OKI Semiconductor

MSC7166

16-Bit Grid Driver with 4 to 16-Decoder

GENERAL DESCRIPTION

The MSC7166 is a driver IC designed to directly drive the grids of a vacuum fluorescent display tube.

Since this IC has a built-in 4 to 16-line decoder and 16 output circuits, a signal device of MSC7166 can replace a set of the following three: two devices of either MSL912 or MSL918 and one device of either MSM4514 or MSM74HC4514.

Setting the DUTY pin to the "L" level makes all driver outputs go "L". Blanking can be set using this function.

FEATURES

- Logic supply voltage   : 5V
- Driver supply voltage   : 65V
- Driver output current I_{OH} : –40 mA
                          I_{OL} : 1 mA
- Can be directly connected to VF display tube without pull-down resistor
- Built-in 4- to 16-line decoder
- Brightness can be adjusted by DUTY pin
- Package
   24-pin plastic SOP (SOP24-P-430-1.27-K) (Product name: MSC7166GS-K)

BLOCK DIAGRAM
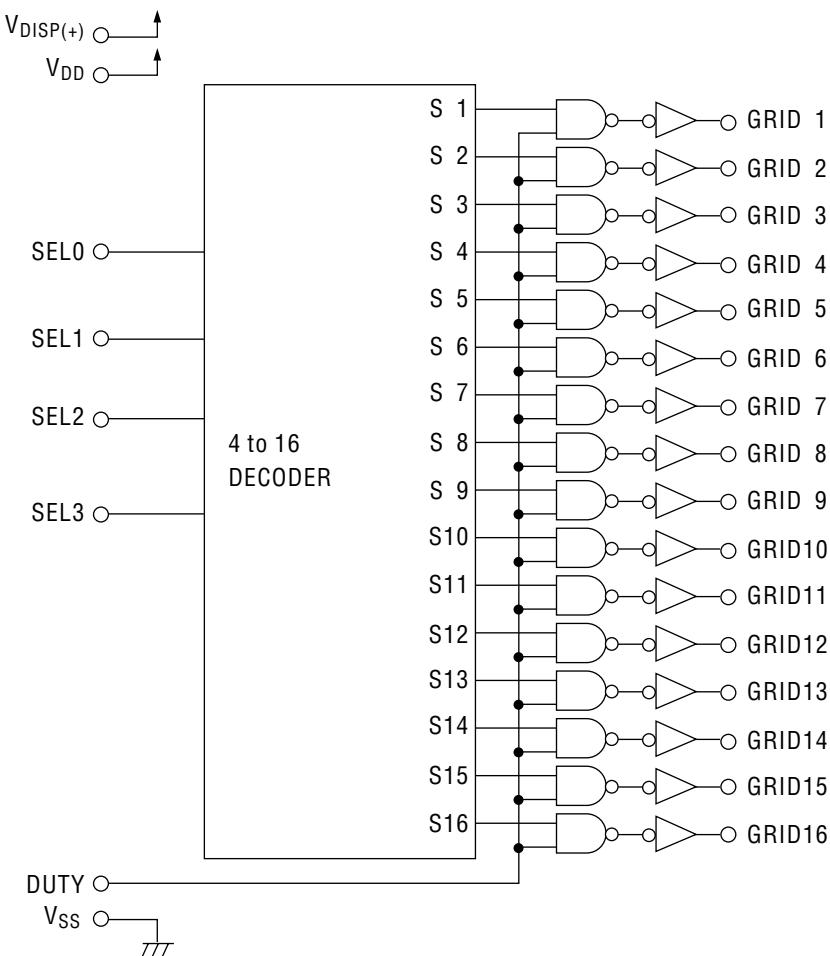
INPUT AND OUTPUT CONFIGURATION

