

Features

- 11 High Drive Buffers on a Chip
- Full Spec. Operation from 3.3v to 5.5v
- High Output Drive Current: 350mA
- Low Supply Current: 3mA (Typ)
- A/B Channel Input per Buffer
- Each Buffer stable with output load of up to 240nF
- 9 Output Power Save Mode

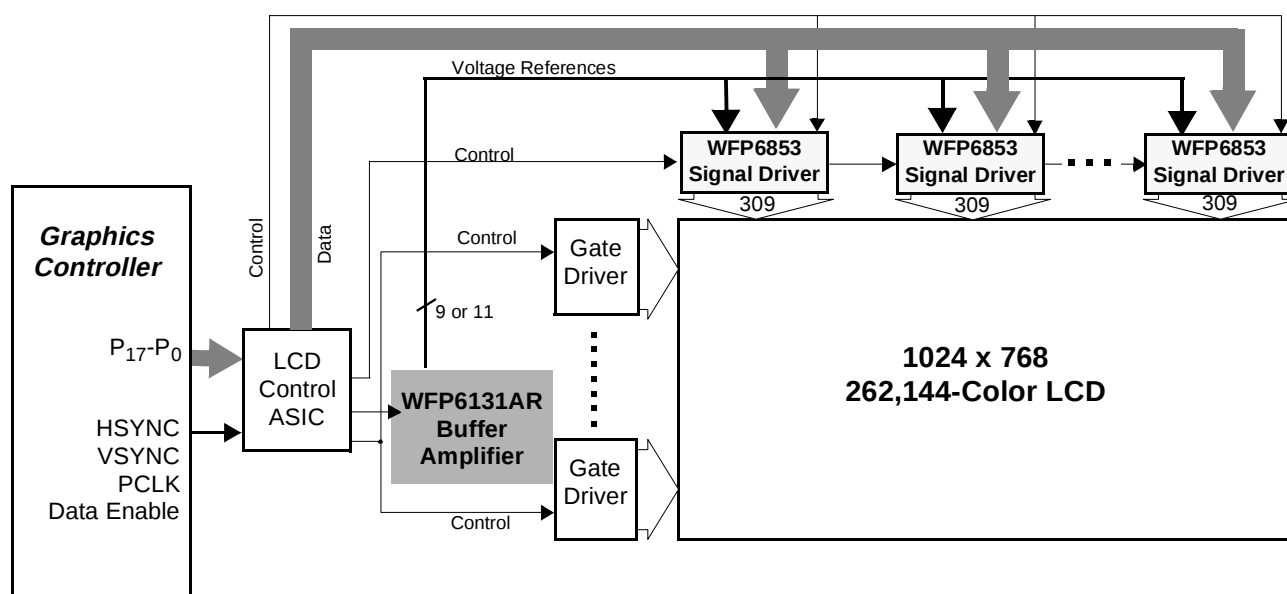
Applications

- Reference Buffer for SVGA/XGA TFT-LCD drive circuit.
- Electronic Notebooks
- Electronic Games
- Personal Communication Devices
- Personal Digital Assistants (PDA)
- Active Filter
- Multi-Voltage Buffering

9/11-Channel Buffer

Product Description

The WFP6131AR is an 11-channel buffer amplifier that provides a **single-chip solution** to the reference voltage requirements of TFT-LCD drivers. It can also be used in any **cost sensitive** application that requires large number (11 maximum) of high drive buffers in a space saving TSSOP package. The WFP6131AR has two selectable inputs per buffer allowing the selection of two reference voltages via one on-chip multiplexer for all 11 buffers. The WFP6131AR supports 9 or 11 reference voltage systems. For 9 reference applications, the 2 unused amplifiers may be disabled to reduce power dissipation.



