Am55/75109 • Am55/75110
Dual Line Drivers

Distinctive Characteristics
- Input is TTL compatible.
- High common-mode output range of −3V to +10V.
- Separate and common output inhibits.

- Open-collector differential outputs for bus-organized systems.
- 100% reliability assurance testing in compliance with MIL–STD–883.

FUNCTIONAL DESCRIPTION

The Am55/75109 and Am55/75110 are dual line drivers characterized for applications in balanced, unbalanced, and party-line systems. The drivers provide a constant current output that is switched to either of the two differential output terminals under the control of the A and B inputs. When A and B are HIGH, the Y output is HIGH and Z output is LOW

These drivers feature a separate inhibit input, C, that is used to switch off the constant current output. This leaves the driver differential output in the high impedance state for use in bus organized systems. A LOW on the C input

forces the driver to the OFF state by switching off the current source of the differential output transistor pair. Likewise, the two drivers have a common inhibit input, D, that forces both drivers to the OFF state. A LOW on the D inputs turns off the output current sources of both drivers such that both differential outputs are in the high impedance state.

The driver outputs have a common mode voltage range of −3V to +10V. The Am55/75109 output current is typically 6mA while the Am55/75110 output current is typically 12mA.

SCHEMATIC DIAGRAM
(One Driver Shown)
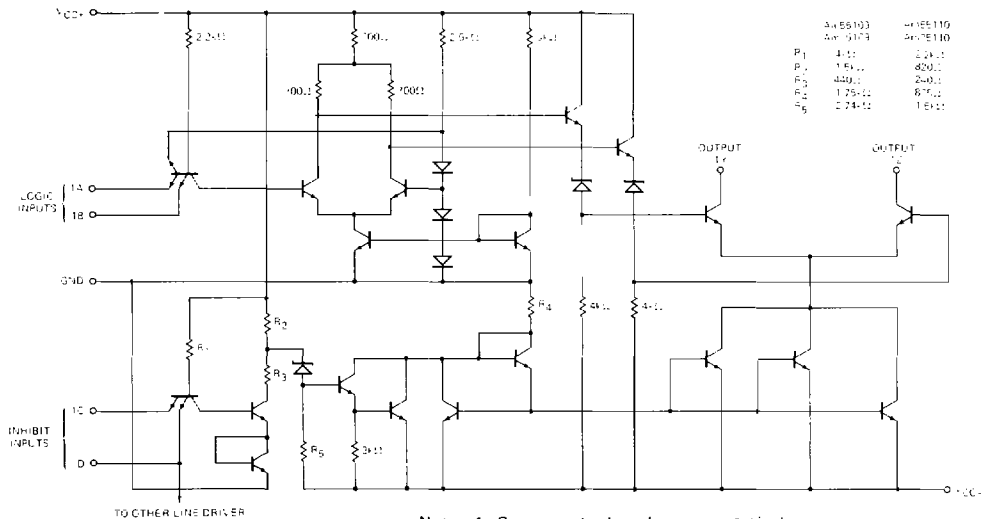
Notes: 1. Component values shown are nominal.
2. Resistance values are in ohms.

LIC-479

ORDERING INFORMATION

Package Type	Temperature Range	Am55/75109 Order Number	Am55/75110 Order Number
Molded DIP	0°C to +70°C	SN75109N	SN75110N
Hermetic DIP	0°C to +70°C	SN75109J	SN75110J
Dice	0°C to +70°C	AM75109X	AM75110X
Hermetic DIP	−55°C to +125°C	SN55109J	SN55110J
Dice	−55°C to +125°C	AM55109X	AM55110X

CONNECTION DIAGRAM
Top View

1A 1	14 V_{CC}+
1B 2	13 1Y
1C 3	12 1Z
2C 4	11 V_{CC}
2A 5	10 D
2B 6	9 2Z
GND 7	8 2Y

Am55 75109
Am55 75110
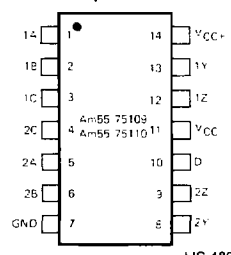
LIC-480

Note:
Pin 1 is marked for orientation.

