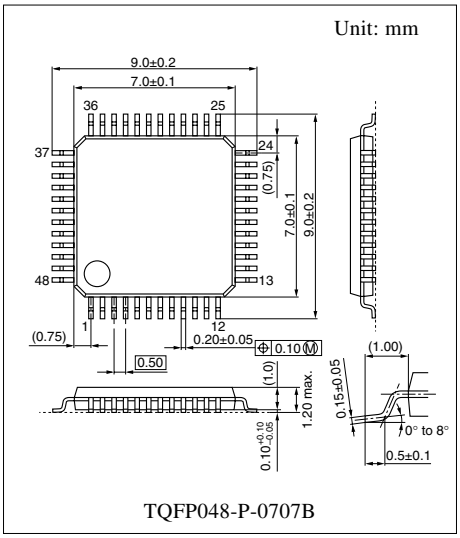
AN1702FHK

Gray-scale voltage generating IC for liquid crystal display

■ Overview

The AN1702FHK has been designed for LCD applications,and features built-in functions such as a gray-scale voltage generatior that supports 256 gradations, a reference voltage of 1.23 V, 16 output buffer amp circuits and a COM amplifier circuit.



TQFP048-P-0707B

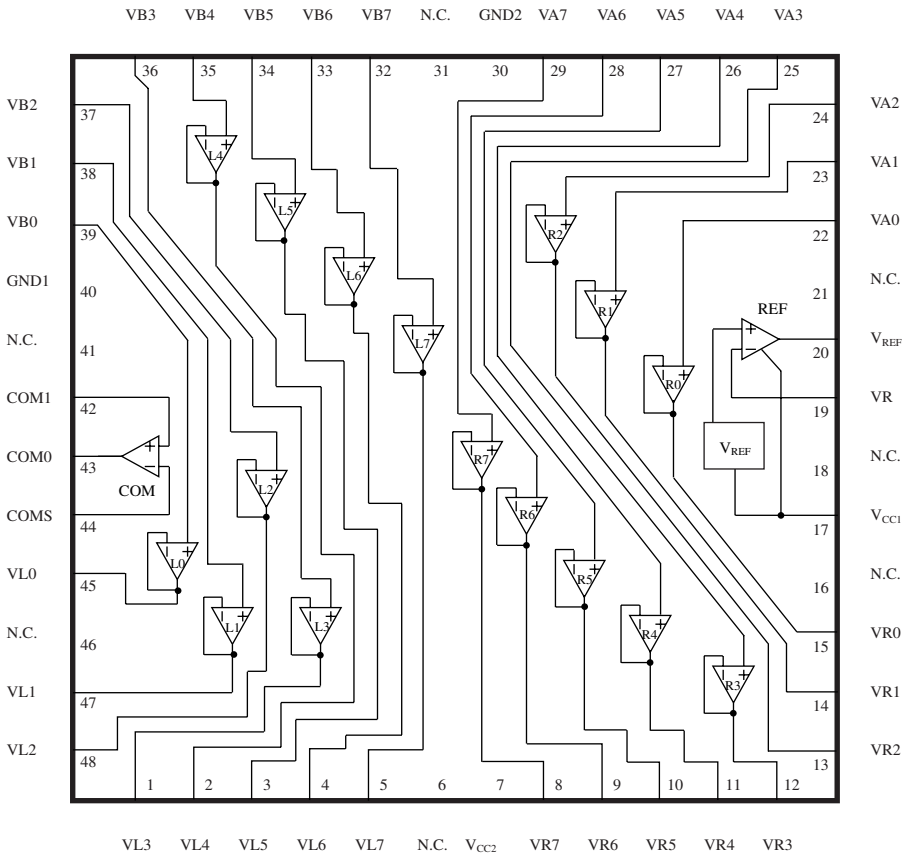
■ Features

- Built-in 1.23 V (typical) high-precision reference voltage power source
- Wide buffer amp. dynamic range output: V_{CC} − 0.2 V (top stage) to GND + 0.15 V (bottom stage)
- Large ±100 mA (max.) COM amp. driving current

