T-77-05-05

LC7267, 7268

3025B

CMOS LSI

Receiving Frequency + Time Display

©1511A

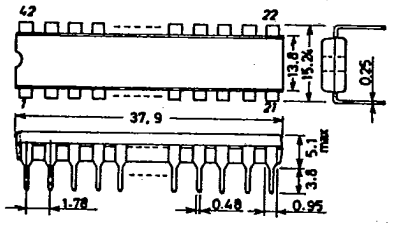
Functions

(1) Capable of selecting receiving frequency display/time display.
(2) Display of receiving frequency at each band of FM/MW/LW

	Display Element	Static/Dynamic	Withstand Voltage at Output Pin	Max. Current
LC7267	LED	Static	15V	18mA (V_{DD} = 6.0 to 10.0V)
LC7268	FLT	Static	V_{DD} − 20V	− 3mA

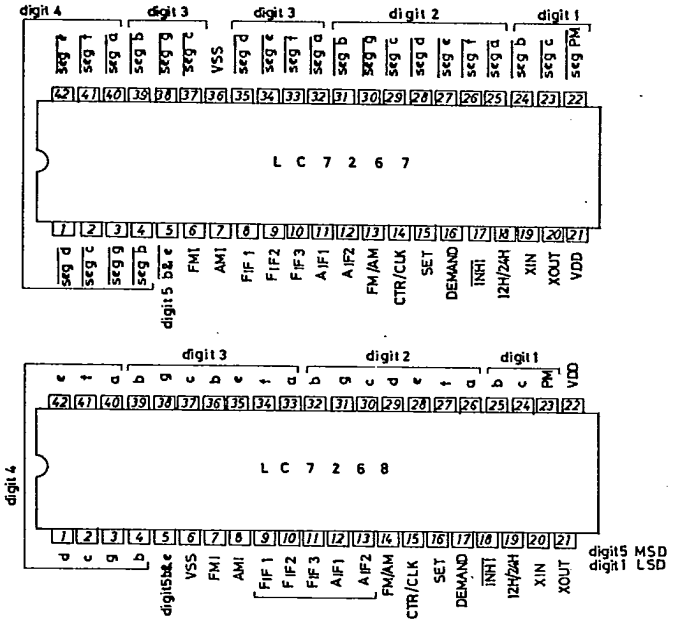
(3) Number of display digits: FM: 5 digits, MW, LW: 4 digits
(4) Covers intermediate frequencies shown below.
FM: +10.700, +10.725, +10.750, +10.675 MHz
−10.700, −10.725, −10.675, −10.650 MHz
MW, LW: +450 kHz(1) - - - 10 kHz-step display
+450 kHz(2) - - - 1 kHz-step display
+455 kHz - - - - - 1 kHz-step display
+469 kHz - - - - - 1 kHz-step display
(5) In FM reception applications, the LB3500 (÷8 prescaler) is used jointly.
(6) Two selections of display system (12-hour system with PM sign, 24-hour system).
(7) Easy to set time by the time signal.
(8) Inhibit pin for inhibiting time setting with display unlighted.
(9) 7.2 MHz crystal for reference frequency.
(10) Supply voltage V_{DD}: 4.5 to 10.0 V.

Case Outline 3025B-D42SIC
(unit:mm)



SANYO: DIP42S

Pin Assignment



Configuration and Display Font

4 or 4-1/2-digit segment LED's are used to display time and frequency in the display font shown below.

Display font 1234567890

Lighting System

Static lighting

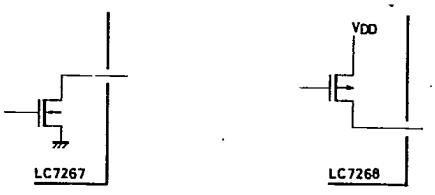
Display Range

- Frequency (MW, LW) 000 kHz to 1999 kHz (The highest-order digit "0" is blanked out.)
- Frequency (FM) 00.00 MHz to 199.95 MHz (The highest-order digit "0" is blanked out.)
- Clock (12-hour) →PM12:00 to PM11:59 → 12:00 to 11:59
- Clock (24-hour) 0:00 to 23:59 (The highest-order digit "0" is blanked out.)