Features & Benefits

Features	Benefits
• High Integration	• 11 high drive reference voltage outputs • Internal multiplexors allow polarity-dependent reference values to be selected via A/B_SEL input.
• Low Power Operation	• Analog supply voltage: $3.3\text{ V} \pm 0.3\text{ V}$ to $5.0\text{ V} \pm 0.5\text{ V}$ • Low supply headroom allows wide output dynamic range and minimizes power dissipation. • Low quiescent current of less than 0.5 mA per reference output (typical). • EN_11 pin (internally pulled-down) disables OUT_1 & OUT_11 amplifiers to reduce power dissipation in 9 reference amplifier applications. May be set to logic high to enable OUT_1 & OUT_11.
• High Performance Amplifiers	• Typical slew rate of $2\text{V}/\mu\text{s}$ with $0.24\text{ }\mu\text{F}$ load • Typically settles to within 50 mV of final value in $6\mu\text{s}$ with $0.24\text{ }\mu\text{F}$ load.
• Drives Large Load Capacitance	• Maintains stable operation with load capacitance of 100 pF to $0.24\text{ }\mu\text{F}$.
• Die Size: 2.25 x 4.5 mm	• Small die size for chip-on-board applications.
• 48-pin TSSOP Package	• TSSOP package reduces cost and board space.

48 Pin TSSOP Package Dimensions (millimeters)

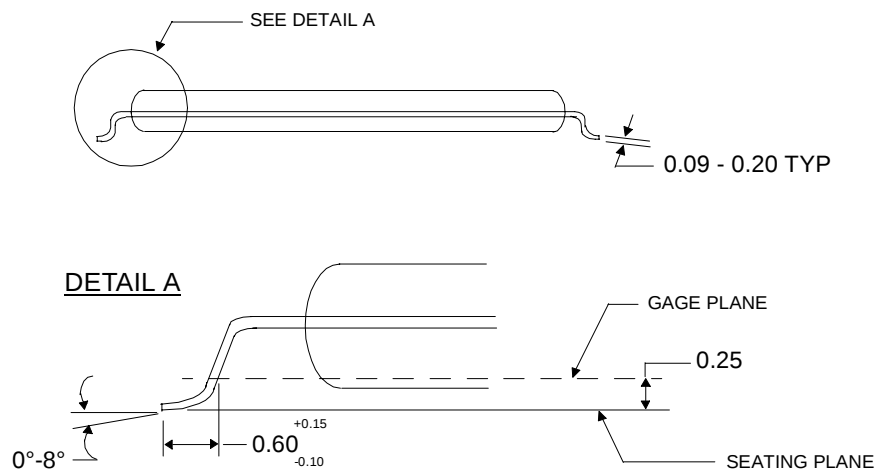
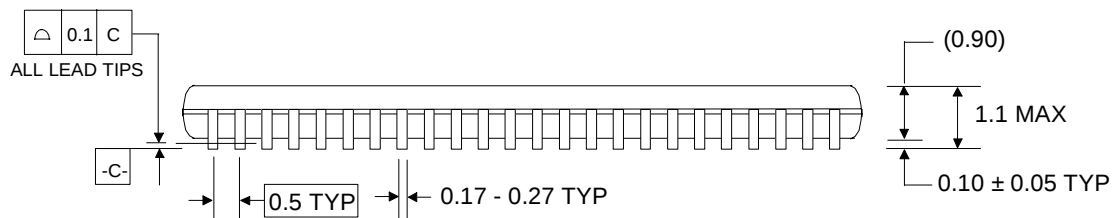
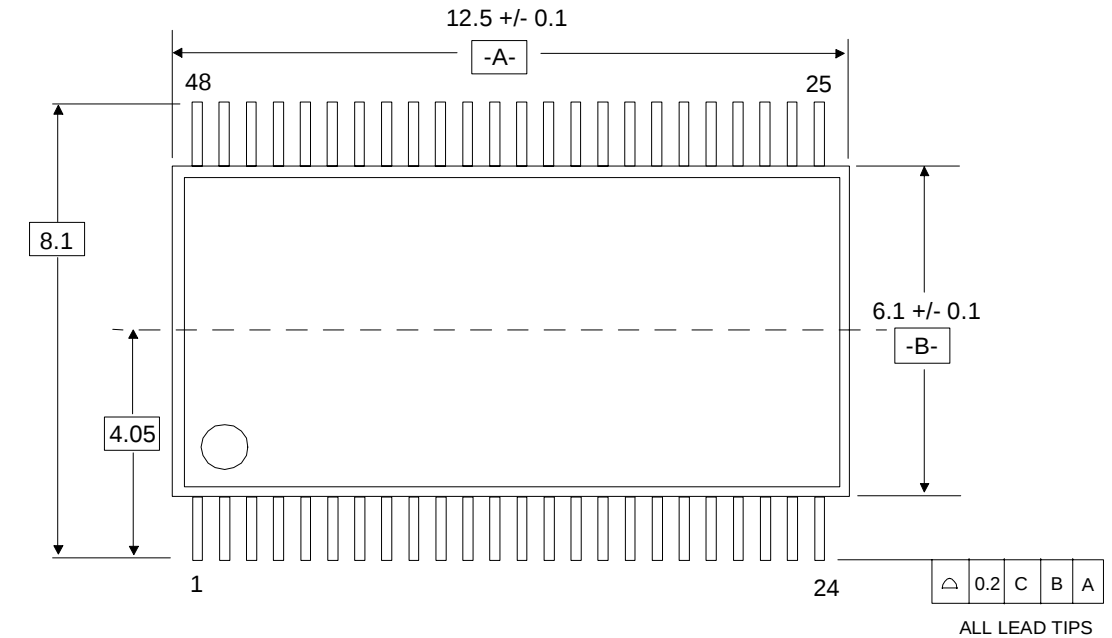