■ Applications

- Gray-scale power sources for LCDs

■ Block Diagram



■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	15.8	V
Supply current	I_{CC}	—	mA
Power dissipation *2	P_D	200	mW
Operating ambient temperature *1	T_{opr}	0 to +75	°C
Strage temperature *1	T_{stg}	−55 to +125	°C
REF amplifier output source current	$I_{O_{SOURCE}}$	−5	mA
R0 amplifier output source current	I_{O-R0}	−15	mA
R0 amplifier output sink current	I_{O+R0}	0.05	mA
R0, R1, R2, R3, R4, R5, L5, L4, L3, L2, L1 amplifier output source current	$I_{O-R1\text{-}R5,\ L1\text{-}L5}$	−10	mA
R6, R7, L7, L6 amplifier output source current	$I_{O-R6\text{-}L6}$	−15	mA
R0, R1, R2, R3, R4, R5, L5, L4, L3, L2, L1 amplifier output sink current	$I_{O+R1\text{-}R5,\ L1\text{-}L5}$	10	mA
R6, R7, L7, L6 amplifier output sink current	$I_{O+R6\text{-}L6}$	15	mA
L0 amplifier output source current	I_{O-L0}	− 0.05	mA
L0 amplifier output sink current	I_{O+L0}	15	mA
COM amplifier output source current	I_{O-COM}	−100	mA
COM amplifier output sink current	I_{O+COM}	100	mA
REF amplifier maximum load capacitance	$C_{O_{REF}}$	0.2	µF
R0, R1, R2, R3, R4, R5, R6, R7, L7, L6, L5, L4, L3, L2, L1, L0 amplifier maximum load capacitance	$C_{OR/L}$	0.1	µF
COM amplifier maximum load capacitance	$C_{O_{COM}}$	10	µF

Note) 1. Do not apply external currents or voltages to any pins not specifically mentioned.
For circuit currents, '+' denotes current flowing into the IC, and '−' denotes current flowing out of the IC.

2. *1: Except for the power dissipation, operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.
*2: T_a = 75°C. For the independent IC without a heat sink.

■ Recommended Operating Range

Parameter		Symbol	Range	Unit
Supply voltage		V_{CC}	7 to 15.5	V
Load capacitance	R0 to L0	CLOAD	0.01	µF
	COM		0.1 to 1	µF
	REF		0.1	µF

■ Electrical Characteristics at T_a = 25°C

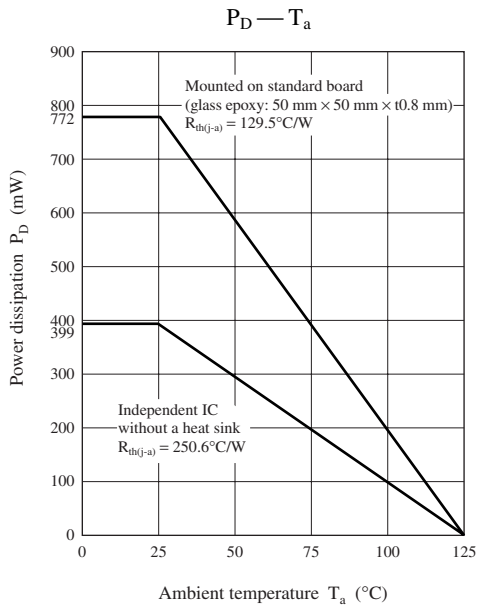
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit current	I_{CC}		—	—	10	mA
Reference voltage	V_{REF}		1.19	1.23	1.27	V
Input bias current	I_B		—	—	500	nA
REF amplifier block						
Operating upper limit voltage	V_H	I_{OUT} = −2 mA, C_{OUT} ≥ 0.1 µF	V_{CC} − 0.2	—	—	V
Operating lower limit voltage	VL	COUT ≥ 0.1 µF	—	—	V_{REF}	V
R0 amplifier block						
Output upper limit voltage 1	$V_{H_{R01}}$	I_{OUT} = −10 mA	V_{CC} − 0.2	—	—	V
Output upper limit voltage 2	$V_{H_{R02}}$	I_{OUT} = −15 mA	V_{CC} − 0.23	—	—	V
Output lower limit voltage	$V_{L_{R0}}$	I_{OUT} = 0.05 mA	—	—	V_{CC} − 3.0	V
Offset voltage	$V_{OFF_{R0}}$		—	—	10	mV
R1 amplifier block						
Output upper limit voltage	$V_{H_{R1}}$	I_{OUT} = −10 mA	V_{CC} − 0.3	—	—	V
Output lower limit voltage	$V_{L_{R1}}$	I_{OUT} = 10 mA	—	—	V_{CC} / 2	V
Offset voltage	$V_{OFF_{R1}}$		—	—	10	mV
R2 amplifier block						
Output upper limit voltage	V_{HR2}	I_{OUT} = −10 mA	V_{CC} − 0.7	—	—	V
Output lower limit voltage	$V_{L_{R2}}$	I_{OUT} = 10 mA	—	—	V_{CC} / 2	V
Offset voltage	$V_{OFF_{R2}}$		—	—	10	mV
R3, R4, R5, R6, R7, L3, L4, L5, L6, L7 amplifier block						
Output upper limit voltage 1	$V_{H_{R3\text{-}R5}}$	I_{OUT} = −10 mA	V_{CC} − 1.2	—	—	V
Output upper limit voltage 2	$V_{H_{R6\text{-}R7}}$	I_{OUT} = −15 mA	V_{CC} − 1.2	—	—	V
Output lower limit voltage 1	$V_{L_{R3\text{-}R5}}$	I_{OUT} = 10 mA	—	—	2	V
Output lower limit voltage 2	$V_{L_{R6\text{-}R7}}$	I_{OUT} = 15 mA	—	—	2	V
Output upper limit voltage 3	$V_{H_{L3\text{-}L5}}$	I_{OUT} = −10 mA	V_{CC} − 2.0	—	—	V
Output upper limit voltage 4	$V_{H_{L6\text{-}L7}}$	I_{OUT} = −15 mA	V_{CC} − 2.0	—	—	V
Output lower limit voltage 3	$V_{L_{L3\text{-}L5}}$	I_{OUT} = 10 mA	—	—	1.2	V
Output lower limit voltage 4	$V_{L_{L6\text{-}L7}}$	I_{OUT} = 15 mA	—	—	1.2	V
Offset voltage	$V_{OFF_{34567}}$		—	—	10	mV