Pin Description (The LC7267/68 have the same pin name, function except output driver pins, provided that the pin No. is not necessarily the same.)

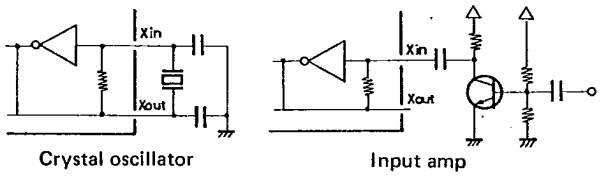
□ $\bar{a}$~$\bar{g}$, $\overline{PM}$, $\overline{b\&e}$ ..... LED (LC7267) driver pin

a~g, PM, b&e ..... FLT (LC7268) driver pin



☐ V_{DD}, V_{SS}.....Power supply pin

☐ X_{IN}, X_{OUT}.....Crystal oscillator, input amp pin



Crystal oscillator Input amp

☐ $F_{IF(1)}$, $F_{IF(2)}$, $F_{IF(3)}$..... FM IF offset value select pin

$F_{IF(1)}$	0	0	0	0	1	1	1	1
$F_{IF(2)}$	0	0	1	1	0	0	1	1
$F_{IF(3)}$	0	1	0	1	0	1	0	1
IF (MHz)	+10.700	+10.725	+10.675	+10.750	-10.700	-10.725	-10.675	-10.650

☐ $A_{IF(1)}$, $A_{IF(2)}$..... AM IF offset value select pin

$A_{IF(1)}$	0	0	1	1
$A_{IF(2)}$	1	0	0	1
IF (kHz)	+450(1)	+450(2)	+455	+469
Display Step	10kHz	1 kHz step		

1: High level
0: Low level

(Note) 450 kHz (1): 10 kHz-step display, others: 1 kHz-step display

☐ FMI, AMI..... Local OSC signal input pin

FMI: For FM
AMI: For MW, LW

☐ FM/AM..... FM/MW, LW select pin

FM: High level
MW, LW: Low level

☐ CTR/CLK..... Frequency display/time display select pin

CTR (Counter): High level
CLK (Clock): Low level

☐ DEMAND..... Input pin for instructing execution of setting

CTR/CLK	DEMAND	MODE
0	1	Mode of setting by the time signal and hours-minutes setting mode
0	0	Time display mode

☐ SET..... Input pin for setting hours-minutes

This pin is set at "M" level normally. The input signal of "H"/"L" level acts as follows:
When in the mode of setting by the time signal and hours-minutes setting mode (CTR/CLK = "L" DEMAND = "H")

High level: Execution of hours setting
Advance at a 2 Hz rate 1.2 seconds after the pin is set to "H" level.
Low level: Execution of setting by the time signal and minutes setting
Advance at a 2 Hz rate 1.2 seconds after the pin is set to "L" level.
Setting by the time signal is executed when the pin is set to "M" level within 1.0 second after set to "L" level. No carry to high-order digit occurs.

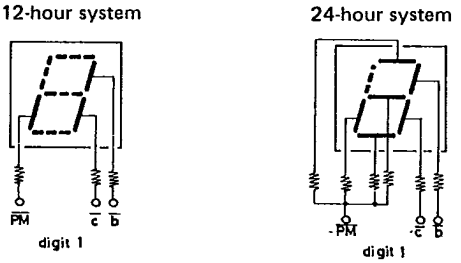
☐ $\overline{\text{INHI}}$..... Input pin for turning OFF the segment pins, inhibiting the SET/DEMAND pin from functioning, and preventing the AMI amp from operating

High level: Normal operation
Low level: Segment pin OFF, SET/DEMAND pin function inhibit