LOGIC SYMBOL
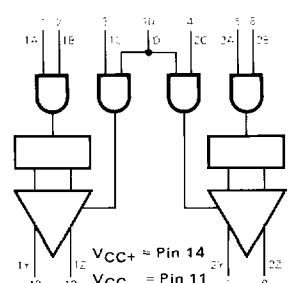
$V_{CC}+$ = Pin 14
$V_{CC}-$ = Pin 11
GND = Pin 7

LIC-481

MAXIMUM RATINGS (Above which the useful life may be impaired)

Storage Temperature	-65°C to $+150^\circ$C
Temperature (Ambient) Under Bias	-55°C to $+125^\circ$C
V_{CC+} Supply Voltage to Ground Potential	$+7$V
V_{CC-} Supply Voltage to Ground Potential	-7V
Common Mode DC Voltage Applied to Outputs	-5V to $+12$V
DC Input Voltage	-0.5V to $+V_{CC+}$max.
DC Input Current	-30mA to $+5.0$mA

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

The Following Conditions Apply Unless Otherwise Noted:

Am75109, Am75110 V_{CC+} MIN. = 4.75V V_{CC+} MAX. = 5.25V, V_{CC-} MIN. = -4.75V V_{CC-} MAX. = -5.25V; T_A = 0°C to $+70^\circ$C

Am55109, Am55110 V_{CC+} MIN. = 4.5V V_{CC+} MAX. = 5.5V, V_{CC-} MIN. = -4.5V V_{CC-} MAX. = -5.5V; T_A = -55°C to $+125^\circ$C

Parameters	Description	Test Conditions (Note 1)		Min.	Typ. (Note 2)	Max.	Units
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs		2.0		5.5	Volts
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs		0		0.8	Volts
I_{IL} (Note 3)	Input Low Current Am55/75109	V_{CC+} = MAX., V_{IN} = 0.4 V V_{CC-} = MAX.	A, B			-3	mA
			C			-1.6	
			D			-3	
I_{IL} (Note 3)	Input LOW Current Am55/75110	V_{CC+} = MAX., V_{IN} = 0.4 V V_{CC-} = MAX.	A, B, C			-3	mA
			D			-6	
I_{IH} (Note 3)	Input HIGH Current	V_{CC+} = MAX., V_{IN} = 2.4 V V_{CC-} = MAX.	A, B, C			40	μA
			D			80	
I_I	Input HIGH Current	V_{CC+} = MAX., V_{IN} = MAX. V_{CC-} = MAX.	A, B, C			1	mA
			D			2	
I_O(on)	Output Current On-State	V_{CC+} = MAX. V_{CC-} = MAX.	109			7	mA
			110			15	
I_O(on)	Output Current On-State	V_{CC+} = MIN. V_{CC-} = MAX.	109	3.5			mA
			110	6.5			
I_O(off)	Output Current Off-State	V_{CC+} = MIN. V_{CC-} = MIN.				100	μA
I_{CC+}(on)	Positive Supply Current; Driver Enabled	A and B = 0.4V C and D = 2.0V	109		18	30	mA
			110		23	35	
I_{CC-}(on)	Negative Supply Current; Driver Enabled	A and B = 0.4V C and D = 2.0V	109		-18	-30	mA
			110		-34	-50	
I_{CC+}(off)	Positive Supply Current; Driver Disabled	All Inputs = 0.4V	109		18		mA
			110		21		
I_{CC-}(off)	Negative Supply Current; Driver Disabled	All Inputs = 0.4V	109		-10		mA
			110		-17		

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical limits are at V_{CC+} = 5.0V, V_{CC-} = -5.0V, T_A = 25°C ambient and maximum loading.
3. Actual input currents = Unit Load Current X Input Load Factor (See Loading Rules).

