

## Dual-Modulus Divider 1:128/129 for 1 GHz with Standby Operation

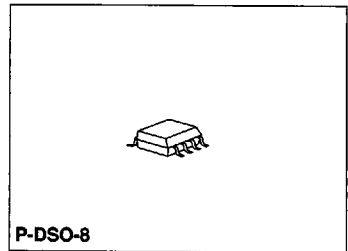
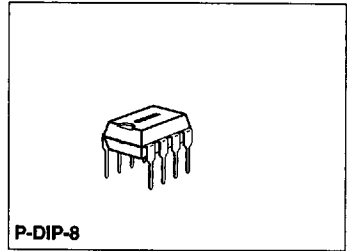
TBB 202

### Preliminary Data

Bipolar IC

#### Features

- High Frequency Operation:  $f_{\max} = 1100$  MHz
- Pulse Swallow Function: 128/129
- Low Power Supply current: 8.5 mA typ.  
 $V_S = 3$  V
- Stable Output Amplitude:  $V_O = 1.0$  Vpp typ.
- Stable output amplitude is obtained up to output load capacitance of 15 pF.



Type	Ordering Code	Package
TBB 202	Q67000-H8217	P-DIP-8
TBB 202 G	Q67000-H8218	P-DSO-8 (SMD)

The TBB 202 is specially intended for applications in radiotelephones. It contains several ECL divider stages, which have a total divider ratio of 1:128/129, depending on the control of the MOD input. It can be employed in standby mode (input STB = low).

## Circuit Description

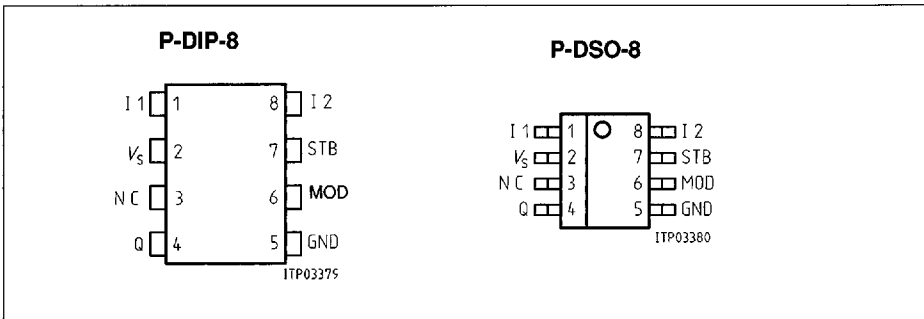
The divider has balanced push-pull inputs. If it is driven unbalanced, the unused input has to be blocked by a capacitor (approx. 1.5 nF) with low series inductance. The divider of the component consists of several status-controlled master-slave flipflops, which have a total divider ratio of 1:128/129. The inputs MOD (divider ratio) and STB (standby mode) are controllable with TTL/CMOS levels. The ECL output of the divider is CMOS compatible (see application circuit). The typical swing is 1 V<sub>pp</sub>.

## Truth Table for Operating Modes

Input	Level	Function at Q
MOD	High or unwired*) low	1:128 1:129
STB	High or unwired*) low	Normal Q = high, standby

