# HEF4541B-Q100

## Programmable timer

Rev. 3 — 25 November 2021 Product data sheet

## 1. General description

The HEF4541B-Q100 is a programmable timer. It consists of a 16-stage binary counter, an integrated oscillator to be used with external timing components, an automatic power-on reset and output control logic. The external components $R_{TC}$ and $C_{TC}$ determines the frequency of the oscillator within the frequency range 1 Hz to 100 kHz. An external clock signal at input RS can replace the oscillator. The timer advances on the positive-going transition of RS. A LOW on the auto reset input (AR) and a LOW on the master reset input (MR) enables the internal power-on reset. A HIGH level at input MR resets the counter independent on all other inputs. Resetting, disables the oscillator to provide no active power dissipation.

A HIGH at input AR turns off the power-on reset to provide a low quiescent power dissipation of the timer. The 16-stage counter divides the oscillator frequency by $2^8$, $2^{10}$, $2^{13}$ or $2^{16}$ depending on the state of the address inputs (A0, A1). The divided oscillator frequency is available at output O. The phase input (PH) features a complementary output signal. When the mode select input (MODE) is LOW the timer is a single transition timer and when HIGH the timer is a $2^n$ frequency divider.

It operates over a recommended $V_{DD}$ power supply range of 3 V to 15 V referenced to $V_{SS}$ (usually ground). Unused inputs must be connected to $V_{DD}$, $V_{SS}$, or another input.

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 supply voltage range from 3.0 V to 15.0 V
- CMOS low power dissipation
- High noise immunity
- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- Complies with JEDEC standard JESD 13-B
- 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. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| HEF4541BT-Q100 | -40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |

nexperia

## 4. Functional diagram

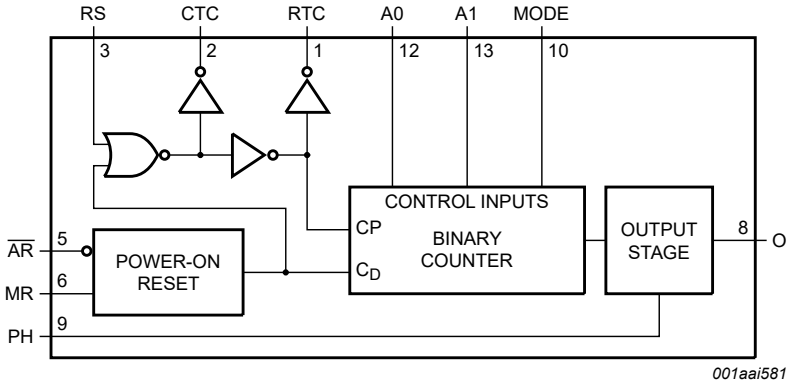



**Fig. 1. Functional diagram**

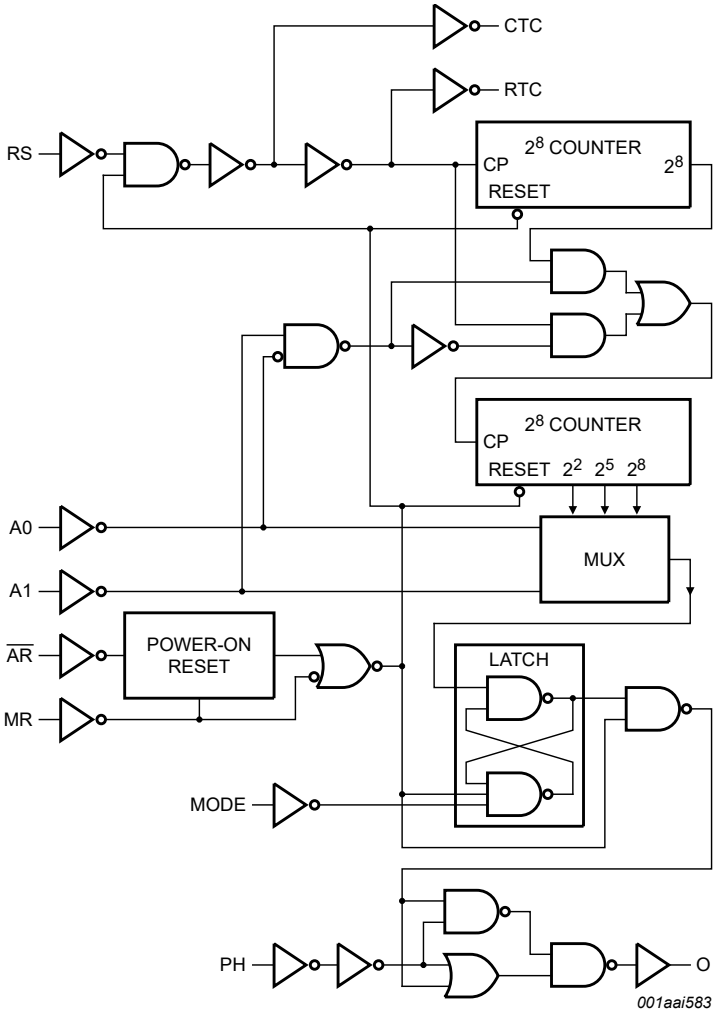



**Fig. 2. Logic diagram**

# 5. Pinning information

## 5.1. Pinning

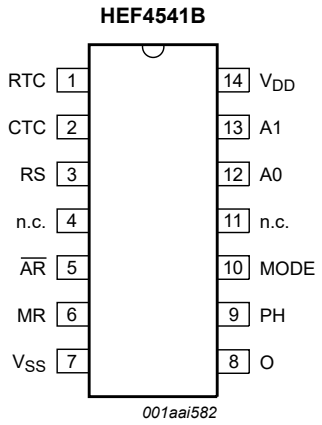



**Fig. 3. Pin configuration for SOT108-1 (SO14)**

## 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| RTC | 1 | external resistor connection |
| CTC | 2 | external capacitor connection |
| RS | 3 | external resistor connection (RS) or external clock input |
| n.c. | 4, 11 | not connected |
| $\overline{AR}$ | 5 | auto reset input (active low) |
| MR | 6 | master reset input |
| $V_{SS}$ | 7 | ground (0 V) |
| O | 8 | timer output |
| PH | 9 | phase input |
| MODE | 10 | mode select input |
| A0, A1 | 12, 13 | address inputs |
| $V_{DD}$ | 14 | supply voltage |

# 6. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care.*

| Input | | | | MODE |
|---|---|---|---|---|
| $\overline{AR}$ | MR | PH | MODE | |
| H | L | X | X | auto reset disabled |
| L | L | X | X | auto reset enabled[1] |
| X | H | X | X | master reset active |
| X | L | X | H | normal operation selected division to output |
| X | L | X | L | single-cycle mode[2] |
| X | L | L | X | output initially LOW after reset |
| X | L | H | X | output initially HIGH, after reset |

[1] For correct power-on reset, the supply voltage should be above 8.5 V. For $V_{DD}$ < 8.5 V, disable the auto reset and connect $\overline{AR}$ to $V_{DD}$.
[2] The timer is initialized on a reset pulse and the output changes state after $2^{n-1}$ counts and remains in that state (latched). A master reset or a LOW to HIGH transition on the MODE input, resets this latch.

**Table 4. Frequency selection table**

| A0 | A1 | Number of counter stages n | $\frac{f_{OSC}}{f_O} = 2^n$ |
|---|---|---|---|
| L | L | 13 | 8192 |
| L | H | 10 | 1024 |
| H | L | 8 | 256 |
| H | H | 16 | 65536 |

# 7. Limiting values

**Table 5. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DD}$ | supply voltage | | -0.5 | +18 | V |
| $I_{IK}$ | input clamping current | $V_I$ < -0.5 V or $V_I$ > $V_{DD}$ + 0.5 V | - | ±10 | mA |
| $V_I$ | input voltage | | -0.5 | $V_{DD}$ + 0.5 | V |
| $I_{OK}$ | output clamping current | $V_O$ < -0.5 V or $V_O$ > $V_{DD}$ + 0.5 V | - | ±10 | mA |
| $I_{I/O}$ | input/output current | O output | - | ±10 | mA |
| $T_{stg}$ | storage temperature | | -65 | +150 | °C |
| $T_{amb}$ | ambient temperature | | -40 | +125 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = -40 °C to +125 °C [1] | - | 500 | mW |
| P | power dissipation | | - | 100 | mW |

[1] For SOT108-1 (SO14) package: $P_{tot}$ derates linearly with 10.1 mW/K above 100 °C.