Switching Characteristics (T_A = $+25^\circ$C)

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t_{PLH}	A or B to Y or Z	V_{CC+} = 5.0 V, V_{CC-} = -5.0 V, R_L = 50Ω, C_L = 40 pF		9	15	ns
t_{PHL}	A or B to Y or Z			9	15	ns
t_{PLH}	C or D to Y or Z			16	25	ns
t_{PHL}	C or D to Y or Z			13	25	ns

FUNCTION TABLE

LOGIC INPUTS		INHIBIT INPUTS		OUTPUTS	
A	B	C	D	Y	Z
X	X	L	X	OFF	OFF
X	X	X	L	OFF	OFF
L	X	H	H	ON	OFF
X	L	H	H	ON	OFF
H	H	H	H	OFF	ON

H = HIGH
L = LOW
ON = I_O(on) Current
OFF = I_O(off) Current
X = Don't Care

LOADING RULES (In Unit Loads)

|		Input Unit Load Am55/ 75109	Input Unit Load Am55/ 75110	Fan-out Output HIGH	Fan-out Output LOW
Input/Output	Pin No.'s				
1A	1	1–7/8	1–7/8	—	—
1B	2	1–7/8	1–7/8	—	—
1C	3	1	1–7/8	—	—
2C	4	1	1–7/8	—	—
2A	5	1–7/8	1–7/8	—	—
2B	6	1–7/8	1–7/8	—	—
GND	7	—	—	—	—
2Y	8	—	—	Diff output	
2Z	9	—	—		
D	10	1–7/8	3–3/4	—	—
V_{CC-}	11	—	—	—	—
1Z	12	—	—	Diff output	
1Y	13	—	—		
V_{CC+}	14	—	—	—	—

A TTL Unit Load is defined as 40 μA measured at 2.4 V HIGH and −1.6mA measured at 0.4 V LOW.
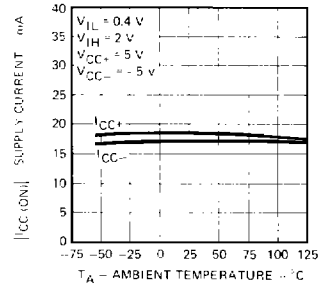
PERFORMANCE CURVES
(Typical)

Am55109, Am75109
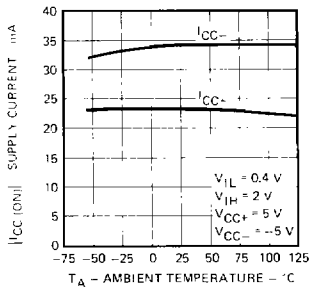**Output Current**
Versus
Logic Input Voltage
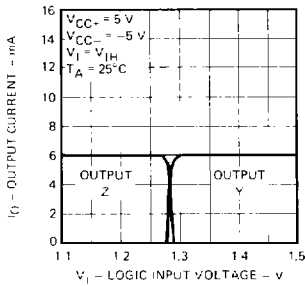
Am55110, Am75110
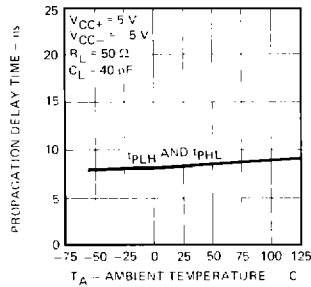**Output Current**
Versus
Logic Input Voltage
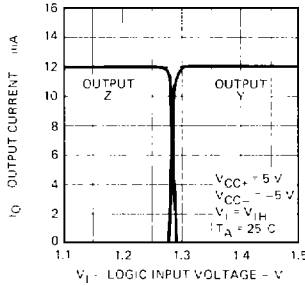
Am55109, Am75109
Supply Current With Driver Enabled
Versus
Ambient Temperature

