

DATA SHEET

Part No.	AN30221A
Package Code No.	TQFP048-P-0707B

Maintenance/Discontinued includes following lifecycle stage.
planned maintenance type
maintenance type
planned discontinued type
discontinued type
Please visit following URL about latest information.
<http://www.semicon.panasonic.co.jp/en/>

Contents

■ Overview	3
■ Features	3
■ Applications	3
■ Package	3
■ Type	3
■ Block Diagram	4
■ Pin Descriptions	5
■ Absolute Maximum Ratings	6
■ Operating Supply Voltage Range	6
■ Electrical Characteristics	7
■ Electrical Characteristics (Reference values for design)	9
■ Technical Data	10
• $P_D - T_a$ diagram	10

AN30221A

For color TFT-LCD

■ Overview

AN30221A is a silicon monolithic bipolar IC for generating gradation voltage for liquid crystal.

■ Features

- Amplifier for 1.23 V reference voltage and reference power supply (single output)
- Gradation voltage output amplifier (10 outputs), COM amplifier (single output)

■ Applications

- IC for generation voltage for liquid crystal

■ Package

- 48-pin quad flat plastic package

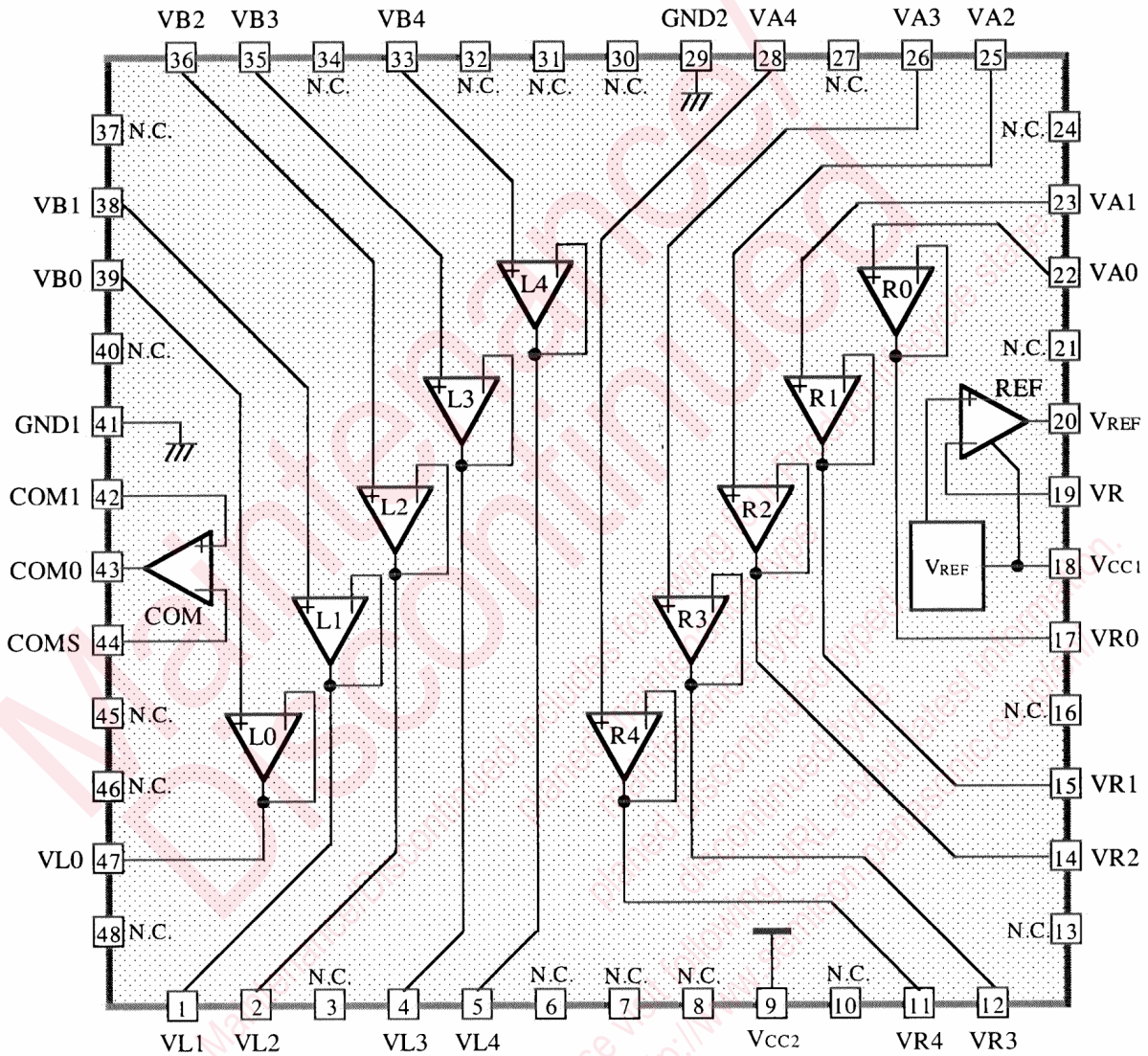
■ Type

- Silicon monolithic bipolar IC

Maintenance/Discontinued includes following four Product lifecycle stage.
planned maintenance type