# 8. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DD}$ | supply voltage | | 3 | 15 | V |
| $V_I$ | input voltage | | 0 | $V_{DD}$ | V |
| $T_{amb}$ | ambient temperature | in free air | -40 | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | $V_{DD}$ = 5 V | - | 3.75 | μs/V |
| | | $V_{DD}$ = 10 V | - | 0.5 | μs/V |
| | | $V_{DD}$ = 15 V | - | 0.08 | μs/V |

# 9. Static characteristics

**Table 7. Static characteristics**

*$V_{SS}$ = 0 V; $V_I$ = $V_{SS}$ or $V_{DD}$; unless otherwise specified.*

| Symbol | Parameter | Conditions | $V_{DD}$ | $T_{amb}$ = -40 °C | | $T_{amb}$ = 25 °C | | $T_{amb}$ = 85 °C | | $T_{amb}$ = 125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| $V_{IH}$ | HIGH-level input voltage | $\|I_O\|$ < 1 μA | 5 V | 3.5 | - | 3.5 | - | 3.5 | - | 3.5 | - | V |
| | | | 10 V | 7.0 | - | 7.0 | - | 7.0 | - | 7.0 | - | V |
| | | | 15 V | 11.0 | - | 11.0 | - | 11.0 | - | 11.0 | - | V |
| $V_{IL}$ | LOW-level input voltage | $\|I_O\|$ < 1 μA | 5 V | - | 1.5 | - | 1.5 | - | 1.5 | - | 1.5 | V |
| | | | 10 V | - | 3.0 | - | 3.0 | - | 3.0 | - | 3.0 | V |
| | | | 15 V | - | 4.0 | - | 4.0 | - | 4.0 | - | 4.0 | V |
| $V_{OH}$ | HIGH-level output voltage | $\|I_O\|$ < 1 μA | 5 V | 4.95 | - | 4.95 | - | 4.95 | - | 4.95 | - | V |
| | | | 10 V | 9.95 | - | 9.95 | - | 9.95 | - | 9.95 | - | V |
| | | | 15 V | 14.95 | - | 14.95 | - | 14.95 | - | 14.95 | - | V |
| $V_{OL}$ | LOW-level output voltage | $\|I_O\|$ < 1 μA | 5 V | - | 0.05 | - | 0.05 | - | 0.05 | - | 0.05 | V |
| | | | 10 V | - | 0.05 | - | 0.05 | - | 0.05 | - | 0.05 | V |
| | | | 15 V | - | 0.05 | - | 0.05 | - | 0.05 | - | 0.05 | V |
| $I_{OH}$ | HIGH-level output current | CTC, RTC; | | | | | | | | | | |
| | | $V_O$ = 2.5 V | 5 V | - | -1.4 | - | -1.2 | - | -0.95 | - | -0.95 | mA |
| | | $V_O$ = 4.6 V | 5 V | - | -0.5 | - | -0.4 | - | -0.3 | - | -0.3 | mA |
| | | $V_O$ = 9.5 V | 10 V | - | -1.4 | - | -1.2 | - | -0.95 | - | -0.95 | mA |
| | | $V_O$ = 13.5 V | 15 V | - | -4.8 | - | -4.0 | - | -3.2 | - | -3.2 | mA |
| | | O; | | | | | | | | | | |
| | | $V_O$ = 2.5 V | 5 V | - | -1.7 | - | -1.4 | - | -1.1 | - | -1.1 | mA |
| | | $V_O$ = 4.6 V | 5 V | - | -0.64 | - | -0.5 | - | -0.36 | - | -0.36 | mA |
| | | $V_O$ = 9.5 V | 10 V | - | -1.6 | - | -1.3 | - | -0.9 | - | -0.9 | mA |
| | | $V_O$ = 13.5 V | 15 V | - | -4.2 | - | -3.4 | - | -2.4 | - | -2.4 | mA |

