74HC4067-Q100; 74HCT4067-Q100

16-channel analog multiplexer/demultiplexer

Rev. 1 — 22 May 2015 Product data sheet

1. General description

The 74HC4067-Q100; 74HCT4067-Q100 is a single-pole 16-throw analog switch (SP16T) suitable for use in analog or digital 16:1 multiplexer/demultiplexer applications. The switch features four digital select inputs (S0, S1, S2 and S3), sixteen independent inputs/outputs (Yn), a common input/output (Z) and a digital enable input ($\overline{E}$). When $\overline{E}$ is HIGH, the switches are turned off. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

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
- Input levels S0, S1, S2, S3 and $\overline{E}$ inputs:
  - For 74HC4067-Q100: CMOS level
  - For 74HCT4067-Q100: TTL level
- Low ON resistance:
  - 80 Ω (typical) at V_{CC} = 4.5 V
  - 70 Ω (typical) at V_{CC} = 6.0 V
  - 60 Ω (typical) at V_{CC} = 9.0 V
- Specified in compliance 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
  - CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Typical ‘break before make’ built-in

3. Applications

- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC4067D-Q100	–40 °C to +125 °C	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
74HCT4067D-Q100				
74HC4067PW-Q100	–40 °C to +125 °C	TSSOP24	plastic thin shrink small outline package; 24 leads; body width 4.4 mm	SOT355-1
74HCT4067PW-Q100				
74HC4067BQ-Q100	–40 °C to +125 °C	DHVQFN24	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body 3.5 × 5.5 × 0.85 mm	SOT815-1
74HCT4067BQ-Q100				

5. Functional diagram

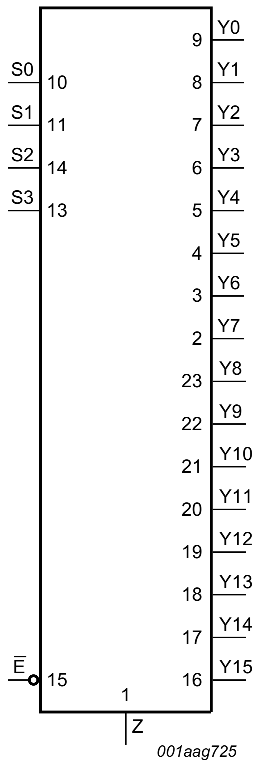


Fig 1. Logic symbol

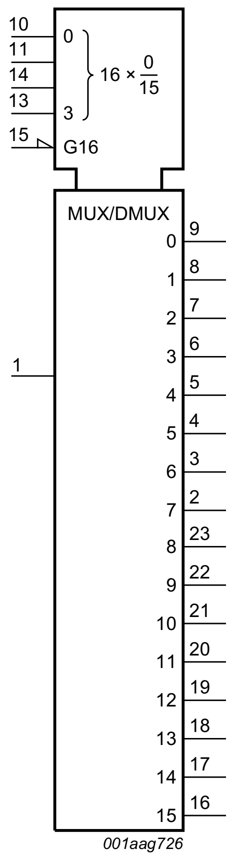


Fig 2. IEC logic symbol

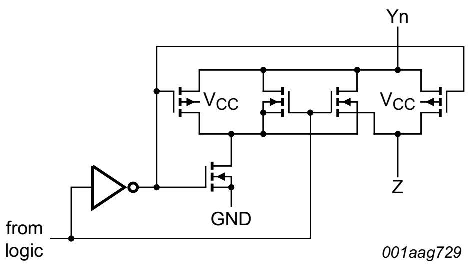


Fig 3. Schematic diagram (one switch)