FIGURE 2-1

Die Size and Pad Coordinates

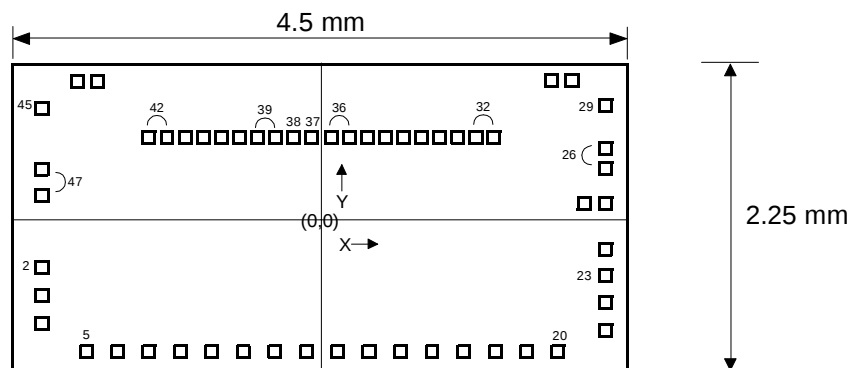


Figure 2-2: WFP6131AR Die

Pad	Signal	X	Y
2	I1_A	-2072.7	-365.9
3	I1_B	-2072.7	-563.7
4	I2_A	-2072.7	-763.7
5	I2_B	-1764.9	-904.2
6	I3_A	-1513.1	-904.2
7	I3_B	-1269.8	-904.2
8	I4_A	-1062.8	-904.2
9	I4_B	-846.2	-904.2
10	I5_A	-631.1	-904.2
11	I5_B	-372.6	-904.2
12	I6_A	-122.8	-904.2
13	I6_B	127.2	-904.2
14	I7_A	377.0	-904.2
15	I7_B	635.5	-904.2
16	I8_A	850.6	-904.2
17	I8_B	1067.2	-904.2
18	I9_A	1274.2	-904.2
19	I9_B	1517.5	-904.2
20	I10_A	1769.3	-904.2
21	I10_B	2072.7	-763.7
22	I11_A	2072.7	-563.7
23	I11_B	2072.7	-365.9
26.1	OUT11	2069.0	250.8
26.2	OUT11	2069.0	377.8
29	A/B_SEL	2069.0	647.5
30	V _{DDA}	1873.0	926.5