| Symbol | Parameter | Conditions | $V_{DD}$ | $T_{amb}$ = -40 °C | | $T_{amb}$ = 25 °C | | $T_{amb}$ = 85 °C | | $T_{amb}$ = 125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| $I_{OL}$ | LOW-level output current | CTC, RTC; | | | | | | | | | | |
| | | $V_O$ = 0.4 V | 5 V | 0.33 | - | 0.27 | - | 0.20 | - | 0.20 | - | mA |
| | | $V_O$ = 0.5 V | 10 V | 1.0 | - | 0.85 | - | 0.68 | - | 0.68 | - | mA |
| | | $V_O$ = 1.5 V | 15 V | 3.2 | - | 2.7 | - | 2.3 | - | 2.3 | - | mA |
| | | O; | | | | | | | | | | |
| | | $V_O$ = 0.4 V | 5 V | 0.64 | - | 0.5 | - | 0.36 | - | 0.36 | - | mA |
| | | $V_O$ = 0.5 V | 10 V | 1.6 | - | 1.3 | - | 0.9 | - | 0.9 | - | mA |
| | | $V_O$ = 1.5 V | 15 V | 4.2 | - | 3.2 | - | 2.4 | - | 2.4 | - | mA |
| $I_I$ | input leakage current | | 15 V | - | ±0.1 | - | ±0.1 | - | ±1.0 | - | ±1.0 | µA |
| $I_{DD}$ | supply current | $I_O$ = 0 A | 5 V | - | 5 | - | 5 | - | 150 | - | 150 | µA |
| | | | 10 V | - | 10 | - | 10 | - | 300 | - | 300 | µA |
| | | | 15 V | - | 20 | - | 20 | - | 600 | - | 600 | µA |
| $C_I$ | input capacitance | | - | - | - | - | 7.5 | - | - | - | - | pF |

**Table 8. Reset characteristics**

*$V_{SS}$ = 0 V; $V_I$ = $V_{SS}$ or $V_{DD}$; see Table 12 for test conditions; unless otherwise specified.*

| Symbol | Parameter | Conditions | $V_{DD}$ | $T_{amb}$ = -40 °C | | $T_{amb}$ = +25 °C | | | $T_{amb}$ = +85 °C | | $T_{amb}$ = +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Min | Typ | Max | Min | Max | Min | Max | |
| $I_{DD}$ | supply current | supply current for power-on reset enable; $\overline{AR}$ = MR = 0 V; other inputs at 0 V or $V_{DD}$ | 5 V | - | 80 | - | 20 | 80 | - | 230 | - | 230 | µA |
| | | | 10 V | - | 750 | - | 250 | 600 | - | 700 | - | 700 | µA |
| | | | 15 V | - | 1.6 | - | 0.5 | 1.3 | - | 1.5 | - | 1.5 | mA |
| $V_{DD}$ | supply voltage | supply voltage for automatic reset initialization; $\overline{AR}$ = MR = 0 V; other inputs at 0 V or $V_{DD}$ | - | - | - | 8.5 | 5 | - | - | - | - | - | V |

# 10. Dynamic characteristics

**Table 9. Dynamic characteristics**

*$V_{SS}$ = 0 V; $T_{amb}$ = 25 °C unless otherwise specified. For test circuit, see Fig. 5.*