Schematic Diagram of Logic Input Circuit
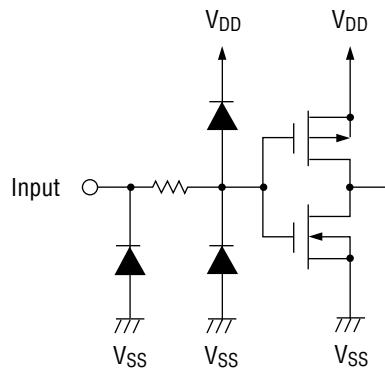
Schematic Diagram of Driver Output Citcuit
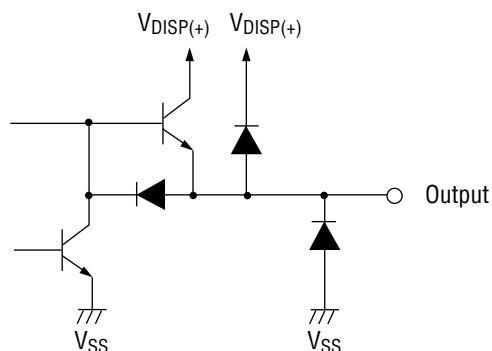
PIN CONFIGURATION (TOP VIEW)

GRID 1	1	
GRID 2	2	
GRID 3	3	
GRID 4	4	
GRID 5	5	
GRID 6	6	
GRID 7	7	
GRID 8	8	
GRID 9	9	
GRID10	10	
GRID11	11	
GRID12	12	

24	V_{SS}
23	SEL 0
22	SEL 1
21	SEL 2
20	SEL 3
19	DUTY
18	V_{DD}
17	$V_{DISP(+)}$
16	GRID 13
15	GRID 14
14	GRID 15
13	GRID 16
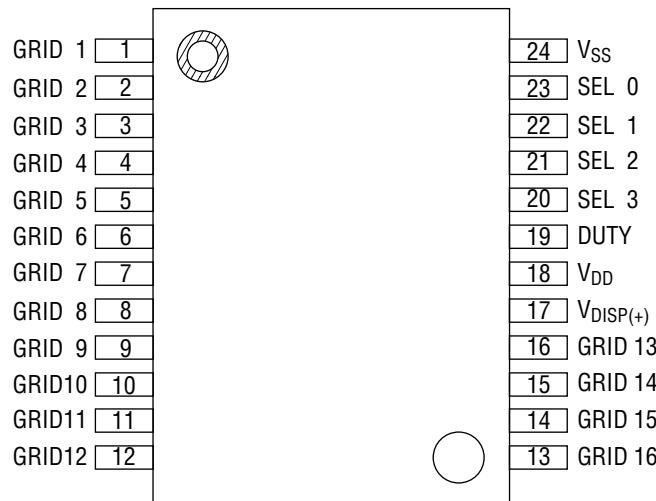
24-pin Plastic SOP

PIN DESCRIPTIONS

Symbol	Type	Description
SEL0-3	I	4- to 16-line decoder input pins. The input 4-bit binary signals are converted into hexadecimal signals, then output through driver output pins.
DUTY	I	Duty control signal input pin. Setting this pin to "L" makes all driver outputs go "L", so this pin can be used for brightness control.
GRID1-16	O	High withstand voltage driver output pins for driving fluorescent display tube. These pins can directly be connected to the grid of fluorescent display tude without pull-down resistor.
$V_{DISP(+)}$	—	Power supply pin for the fluorescent display tube driver circuit.
V_{DD}	—	Logic power supply pin.
V_{SS}	—	Ground pin.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating		Unit
Logic Supply Voltage	V_{DD}	Applied to logic supply pin	−0.3 to +6.5	*1	V
Driver Supply Voltage	$V_{DISP(+)}$	Applied to driver supply pin	−0.3 to +70	*1,2	V
Input Voltage	V_{IN}	Applied to all input pins	−0.3 to V_{DD}+0.3	*1	V
Power Dissipation	P_D	Ta≦25°C	790		mW
Thermal Resistance of Package	R_{j-a}	—	158	*3	°C/W
Storage Temperature	T_{STG}	—	−55 to +150		°C

*1 The maximum supply voltage for V_{SS}.