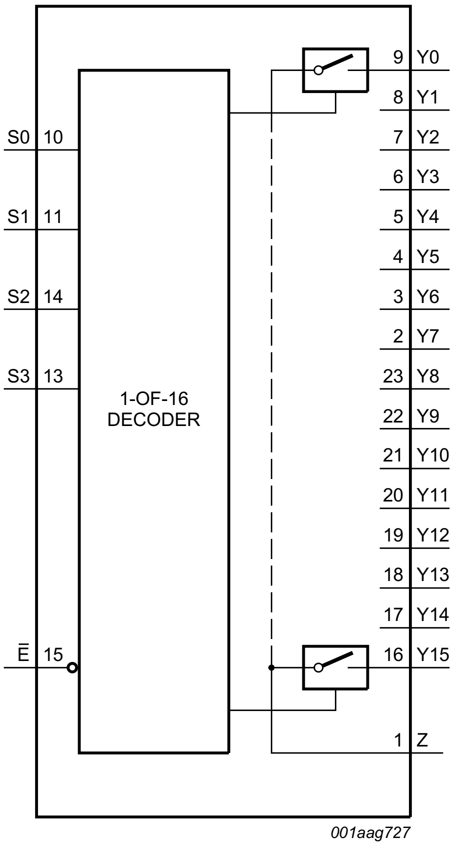


Fig 4. Functional diagram

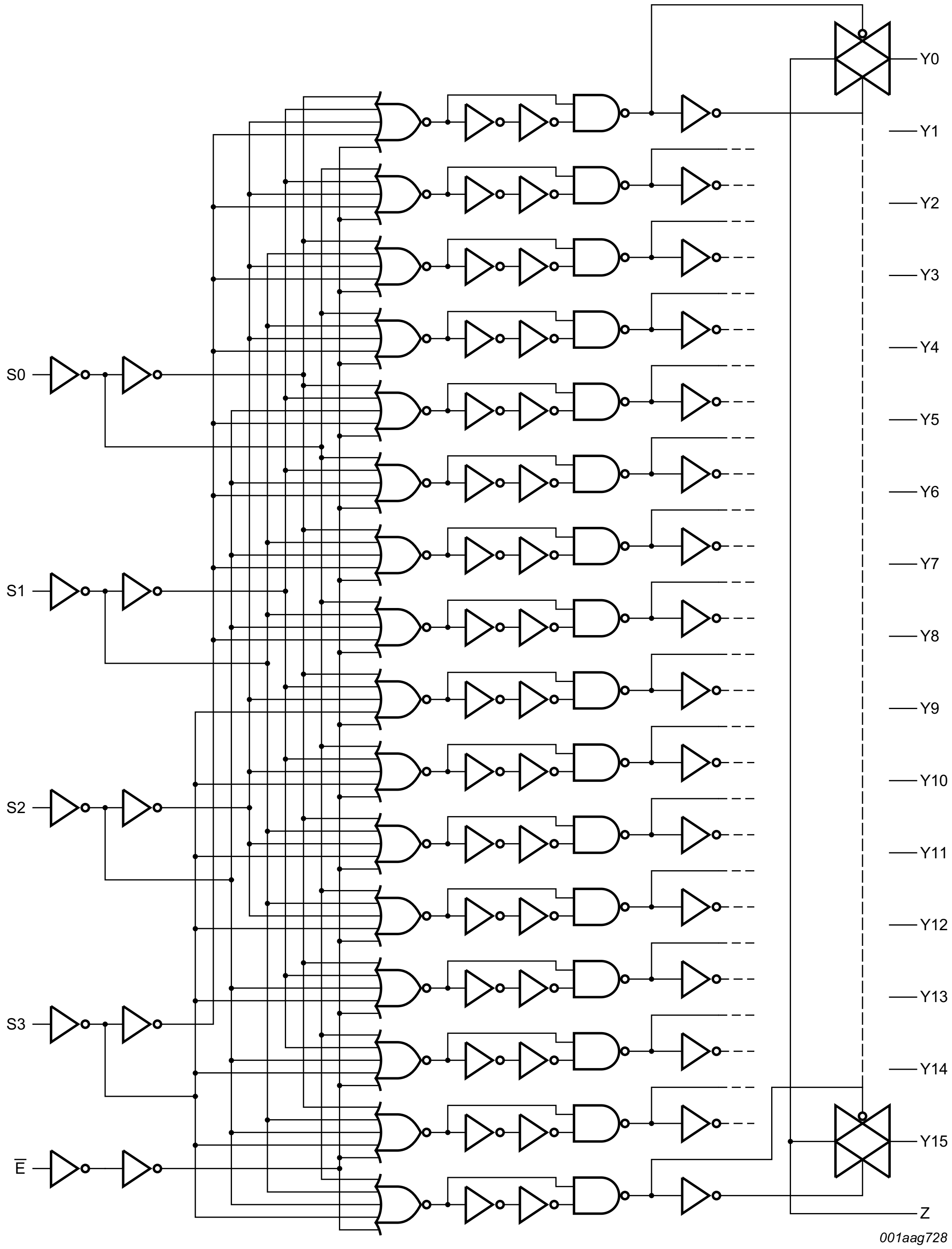


Fig 5. Logic diagram

6. Pinning information

6.1 Pinning

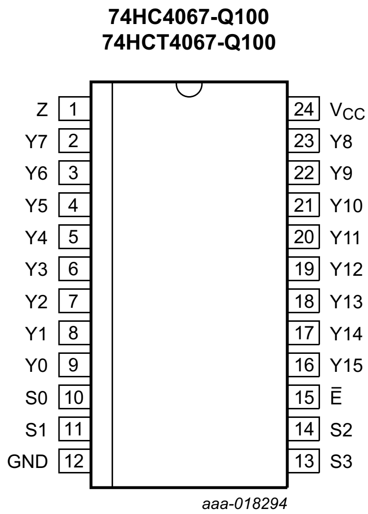
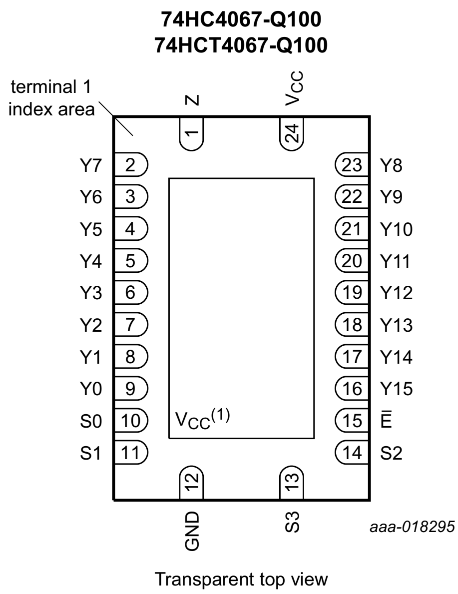


Fig 6. Pin configuration for SO24 and TSSOP24



(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to V_{CC}.

Fig 7. Pin configuration for DHVQFN24

6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
Z	1	common input or output
Y7, Y6, Y5, Y4, Y3, Y2, Y1, Y0, Y15, Y14, Y13, Y12, Y11, Y10, Y9, Y8	2, 3, 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 22, 23	independent input or output
S0, S1, S3, S2	10, 11, 13, 14	address input 0
GND	12	ground (0 V)
$\overline{E}$	15	enable input (active LOW)
V_{CC}	24	supply voltage

7. Functional description

Table 3. Function table[1]

Inputs					Channel ON
$\overline{E}$	S3	S2	S1	S0	
L	L	L	L	L	Y0 to Z
L	L	L	L	H	Y1 to Z
L	L	L	H	L	Y2 to Z
L	L	L	H	H	Y3 to Z
L	L	H	L	L	Y4 to Z
L	L	H	L	H	Y5 to Z
L	L	H	H	L	Y6 to Z
L	L	H	H	H	Y7 to Z
L	H	L	L	L	Y8 to Z
L	H	L	L	H	Y9 to Z
L	H	L	H	L	Y10 to Z
L	H	L	H	H	Y11 to Z
L	H	H	L	L	Y12 to Z
L	H	H	L	H	Y13 to Z
L	H	H	H	L	Y14 to Z
L	H	H	H	H	Y15 to Z
H	X	X	X	X	-

[1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care.

8. Limiting values

Table 4. 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	[1]	–0.5	+11.0	V
I_{IK}	input clamping current	$V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ V	-	±20	mA
I_{SK}	switch clamping current	$V_{SW} < –0.5$ V or $V_{SW} > V_{CC} + 0.5$ V	-	±20	mA
I_{SW}	switch current	$V_{SW} = –0.5$ V to $V_{CC} + 0.5$ V	-	±25	mA
I_{CC}	supply current		-	+50	mA
I_{GND}	ground current		–50	-	mA
T_{stg}	storage temperature		–65	+150	°C

Table 4. Limiting values *...continued*

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{tot}	total power dissipation	T_{amb} = –40 °C to +125 °C				
		SO24 package	[2]	-	500	mW
		SSOP24 package	[3]	-	500	mW
		TSSOP24 package	[3]	-	500	mW
		DHVQFN24 package	[4]	-	500	mW
P	power dissipation	per switch		-	100	mW

[1] To avoid drawing V_{CC} current out of terminal Z, when switch current flows in terminals Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no V_{CC} current will flow out of terminals Yn. In this case there is no limit for the voltage drop across the switch, but the voltages at Yn and Z may not exceed V_{CC} or GND.

[2] For SO24 package: P_{tot} derates linearly with 8 mW/K above 70 °C.