## Pin Configurations

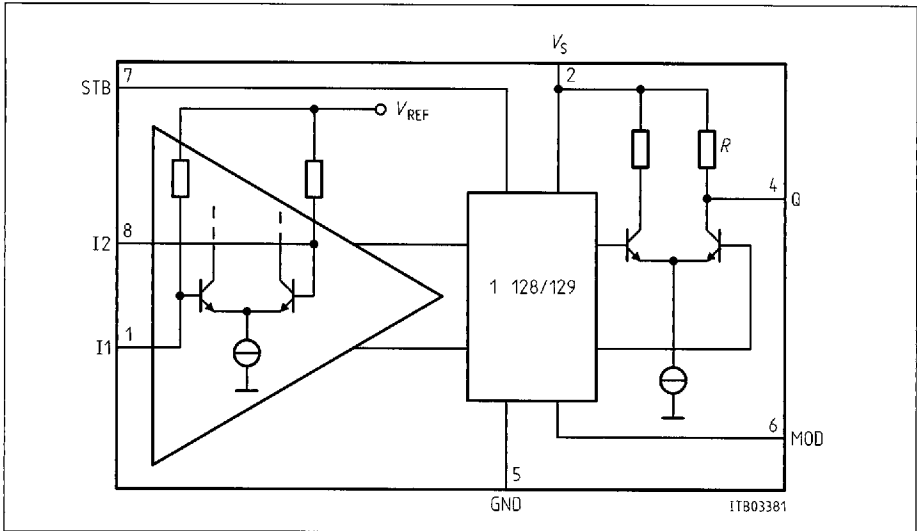
(top view)



## Pin Definitions and Functions

Pin No.	Symbol	Function
1	I1	Input
2	V <sub>s</sub>	Supply voltage
3	N.C.	Not connected
4	Q	Output
5	GND	Ground
6	MOD	Input for control of divider ratio
7	STB	Input for standby mode
8	I2	Input

\*) External circuitry increase noise immunity



**Block Diagram**

**Absolute Maximum Ratings**

$T_A = -40\text{ }^\circ\text{C}$  to  $85\text{ }^\circ\text{C}$

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	$V_S$	-0.3	6	V
Input voltage (pin 1; pin 8)	$V_I$	-0.3	2.5	V
Input voltage (pin 6; pin 7)	$V_{MOD}, V_{STB}$	-0.3	6	V
Output voltage (pin 4)	$V_Q$		$V_S$	V
Output current (pin 4)	$-I_Q$		10	mA
Junction temperature	$T_J$		125	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-65	125	$^\circ\text{C}$
Thermal resistance				
System – air P-DIP-8	$R_{th SA}$		105	K/W
P-DSO-8	$R_{th SA}$		185	K/W

**Operating Range**

Supply voltage	$V_S$	3.0	5.5	V
Input frequency	$f$	140	1100	MHz
Ambient temperature	$T_A$	-40	85	$^\circ\text{C}$

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### Characteristics

$V_S = 3.0\text{ V to }5.5\text{ V}$ ,  $T_A = -40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$ , refer to test circuit

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Current consumption in operation	$I_S$		8.5		mA	Inputs blocked STB open, no load $T_A = 25\text{ }^\circ\text{C}$ $V_S = 3\text{ V}$ $V_S = 4\text{ V}$ $V_S = 5\text{ V}$
	$I_S$		9.5	12.8	mA	
	$I_S$		10.5	13.5	mA	
in standby	$I_S$		1.5		mA	Output n.c. STB = GND Inputs blocked
Input level (input sensitivity)	$V_I$			100	mV <sub>rms</sub>	140 MHz (sine voltage) 400 MHz 600 MHz 800 MHz 900 MHz 1000 MHz
		10		100	mV <sub>rms</sub>	
		5		100	mV <sub>rms</sub>	
		5		100	mV <sub>rms</sub>	
		5		100	mV <sub>rms</sub>	
		7		100	mV <sub>rms</sub>	
10		100	mV <sub>rms</sub>			

### MOD Input

Switching threshold	$V_I$		0.7		V	
H-input current	$I_{IH}$		0	50	$\mu\text{A}$	MOD = $V_S$ (1:128)
L-input current	$-I_{IL}$		110	210	$\mu\text{A}$	MOD = ground (1:129)