| Symbol | Parameter | Conditions | $V_{DD}$ | Extrapolation formula | Min | Typ[1] | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| $t_{pd}$ | propagation delay | RS to O; $2^8$ selected; see Fig. 4 | 5 V [2] | 348 ns + (0.55 ns/pF)$C_L$ | - | 375 | 750 | ns |
| | | | 10 V | 139 ns + (0.23 ns/pF)$C_L$ | - | 150 | 300 | ns |
| | | | 15 V | 102 ns + (0.16 ns/pF)$C_L$ | - | 110 | 220 | ns |
| | | RS to O; $2^{10}$ selected; see Fig. 4 | 5 V | 398 ns + (0.55 ns/pF)$C_L$ | - | 425 | 850 | ns |
| | | | 10 V | 154 ns + (0.23 ns/pF)$C_L$ | - | 165 | 330 | ns |
| | | | 15 V | 112 ns + (0.16 ns/pF)$C_L$ | - | 120 | 240 | ns |
| | | RS to O; $2^{13}$ selected; see Fig. 4 | 5 V | 483 ns + (0.55 ns/pF)$C_L$ | - | 510 | 1020 | ns |
| | | | 10 V | 179 ns + (0.23 ns/pF)$C_L$ | - | 190 | 380 | ns |
| | | | 15 V | 127 ns + (0.16 ns/pF)$C_L$ | - | 135 | 270 | ns |
| | | RS to O; $2^{16}$ selected; see Fig. 4 | 5 V | 548 ns + (0.55 ns/pF)$C_L$ | - | 575 | 1150 | ns |
| | | | 10 V | 199 ns + (0.23 ns/pF)$C_L$ | - | 210 | 420 | ns |
| | | | 15 V | 142 ns + (0.16 ns/pF)$C_L$ | - | 150 | 300 | ns |
| $t_W$ | pulse width | RS LOW; MR HIGH; see Fig. 4 | 5 V [3] | | 60 | 30 | - | ns |
| | | | 10 V | | 30 | 15 | - | ns |
| | | | 15 V | | 24 | 12 | - | ns |
| $f_{clk(max)}$ | maximum clock frequency | RS; see Fig. 4 | 5 V | | 8 | 16 | - | MHz |
| | | | 10 V | | 15 | 30 | - | MHz |
| | | | 15 V | | 18 | 36 | - | MHz |
| $f_{osc}$ | oscillator frequency | $R_t$ = 5 kΩ; $C_t$ = 1 nF; $R_S$ = 10 kΩ; see Fig. 6 | 5 V | | - | 90 | - | kHz |
| | | | 10 V | | - | 90 | - | kHz |
| | | | 15 V | | - | 90 | - | kHz |
| | | $R_t$ = 56 kΩ; $C_t$ = 1 nF; $R_S$ = 120 kΩ; see Fig. 6 | 5 V | | - | 8 | - | kHz |
| | | | 10 V | | - | 8 | - | kHz |
| | | | 15 V | | - | 8 | - | kHz |

[1] The typical values of the propagation delay and transition times are calculated from the extrapolation formulas shown ($C_L$ in pF).
[2] $t_{pd}$ is the same as $t_{PHL}$ and $t_{PLH}$.
[3] $t_W$ is the same as $t_{WL(min)}$ and $t_{WH(min)}$.

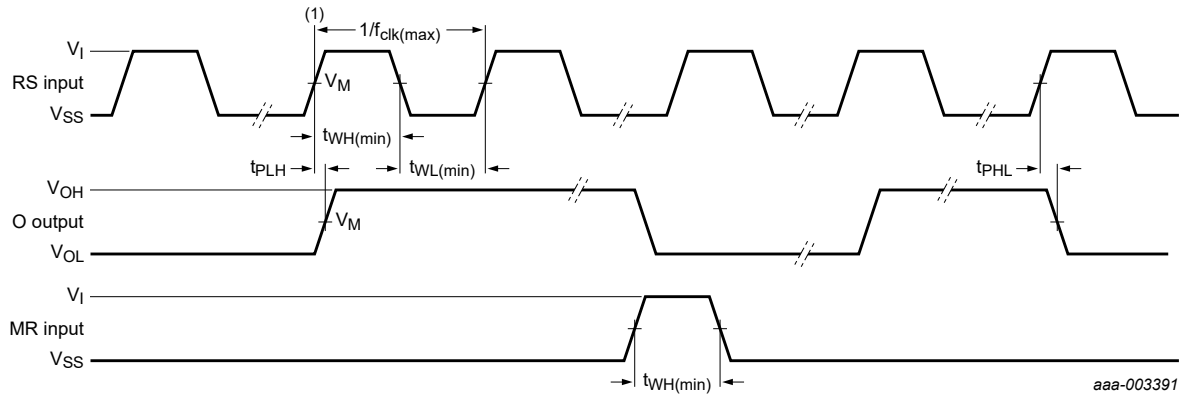
**Table 10. Dynamic power dissipation**

*$P_D$ can be calculated from the formulas shown. $V_{SS}$ = 0 V; $t_r = t_f \leq 20$ ns; $T_{amb}$ = 25 °C.*