■ Electrical Characteristics at T_a = 25°C (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
L2 amplifier block						
Output upper limit voltage	$V_{H_{L2}}$	I_{OUT} = −10 mA	V_{CC} / 2	—	—	V
Output lower limit voltage	$V_{L_{L2}}$	I_{OUT} = 10 mA	—	—	0.7	V
Offset voltage	$V_{OFF_{L2}}$		—	—	10	mV
L1 amplifier block						
Output upper limit voltage	$V_{H_{L1}}$	I_{OUT} = −10 mA	V_{CC} / 2	—	—	V
Output lower limit voltage	$V_{L_{L1}}$	I_{OUT} = 10 mA	—	—	0.25	V
Offset voltage	$V_{OFF_{L1}}$		—	—	10	mV
L0 amplifier block						
Output upper limit voltage	$V_{H_{L0}}$	I_{OUT} = − 0.05 mA	3	—	—	V
Output lower limit voltage	$V_{L_{L0}}$	I_{OUT} = 15 mA	—	—	0.15	V
Offset voltage	$V_{OFF_{L0}}$		—	—	10	mV
COM amplifier block						
Output upper limit voltage	$V_{H_{COM}}$	I_{OUT} = −100 mA	V_{CC} −2.5	—	—	V
Output lower limit voltage	$V_{L_{COM}}$	I_{OUT} = 100 mA	—	—	2.5	V
Offset voltage	$V_{OFF_{COM}}$	V_{IN} = 5 V	—	—	10	mV