Table 2-1: Die Pad Coordinates

Pad	Signal	X	Y
31	GND	1736.0	926.5
32.1	OUT10	1323.9	562.8
32.2	OUT10	1196.9	562.8
33.1	OUT9	1046.3	562.8
33.2	OUT9	919.3	562.8
34.1	OUT8	768.7	562.8
34.2	OUT8	641.7	562.8
35.1	OUT7	491.1	562.8
35.2	OUT7	364.1	562.8
36.1	OUT6	213.5	562.8
36.2	OUT6	86.5	562.8
37	GND	-70.3	562.8
38	V _{DDA}	-207.3	562.8
39.1	OUT5	-364.1	562.8
39.2	OUT5	-491.1	562.8
40.1	OUT4	-641.7	562.8
40.2	OUT4	-768.7	562.8
41.1	OUT3	-919.3	562.8
41.2	OUT3	-1046.3	562.8
42.1	OUT2	-1196.9	562.8
42.2	OUT2	-1323.9	562.8
43	GND	-1736.0	926.5
44	V _{DDA}	-1873.0	926.5
45	EN_11	-2069.0	647.5
47.1	OUT1	-2069.0	377.8
47.2	OUT1	-2069.0	250.8

Table 2-1: Die Pad Coordinates

Function & Pin Information

Table 3-1 Mux Function

