



**IT8687R**

*I/O Buffer Chip*

**Preliminary Specification V0.6**

## Revision History

**Note: Words in bold lettering in the revisions below indicate the changes.**

Document Release	Date	Revision	Page No.
Release Version 0.6	3/6/98	On page 5, change the parameter name of O18 Type Buffer on Table 6-1. DC Electrical Characteristics to <b>O12 Type Buffer</b> .	5
		On page 5, change the Min. of $V_{IH}$ of ISH Type Buffer from 1.0 to <b>3.0</b> .	5
		On page 5, change the Max. of $V_{IL}$ of IS Type Buffer from 0.6 to <b>0.7</b> .	5
		On page 5, change the Max. of $V_{IL}$ of ISH Type Buffer from -1 to <b>0.9</b> .	5
		On page 5, change the Conditions of $V_{OL}$ under O12 Type Buffer from $I_{OL}=18mA$ to " $I_{OL}=12mA."$	5
		On page 5, change the Conditions of $V_{OH}$ under O12 Type Buffer from $I_{OH}=-6mA$ to " $I_{OH}=-4mA."$	5

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### 1. Features

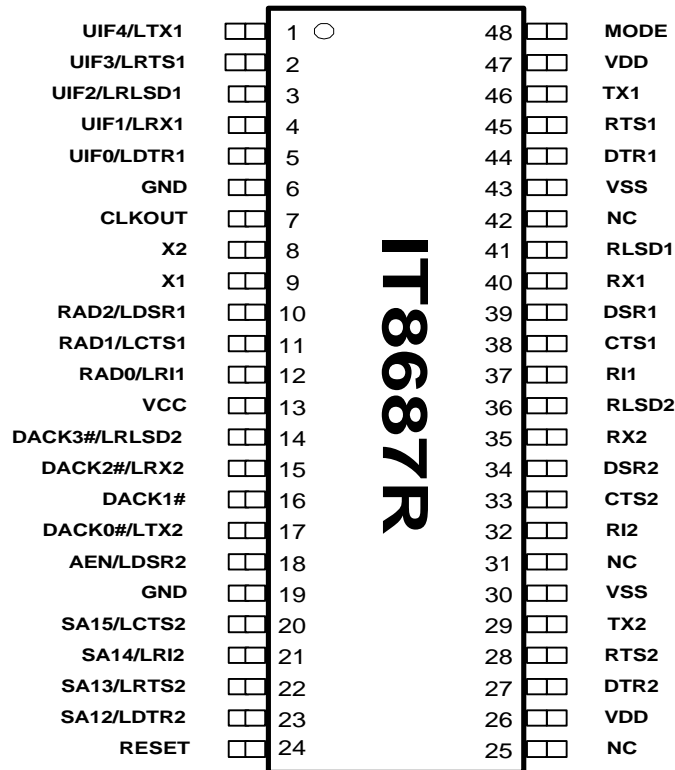
- Contains six (6) line drivers (1488) and ten (10) line receivers (1489)
- Supports two (2) RS-232 serial ports
- Very low power consumption (150mW)
- Supports one (1) crystal oscillator clock generator
- Four power supply inputs: 0V, 5V, -12V, +12V
- High voltage CMOS process
- 48-pin SSOP package