### Standby Input

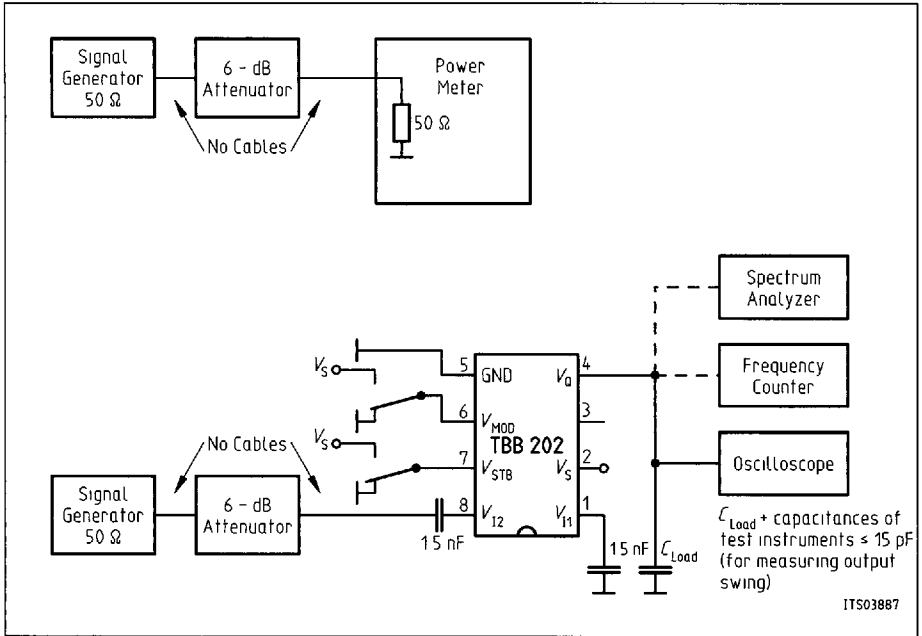
Switching threshold	$V_{STB}$		0.7		V	
H-input current	$I_{IH}$			50	$\mu\text{A}$	STB = $V_S$
L-input current	$-I_{IL}$		100	200	$\mu\text{A}$	STB = ground

### Output

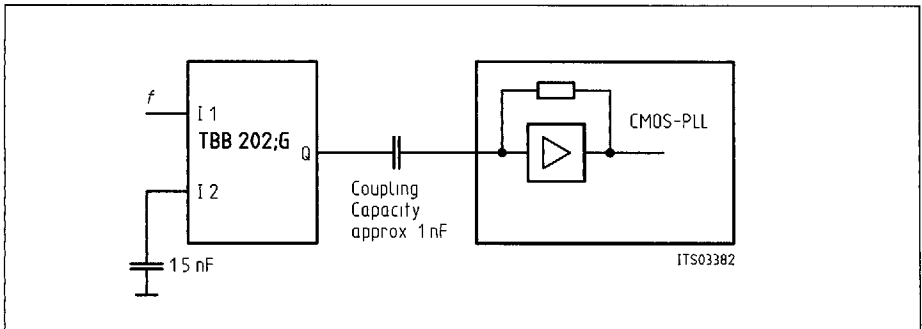
Output voltage swing	$V_O$		1		V <sub>pp</sub>	$C_L \leq 15\text{ pF}$
Output resistance	$R$		1		k $\Omega$	