Am55110, Am75110
Supply Current With Driver Enabled
Versus-
Ambient Temperature

Propagation Delay Time
Logic Inputs
Versus
Ambient Temperature

Propagation Delay Time
Inhibit Inputs
Versus
Ambient Temperature
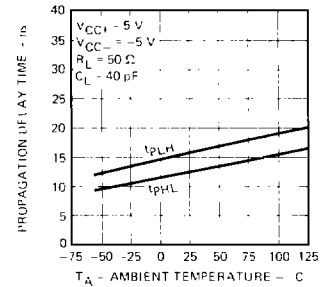
Note: For Am75 Series use 0°C to +70°C temperature range only.
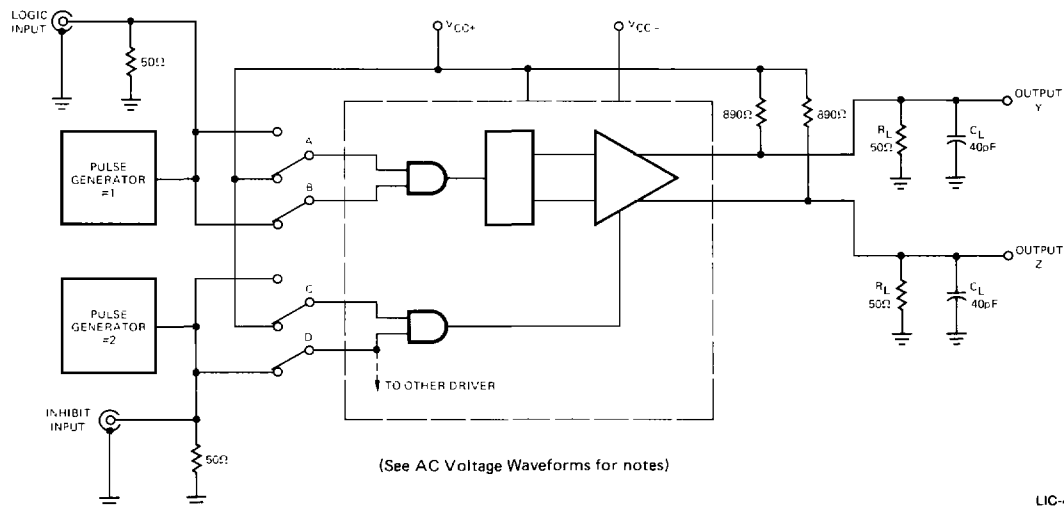
LIC-482