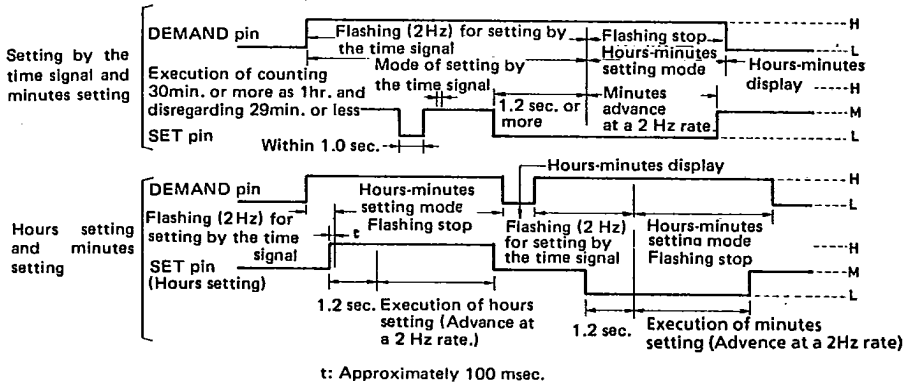
☐ 12H/24H..... Input pin for selecting 12-hour system with PM sign/24-hour system

High level: 12-hour system with PM sign
Low level: 24-hour system

Make connection of the highest-order digit as shown below.



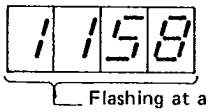
Timing Chart: Time setting (CTR/CLK = "L")



t: Approximately 100 msec.

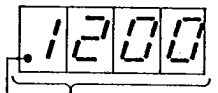
Sample Display at Each Display (Setting by the time signal, hours-minutes display, hours-minutes setting)

Setting by the time signal: Setting to PM 12:00



Execute setting by the time signal with the SET pin.

Flashing at a 2Hz rate when in the mode of setting by the time signal

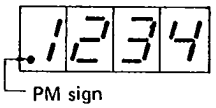


When setting by the time signal is executed, minutes become 00. If the minutes display is at 30 to 59, hours are incremented by 1 (counting 30 or more as 1hr. and disregarding 29 or less).

PM sign

Flashing at a 2Hz rate

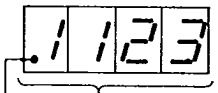
Hours-minutes display: Display of PM 12:34



The PM sign flashes in the afternoon when in the mode of setting by the time signal, hours-minutes display, hours-minutes setting. (for 12-hour system).

PM sign

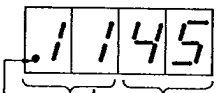
Hours-minutes setting: Setting to PM 11:45 from PM 11:23



Set the SET pin to V_{DD} or V_{SS}. After lapse of 1.2sec., flashing stops and hours or minutes advance at a 2Hz rate.