[3] For TSSOP24 package: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

[4] For DHVQFN24 package: P_{tot} derates linearly with 4.5 mW/K above 60 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74HC4067-Q100						
V_{CC}	supply voltage		2.0	5.0	10.0	V
V_I	input voltage		GND	-	V_{CC}	V
V_{SW}	switch voltage		GND	-	V_{CC}	V
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 2.0 V	-	-	625	ns
		V_{CC} = 4.5 V	-	1.67	139	ns
		V_{CC} = 6.0 V	-	-	83	ns
		V_{CC} = 10.0 V	-	-	31	ns
T_{amb}	ambient temperature		–40	+25	+125	°C
74HCT4067-Q100						
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_I	input voltage		GND	-	V_{CC}	V
V_{SW}	switch voltage		GND	-	V_{CC}	V
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 4.5 V	-	1.67	139	ns
T_{amb}	ambient temperature		–40	+25	+125	°C

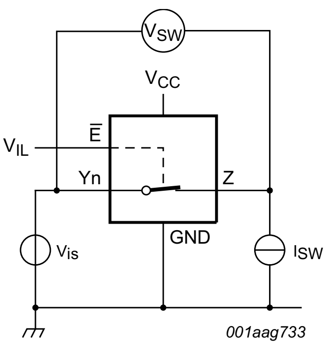
10. Static characteristics

Table 6. R_{ON} resistance per switch for types 74HC4067-Q100 and 74HCT4067-Q100

$V_I = V_{IH}$ or V_{IL}; for test circuit see Figure 8.
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.
For 74HC4067-Q100: V_{CC} − GND = 2.0 V, 4.5 V, 6.0 V and 9.0 V.
For 74HCT4067-Q100: V_{CC} − GND = 4.5 V.

Symbol	Parameter	Conditions		25 °C		−40 °C to +125 °C		Unit
				Typ	Max	Max (85 °C)	Max (125 °C)	
$R_{ON(peak)}$	ON resistance (peak)	$V_{is} = V_{CC}$ to GND						
		V_{CC} = 2.0 V; I_{SW} = 100 μA	[1]	-	-	-	-	Ω
		V_{CC} = 4.5 V; I_{SW} = 1000 μA		110	180	225	270	Ω
		V_{CC} = 6.0 V; I_{SW} = 1000 μA		95	160	200	240	Ω
		V_{CC} = 9.0 V; I_{SW} = 1000 μA		75	130	165	195	Ω
$R_{ON(rail)}$	ON resistance (rail)	V_{is} = GND or V_{CC}						
		V_{CC} = 2.0 V; I_{SW} = 100 μA	[1]	150	-	-	-	
		V_{CC} = 4.5 V; I_{SW} = 1000 μA		90	160	200	240	Ω
		V_{CC} = 6.0 V; I_{SW} = 1000 μA		80	140	175	210	Ω
		V_{CC} = 9.0 V; I_{SW} = 1000 μA		70	120	150	180	Ω
ΔR_{ON}	ON resistance mismatch between channels	$V_{is} = V_{CC}$ to GND						
		V_{CC} = 2.0 V	[1]	-	-	-	-	Ω
		V_{CC} = 4.5 V		9	-	-	-	Ω
		V_{CC} = 6.0 V		8	-	-	-	Ω
		V_{CC} = 9.0 V		6	-	-	-	Ω

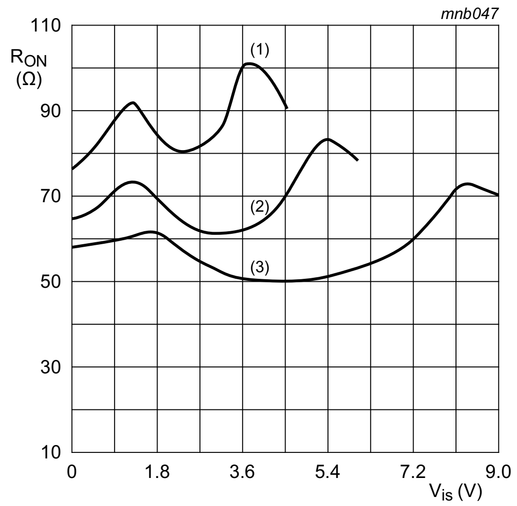
[1] At supply voltages (V_{CC} − GND) approaching 2 V, the analog switch ON resistance becomes extremely non-linear. Therefore it is recommended that these devices be used to transmit digital signals only, when using these supply voltages.



V_{is} = 0 V to V_{CC}

$$R_{ON} = \frac{V_{SW}}{I_{SW}}$$

Fig 8. Test circuit for measuring R_{ON}



V_{is} = 0 V to V_{CC}

(1) V_{CC} = 4.5 V

(2) V_{CC} = 6.0 V

(3) V_{CC} = 9.0 V

Fig 9. Typical R_{ON} as a function of input voltage V_{is}

Table 7. Static characteristics 74HC4067-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	V
		V_{CC} = 4.5 V	3.15	2.4	-	V
		V_{CC} = 6.0 V	4.2	3.2	-	V
		V_{CC} = 9.0 V	6.3	4.7	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	0.8	0.5	V
		V_{CC} = 4.5 V	-	2.1	1.35	V
		V_{CC} = 6.0 V	-	2.8	1.80	V
		V_{CC} = 9.0 V	-	4.3	2.70	V
I_I	input leakage current	V_I = V_{CC} or GND				
		V_{CC} = 6.0 V	-	-	±0.1	μA
		V_{CC} = 10.0 V	-	-	±0.2	μA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 10.0 V; V_I = V_{IH} or V_{IL}; $\|V_{SW}\|$ = V_{CC} − GND; see Figure 10				
		per channel	-	-	±0.1	μA
		all channels	-	-	±0.8	μA
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 10.0 V; V_I = V_{IH} or V_{IL}; $\|V_{SW}\|$ = V_{CC} − GND; see Figure 11	-	-	±0.8	μA

Table 7. Static characteristics 74HC4067-Q100 *...continued*

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current	$V_I = V_{CC}$ or GND; V_{is} = GND or V_{CC}; $V_{os} = V_{CC}$ or GND				
		V_{CC} = 6.0 V	-	-	8.0	μA
		V_{CC} = 10.0 V	-	-	16.0	μA
C_I	input capacitance		-	3.5	-	pF
T_{amb} = –40 °C to +85 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	V
		V_{CC} = 4.5 V	3.15	-	-	V
		V_{CC} = 6.0 V	4.2	-	-	V
		V_{CC} = 9.0 V	6.3	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.50	V
		V_{CC} = 4.5 V	-	-	1.35	V
		V_{CC} = 6.0 V	-	-	1.80	V
		V_{CC} = 9.0 V	-	-	2.70	V
I_I	input leakage current	$V_I = V_{CC}$ or GND				
		V_{CC} = 6.0 V	-	-	±1.0	μA
		V_{CC} = 10.0 V	-	-	±2.0	μA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 10.0 V; $V_I = V_{IH}$ or V_{IL}; $\|V_{SW}\| = V_{CC}$ − GND; see Figure 10				
		per channel	-	-	±1.0	μA
		all channels	-	-	±8.0	μA
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 10.0 V; $V_I = V_{IH}$ or V_{IL}; $\|V_{SW}\| = V_{CC}$ − GND; see Figure 11	-	-	±8.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; V_{is} = GND or V_{CC}; $V_{os} = V_{CC}$ or GND				
		V_{CC} = 6.0 V	-	-	80.0	μA
		V_{CC} = 10.0 V	-	-	160	μA
T_{amb} = –40 °C to +125 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	V
		V_{CC} = 4.5 V	3.15	-	-	V
		V_{CC} = 6.0 V	4.2	-	-	V
		V_{CC} = 9.0 V	6.3	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.50	V
		V_{CC} = 4.5 V	-	-	1.35	V
		V_{CC} = 6.0 V	-	-	1.80	V
		V_{CC} = 9.0 V	-	-	2.70	V
I_I	input leakage current	$V_I = V_{CC}$ or GND				
		V_{CC} = 6.0 V	-	-	±1.0	μA
		V_{CC} = 10.0 V	-	-	±2.0	μA