### 2. General Description

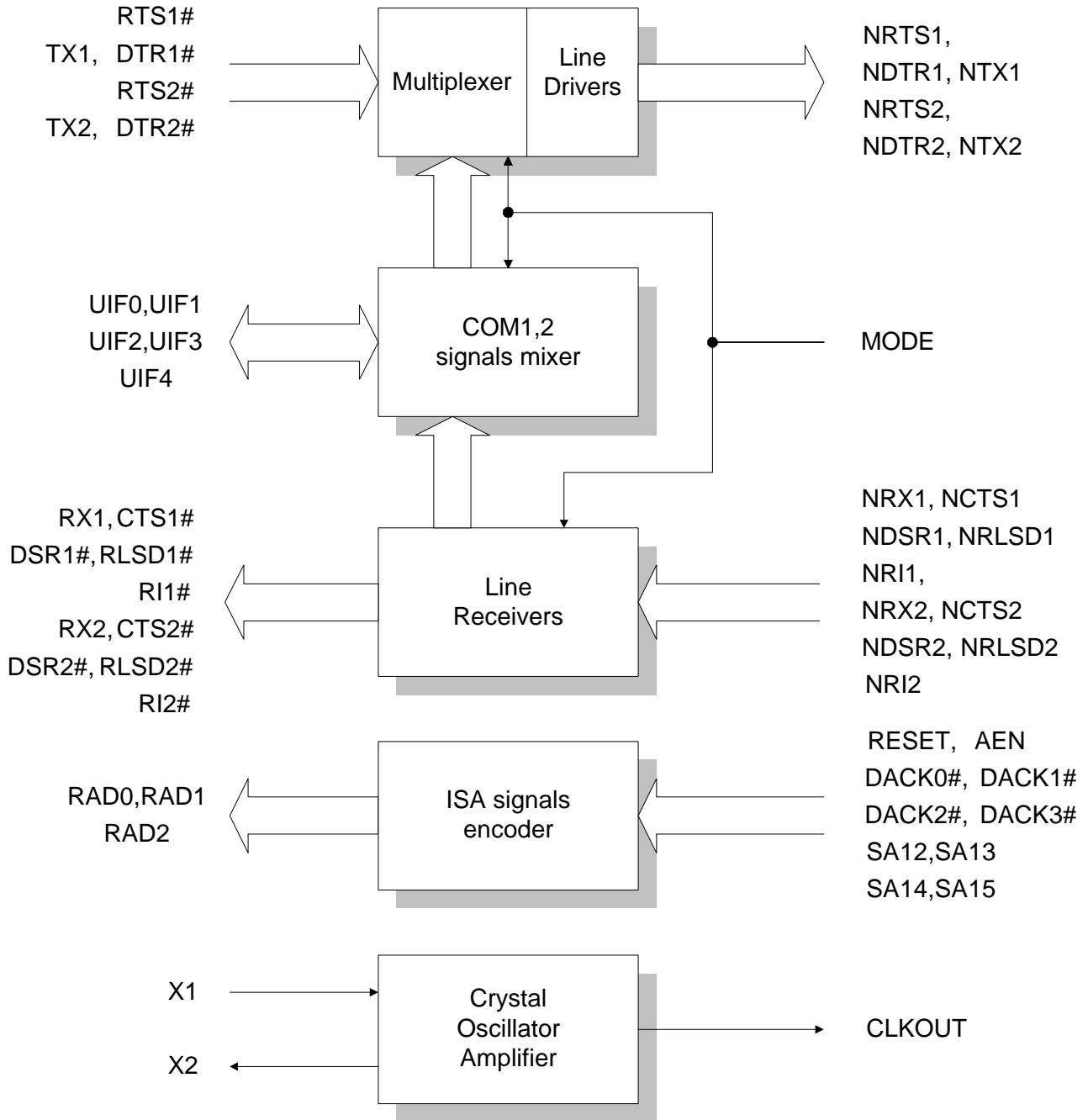
IT8687R integrates six (6) line drivers, ten (10) line receivers, one ISA signal encoder, one (1) UART signal-mixing control logic, and one 24/48 MHz clock generator. The ISA signals; (1) SA12, SA13, SA14, SA15, DACK0#, DACK1#, DACK2#, DACK3#, AEN, RESET are encoded into three (3) signals -- RAD0, RAD1, RAD2. 16 UART interface

signals are encoded into UIF0, UIF1, UIF2, UIF3, UIF4 to minimize the pin count and the package cost. This low power consumption chip is designed to serve as an interface between data terminal equipment and data communication equipment in conformance with the EIA standard RS-232 specifications.