*2 Permanent damage to the device may be caused if the voltage is supplied over the the absolute maximum rating value.

*3 Thermal resistance of the package (between junction and atmosphere).
    The junction temperature (Tj) given by the equation indicated below should not exceed 150°C.
        Tj=P $\times$ R_{j-a} + Ta (P: maximum power consumption of IC)

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition	Min.	Max.	Unit
Logic Supply Voltage	V_{DD}	Applied to logic supply pin	4.5	5.5	V
Driver Supply Voltage	$V_{DISP(+)}$	Applied to driver supply pin	8	65	V
High Level Input Voltage	V_{IH}	Applied to all input pins	3.1	—	V
Low Level Input Voltage	V_{IL}	Applied to all input pins	—	1.7	V
High Level Output Current	I_{OH}	Applied to all driver output pins	—	−40	mA
Low Level Output Current	I_{OL}	Applied to all driver output pins	—	1.0	mA
Operating Temperature	T_{op}	—	−40	85	°C
Input Pulse Rise Time	t_r	Applied to all input pins	—	1.0	µs
Input Pulse Fall Time	t_f	Applied to all input pins	—	1.0	µs

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{DD}=4.5 to 5.5V, $V_{DISP(+)}$=8 to 65V, Ta=−40 to +85°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Current	I_{DD1}	No load, 1 output H	—	—	4.8	mA
	I_{DD2}	No load, DUTY=L	—	—	5.0	mA
Driver Supply Current	I_{DISP1}	No load, 1 output H	—	—	0.3	mA
	I_{DISP2}	No load, DUTY=L	—	—	1.0	μA
High Level Input Current	I_{IH}	—	—	—	±1	μA
Low Level Input Current	I_{IL}	—	—	—	±1	μA
High Level Output Voltage	V_{OH}	I_{OH}=−40mA	$V_{DISP(+)}$ −4	—	—	V
Low Level Output Voltage	V_{OL}	I_{OL}=1mA	—	—	2.5	V

AC Characteristics

(V_{DD}=4.5 to 5.5V, $V_{DISP(+)}$=8 to 65V, Ta=−40 to +85°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Delay Time L to H	t_{DLH}	C_L=10pF, See figure below	—	0.3	1.0	μs
Transient Time L to H	t_{TLH}	C_L=10pF, See figure below	—	2.0	4.0	μs
Delay Time H to L	t_{DHL}	C_L=10pF, See figure below	—	0.3	1.0	μs
Transient Time H to L	t_{THL}	C_L=10pF, See figure below	—	2.0	4.0	μs
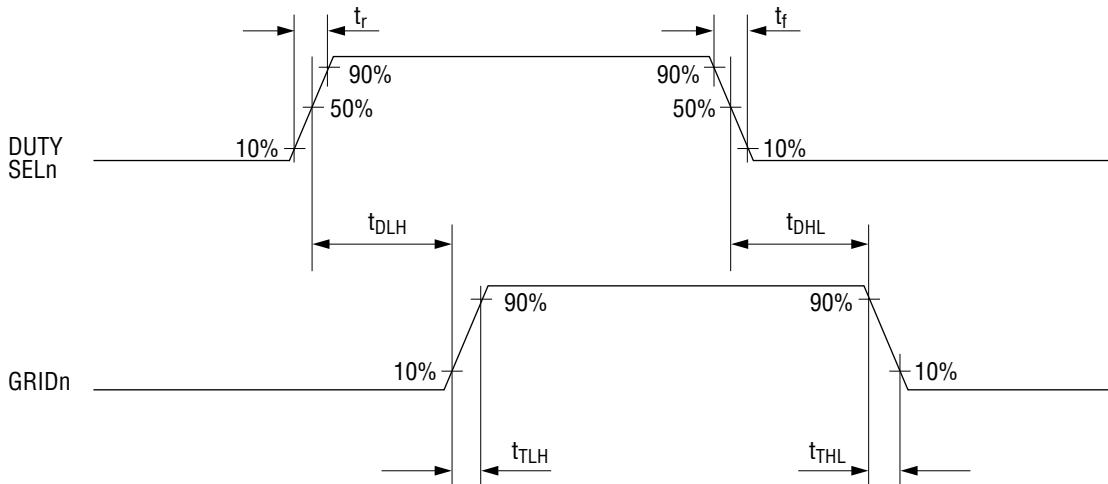
FUNCTION DESCRIPTION