| Symbol | Parameter | $V_{DD}$ | Typical formula[1] |
|---|---|---|---|
| $P_D$ | dynamic power dissipation | **Per package** | |
| | | 5 V | $P_D = 1300 \times f_i + (f_o \times C_L \times V_{DD}^2)$ µW |
| | | 10 V | $P_D = 5300 \times f_i + (f_o \times C_L \times V_{DD}^2)$ µW |
| | | 15 V | $P_D = 12000 \times f_i + (f_o \times C_L \times V_{DD}^2)$ µW |
| | | **Total, using the on-chip oscillator** | |
| | | 5 V | $P_D = 1300 \times f_{osc} + f_o C_L V_{DD}^2 + 2C_{TC}V_{DD}^2 f_{osc} + 10V_{DD}$ µW |
| | | 10 V | $P_D = 5300 \times f_{osc} + f_o C_L V_{DD}^2 + 2C_{TC}V_{DD}^2 f_{osc} + 100V_{DD}$ µW |
| | | 15 V | $P_D = 12000 \times f_{osc} + f_o C_L V_{DD}^2 + 2C_{TC}V_{DD}^2 f_{osc} + 400V_{DD}$ µW |

[1] $f_i$ = input frequency in MHz; $f_o$ = output frequency in MHz; $C_L$ = output load capacitance in pF; $V_{DD}$ = supply voltage in V; $f_{osc}$ = oscillator frequency in MHz; $C_{TC}$ = timing capacitance in pF.

## 10.1. Waveforms and test circuit

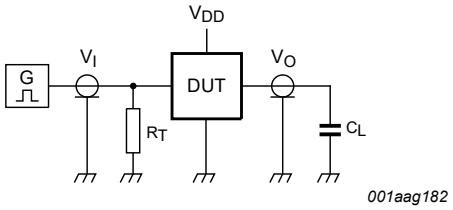



$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.
Measurement points are given in Table 11.
(1) $2^n$ pulses as selected by address inputs (A0, A1).

**Fig. 4. Propagation delay clock (RS) to output (O), clock pulse width and maximum clock frequency**

**Table 11. Measurement points**

| Supply voltage | Input | Output |
|---|---|---|
| $V_{DD}$ | $V_M$ | $V_M$ |
| 5 V to 15 V | $0.5V_{DD}$ | $0.5V_{DD}$ |




Test data is given in Table 12.
Definitions for test circuit:
$R_L$ = Load resistance.
$C_L$ = Load capacitance.
$R_T$ = Termination resistance should be equal to output impedance of $Z_o$ of the pulse generator.

**Fig. 5. Test circuit for measuring switching times**

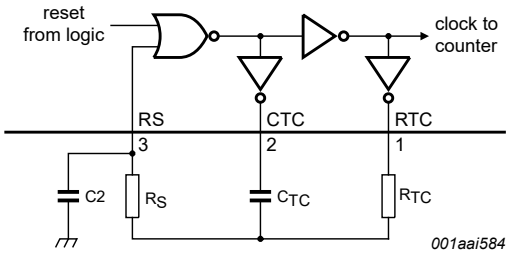
**Table 12. Test data**

| Supply | Input | | Load |
|---|---|---|---|
| $V_{DD}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ |
| 5 V to 15 V | $V_{SS}$ or $V_{DD}$ | ≤ 20 ns | 50 pF |