### Switching Times

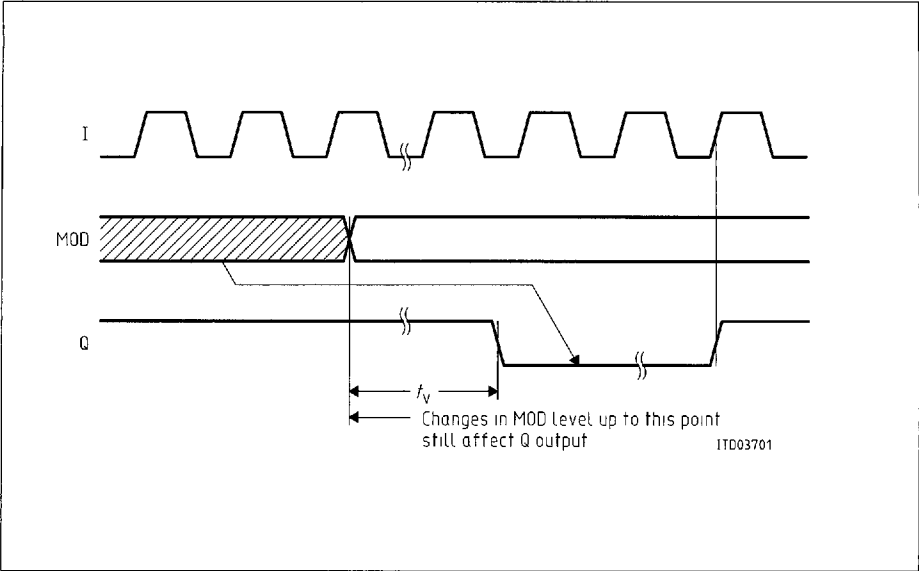
Setup time	$t_V$			28	ns	
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Test Circuit



Application Circuit



Diagram

## Dual-Modulus Divider 1:64/65 for 1 GHz with Standby Operation

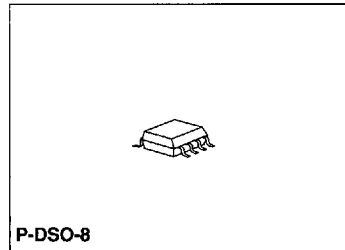
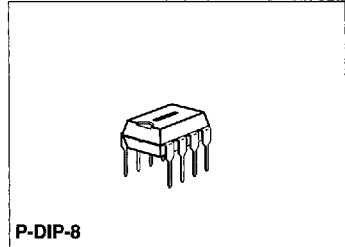
TBB 212 A

### Preliminary Data

Bipolar IC

### Features

- High frequency operation:  $f_{\max} = 1100$  MHz
- Pulse swallow function: 64/65
- Low power supply current: 8.5 mA typ.  
 $V_S = 3$  V
- Stable output amplitude:  $V_O = 1.0$  Vpp typ.
- Stable output amplitude is obtained  
load capacitance of 15 pF.



Type	Ordering Code	Package
TBB 212 A	Q67000-H8760	P-DIP-8
TBB 212 AG	Q67000-H8761	P-DSO-8 (SMD)

The TBB 212 is specially intended for applications in radiotelephones. It contains several ECL divider stages, which have a total divider ratio of 1:64/65, depending on the control of the MOD input. It can be employed in standby mode (input STB = low). The IC is particular intended for GSM.

## Circuit Description

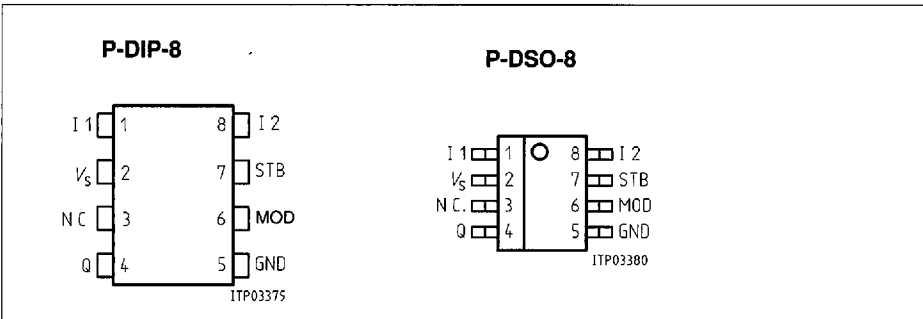
The divider has balanced push-pull inputs. It is driven unbalanced, the unused input has to be blocked by a capacitor (approx. 1.5 nF) with low series inductance. The divider of the component consists of several status-controlled master-slave flipflops, which have a total divider ratio of 1: 64/65. The MOD inputs (divider ratio changeover input) and STB (input for standby mode) are controllable with TTL/CMOS levels. The ECL output of the divider is CMOS compatible (see application circuit). The typical swing is 1 V<sub>pp</sub>.

