

# M62230FP

## LCD MATRIX REGULATOR

### DESCRIPTION

The M62230FP is a semiconductor circuit for LCD matrix regulator, which will generate the divided-voltage to drive LCD matrix.

By changing the connection of R pin(i.e.,Change the internal resistor ratio), M62230FP can support divided voltage ratio ranging from 1/5 bias to 1/13 bias.

The high stability and any desired voltage levels is possible, since the variable voltage regulator for Vref is built-in.

### FEATURES

- Adjustable type voltage divider.  
(The setting range of internal resistor is from 1/5 bias to 1/13 bias)
- 5 resident buffer-Amp. (5 divided output)
- Low power dissipation(1.8 mA Typ.)
- Resident voltage-variable regulator for Vref.

### APPLICATION

To drive LCD.

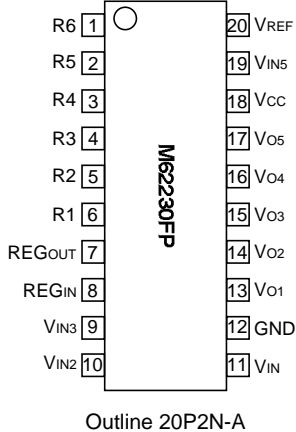
### RECOMMEND OPERATING CONDITIONS (Ta=25°C)

Supply voltage range : GND-Vcc :(if V<sub>1</sub> > -1V, it is necessary to support V<sub>IN</sub>)..... -30 to -10V

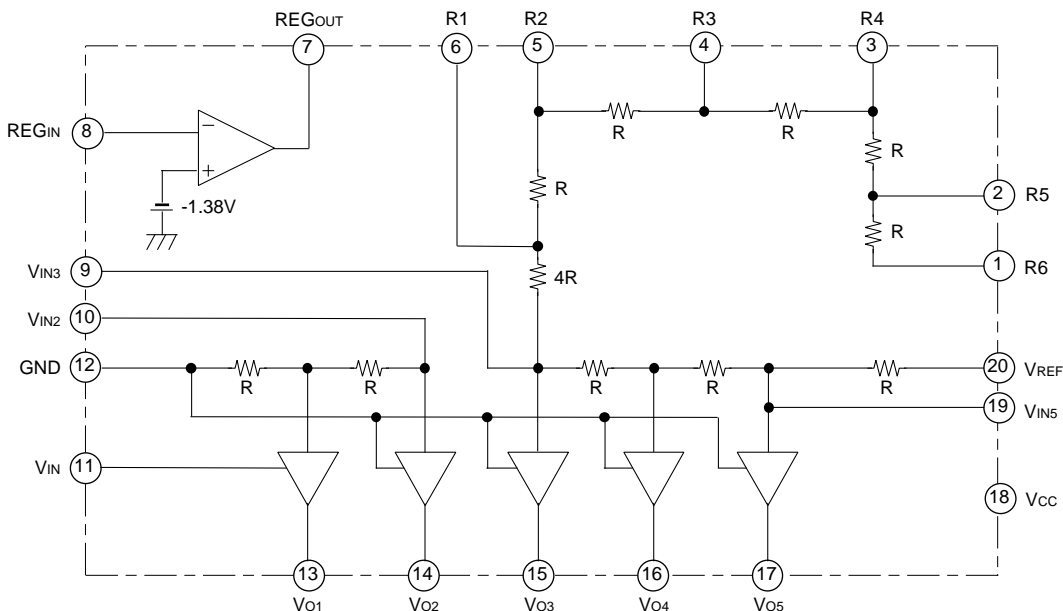
Recommend input voltage GND-VREF :VREF Vcc..... -30 to -6V

(To set Vcc, VREF, in order that both |I<sub>O-V2</sub>| & |I<sub>Vcc-V5</sub>| are larger than 1V)

### PIN CONFIGURATION (TOP VIEW)



### BLOCK DIAGRAM



**EXPLANATION OF TERMINALS**

Pin No.	Symbol	Function
①	R6	If the voltage of each pin can satisfy the following condition: <div style="border: 1px solid black; display: inline-block; padding: 2px;"> <math>V_{o6} \quad V_{o5} \quad V_{o4} \quad V_{o3} \quad V_{o2} \quad V_{o1}</math> </div> these pins will be used. Please refer to page. 4 to set the bias ratio.
②	R5	
③	R4	
④	R3	
⑤	R2	
⑥	R1	
⑦	REGOUT	Regulator output for VREF to use
⑧	REGIN	The inverting input pin of REG OP-Amp
⑨	VIN3	VIN3 Input
⑩	VIN2	VIN2 Input
⑪	VIN	VIN Power if $V_1 > -1.0V$ , it is necessary to support VIN if $V_1 < -1.0V$ , this pin connect to GND
⑫	GND	GND Pin
⑬	VO1	Divided-voltage output pin  To set VCC & VREF, in order that $0 - V_2 \quad 1V$ To set VCC & VREF, in order that $V_5 - V_{CC} \quad 1V$
⑭	VO2	
⑮	VO3	
⑯	VO4	
⑰	VO5	
⑱	VCC	Vcc Power (-Power)
⑲	VIN5	VIN5 input
⑳	VREF	Reference voltage input pin