Table 7. Static characteristics 74HC4067-Q100 *...continued*

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 10.0 V; V_I = V_{IH} or V_{IL}; $\lvert V_{SW}\rvert$ = V_{CC} − GND; see Figure 10				
		per channel	-	-	±1.0	μA
		all channels	-	-	±8.0	μA
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 10.0 V; V_I = V_{IH} or V_{IL}; $\lvert V_{SW}\rvert$ = V_{CC} − GND; see Figure 11	-	-	±8.0	μA
I_{CC}	supply current	V_I = V_{CC} or GND; V_{is} = GND or V_{CC}; V_{os} = V_{CC} or GND				
		V_{CC} = 6.0 V	-	-	160	μA
		V_{CC} = 10.0 V	-	-	320	μA

Table 8. Static characteristics 74HCT4067-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.6	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	1.2	0.8	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±0.1	μA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\lvert V_{SW}\rvert$ = V_{CC} − GND; see Figure 10				
		per channel	-	-	±0.1	μA
		all channels	-	-	±0.8	μA
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\lvert V_{SW}\rvert$ = V_{CC} − GND; see Figure 11	-	-	±0.8	μA
I_{CC}	supply current	V_I = V_{CC} or GND; V_{is} = GND or V_{CC}; V_{os} = V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V	-	-	8.0	μA
ΔI_{CC}	additional supply current	per input pin; V_I = V_{CC} − 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V				
		pin $\overline{E}$	-	60	216	μA
		pin Sn	-	50	180	μA
C_I	input capacitance		-	3.5	-	pF
T_{amb} = −40 °C to +85 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	0.8	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±1.0	μA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\lvert V_{SW}\rvert$ = V_{CC} − GND; see Figure 10				
		per channel	-	-	±1.0	μA
		all channels	-	-	±8.0	μA

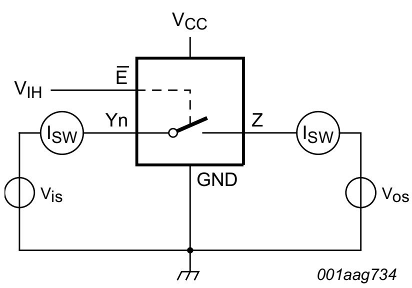
Table 8. Static characteristics 74HCT4067-Q100 *...continued*

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

V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

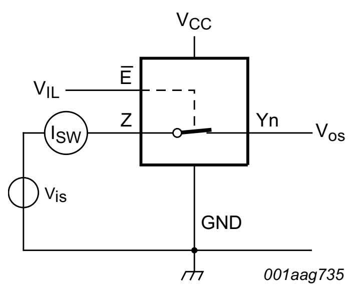
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\|V_{SW}\|$ = V_{CC} − GND; see Figure 11	-	-	±8.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; V_{is} = GND or V_{CC}; V_{os} = V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V	-	-	80.0	µA
ΔI_{CC}	additional supply current	per input pin; V_I = V_{CC} − 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V				
		pin $\overline{E}$	-	-	270	µA
		pin Sn	-	-	225	µA
T_{amb} = −40 °C to +125 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	0.8	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±1.0	µA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\|V_{SW}\|$ = V_{CC} − GND; see Figure 10				
		per channel	-	-	±1.0	µA
		all channels	-	-	±8.0	µA
$I_{S(ON)}$	ON-state leakage current	V_{CC} = 5.5 V; V_I = V_{IH} or V_{IL}; $\|V_{SW}\|$ = V_{CC} − GND; see Figure 11	-	-	±8.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; V_{is} = GND or V_{CC}; V_{os} = V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V	-	-	160	µA
ΔI_{CC}	additional supply current	per input pin; V_I = V_{CC} − 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V				
		pin $\overline{E}$	-	-	294	µA
		pin Sn	-	-	245	µA



V_{is} = V_{CC} and V_{os} = GND

V_{is} = GND and V_{os} = V_{CC}

Fig 10. Test circuit for measuring OFF-state leakage current



V_{is} = V_{CC} and V_{os} = open

V_{is} = GND and V_{os} = open

Fig 11. Test circuit for measuring ON-state leakage current

11. Dynamic characteristics

Table 9. Dynamic characteristics 74HC4067-Q100

GND = 0 V; t_r = t_f = 6 ns; C_L = 50 pF unless specified otherwise; for test circuit see Figure 14.
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	25 °C		–40 °C to +125 °C		Unit
			Typ	Max	Max (85 °C)	Max (125 °C)	
t_{pd}	propagation delay	Yn to Z; see Figure 12 [1][2]					
		V_{CC} = 2.0 V	25	75	95	110	ns
		V_{CC} = 4.5 V	9	15	19	22	ns
		V_{CC} = 6.0 V	7	13	16	19	ns
		V_{CC} = 9.0 V	5	9	11	14	ns
		Z to Yn					
		V_{CC} = 2.0 V	18	60	75	90	ns
		V_{CC} = 4.5 V	6	12	15	18	ns
		V_{CC} = 6.0 V	5	10	13	15	ns
		V_{CC} = 9.0 V	4	8	10	12	ns
t_{off}	turn-off time	$\overline{E}$ to Yn; see Figure 13 [3]					
		V_{CC} = 2.0 V	74	250	315	375	ns
		V_{CC} = 4.5 V	27	50	63	75	ns
		V_{CC} = 5.0 V; C_L = 15 pF	27	-	-	-	ns
		V_{CC} = 6.0 V	22	43	54	64	ns
		V_{CC} = 9.0 V	20	38	48	57	ns
		Sn to Yn					
		V_{CC} = 2.0 V	83	250	315	375	ns
		V_{CC} = 4.5 V	30	50	63	75	ns
		V_{CC} = 5.0 V; C_L = 15 pF	29	-	-	-	ns
		V_{CC} = 6.0 V	24	43	54	64	ns
		V_{CC} = 9.0 V	21	38	48	57	ns
		$\overline{E}$ to Z					
		V_{CC} = 2.0 V	85	275	345	415	ns
		V_{CC} = 4.5 V	31	55	69	83	ns
		V_{CC} = 6.0 V	25	47	59	71	ns
		V_{CC} = 9.0 V	24	42	53	63	ns
		Sn to Z					
		V_{CC} = 2.0 V	94	290	365	435	ns
		V_{CC} = 4.5 V	34	58	73	87	ns
		V_{CC} = 6.0 V	27	47	62	74	ns
		V_{CC} = 9.0 V	25	45	56	68	ns