## Truth Table for Operating Modes

Input	Level	Function at Q
MOD	High or unwired*) low	1:64 1:65
STB	High or unwired*) low	Normal Q = high, standby

## Pin Configurations

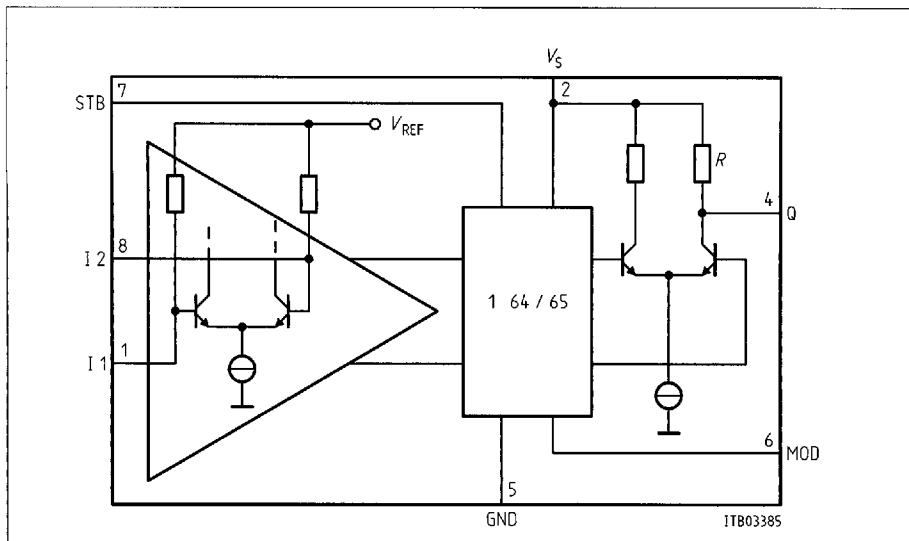
(top view)



## Pin Definitions and Functions

Pin No.	Symbol	Function
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2	V <sub>s</sub>	Supply voltage
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4	Q	Output
5	GND	Ground
6	MOD	Input for control of divider ratio
7	STB	Input for standby mode
8	I2	Input

\*) External circuitry increase noise immunity



Block Diagram

**Absolute Maximum Ratings**

$T_A = -40\text{ }^\circ\text{C}$  to  $85\text{ }^\circ\text{C}$

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	$V_S$	-0.3	6	V
Input voltage (pin 1; pin 8)	$V_I$	-0.3	2.5	V
Input voltage (pin 6; pin 7)	$V_{MOD}, V_{STB}$	-0.3	6	V
Output voltage (pin 4)	$V_Q$		$V_S$	V
Output current (pin 4)	$-I_Q$		10	mA
Junction temperature	$T_J$		125	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-65	125	$^\circ\text{C}$
Thermal resistance system – air P-DIP-8 P-DSO-8	$R_{th SA}$ $R_{th SA}$		105 185	K/W K/W

**Operating Range**

Supply voltage	$V_S$	3.0	5.5	V
Input frequency	$f$	140	1100	MHz
Ambient temperature	$T_A$	-40	85	$^\circ\text{C}$

■ 8235605 0059400 8T3 ■

## Characteristics

$V_S = 3.0\text{ V to }5.5\text{ V}$ ,  $T_A = -40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$ , refer to test circuit

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Current consumption in operation	$I_S$		8.5		mA	Inputs blocked STB open, no load $T_A = 25\text{ }^\circ\text{C}$ $V_S = 3\text{ V}$ $V_S = 4\text{ V}$ $V_S = 5\text{ V}$
	$I_S$		9.5	12.8	mA	
	$I_S$		10.5	13.5	mA	
in standby	$I_S$		1.5		mA	Output n.c. STB = GND Inputs blocked
Input level (input sensitivity)	$V_I$	10		100	mVrms	140 MHz (sine voltage) 400 MHz 600 MHz 800 MHz 900 MHz 1000 MHz
		5		100	mVrms	
		5		100	mVrms	
		5		100	mVrms	
		7		100	mVrms	
		10		100	mVrms	