# 11. Application information

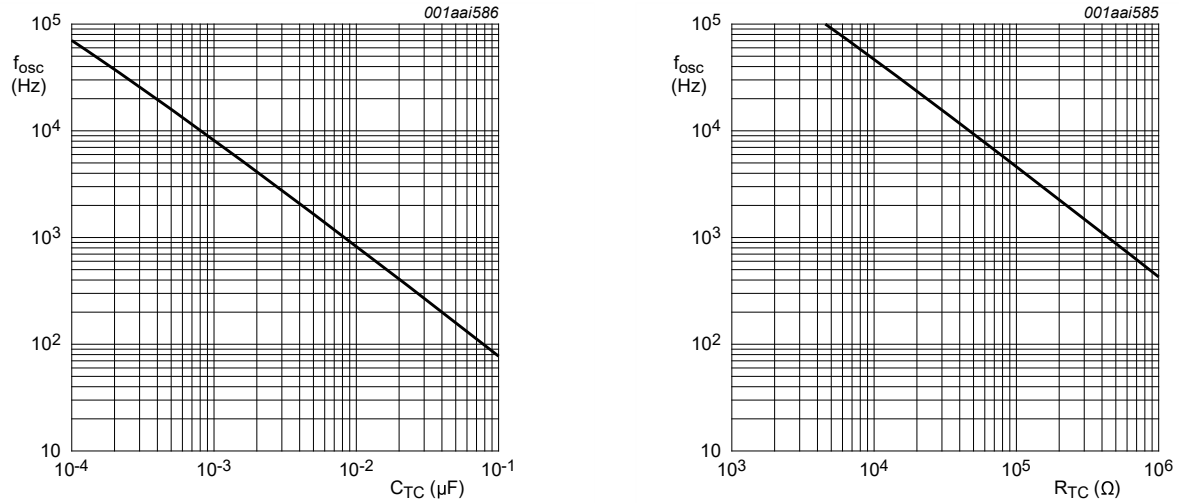
## RC oscillator timing component limitations

$R_{TC}C_{TC}$ determines the oscillator frequency, provided $R_{TC} << R_S$ and $R_SC_2 << R_{TC}C_{TC}$. The function of $R_S$ is to minimize the influence of the forward voltage across the input protection diodes on the frequency. The stray capacitance $C_2$ should be kept as small as possible. In consideration of accuracy, $C_{TC}$ must be larger than the inherent stray capacitance. $R_{TC}$ must be larger than the LOCMOS 'ON' resistance in series with it, which typically is 500 Ω at $V_{DD}$ = 5 V, 300 Ω at $V_{DD}$ = 10 V and 200 Ω at $V_{DD}$ = 15 V. The recommended values for these components to maintain agreement with the typical oscillation formula are: $C_{TC} \geq 100$ pF, up to any typical value, 10 kΩ ≤ $R_{TC}$ ≤ 1 MΩ.




Typical formula for oscillator frequency: $f_{osc} = \frac{1}{2.3 \times R_{TC} \times C_{TC}}$

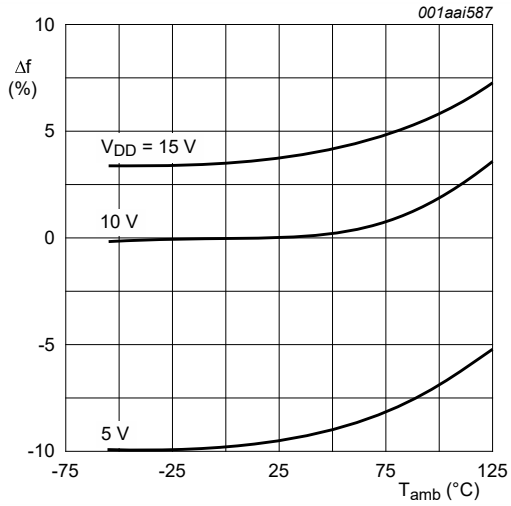
**Fig. 6. External component connection for RC oscillator; $R_S \approx R_{TC}$**



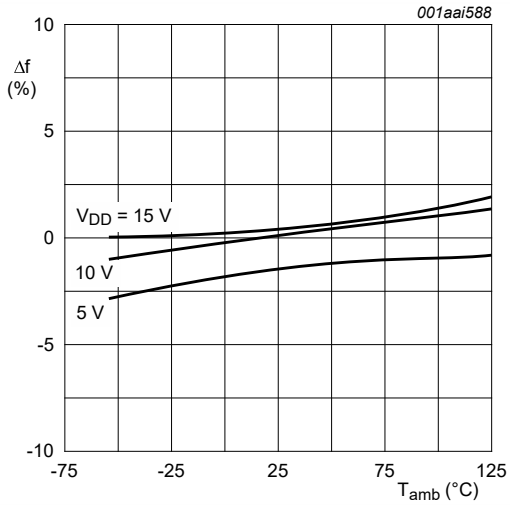

a. $C_{TC}$ curve at $R_{TC}$ = 56 kΩ; RS = 120 kΩ.

b. $R_{TC}$ curve at $C_{TC}$ = 1 nF; RS = 2 $R_{TC}$.

