

TYPES SN54H15, SN54LS15, SN54S15, SN74H15, SN74LS15, SN74S15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

REVISED APRIL 1985

- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

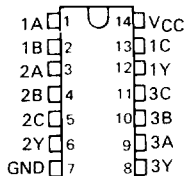
These devices contain three independent 3-input AND gates with open-collector outputs. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate high V_{OH} levels.

The SN54H15, SN54LS15, and SN54S15 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74H15, SN74LS15, and SN74S15 are characterized for operation from 0°C to 70°C .

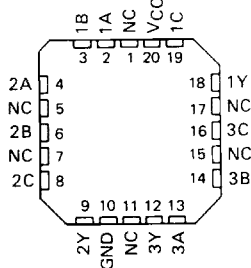
FUNCTION TABLE (each gate)

INPUTS			OUTPUT
A	B	C	Y
H	H	H	H
L	X	X	L
X	L	X	L
X	X	L	L

SN54H15, SN54LS15, SN54S15 ... J OR W PACKAGE
SN74H15 ... J OR N PACKAGE
SN74LS15, SN74S15 ... D, J OR N PACKAGE
(TOP VIEW)



SN54LS15, SN54S15 ... FK PACKAGE
SN74LS15, SN74S15 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram (each gate)



positive logic

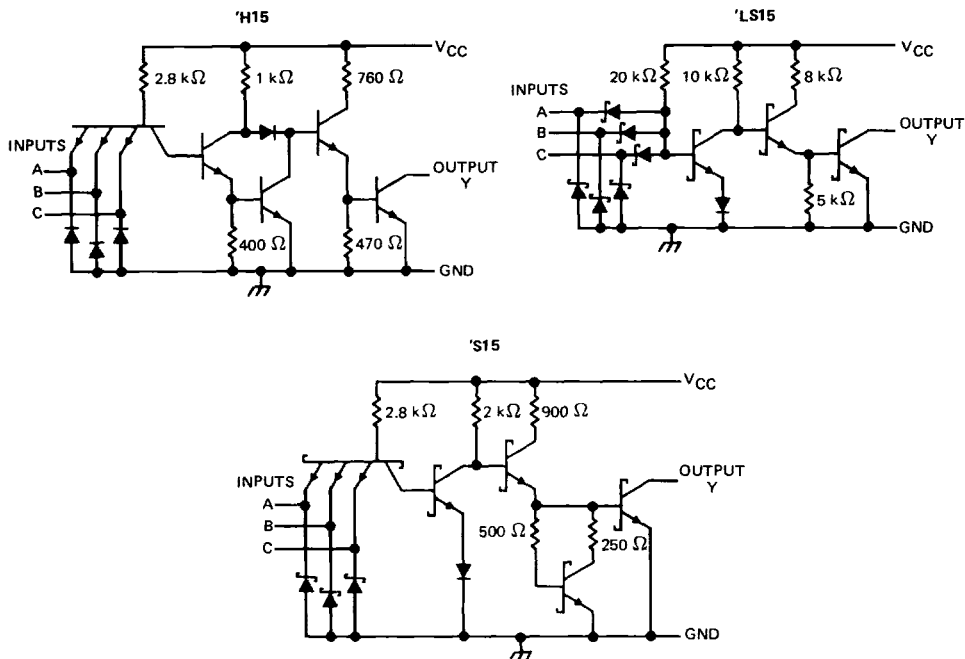
$$Y = A \cdot B \cdot C \text{ or } Y = \overline{\overline{A} + \overline{B} + \overline{C}}$$

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TTL DEVICES

**TYPES SN54H15, SN54LS15, SN54S15,
SN74H15, SN74LS15, SN74S15
TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS**

schematics (each gate)



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: 'H15, 'S15	5.5 V
'LS15	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

TYPES SN54H15, SN74H15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54H15			SN74H15			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage			0.8			0.8	V
V_{OH} High-level output voltage			5.5			5.5	V
I_{OL} Low-level output current			20			20	mA
T_A Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN54H15			SN74H15			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$		-1.5			-1.5		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{OH} = 5.5 \text{ V}$		0.25			0.25		mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$	0.2	0.4		0.2	0.4		V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		0.1			0.1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		50			50		µA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-2			-2		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$	15	25		15	25		mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$	30	48		30	48		mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A, B, or C	Y	$R_L = 280 \Omega,$	$C_L = 25 \text{ pF}$		12	18	ns
t_{PHL}						9	13	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms

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TYPES SN54LS15, SN74LS15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54LS15			SN74LS15			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage			0.7			0.8	V
V_{OH} High-level output voltage			5.5			5.5	V
I_{OL} Low-level output current			4			8	mA
T_A Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN54LS15			SN74LS15			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$		-1.5			-1.5		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{OH} = 5.5 \text{ V}$		0.1			0.1		mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 4 \text{ mA}$	0.25	0.4		0.25	0.4		V
	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 8 \text{ mA}$				0.35	0.5		
I_I	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$		0.1			0.1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$		20			20		µA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-0.4			-0.4		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$	1.8	3.6		1.8	3.6		mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$	3.3	6.6		3.3	6.6		mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A, B, or C	Y	$R_L = 2 \text{ k}\Omega, C_L = 15 \text{ pF}$		20	35	ns
t_{PHL}					17	35	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

TYPES SN54S15, SN74S15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54S15			SN74S15			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage			0.8			0.8	V
V_{OH} High-level output voltage			5.5			5.5	V
I_{OL} Low-level output current			20			20	mA
T_A Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
V_{IK}	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$		-1.2		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{OH} = 5.5 \text{ V}$		0.25		mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$		0.5		V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$		50		μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$		-2		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$	10.5	19.5		mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$	24	42		mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A, B, or C	Y	$R_L = 280 \Omega, C_L = 15 \text{ pF}$	5.5	8.5		ns
t_{PHL}				6	9		ns
t_{PLH}			$R_L = 280 \Omega, C_L = 50 \text{ pF}$	8.5			ns
t_{PHL}				8			ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

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