## MOD Input

Switching threshold	$V_I$		0.7		V	
H-input current	$I_{IH}$		0	50	$\mu\text{A}$	MOD = $V_S$ (1: 64)
L-input current	$-I_{IL}$		110	210	$\mu\text{A}$	MOD = ground (1: 65)

## Standby Input

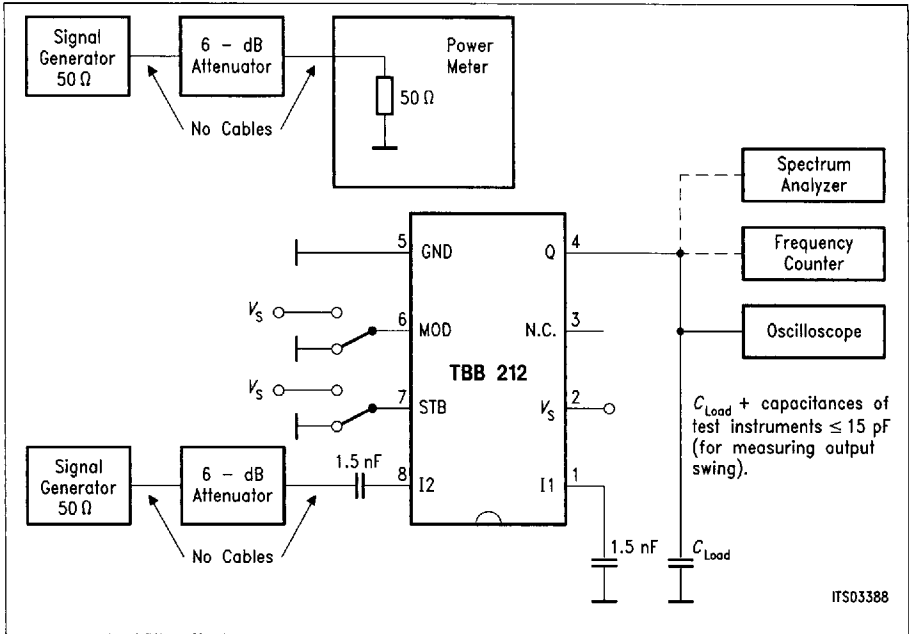
Switching threshold	$V_{STB}$		0.7		V	
H-input current	$I_{IH}$			50	$\mu\text{A}$	STB = $V_S$
L-input current	$-I_{IL}$		100	200	$\mu\text{A}$	STB = ground

## Output

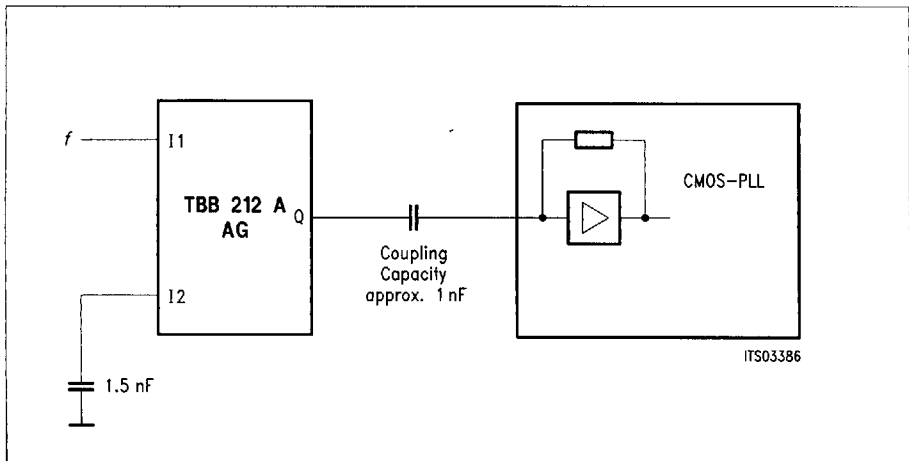
Output voltage swing	$V_O$		1		Vpp	$C_L \leq 15\text{ pF}$
Output resistance	$R$		1		k $\Omega$	