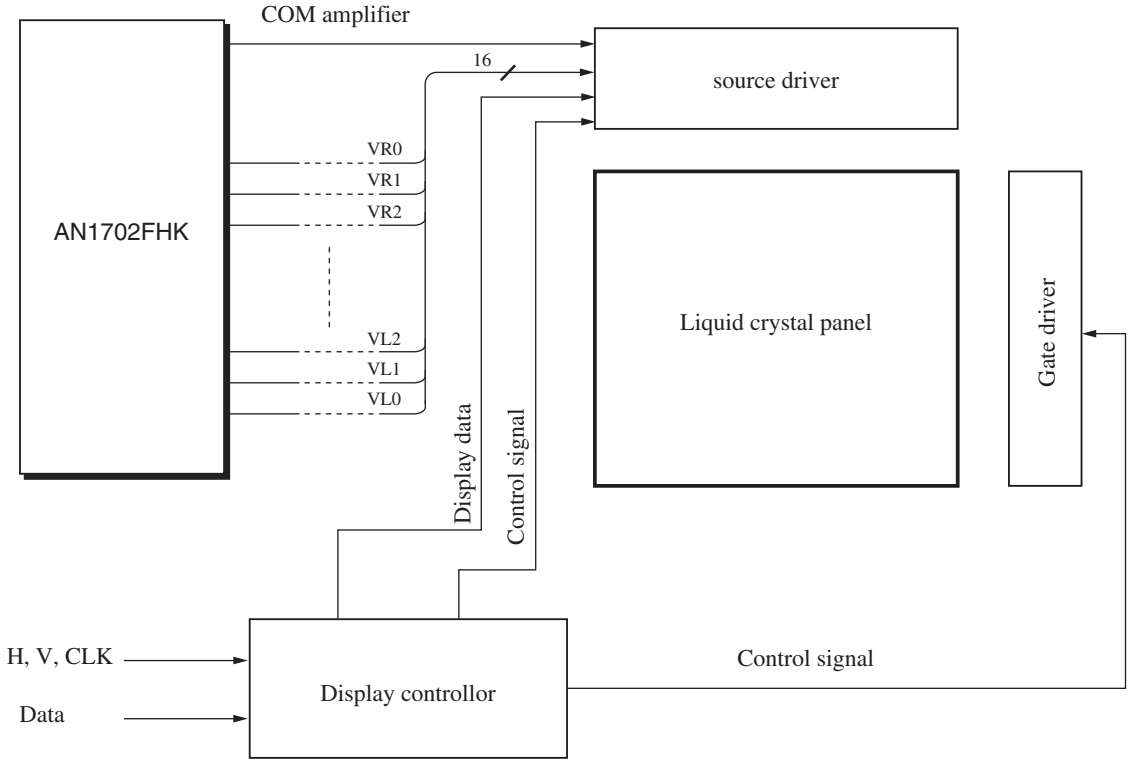
■ Technical Data

• P_D — T_a curves of TQFP048-P-0707B



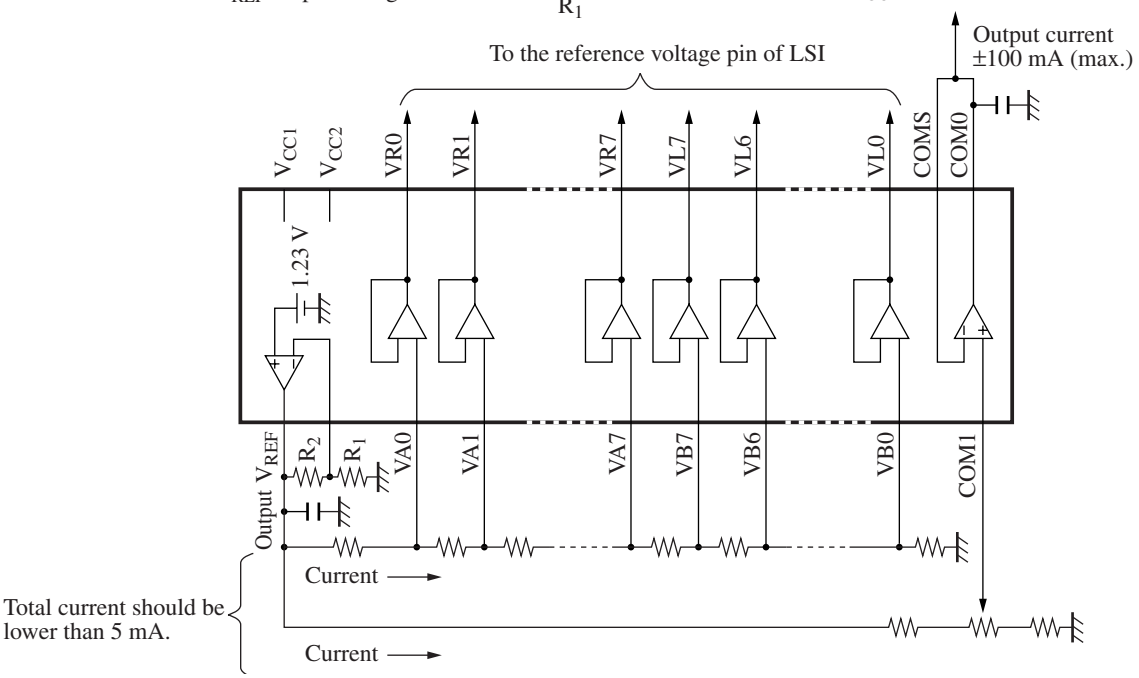
■ Application Circuit Example

• System configuration example



• Application circuit example

$$V_{REF} \text{ output voltage} = 1.23\ V \times \frac{R_1 + R_2}{R_1} \text{ (but this never exceeds } V_{CC})$$



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