Table 9. Dynamic characteristics 74HC4067-Q100 *...continued*

GND = 0 V; t_r = t_f = 6 ns; C_L = 50 pF unless specified otherwise; for test circuit see Figure 14.
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	25 °C		−40 °C to +125 °C		Unit
			Typ	Max	Max (85 °C)	Max (125 °C)	
t_{on}	turn-on time	$\overline{E}$ to Yn; see Figure 13 [4]					
		V_{CC} = 2.0 V	80	275	345	415	ns
		V_{CC} = 4.5 V	29	55	69	83	ns
		V_{CC} = 5.0 V; C_L = 15 pF	26	-	-	-	ns
		V_{CC} = 6.0 V	23	47	59	71	ns
		V_{CC} = 9.0 V	17	42	53	63	ns
		Sn to Yn					
		V_{CC} = 2.0 V	88	300	375	450	ns
		V_{CC} = 4.5 V	32	60	75	90	ns
		V_{CC} = 5.0 V; C_L = 15 pF	29	-	-	-	ns
		V_{CC} = 6.0 V	26	51	64	77	ns
		V_{CC} = 9.0 V	18	45	56	68	ns
		$\overline{E}$ to Z					
		V_{CC} = 2.0 V	85	275	345	415	ns
		V_{CC} = 4.5 V	31	55	69	83	ns
		V_{CC} = 6.0 V	25	47	59	71	ns
		V_{CC} = 9.0 V	18	42	53	63	ns
		Sn to Z					
		V_{CC} = 2.0 V	94	300	375	450	ns
		V_{CC} = 4.5 V	34	60	75	90	ns
		V_{CC} = 6.0 V	27	51	64	77	ns
		V_{CC} = 9.0 V	19	45	56	68	ns
C_{PD}	power dissipation capacitance	per switch; V_I = GND to V_{CC} [5]	29	-	-	-	pF

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

[2] Due to higher Z terminal capacitance (16 switches versus 1) the delay figures to the Z terminal are higher than those to the Y terminal.

[3] t_{on} is the same as t_{PHZ} and t_{PLZ}.

[4] t_{off} is the same as $t_{PZH \text{ and }}$ t_{PZL}.

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

Table 10. Dynamic characteristics 74HCT4067-Q100

GND = 0 V; t_r = t_f = 6 ns; C_L = 50 pF unless specified otherwise; for test circuit see Figure 14.
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions		25 °C		–40 °C to +125 °C		Unit
				Typ	Max	Max (85 °C)	Max (125 °C)	
t_{pd}	propagation delay	Yn to Z; see Figure 12	[1][2]					
		V_{CC} = 4.5 V		9	15	19	22	ns
		Z to Yn						
		V_{CC} = 4.5 V		6	12	15	18	ns
t_{off}	turn-off time	$\overline{E}$ to Yn; see Figure 13	[3]					
		V_{CC} = 4.5 V		26	55	69	83	ns
		V_{CC} = 5.0 V; C_L = 15 pF		26	-	-	-	ns
		Sn to Yn						
		V_{CC} = 4.5 V		31	55	69	83	ns
		V_{CC} = 5.0 V; C_L = 15 pF		30	-	-	-	ns
		$\overline{E}$ to Z						
		V_{CC} = 4.5 V		30	60	75	90	ns
		Sn to Z						
		V_{CC} = 4.5 V		35	60	75	90	ns
t_{on}	turn-on time	$\overline{E}$ to Yn; see Figure 13	[4]					
		V_{CC} = 4.5 V		32	60	75	90	ns
		V_{CC} = 5.0 V; C_L = 15 pF		32	-	-	-	ns
		Sn to Yn						
		V_{CC} = 4.5 V		35	60	75	90	ns
		V_{CC} = 5.0 V; C_L = 15 pF		33	-	-	-	ns
		$\overline{E}$ to Z						
		V_{CC} = 4.5 V		38	65	81	98	ns
		Sn to Z						
		V_{CC} = 4.5 V		38	65	81	98	ns
C_{PD}	power dissipation capacitance	per switch; V_I = GND to (V_{CC} – 1.5 V)	[5]	29	-	-	-	pF

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

[2] Due to higher Z terminal capacitance (16 switches versus 1) the delay figures to the Z terminal are higher than those to the Y terminal.

[3] t_{on} is the same as t_{PHZ} and t_{PLZ}.

[4] t_{off} is the same as t_{PZH} and t_{PZL}.

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$ where:

f_i = input frequency in MHz;

f_o = output frequency in MHz;

$\sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$ = sum of outputs;

C_L = output load capacitance in pF;

C_{sw} = switch capacitance in pF;

V_{CC} = supply voltage in V.

12. Waveforms

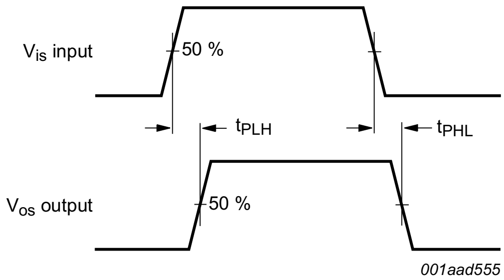
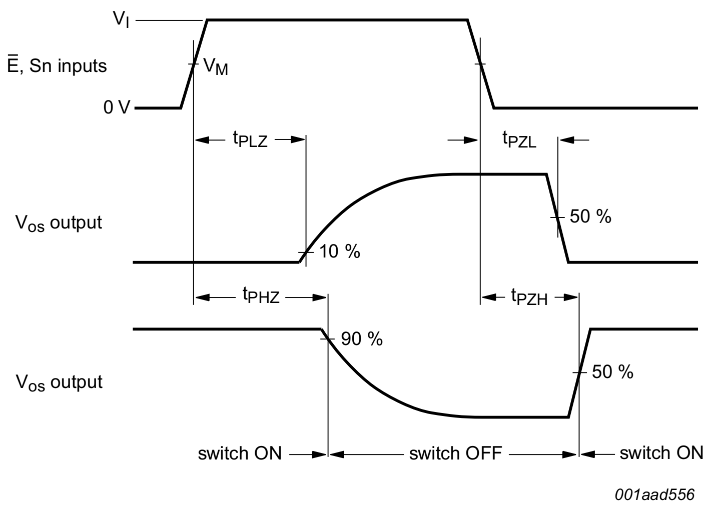