A/B_SEL	OUT_x
logic low	Ix_B
logic high	Ix_A

Table 3-2 EN_11 Function

EN_11	Outputs Enabled
logic low or n.c.	OUT_2..OUT_10
logic high	OUT_1..OUT_11

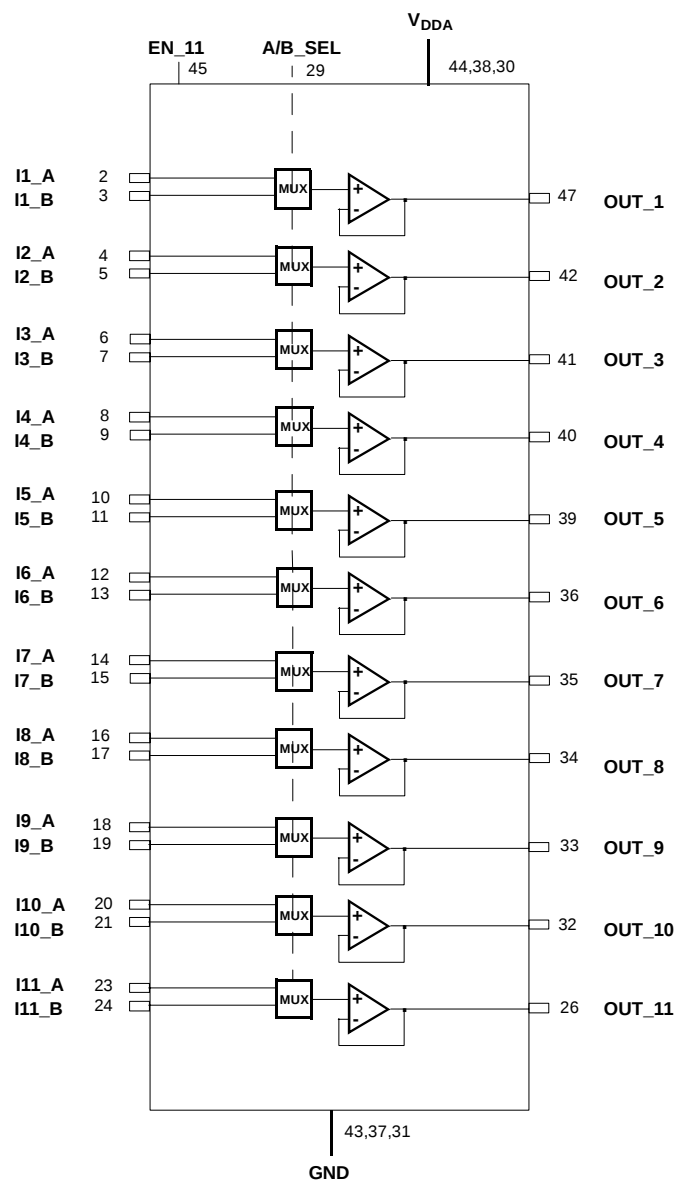


FIGURE 3-1

Application Information

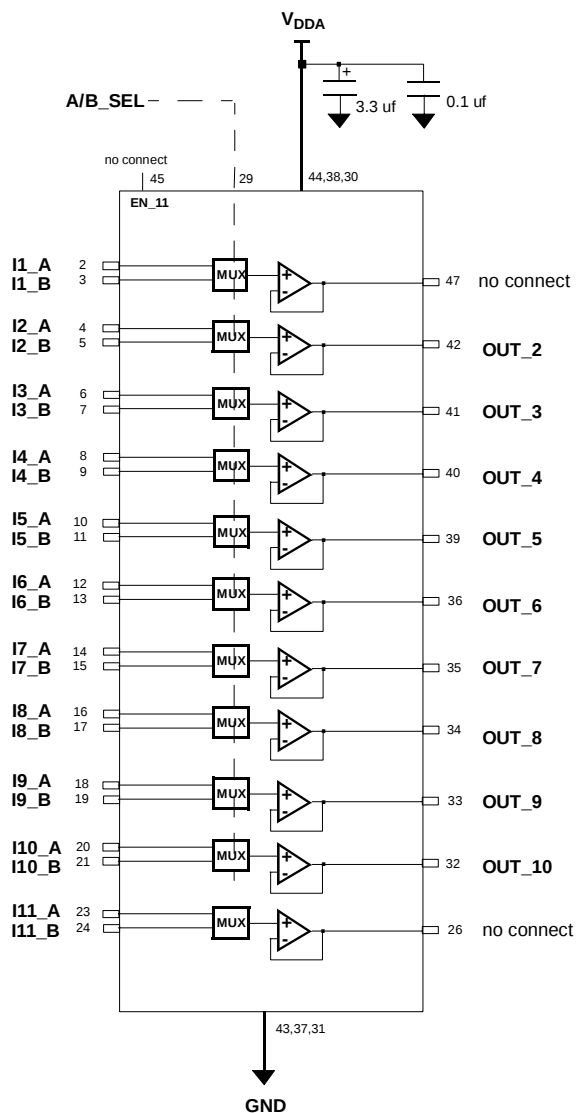


FIGURE 3-2: 9 References
(OUT_1 & OUT_11 disabled)

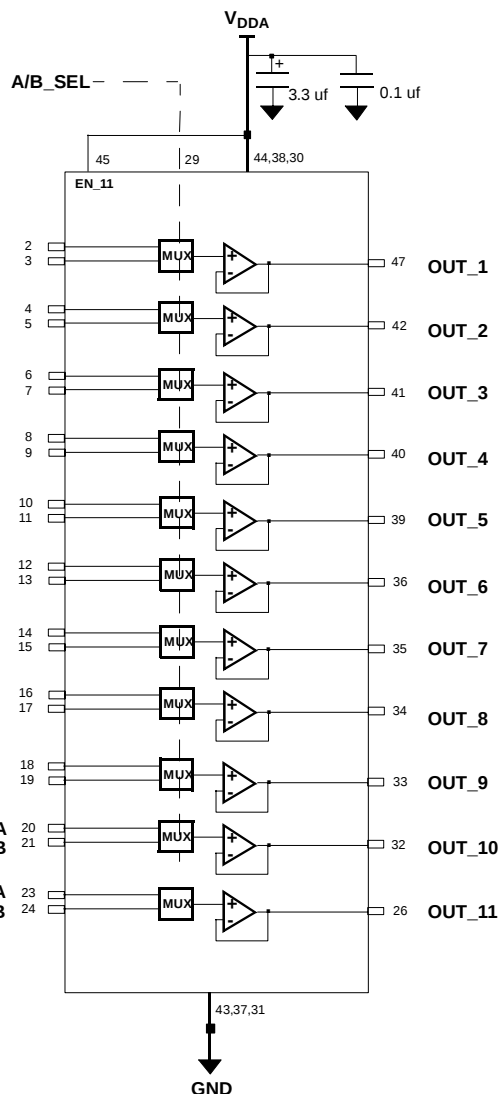


FIGURE 3-3: 11 References

Specifications

0.1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Units	Notes
V _{IN}	Input Voltage	-0.3	V _{DDA} + 0.3	Volts	1
V _{DDA}	Supply Voltage	-0.3	6.0	Volts	1
I _L	Injection Current	-100	100	mA	
T _J	Junction Temperature		150	°C	
T _A	Operating temperature	-20	85	°C	2
T _{STG}	Storage temperature	-30	85	°C	