maintenance type
planned discontinued type
discontinued type
Please visit following URL about latest information.
<http://www.semicon.panasonic.co.jp/en/>

■ Block Diagram

(TOP-VIEW)



■ Pin Descriptions

Pin No.	Pin Name	Pin No.	Pin Name
1	VL1	25	VA2
2	VL2	26	VA3
3	N.C.	27	N.C.
4	VL3	28	VA4
5	VL4	29	GND2
6	N.C.	30	N.C.
7	N.C.	31	N.C.
8	N.C.	32	N.C.
9	V _{CC2}	33	VB4
10	N.C.	34	N.C.
11	VR4	35	VB3
12	VR3	36	VB2
13	N.C.	37	N.C.
14	VR2	38	VB1
15	VR1	39	VB0
16	N.C.	40	N.C.
17	VR0	41	GND1
18	V _{CC1}	42	COM1
19	VR	43	COM0
20	V _{REF}	44	COMS
21	N.C.	45	N.C.
22	VA0	46	N.C.
23	VA1	47	VL0
24	N.C.	48	N.C.

■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Supply voltage	V_{CC}	14.2	V	—
2	Supply current	I_{CC}	—	mA	—
3	Power dissipation	P_D	300	mW	*1
4	Operating ambient temperature	T_{opr}	-25 to +75	°C	*2
5	Storage temperature	T_{stg}	-55 to +150	°C	*2

Note) *1: Power dissipation shows the value of only package at $T_a = 75^\circ\text{C}$.

When using this IC, refer to the $\bullet P_D - T_a$ diagram in the ■ Technical Data and use under the condition not exceeding the allowable value.

*2: Expect for the storage temperature and operating ambient temperature, all ratings are for $T_a = 25^\circ\text{C}$.