Fig 12. Input (V_{is}) to output (V_{os}) propagation delays

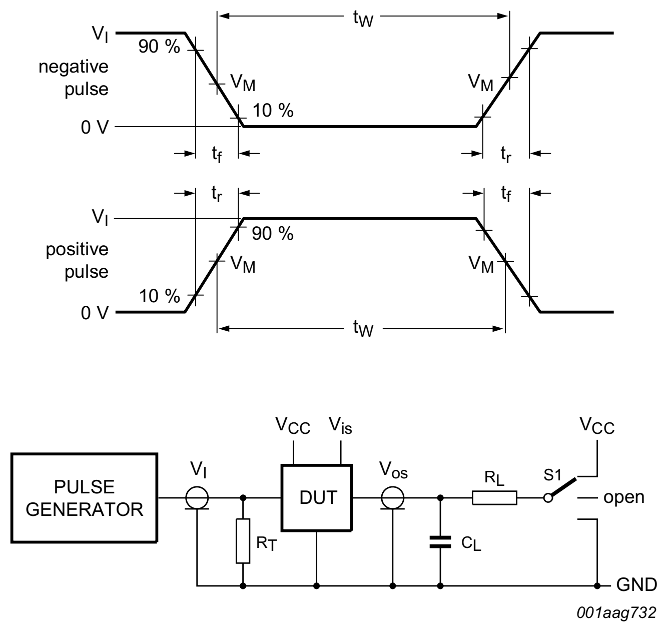


Measurement points are shown in Table 11.

Fig 13. Turn-on and turn-off times

Table 11. Measurement points

Type	V_I	V_M
74HC4067-Q100	V_{CC}	$0.5V_{CC}$
74HCT4067-Q100	3.0 V	1.3 V



Test data is given in Table 12.

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.

S1 = Test selection switch.

Fig 14. Test circuit for measuring switching times

Table 12. Test data

Test	Input				Output		S1 position
	Control $\overline{E}$	Address Sn	Switch Yn (Z)	t_r, t_f	Switch Z (Yn)		
	V_I [1]	V_I [1]	V_{is}		C_L	R_L	
t_{PHL}, t_{PLH}	GND	GND or V_{CC}	GND to V_{CC}	6 ns	50 pF	-	open
t_{PHZ}, t_{PZH}	GND to V_{CC}	GND to V_{CC}	V_{CC}	6 ns	50 pF, 15 pF	1 kΩ	GND
t_{PLZ}, t_{PZL}	GND to V_{CC}	GND to V_{CC}	GND	6 ns	50 pF, 15 pF	1 kΩ	V_{CC}

[1] For 74HCT4067-Q100: maximum input voltage V_I = 3.0 V.

13. Additional dynamic characteristics

Table 13. Additional dynamic characteristics

Recommended conditions and typical values; GND = 0 V; T_{amb} = 25 °C.
V_{is} is the input voltage at a Yn or Z terminal, whichever is assigned as an input.
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
THD	total harmonic distortion	R_L = 10 kΩ; C_L = 50 pF; see Figure 15					
		f_i = 1 kHz					
		V_{CC} = 4.5 V; $V_{is(p-p)}$ = 4.0 V		-	0.04	-	%
		V_{CC} = 9.0 V; $V_{is(p-p)}$ = 8.0 V		-	0.02	-	%
		f_i = 10 kHz					
		V_{CC} = 4.5 V; $V_{is(p-p)}$ = 4.0 V		-	0.12	-	%
		V_{CC} = 9.0 V; $V_{is(p-p)}$ = 8.0 V		-	0.06	-	%
α_{iso}	isolation (OFF-state)	R_L = 600 Ω; C_L = 50 pF; see Figure 16	[1]				
		V_{CC} = 4.5 V		-	−50	-	dB
		V_{CC} = 9.0 V		-	−50	-	dB
$f_{(-3dB)}$	−3 dB frequency response	R_L = 50 Ω; C_L = 10 pF; see Figure 17	[2]				
		V_{CC} = 4.5 V		-	90	-	MHz
		V_{CC} = 9.0 V		-	100	-	MHz
C_{sw}	switch capacitance	independent pins Y		-	5	-	pF
		common pin Z		-	45	-	pF

[1] Adjust input voltage V_{is} to 0 dBm level (0 dBm = 1 mW into 600 Ω).

[2] Adjust input voltage V_{is} to 0 dBm level at V_{os} for f_i = 1 MHz (0 dBm = 1 mW into 50 Ω). After set-up, f_i is increased to obtain a reading of −3 dB at V_{os}.

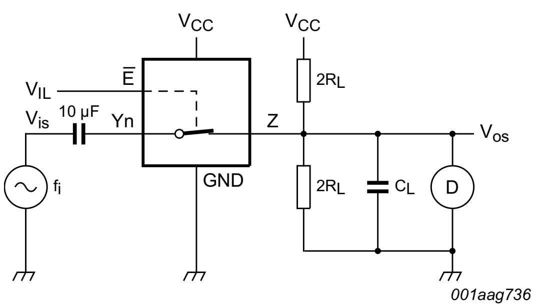
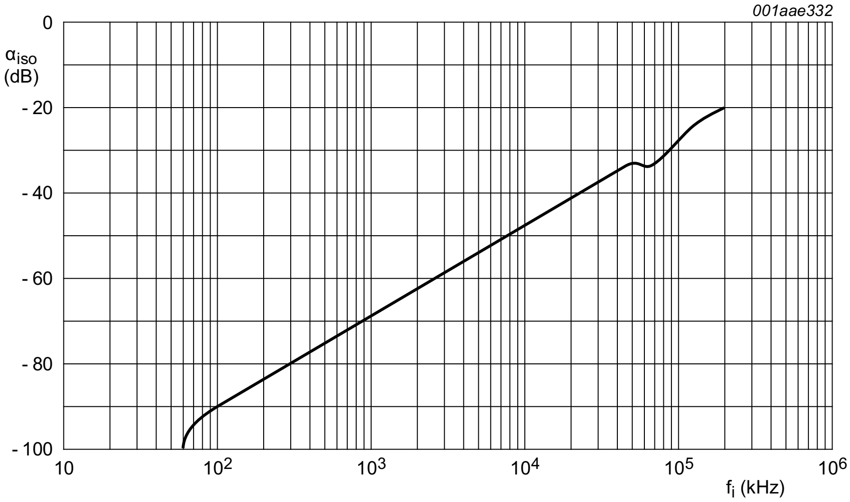
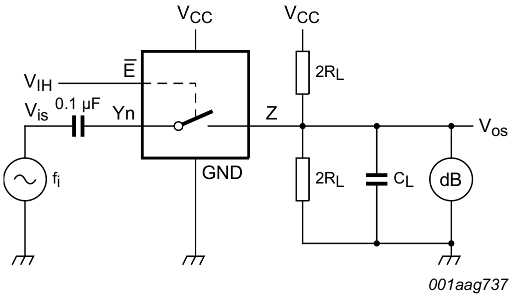