**Operation at or beyond these limits may result in permanent damage to the device.
Normal operation is not guaranteed at these extremes.**

NOTES: 1) Voltages are with respect to ground (GND).
2) Ambient temperature under bias.

0.2 Recommended Operating Conditions (Preliminary data – subject to change)

Symbol	Parameter	Min	Typical	Max	Units	Notes
V _{DDA}	Analog supply voltage	3.0		5.5	Volts	1
T _A	Ambient air temperature	0	25	70	°C	
C _L	Output load capacitance			0.3	μF	

NOTES: 1) Voltages are with respect to GND.

0.3. DC Characteristics (Preliminary data – subject to change)

$V_{DDA} = 5.0\text{ V}$, $T_A = 25^\circ\text{ C}$.

All voltages are with respect to GND.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions	Note
A_V	Large Signal Gain	0.985	1.0	1.015	V/V	Fig. 4-1	1
V_{IO}	Input Offset Voltage			20	mV	Fig. 4-1	1
V_{O1}	Output Voltage Range	0.2		4.8	V	Fig. 4-1	2
I_{SC}	Output Short Circuit Current	0.5			A	Fig. 4-3	3
I_{VDDA}	Analog Power Supply Current		3	6	mA	EN_11 high	
V_{IH}	Input Logic High	3.6			V		4,5
V_{IL}	Input logic low			0.8	V		4
I_{IN}	Input Leakage Current	-5.0		5.0	μA	$0 < V_{IN} < V_{DDA}$	6
I_{EN_11}	Input Current on EN_11 (high)			50	μA	$V_{IN} = V_{DDA}$	7

- NOTES:**
- 1) $R_L = \text{open}$ and $V_x = 0.0\text{ V}$; $R_S = 2\ \Omega$; $C_L = 0.24\ \mu\text{f}$, $\text{OUT}_n = 2.5\text{V}$
 - 2) $-75\text{ mA} < I_{OUTDC} < 75\text{ mA}$. Applies to $\text{OUT}_1 \dots \text{OUT}_{11}$
 - 3) $\text{OUT}_n = 2.5\text{V}$.
 - 4) Applies to A/B_SEL and EN_11 input pins.
 - 5) For $V_{DDA} = 4.5\text{V}$, $V_{IH\text{ min}} = 2.8\text{V}$.
 - 6) Applies to all input pins except EN_11 in high state.
 - 7) Applies to EN_11 pin when V_{IN} on EN_11 pin = V_{DDA}

0.4. AC Characteristics (Preliminary data – subject to change)

$V_{DDA} = 5.0\text{ V}$, $T_A = 25^\circ\text{ C}$.

All voltages are with respect to GND.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions	Note
T_{SET}	Settling Time			8.0	μsec	Fig. 4-2	1
SR+,SR-	Pos. & Neg. Slew Rate	0.8			V/ μsec	Fig. 4-2	1,2

- NOTES:**
- 1) $R_L/R_S < 5$, $-75\text{ mA} < I_{OUTDC} < 75\text{ mA}$. $C_L = 0.24\ \mu\text{F}$.
Measured for a 4.4V step settling to within 50 mV of final value.
Applies to $\text{OUT}_1 \dots \text{OUT}_{11}$
 - 2) Slew rate measured between 20% and 80% points of step.