### 3. Pin Configuration



4. Block Diagram



**5. IT8687R Pin Description**
**Table 5-1. Signal Names (by pin numbers in alphabetical order)**

Pin No.	Symbol	I/O	Description
1	UIF4/LTX1	IS	Serial ports 1,2 signals sample clock input. The second function is Serial Port 1 TX line driver input.
2	UIF3/LRTS1	IS	Serial ports 1,2 transfer cycle indicator. The second function is Serial Port 1 RTS line driver input.
3	UIF2/LRLSD1	O18	Serial port 2 signals RLSD2, RX2, DSR2, CTS2, RI2 mixing-signal output pin. The second function is Serial Port 1 RLSD line receiver output.
4	UIF1/LRX1	O18	Serial port 1 signals RLSD1, RX1, DSR1, CTS1, RI1 mixing-signal output pin. The second function is Serial Port 1 RX line receiver output.
5	UIF0/LDTR1	IS	Serial ports 1,2 signals TX1, TX2, RTS1, RTS2, DTR1, DTR2 mixing-signal input pin. The second function is Serial Port 1 DTR line driver input.
7	CLKOUT	O8	Output clock generated by the crystal oscillator
8	X2	O	Crystal oscillator output
9	X1	I	Crystal oscillator input
10	RAD2/LDSR1	O18	ISA signal encoding output pin 2. The second function is Serial Port 1 DSR line receiver output.
11	RAD1/LCTS1	O18	ISA signal encoding output pin 1. The second function is Serial Port 1 CTS line receiver output.
12	RAD0/LRI1	O18	ISA signal encoding output pin 0. The second function is Serial Port 1 RI line receiver output.
14	DACK3#/ LRLSD2	I/O18	ISA DMA Acknowledge 3, active low. The second function is Serial Port 2 RLSD line receiver output.
15	DACK2#/ LRX2	I/O18	ISA DMA Acknowledge 2, active low. The second function is Serial Port 2 RX line receiver output.
16	DACK1#	IS	ISA DMA Acknowledge 1, active low
17	DACK0#/ LTX2	IS	ISA DMA Acknowledge 0, active low. The second function is Serial Port 2 TX line driver input.
18	AEN/LDSR2	I/O18	Address Enable, active high indicates system is in DMA transfer mode. The second function is Serial Port 2 DSR line receiver output.
20	SA15/LCTS2	I/O18	ISA I/O Address 15. The second function is Serial Port 2 CTS line receiver output.
21	SA14/LRI2	I/O18	ISA I/O Address 14. The second function is Serial Port 2 RI line receiver output.

**Table 5-1. Signal Names (by pin numbers in alphabetical order) [cont'd]**

Pin No.	Symbol	I/O	Description
22	SA13/LRTS2	IS	ISA I/O Address 13. The second function is Serial Port 2 RTS line driver input.
23	SA12/LDTR2	IS	ISA I/O Address 12. The second function is Serial Port 2 DTR line driver input.
24	RESET	IS	System reset, active high
27	DTR2	O16H	Serial port 2 DTR line driver output
28	RTS2	O16H	Serial port 2 RTS line driver output
29	TX2	O16H	Serial port 2 TX line driver output
32	RI2	ISH	Serial port 2 RI line receiver input
33	CTS2	ISH	Serial port 2 CTS line receiver input
34	DSR2	ISH	Serial port 2 DSR line receiver input
35	RX2	ISH	Serial port 2 RX line receiver input
36	RLSD2	ISH	Serial port 2 RLSD line receiver input
37	RI1	ISH	Serial port 1 RI line receiver input
38	CTS1	ISH	Serial port 1 CTS line receiver input
39	DSR1	ISH	Serial port 1 DSR line receiver input
40	RX1	ISH	Serial port 1 RX line receiver input
41	RLSD1	ISH	Serial port 1 RLSD line receiver input
44	DTR1	O16H	Serial port 1 DTR line driver output
45	RTS1	O16H	Serial port 1 RTS line driver output
46	TX1	O16H	Serial port 1 TX line driver output
48	MODE	IS	Primary function is selected when this pin is low; secondary function is selected when it is high.
25,31 42	NC		No Connection
6,19	GND		Ground
13	VCC		+5V power
30,43	VSS		-12V power
26,47	VDD		+12V power

**6. DC Electrical Characteristics**
**Absolute Maximum Ratings**

Ambient Operating Temperature.....0°C to +70°C  
 Storage Temperature.....-55°C to +150°C  
 Supply Voltage to Ground Potential ....-0.5V to VCC+0.3V  
 Supply Hi-Voltage to Ground Potential .....±0.5V to ±12V  
 Applied Normal Output Voltage .....0.5V to VCC+0.3V  
 Applied Normal Input Voltage .....-0.5V to 7V  
 Applied I/O High Voltage .....-0.5V to +15V  
 Power Dissipation .....300mW

**\*Comments**

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to this device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied or intended. Exposure to the absolute maximum rating conditions for extended periods may affect device reliability.