**Fig. 7. RC oscillator frequency as a function of $R_{TC}$ and $C_{TC}$ at $V_{DD}$ = 5 V to 15 V; $T_{amb}$ = 25 °C**




a. $R_{TC}$ = 56 kΩ; $C_{TC}$ = 1 nF; RS = 0 Ω.

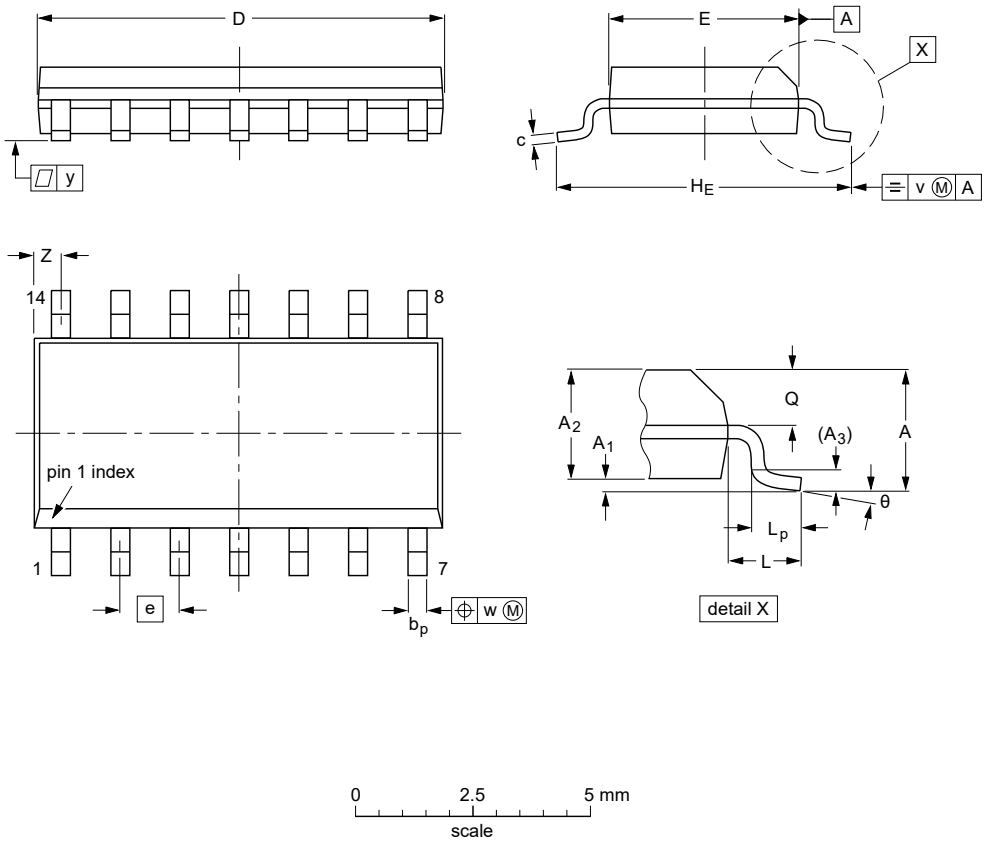



b. $R_{TC}$ = 56 kΩ; $C_{TC}$ = 1 nF; RS = 120 kΩ.

**Fig. 8. Frequency deviation (Δf) as a function of ambient temperature**

## 12. Package outline

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




**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<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | $8^o$<br>$0^o$ |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>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 | | | |
| SOT108-1 | 076E06 | MS-012 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig. 9. Package outline SOT108-1 (SO14)**

## 13. Abbreviations

**Table 13. Abbreviations**

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

## 14. Revision history

**Table 14. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| HEF4541B_Q100 v.3 | 20211125 | Product data sheet | - | HEF4541B_Q100 v.2 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Section 2 updated.<br>• Section 7: Derating values for $P_{tot}$ total power dissipation have been updated. | | | |
| HEF4541B_Q100 v.2 | 20131231 | Product data sheet | - | HEF4541B_Q100 v.1 |
| Modifications: | • Maximum temperature changed to 125 °C throughout the data sheet. | | | |
| HEF4541B_Q100 v.1 | 20131021 | Product data sheet | - | - |

# 15. Legal information

## 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 https://www.nexperia.com.

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