■ Operating Supply Voltage Range

Parameter	Symbol	Range	Unit	Note
Supply voltage range	V_{CC}	7 to 14	V	—

■ Electrical Characteristics

Note) $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
Total								
1	Circuit current	I_{CC}		—	4	6	mA	—
2	Reference voltage	V_{REF}		1.217	1.23	1.243	V	—
3	Input bias current	I_B		—	—	500	nA	—
REF amplifier								
4	Operation upper limit voltage 1	V_{H1}	Source current: 2 mA An oscillation preventive capacitor of 0.1 μF or more is connected	$V_{CC} - 0.2 \text{ V}$	—	—	V	—
5	Operation upper limit voltage 2	V_{H2}	Source current: 3 mA An oscillation preventive capacitor of 0.1 μF or more is connected	$V_{CC} - 0.3 \text{ V}$	—	—	V	—
6	Operation lower limit voltage	V_L	An oscillation preventive capacitor of 0.1 μF or more is connected	—	—	V_{REF}	V	—
R0 amplifier								
7	Operation upper limit voltage 1	V_H^{R01}	Source current: 10 mA	$V_{CC} - 0.2 \text{ V}$	—	—	V	—
8	Operation upper limit voltage 2	V_H^{R02}	Source current: 15 mA	$V_{CC} - 0.25 \text{ V}$	—	—	V	—
9	Operation lower limit voltage	V_L^{R0}	Sink current: 0.1 mA	—	—	$V_{CC} - 3 \text{ V}$	V	—
10	Offset voltage	V_{OFFR0}		—	—	10	mV	—
R1 amplifier								
11	Operation upper limit voltage	V_H^{R1}	Source current: 15 mA	$V_{CC} - 0.7 \text{ V}$	—	—	V	—
12	Operation lower limit voltage	V_L^{R1}	Sink current: 15 mA	—	—	$V_{CC}/2$	V	—
13	Offset voltage	V_{OFFR1}		—	—	10	mV	—
R2/R3/R4/L2/L3/L4 amplifier								
14	Output upper limit voltage 1	$V_H^{R2, R4}$	Source current: 15 mA	$V_{CC} - 1.5 \text{ V}$	—	—	V	—
15	Output lower limit voltage 1	$V_L^{R2, R4}$	Sink current: 15 mA	—	—	2	V	—
16	Output upper limit voltage 2	$V_H^{L2, L4}$	Source current: 15 mA	$V_{CC} - 2 \text{ V}$	—	—	V	—
17	Output lower limit voltage 2	$V_L^{L2, L4}$	Sink current: 15 mA	—	—	1.5	V	—
18	Offset voltage	V_{OFF234}		—	—	10	mV	—

■ Electrical Characteristics (continued)

Note) $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
L1 amplifier								
19	Output upper limit voltage	V_H^{L1}	Source current: 15 mA	$V_{CC}/2$	—	—	V	—
20	Output lower limit voltage	V_L^{L1}	Sink current: 15 mA	—	—	0.7	V	—
21	Offset voltage	V_{OFFL1}		—	—	15	mV	—
L0 amplifier								
22	Output upper limit voltage	V_H^{L0}	Source current: 50 μA	3	—	—	V	—
23	Output lower limit voltage	V_L^{L0}	Sink current: 15 mA	—	—	0.2	V	—
24	Offset voltage	V_{OFFL0}				15	mV	—
COM amplifier								
25	Output upper limit voltage	V_H^{COM}	Source current: 100 mA	$V_{CC} - 2.5\text{ V}$	—	—	V	—
26	Output lower limit voltage	V_L^{COM}	Sink current: 100 mA	—	—	2.5	V	—
27	Offset voltage	V_{OFFCOM}				10	mV	—

■ Electrical Characteristics (Reference values for design)

Note) $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ unless otherwise specified.