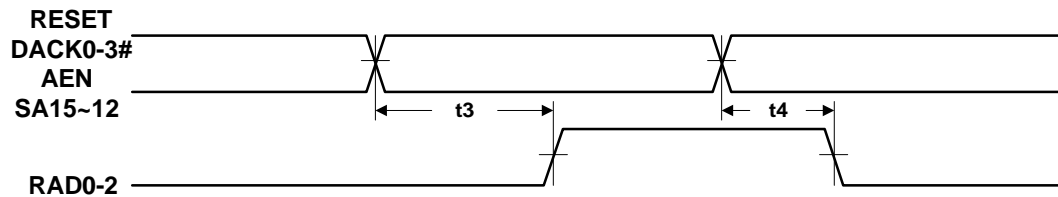
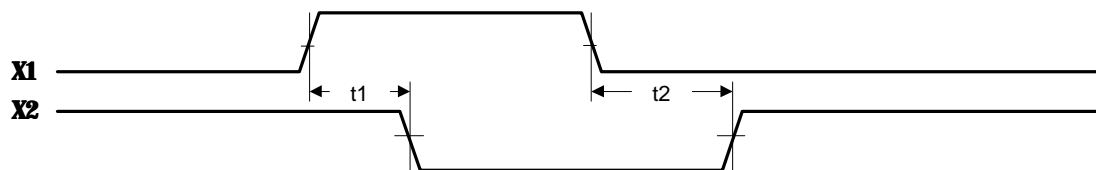
**Table 6-1. DC Electrical Characteristics**

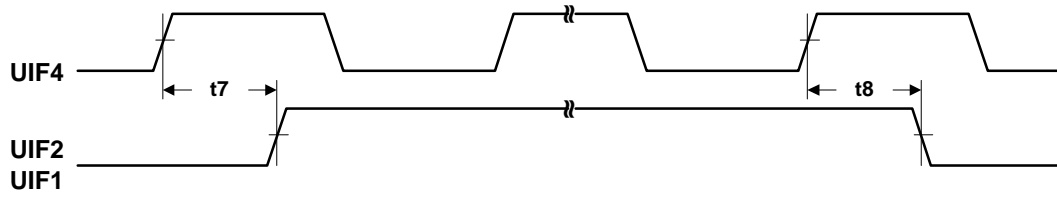
Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
<b>IS Type Buffer (VCC=5V)</b>						
I <sub>IL</sub>	Input Low Leakage			10	μA	V <sub>IN</sub> = 0
I <sub>IH</sub>	Input High Leakage			-10	μA	V <sub>IN</sub> = VCC
V <sub>IL</sub>	Input Low Voltage			0.7	V	
V <sub>IH</sub>	Input High Voltage	3.0			V	
<b>I Type Buffer (VCC=5V)</b>						
I <sub>IL</sub>	Input Low Leakage			10	μA	V <sub>IN</sub> = 0
I <sub>IH</sub>	Input High Leakage			-10	μA	V <sub>IN</sub> = VCC
<b>O8 Type Buffer (VCC=5V)</b>						
V <sub>OL</sub>	Output Low Voltage			0.4	V	I <sub>OL</sub> = 8mA
V <sub>OH</sub>	Output High Voltage	2.4			V	I <sub>OH</sub> = -4mA
<b>O12 Type Buffer (VCC=5V)</b>						
V <sub>OL</sub>	Output Low Voltage			0.4	V	I <sub>OL</sub> = 12 mA
V <sub>OH</sub>	Output High Voltage	2.4			V	I <sub>OH</sub> = -4 mA
<b>ISH Type Buffer (VDD=+12V, VSS=-12V)</b>						
I <sub>IL</sub>	Input Low Leakage		10		μA	V <sub>IN</sub> = -12 V
I <sub>IH</sub>	Input High Leakage			-10	μA	V <sub>IN</sub> = +12 V
V <sub>IL</sub>	Input Low Voltage			0.9	V	
V <sub>IH</sub>	Input High Voltage	3.0			V	
<b>O16H Type Buffer (VDD=+12V, VSS=-12V)</b>						
V <sub>OL</sub>	Output Low Voltage			-8	V	I <sub>OL</sub> = 8 mA
V <sub>OH</sub>	Output High Voltage	8			V	I <sub>OH</sub> = -4 mA