Fig 15. Test circuit for measuring total harmonic distortion



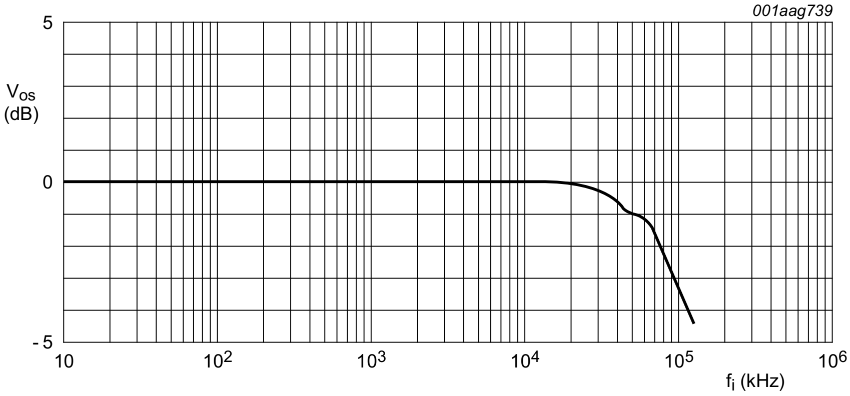
a. Isolation (OFF-state)



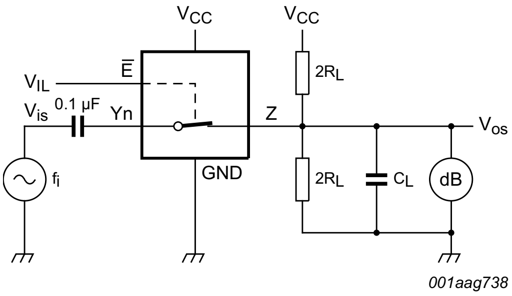
b. Test circuit

V_{CC} = 4.5 V; GND = 0 V; R_L = 600 Ω; R_{source} = 1 kΩ.

Fig 16. Isolation (OFF-state) as a function of frequency



a. Typical −3 dB frequency response



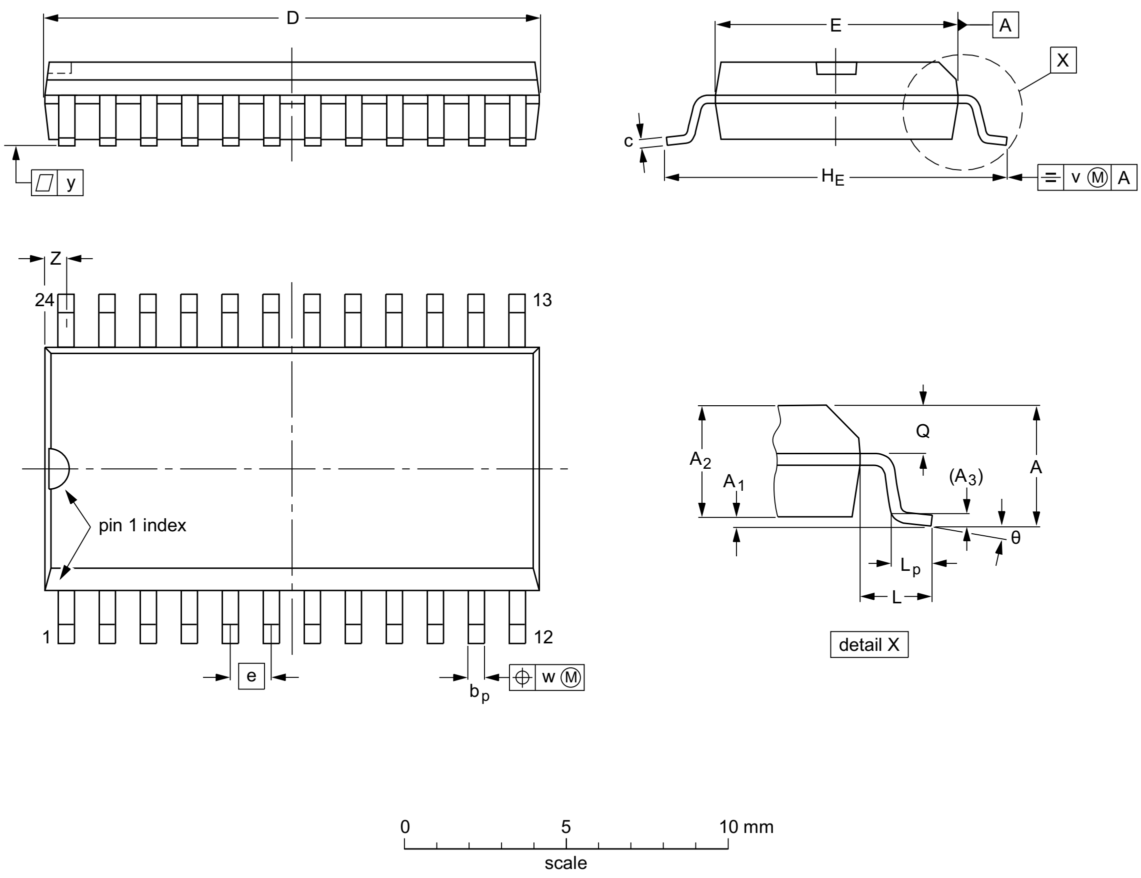
b. Test circuit

V_{CC} = 4.5 V; GND = 0 V; R_L = 50 Ω; R_{source} = 1 kΩ.

