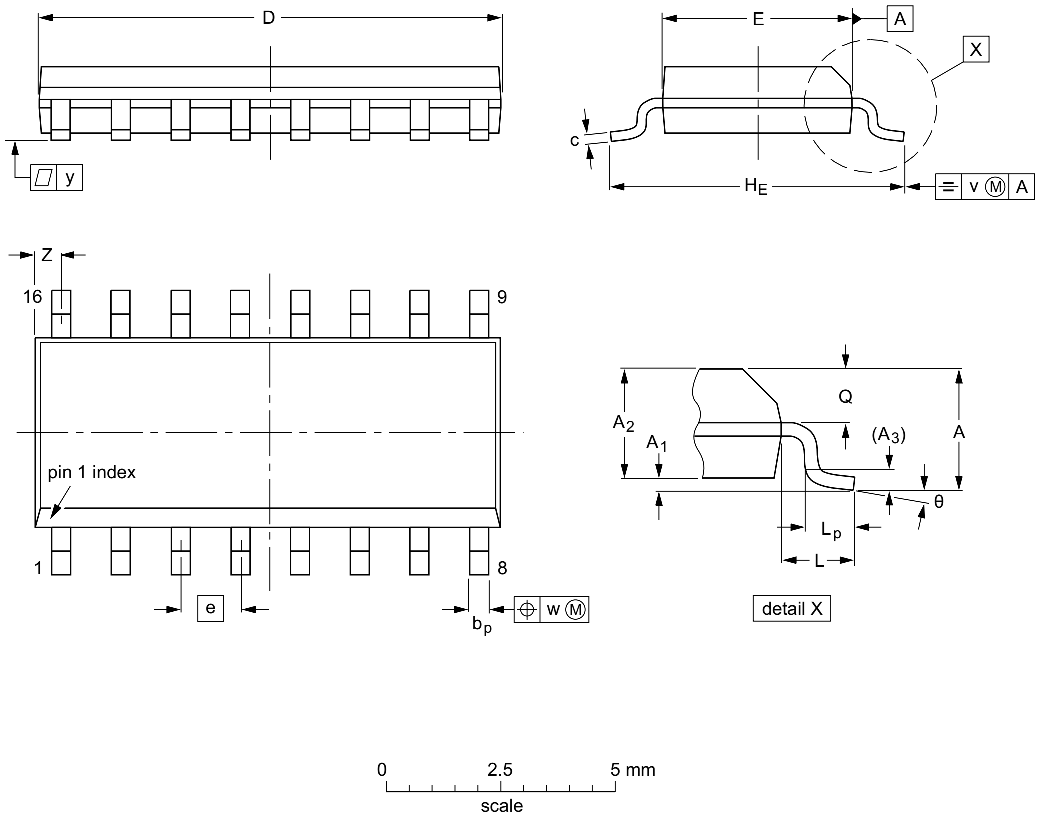


Fig 17. External components connection for a typical crystal oscillator

15. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(1)	e	H_E	L	L_p	Q	v	w	y	Z(1)	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

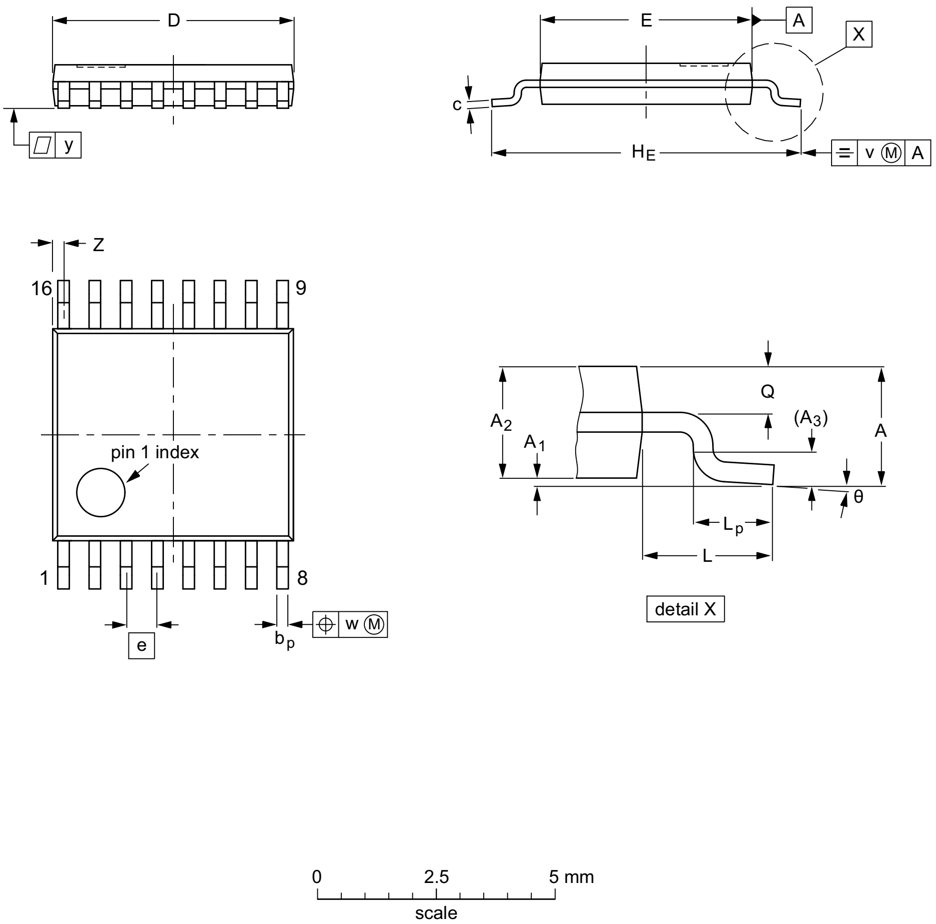
Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig 18. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				~~99-12-27~~ 03-02-18

Fig 19. Package outline SOT403-1 (TSSOP16)

16. Abbreviations

Table 9. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

17. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LV4060_Q100 v.1	20140725	Product data sheet	-	-

18. Legal information

18.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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