DC TEST TABLE

Parameter	INPUTS				OUTPUTS	
	A	B	C	D	Y	Z
V_{IH}	Test	Open	V_{IH}	V_{IH}	OFF	ON
V_{IH}	Open	Test	V_{IH}	V_{IH}	OFF	ON
V_{IL}	Test	V_{CC+}	V_{IH}	V_{IH}	ON	OFF
V_{IL}	V_{CC+}	Test	V_{IH}	V_{IH}	ON	OFF
I_{IH}	Test	GND	V_{IH}	V_{IH}	GND	GND
I_{IH}	GND	Test	V_{IH}	V_{IH}	GND	GND
I_{IL}	Test	4.5 V	V_{IH}	V_{IH}	GND	GND
I_{IL}	4.5 V	Test	V_{IH}	V_{IH}	GND	GND
V_{IH}	V_{IH}	V_{IH}	Test	Open	OFF	ON
V_{IH}	V_{IH}	V_{IH}	Open	Test	OFF	ON
V_{IH}	V_{IL}	V_{IL}	Test	Open	ON	OFF
V_{IH}	V_{IL}	V_{IL}	Open	Test	ON	OFF
V_{IL}	V_{IH}	V_{IH}	Test	Open	OFF	OFF
V_{IL}	V_{IH}	V_{IH}	Open	Test	OFF	OFF
V_{IL}	V_{IL}	V_{IL}	Test	V_{CC+}	OFF	OFF
V_{IL}	V_{IL}	V_{IL}	V_{CC+}	Test	OFF	OFF
I_{IH}	GND	GND	Test	GND	GND	GND
I_{IH}	GND	GND	GND	Test	GND	GND
I_{IL}	GND	GND	Test	4.5 V	GND	GND
I_{IL}	GND	GND	4.5 V	Test	GND	GND
$I_{O(on)}$	V_{IL}	V_{IL}	V_{IH}	V_{IH}	Test	Note 1
$I_{O(on)}$	V_{IL}	V_{IH}	V_{IH}	V_{IH}	Test	Note 1
$I_{O(on)}$	V_{IH}	V_{IL}	V_{IH}	V_{IH}	Test	Note 1
$I_{O(on)}$	V_{IH}	V_{IH}	V_{IH}	V_{IH}	Note 1	Test
$I_{O(off)}$	V_{IH}	V_{IH}	V_{IH}	V_{IH}	Test	Note 1
$I_{O(off)}$	V_{IL}	V_{IL}	V_{IH}	V_{IH}	Note 1	Test
$I_{O(off)}$	V_{IL}	V_{IH}	V_{IH}	V_{IH}	Note 1	Test
$I_{O(off)}$	V_{IH}	V_{IL}	V_{IH}	V_{IH}	Note 1	Test
$I_{O(off)}$	X	X	V_{IL}	V_{IL}	Test	Test
$I_{O(off)}$	X	X	V_{IL}	V_{IH}	Test	Test
$I_{O(off)}$	X	X	V_{IH}	V_{IL}	Test	Test
$I_{CC+(on)}$	V_{IL}	V_{IL}	V_{IH}	V_{IH}	GND	GND
$I_{CC-(on)}$	V_{IL}	V_{IL}	V_{IH}	V_{IH}	GND	GND
$I_{CC+(off)}$	V_{IL}	V_{IL}	V_{IL}	V_{IL}	GND	GND
$I_{CC-(off)}$	V_{IL}	V_{IL}	V_{IL}	V_{IL}	GND	GND

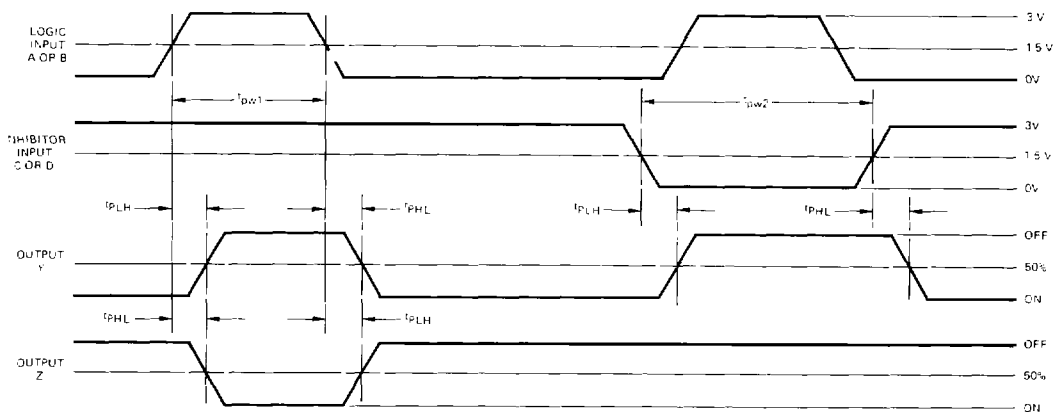X = Don't Care; Note 1: Output not under test must have a low impedance (<50Ω) termination to GND.

AC PARAMETER MEASUREMENT INFORMATION

TEST CIRCUIT

(See AC Voltage Waveforms for notes)

LIC-483

AC VOLTAGE WAVEFORMS

Notes: 1. The pulse generators have the following characteristics: $Z_{out} = 50\,\Omega$, $t_r = t_f = 10 \pm 5$ns; $t_{pw1} = 500$ns, $PRR = 1$ MHz; $t_{pw2} = 1\,\mu s$, $PRR = 500$ kHz.