Fig 17. −3 dB frequency response

14. Package outline

SO24: plastic small outline package; 24 leads; body width 7.5 mm **SOT137-1**



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	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

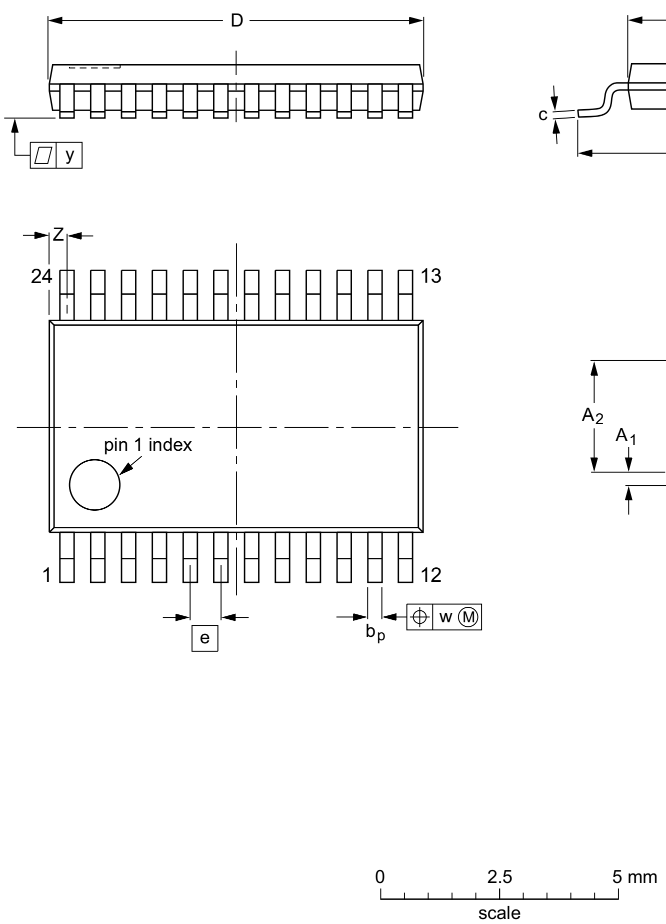
Note

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			
SOT137-1	075E05	MS-013				~~99-12-27~~ 03-02-19

Fig 18. Package outline SOT137-1 (SO24)

TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm **SOT355-1**



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	7.9 7.7	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	0.5 0.2	8° 0°

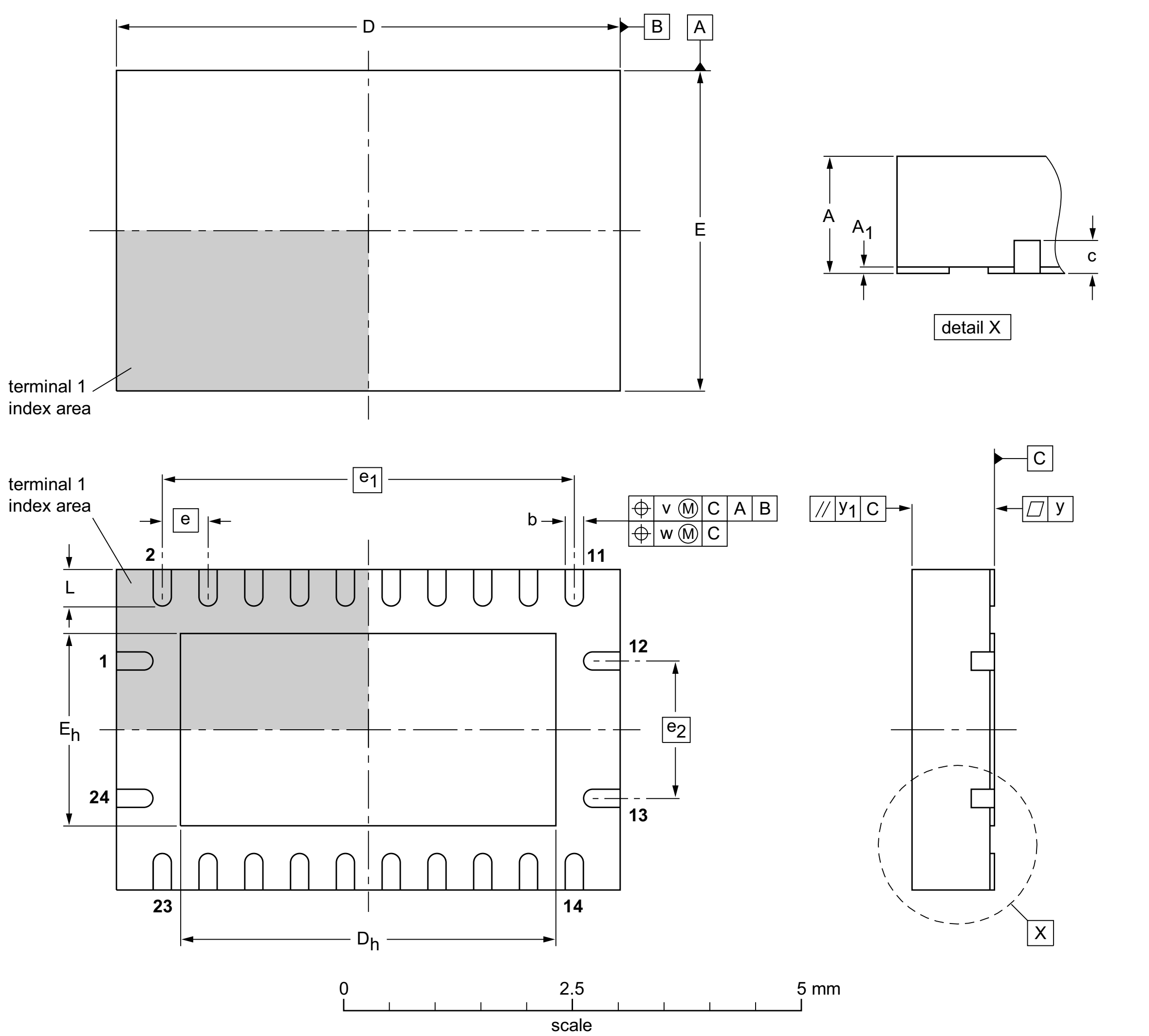
Notes

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			
SOT355-1		MO-153				~~99-12-27~~ 03-02-19

Fig 19. Package outline SOT355-1 (TSSOP24)

DHVQFN24: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body 3.5 x 5.5 x 0.85 mm **SOT815-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max.	A_1	b	c	D(1)	D_h	E(1)	E_h	e	e_1	e_2	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	5.6 5.4	4.25 3.95	3.6 3.4	2.25 1.95	0.5	4.5	1.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

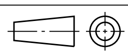
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT815-1	- - -	- - -	- - -			03-04-29

Fig 20. Package outline SOT815-1 (DHVQFN24)

15. Abbreviations

Table 14. Abbreviations

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

16. Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4067_Q100 v.1	20150522	Product data sheet	-	-

17. Legal information

17.1 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".

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19. Contents

1 General description 1
2 Features and benefits 1
3 Applications 1
4 Ordering information 2
5 Functional diagram 2
6 Pinning information 5
6.1 Pinning 5
6.2 Pin description 5
7 Functional description 6
8 Limiting values 6
9 Recommended operating conditions 7
10 Static characteristics 8
11 Dynamic characteristics 13
12 Waveforms 16
13 Additional dynamic characteristics 18
14 Package outline 21
15 Abbreviations 24
16 Revision history 24
17 Legal information 25
17.1 Data sheet status 25
17.2 Definitions 25
17.3 Disclaimers 25
17.4 Trademarks 26
18 Contact information 26
19 Contents 27

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