0.5. DC Characteristics (Preliminary data – subject to change)
 $V_{DDA} = 3.3\text{ V}$, $T_A = 25^\circ\text{ C}$.

All voltages are with respect to GND.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions	Note
A_V	Large Signal Gain	0.975	1.0	1.025	V/V	Fig. 4-1	1
V_{IO}	Input Offset Voltage			30	mV	Fig. 4-1	1
V_{O1}	Output Voltage	0.2		3.1	V	Fig. 4-1	2
I_{SC}	Output Short Circuit Current	0.33			A	Fig. 4-3	3
I_{VDDA}	Analog Power Supply Current		3	5	mA	EN_11 high	
V_{IH}	Input Logic High	2.0			V		4
V_{IL}	Input logic low			0.8	V		4
I_{IN}	Input Leakage Current	-5.0		5.0	μA	$0 < V_{IN} < V_{DDA}$	5
I_{EN_11}	Input Current on EN_11 (high)			33	μA	$V_{IN} = V_{DDA}$	6

- NOTES:**
- 1) $R_L = \text{open}$ and $V_x = 0.0\text{ V}$; $R_S = 2\ \Omega$; $C_L = 0.24\ \mu\text{f}$, $\text{OUT}_n = 1.65\text{ V}$
 - 2) $-50\text{ mA} < I_{OUTDC} < 50\text{ mA}$. Applies to $\text{OUT}_1 \dots \text{OUT}_{11}$
 - 3) $\text{OUT}_n = 1.65\text{ V}$
 - 4) Applies to A/B_SEL and EN_11 input pins
 - 5) Applies to all input pins except EN_11 in high state
 - 6) Applies to EN_11 pin when V_{IN} on EN_11 pin = V_{DDA}

0.6. AC Characteristics (Preliminary data – subject to change)
 $V_{DDA} = 3.3\text{ V}$, $T_A = 25^\circ\text{ C}$.

All voltages are with respect to GND.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions	Note
T_{SET}	Settling Time			8.0	μsec	Fig. 4-2	1
SR+, SR-	Pos. & Neg. Slew Rate	0.6			V/ μsec	Fig. 4-2	1

- NOTES:**
- 1) $R_L/R_S < 5$, $-50\text{ mA} < I_{OUTDC} < 50\text{ mA}$. $C_L = 0.24\ \mu\text{F}$.
 Measured for a 2.6V step settling to within 30 mV of final value.
 Applies to $\text{OUT}_1 \dots \text{OUT}_{11}$
 - 2) Slew rate measured between 20% and 80% points of step.