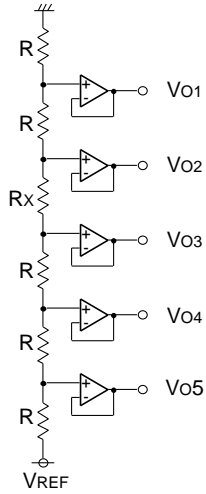
**ABSOLUTE MAXIMUM RATINGS** (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CC</sub>	Supply voltage		-36 to 0	V
I <sub>OUT</sub>	Maximum output current		30	mA
P <sub>d</sub>	Power dissipation	Ta=25°C	550	mW
K <sub>θ</sub>	Thermal derating	Ta>25°C	5.5	mW/°C
T <sub>opr</sub>	Operating temperature		-20 to +75	°C
T <sub>stg</sub>	Storage temperature		-40 to +125	°C

**ELECTRICAL CHARACTERISTICS**(V<sub>CC</sub>=-16V, V<sub>IN</sub>=GND, V<sub>REF</sub>=-12V, Resistor setting=5R, Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V <sub>CC</sub>	Supply voltage		-35		-10	V
I <sub>CC</sub>	Dissipation current	V <sub>REF</sub> = -16V		1.80		mA
R <sub>VO1</sub>	Output voltage ratio 1	V <sub>2</sub> /V <sub>1</sub>	1.98	2.00	2.02	
R <sub>VO2</sub>	Output voltage ratio 2	(V <sub>5</sub> -V <sub>3</sub> )/(V <sub>5</sub> -V <sub>4</sub> )	1.98	2.00	2.02	
R <sub>VO3</sub>	Output voltage ratio 3	V <sub>5</sub> /V <sub>1</sub>	8.90	9.00	9.10	
R <sub>VO4</sub>	Output voltage ratio 4	V <sub>5</sub> /V <sub>2</sub>	4.45	4.50	4.55	
R <sub>VO5</sub>	Output voltage ratio 5	V <sub>5</sub> /(V <sub>5</sub> -V <sub>3</sub> )	4.45	4.50	4.55	
R <sub>VO6</sub>	Output voltage ratio 6	V <sub>5</sub> /(V <sub>5</sub> -V <sub>4</sub> )	8.90	9.00	9.10	
R <sub>R1</sub>	Resistor ratio 1	Resistor between V <sub>IN3</sub> and R <sub>1</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		4		
R <sub>R2</sub>	Resistor ratio 2	Resistor between V <sub>IN3</sub> and R <sub>2</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		5		
R <sub>R3</sub>	Resistor ratio 3	Resistor between V <sub>IN3</sub> and R <sub>3</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		6		
R <sub>R4</sub>	Resistor ratio 4	Resistor between V <sub>IN3</sub> and R <sub>4</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		7		
R <sub>R5</sub>	Resistor ratio 5	Resistor between V <sub>IN3</sub> and R <sub>5</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		8		
R <sub>R6</sub>	Resistor ratio 6	Resistor between V <sub>IN3</sub> and R <sub>6</sub> / resistor between R <sub>1</sub> and R <sub>2</sub>		9		
R	Resistance	Resistor between R <sub>1</sub> and R <sub>2</sub>		20		k
V <sub>1</sub>	Load regulation of output voltage 1	+200μA<I <sub>OUT1</sub> <+10mA			20	mV
V <sub>2-1</sub>	Load regulation of output voltage 2-1	+200μA<I <sub>OUT2</sub> <+10mA			20	mV
V <sub>3-1</sub>	Load regulation of output voltage 3-1	+200μA<I <sub>OUT3</sub> <+10mA			20	mV
V <sub>2-2</sub>	Load regulation of output voltage 2-2	-10mA<I <sub>OUT2</sub> <-200μA			20	mV
V <sub>3-2</sub>	Load regulation of output voltage 3-2	-10mA<I <sub>OUT3</sub> <-200μA			20	mV
V <sub>4</sub>	Load regulation of output voltage 4	-20mA<I <sub>OUT4</sub> <-200μA			20	mV
V <sub>5</sub>	Load regulation of output voltage 5	-20mA<I <sub>OUT5</sub> <-200μA			20	mV
V <sub>REG</sub>	Output voltage of regulator	Buffer output	-1.45	-1.38	-1.31	V
REG-L	Load regulation of V <sub>REF</sub>	-10mA<I <sub>REG</sub> <+2mA			50	mV

**THE SETTING METHOD OF DIVIDED-VOLTAGE**



Rx	Bias ratio	Example of setting
R	1/5	⑨ pin-⑥ pin short, ⑩ pin-⑤ pin short
2R	1/6	⑨ pin-⑥ pin short, ⑩ pin-④ pin short
3R	1/7	⑨ pin-⑥ pin short, ⑩ pin-③ pin short
4R	1/8	⑩ pin-⑥ pin short
5R	1/9	⑩ pin-⑤ pin short
6R	1/10	⑩ pin-④ pin short
7R	1/11	⑩ pin-③ pin short
8R	1/12	⑩ pin-② pin short
9R	1/13	⑩ pin-① pin short