2. C_L includes probe and jig capacitance.

3. For simplicity, only one channel and the inhibitor connections are shown.

LIC-484

UNIT LOAD DEFINITIONS

SERIES	HIGH		LOW	
	Current	Measure Voltage	Current	Measure Voltage
Am25/26/2700	40 µA	2.4 V	−1.6 mA	0.4 V
Am25S/26S/27S	50 µA	2.7 V	−2.0 mA	0.5 V
Am25L/26L/27L	20 µA	2.4 V	−0.4 mA	0.3 V
Am25LS/26LS/27LS	20 µA	2.7 V	−0.36 mA	0.4 V
Am54/74	40 µA	2.4 V	−1.6 mA	0.4 V
54H/74H	50 µA	2.4 V	−2.0 mA	0.4 V
Am54S/74S	50 µA	2.7 V	−2.0 mA	0.5 V
54L/74L (Note 1)	20 µA	2.4 V	−0.8 mA	0.4 V
54L/74L (Note 1)	10 µA	2.4 V	−0.18 mA	0.3 V
Am54LS/74LS	20 µA	2.7 V	−0.36 mA	0.4 V
Am9300	40 µA	2.4 V	−1.6 mA	0.4 V
Am93L00	20 µA	2.4 V	−0.4 mA	0.3 V
Am93S00	50 µA	2.7 V	−2.0 mA	0.5 V
Am75/85	40 µA	2.4 V	−1.6 mA	0.4 V
Am8200	40 µA	4.5 V	−1.6 mA	0.4 V

Note 1. 54L/74L has two different types of standard inputs.
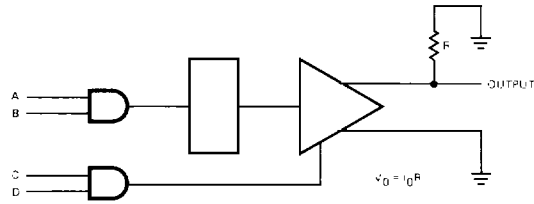
DEFINITION OF FUNCTIONAL TERMS

1A, 2A, 1B, 2B The TTL data inputs to each driver.

1C, 2C The TTL inhibit inputs to each driver. A LOW input forces both outputs to the off-state.

D The common TTL inhibit input to both drivers. A LOW input forces all four outputs to the off-state.
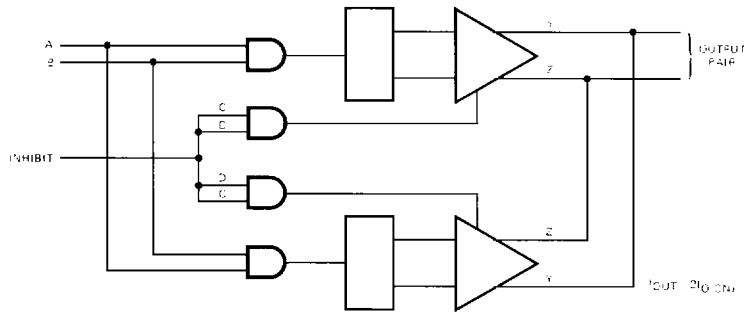
1Y, 2Y, 1Z, 2Z The differential output of each driver.

APPLICATIONS

LIC-485

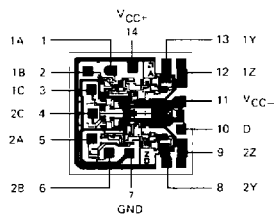Am55/75109 or Am55/75110 in a unbalanced or single-ended connection.

LIC-486

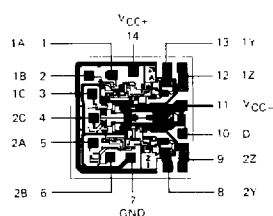Two line drivers connected in parallel for higher current.

Metallization and Pad Layouts

Am55/75109

DIE SIZE 0.056" X 0.056"

Am55/75110

DIE SIZE 0.056" X 0.056"