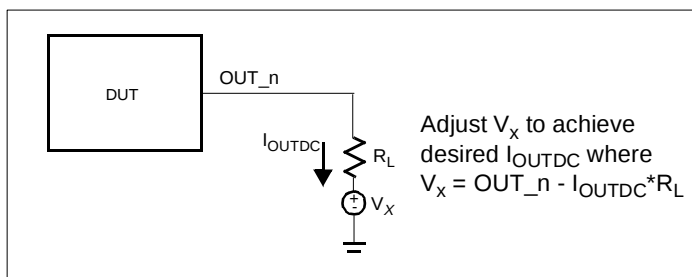


Figure 4-1

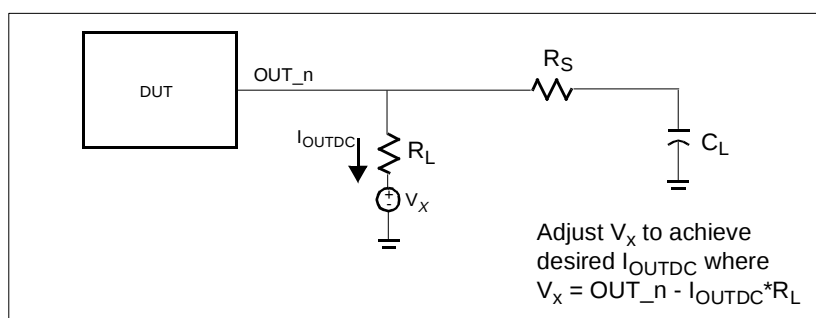


Figure 4-2

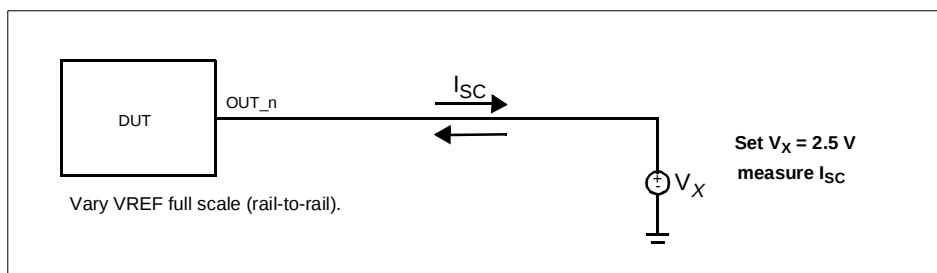
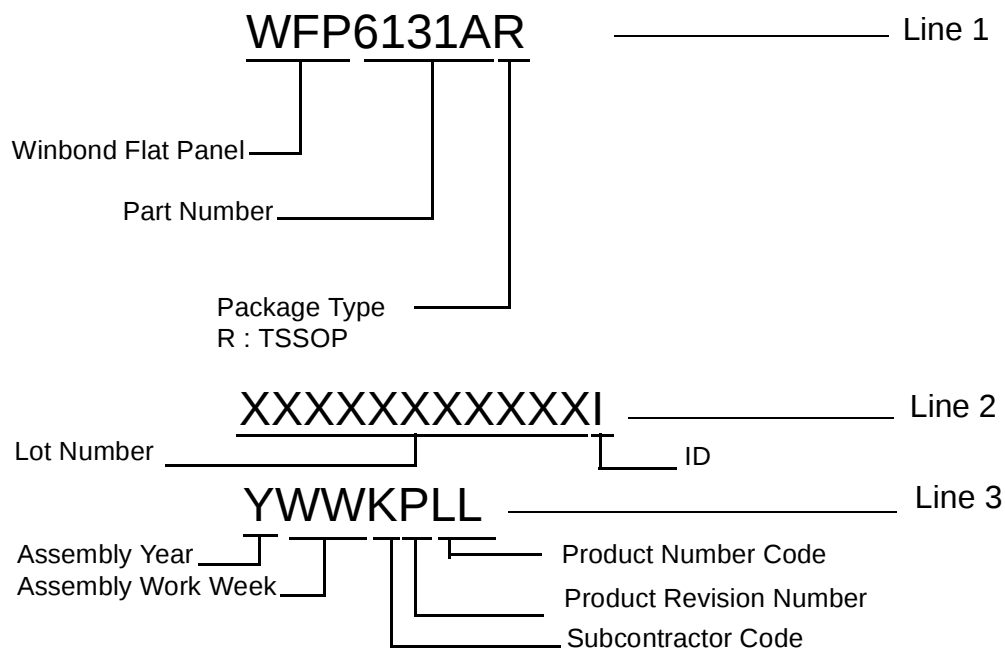


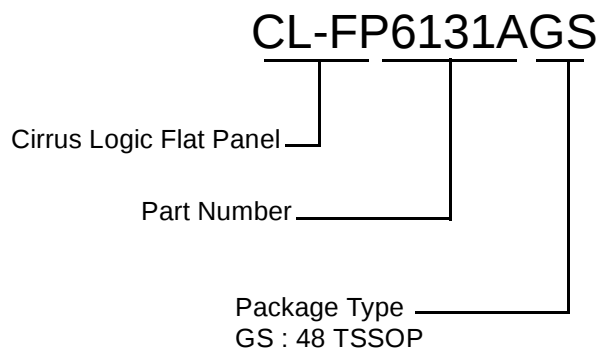
Figure 4-3

Package Top Marking Guide

For product assembled *after* 12/31/99



For product assembled *before* 12/31/99



Date of Issue	Description of Changes in Rev. 0.02
January 5, 2000	Changed package marking specification to reflect Winbond part number.
Date of Issue	Description of Changes in Rev. 0.03
May 22, 2000	Changed part number from WFP6131AGSR to WFP6131AR.