Functional Table

DUTY	SEL				GRID															
	0	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L	X	X	X	X	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
	H	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
	H	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L
	L	H	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L
	H	H	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L
	L	L	L	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L
	H	L	L	H	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L
	L	H	L	H	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L
	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L
	L	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L
	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L
	L	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L
	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H

PACKAGE DIMENSIONS

(Unit : mm)

SOP24-P-430-1.27-K

Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	0.58 TYP.
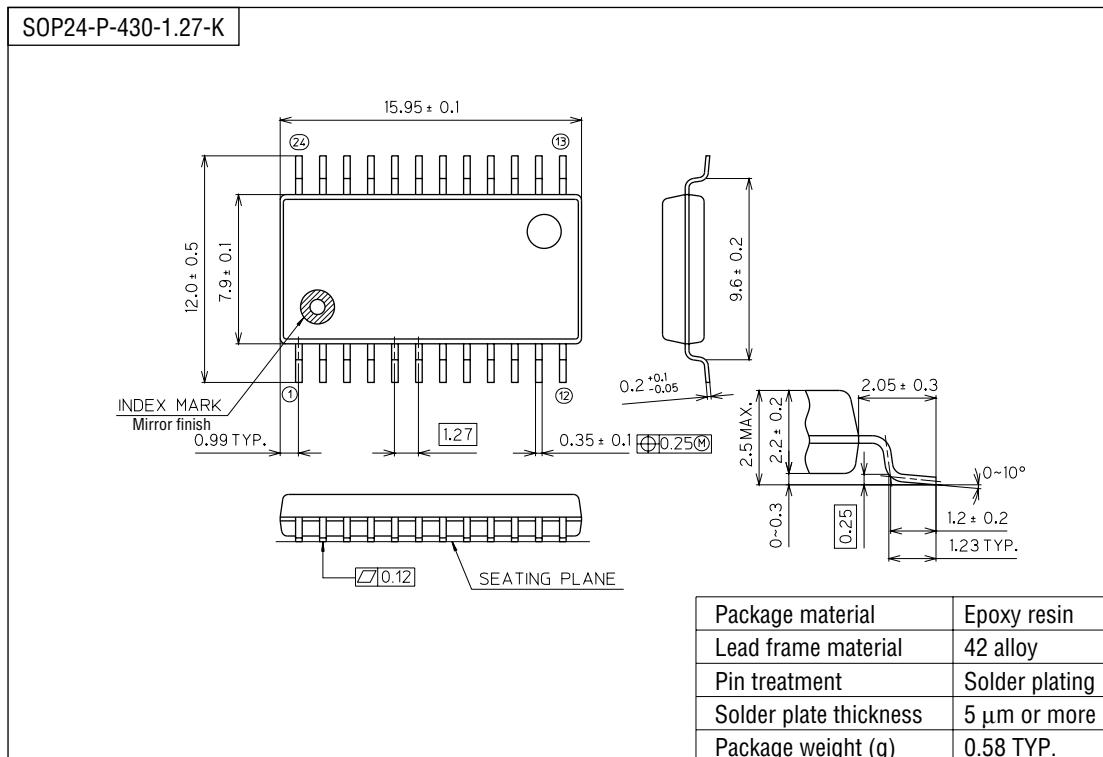
Notes for Mounting the Surface Mount Type Package

The SOP, QFP, TSOP, SOJ, QFJ (PLCC), SHP and BGA are surface mount type packages, which are very susceptible to heat in reflow mounting and humidity absorbed in storage.
Therefore, before you perform reflow mounting, contact Oki's responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).