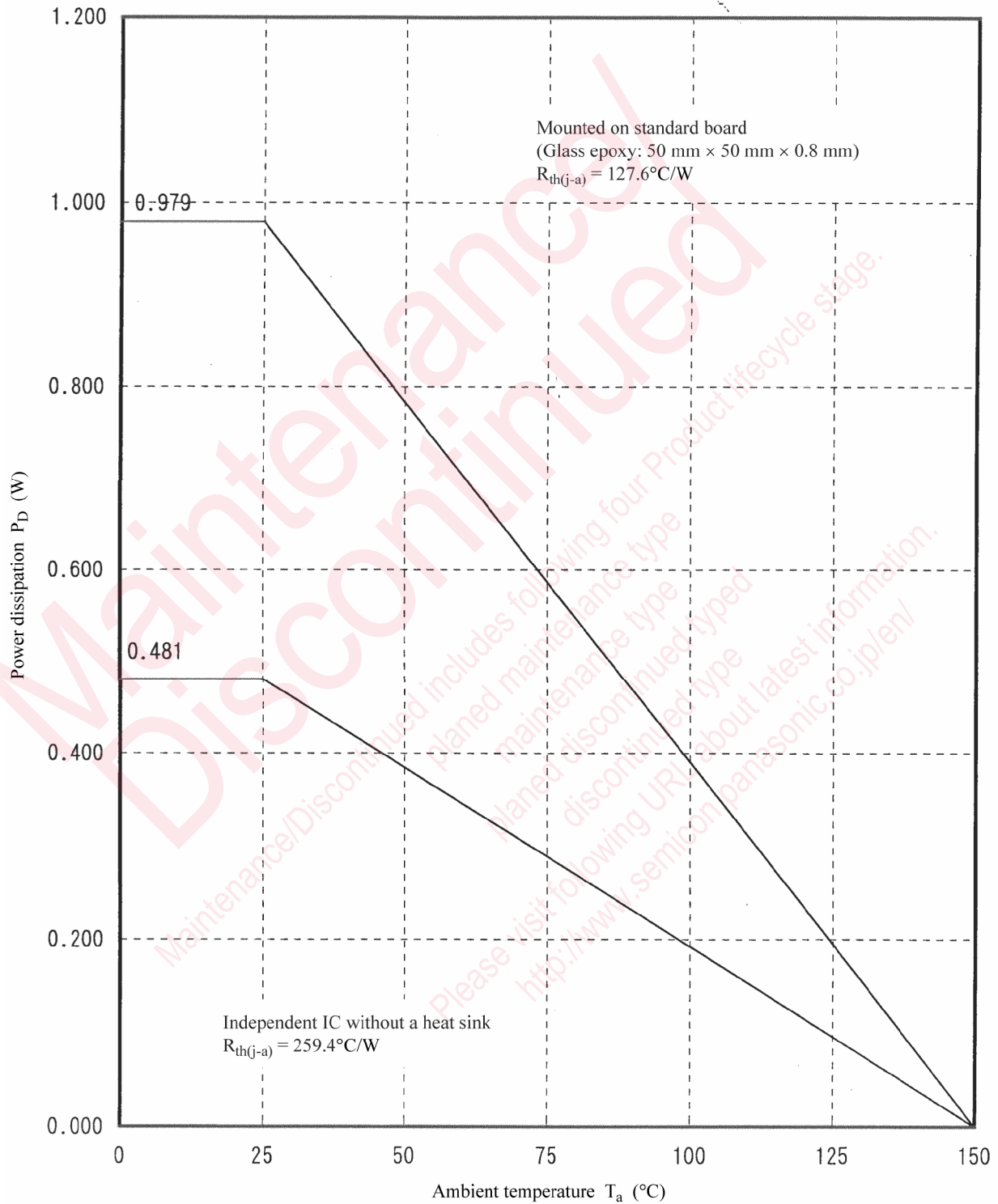
The characteristics listed below are reference values for design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, Matsushita will respond in good faith to user concerns.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
28	Recovery time	Ri-Time COM		—	—	2	μs	—
29	REF amplifier supply voltage change rejection ratio	RS_{RRREF}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-40	dB	—
30	R0 amplifier supply voltage change rejection ratio	RS_{RRR0}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-10	dB	—
31	R1 amplifier supply voltage change rejection ratio	RS_{RRR1}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-15	dB	—
32	R2/R3/R4 amplifier supply voltage change rejection ratio	RS_{RRR234}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-40	dB	—
33	L2/L3/L4 amplifier supply voltage change rejection ratio	RS_{RRL234}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-40	dB	—
34	L1 amplifier supply voltage change rejection ratio	RS_{RRL1}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-10	dB	—
35	L0 amplifier supply voltage change rejection ratio	RS_{RRL0}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-20	dB	—
36	COM amplifier supply voltage change rejection ratio	RS_{RRCOM}	$f = 100 \text{ kHz to } 500 \text{ kHz}$ $200 \text{ mV[p-p]}, 0.1 \mu\text{F connected}$	—	—	-40	dB	—
37	R0 amplifier operation upper limit voltage	V_H^{R03}	Source current: 20 mA	—	$V_{CC} - 0.23$	—	V	—
38	L0 amplifier output lower limit voltage	V_L^{L02}	Sink current: 20 mA	—	0.1	—	V	—

■ Technical Data

- P_D — T_a diagram



Request for your special attention and precautions in using the technical information and semiconductors described in this book

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
 - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.