

# CGS2535/36V Commercial Quad Memory Array Clock Drivers CGS2535/36TV Industrial Quad Memory Array Clock Drivers

## General Description

These Clock Generation and Support clock drivers are specifically designed for driving memory arrays requiring large fanouts while operating at high speeds.

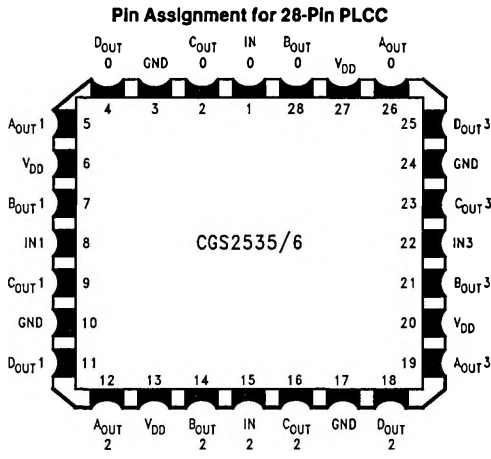
CGS2535 is a non-inverting 4 to 16 driver with CMOS I/Os. The 2536 option employs the CMOS I/O structure with half of the drivers being inverting and the other half non-inverting while providing divide-by-two banks.

They offer pin-to-pin skew specification that guarantees output skew across a given device.

## Features

- Guaranteed and tested:
  - 500 ps pin-to-pin skew ( $t_{OSHL}$  and  $t_{OHLH}$ )
- Implemented on National's ABT family process
- Symmetric output current drive:
  - 24 mA  $I_{OH}/I_{OL}$
- Industrial temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 28-pin PLCC for optimum skew performance
- 5.5V/3.3V options available
- Symmetric package orientation
- Large fanout for memory driving applications
- Guaranteed 2 kV ESD protection

## Connection Diagram

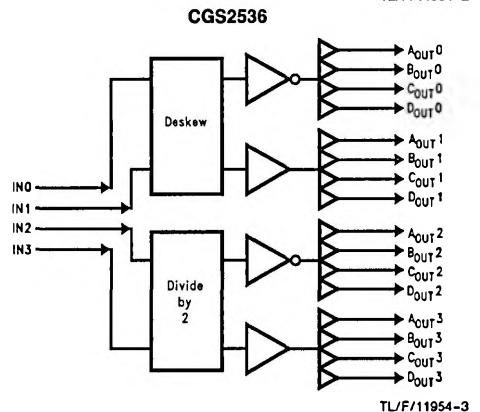
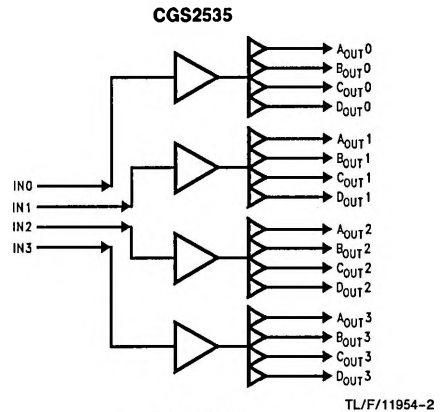


See NS Package Number V28A

### Truth Table

Device	Input	Output
CGS2535	In (0-3)	ABCD Out (0-3)
CGS2536	In (0)	ABCD Out (0)
	In (1)	$\overline{\text{ABCD}}$ Out (1)
	In (2)	ABCD Out (2) $\div 2$
	In (3)	$\overline{\text{ABCD}}$ Out (3) $\div 2$

## Logic Diagrams



## Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ( $V_{CC}$ )		7.0V
Input Voltage ( $V_i$ )		-0.5V to $V_{CC} + 0.5V$
Storage Temperature Range		-65°C to +150°C
Typical $\theta_{JA}$	Airflow	V Pack
	0 LFM	62°C/W
	225 LFM	43°C/W
	500 LFM	34°C/W
	900 LFM	27°C/W

## Recommended Operating Conditions

Supply Voltage		4.5V to 5.5V
$V_{CC}$		3.0V to 3.6V
$V_{CC}$		
High Level Output Current ( $I_{OH}$ )		-24 mA
Low Level Output Current ( $I_{OL}$ )		24 mA
Free Air Operating Temperature		
Industrial		-40°C to +85°C
Commercial		0°C to +70°C

Note: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the DC and AC Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The Recommended Operating Conditions will define the conditions for actual device operation.

## DC Electrical Characteristics

Over recommended operating free air temperature range. All typical values are measured at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ .

Symbol	Parameter	Conditions	$V_{CC}$ (V)	Min	Typ	Max	Units
$V_{IH}$	Input High Level Voltage		3.3	2.1			V
			4.5	3.15			
			5.5	3.85			
$V_{IL}$	Input Low Level Voltage		3.3			0.9	V
			4.5			1.35	
			5.5			1.65	
$V_{IK}$	Input Clamp Voltage	$I_I = -18 \text{ mA}$	4.5			-1.2	V
$V_{OH}$	High Level Output Voltage	$I_{OH} = -50 \mu A$	3.3	2.9			V
			4.5	4.4			
			5.5	5.4			
		$I_{OH} = -24 \text{ mA}$	3.3	2.46			V
			4.5	3.76			
			5.5	4.76			
$V_{OL}$	Low Level Output Voltage	$I_{OL} = 50 \mu A$	3.3			0.1	V
			4.5			0.1	
			5.5			0.1	
		$I_{OL} = 24 \text{ mA}$	3.3			0.44	V
			4.5			0.44	
			5.5			0.44	
$I_I$	Input Current @ Max Input Voltage	$V_{IH} = 7V$	5.5	-7		7	$\mu A$
		$V_{IH} = V_{CC}$	3.6	-1		1	$\mu A$
$I_{IH}$	High Level Input Current	$V_{IH} = 2.7V$	5.5			5	$\mu A$
$I_{IL}$	Low Level Input Current	$V_{IL} = 0.4V$	5.5	-5			$\mu A$
$I_{OLD}$	Minimum Dynamic Output Current*	$V_{OLD} = 1.65V \text{ (max)}$	5.5	75	50		mA
		$V_{OLD} = 0.8V \text{ (max)}$	3.6	36			mA
$I_{OHD}$	Minimum Dynamic Output Current*	$V_{OHD} = 3.85V \text{ (min)}$	5.5	-75	-50		mA
		$V_{OHD} = 2.0V \text{ (min)}$	3.6	-25			mA
$I_{CC}$	Supply Current '2535/36		3.6			25	$\mu A$
			5.5			80	
$C_{IN}$	Input Capacitance		5.0		5		pF

\*Maximum test duration 2.0 ms, one output loaded at a time.

### AC Electrical Characteristics (Notes 1, 2, and 3)

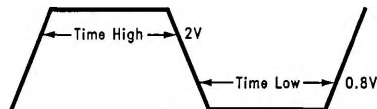
Over recommended operating free air temperature range. All typical values are measured at  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$

Symbol	Parameter	V <sub>CC</sub> * (V)	CGS2535/36						Units	
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500Ω			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500Ω				
			Min	Typ	Max	Min	Typ	Max		
f <sub>max</sub>	Frequency Maximum	3.3 5.5					85		MHz	
t <sub>PLH</sub>	Low to High Propagation Delay CK to On	2535	3.3 5.0			4.5 3.5			4.5 3.5	ns
		2536	3.3 5.0			5.5 4.5			5.5 4.5	
t <sub>PHL</sub>	High to Low Propagation Delay CK to On	2535	3.3 5.0			4.5 3.5			4.5 3.5	ns
		2536	3.3 5.0			5.5 4.5			5.5 4.5	
t <sub>OSHL</sub>	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	2535	3.3 5.0			500 500			500 500	ps
		2536	3.3 5.0			500 500			500 500	
t <sub>OSLH</sub>	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	2535	3.3 5.0			500 500			500 500	ps
		2536	3.3 5.0			500 500			500 500	
t <sub>rise</sub> t <sub>fall</sub>	Rise/Fall Time (from 0.8V/2.0V to 2.0V/0.8V)	2535	3.3 5.0			1.5 1.5			1.5 1.5	ns
		2536	3.3 5.0			1.5 1.5			1.5 1.5	
t <sub>High</sub>	Pulse Width Duration High	2535/6	3.3 5.0	4.0 4.0			4.0 4.0			ns
t <sub>Low</sub>	Pulse Width Duration Low	2535/6	3.3 5.0	4.0 4.0			4.0 4.0			
t <sub>PV LH</sub>	Part-to-Part Variation of Low-to-High Transitions	2535	3.3 5.0			1.0 1.0			1.0 1.0	ns
t <sub>PV HL</sub>	Part-to-Part Variation of High-to-Low Transitions	2535	3.3 5.0			1.0 1.0			1.0 1.0	ns

\*Voltage Range 5.0 is 5.0V ± 0.5V, 3.3 is 3.3V ± 0.3V

**Note 1:** Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH to LOW (t<sub>OSHL</sub>) or LOW to HIGH (t<sub>OSLH</sub>).

**Note 2:** Time high is measured with outputs which are at 2.0V or above. Time low is measured with outputs which are at 0.8V or below.



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**Note 3:** The input signal has a rise and fall time transition time of 2.5 ns with high and low values of 3.0V and 0.0V respectively.