PM sign

Flashing at a 2Hz rate

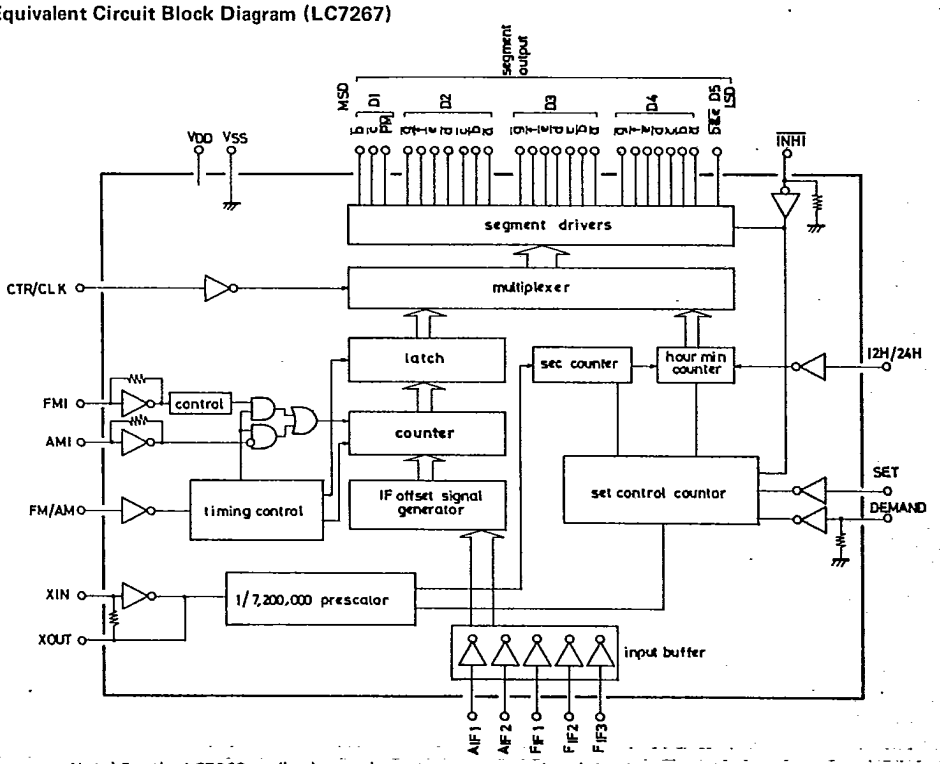


PM sign

Set the SET pin to V_{SS}, and setting is executed.

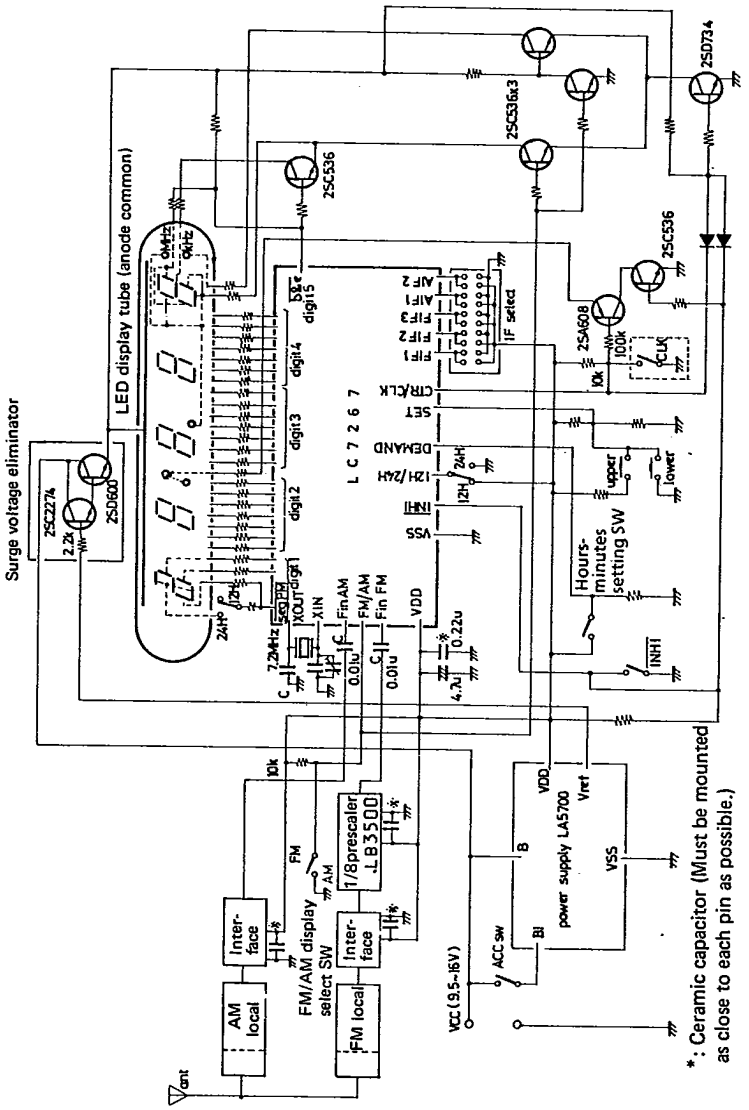
Set the SET pin to V_{DD}, and setting is executed.