**7. AC Characteristics**
**Table 7-1. AC Characteristics**

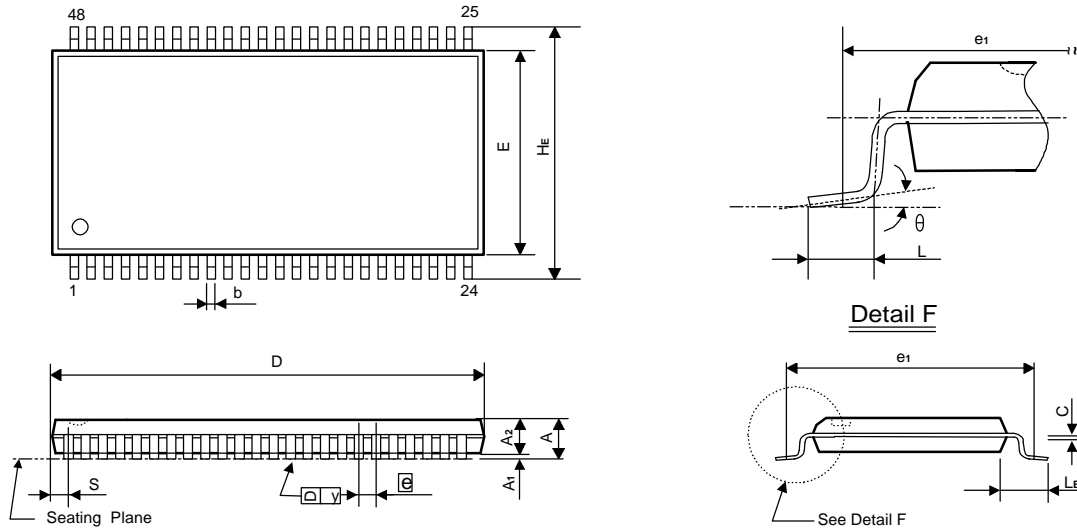
Symbol	Parameter	Min.	Typ.	Max.	Unit
t1	X1 ↑ to X2 ↓		20	30	ns
t2	X1 ↓ to X2 ↑		25	40	ns
t3	RESET/DACK0-3#/AEN/SA15-12 change state to RAD0-2 ↑		50	70	ns
t4	RESET/DACK0-3#/AEN/SA15-12 change state to RAD0-2 ↓		40	60	ns
t5	UIF4 ↓ to DTR1/2, RTS1/2, TX1/2 ↑		100	120	ns
t6	UIF4 ↓ to DTR1/2, RTS1/2, TX1/2 ↓		95	110	ns
t7	UIF4 ↑ to UIF1, UIF2 ↑		60	80	ns
t8	UIF4 ↑ to UIF1, UIF2 ↓		50	80	ns





**8. Package Information**  
 SSOP 48L Outline Dimensions

unit: inches/mm



Symbol	Dimension in inches	Dimension in mm
A	0.110 Max.	2.79 Max.
A1	0.004 Min.	0.10 Min.
A2	0.090 ± 0.005	2.29 ± 0.12
b	0.010 +0.003 -0.002	0.25 +0.08 -0.05
C	0.008 +0.002 -0.002	0.20 +0.05 -0.05
D	0.625 Typ. (0.637 Max.)	15 Typ. (16.18 Max.)
E	0.295 ± 0.005	7.49 ± 0.13
e	0.025 ± 0.006	0.64 ± 0.15
e <sub>1</sub>	0.370 NOM.	9.40 NOM.
HE	0.408 ± 0.012	10.36 ± 0.31
L	0.030 ± 0.010	0.76 ± 0.26
LE	0.057 ± 0.008	1.45 ± 0.20
S	0.035 Max.	0.89 Max.
y	0.004 Max.	0.10 Max.
θ	0° ~ 10°	0° ~ 10°

**Notes:**

1. The maximum value of dimension D includes end flash.
2. Dimension E does not include resin fins.
3. Dimension e<sub>1</sub> is for PC Board surface mount pad pitch design reference only.
4. Dimension S includes end flash.

**9. Ordering Information**

<b>Part No.</b>	<b>Package</b>
IT8687R	SSOP 48L