## Switching Times

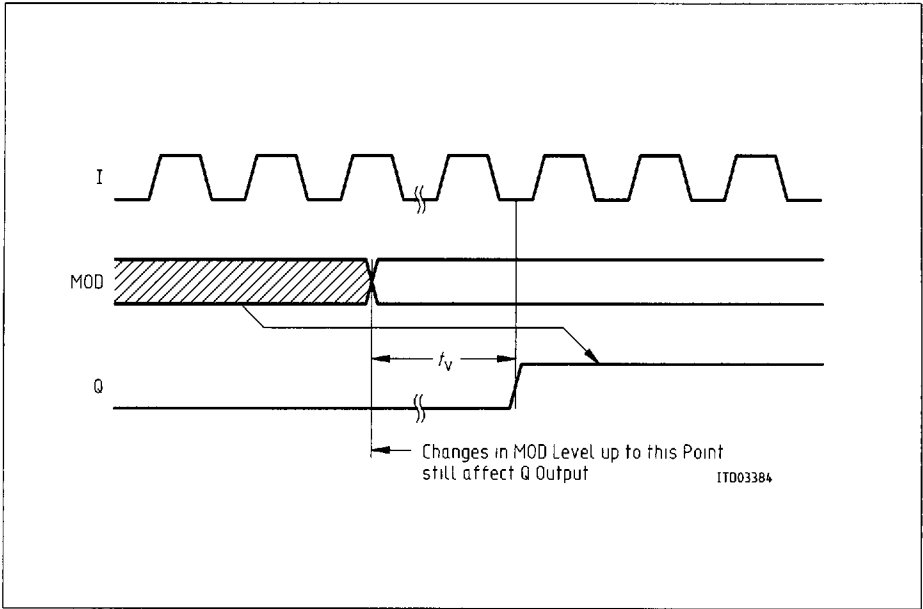
Setup time	$t_V$			24	ns	
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Test Circuit

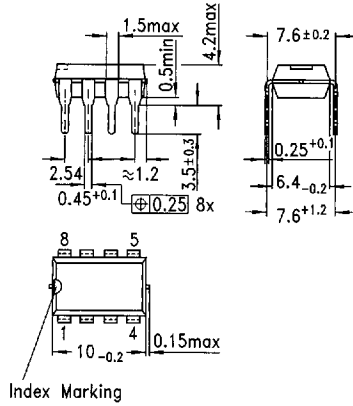


Application Circuit

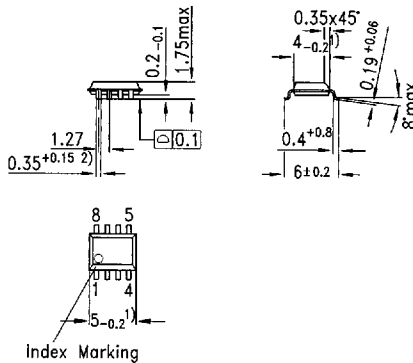


Diagram

**Plastic Package, P-DIP-8**  
(Plastic In-Line Package)



**Plastic Package, P-DSO-8 (SMD)**  
(Plastic Dual Small Outlines)



- 1) Does not include plastic or metal protrusions of 0.15 max per side
- 2) Does not include dambar protrusion of 0.05 max per side

**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information"

SMD = Surface Mounted Device

■ 8235605 0059404 449 ■

Semiconductor Group

Dimensions in mm

B115-H6627-  
G1-X-7600