Equivalent Circuit Block Diagram (LC7267)

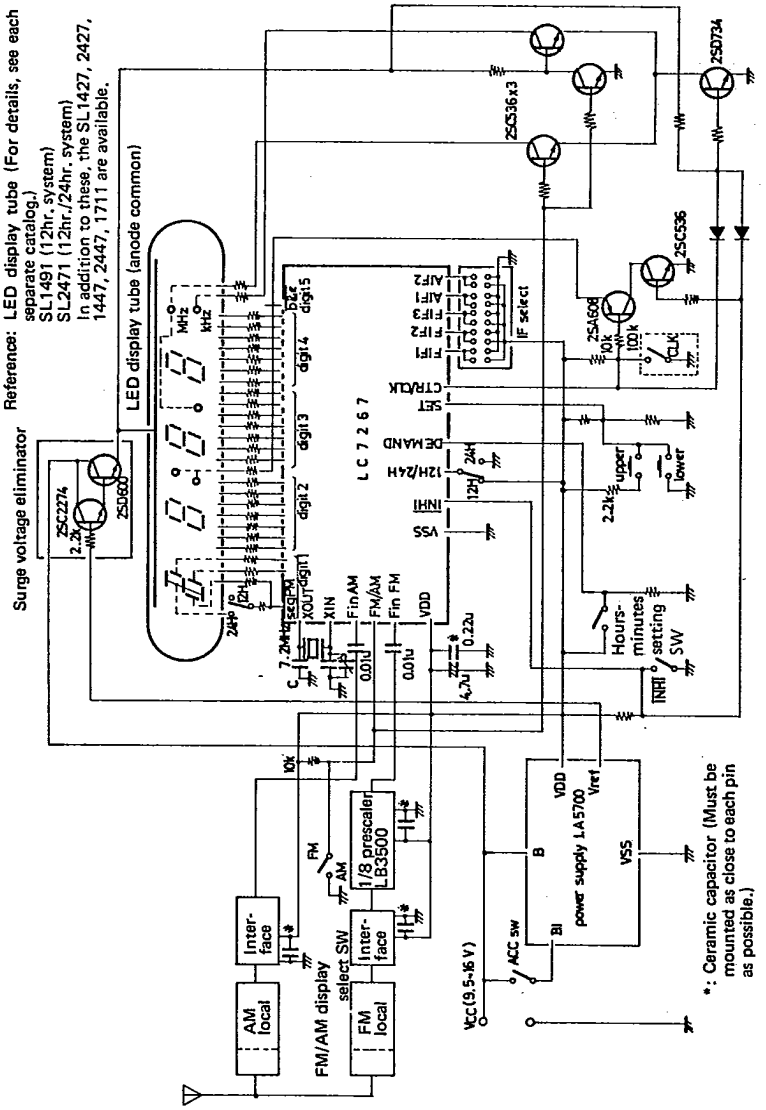


Note) For the LC7268, – (bar) over the output segment signal sign is removed.

Sample Application Circuit 1: 5-digit display in FM use

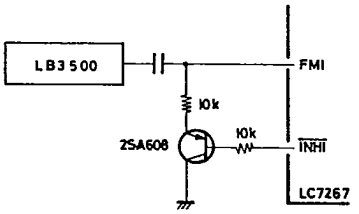


Sample Application Circuit 2: 4-digit display in FM use



(Note) How to reduce current dissipation when display is turned off

To reduce current dissipation when display is turned off (INHI: 'L'), the circuit shown below must be connected to the FMI pin.



Main Specifications
[LC7267]

Absolute Maximum Ratings at V_{SS} = 0V

				unit
Maximum Supply Voltage	V_{DD} max		−0.3 to +11	V
Input Voltage	V_{IN}		−0.3 to V_{DD} + 0.3	V
Output Voltage	V_O (1)	Xout	−0.3 to V_{DD} + 0.3	V
Output Voltage	V_O (2)	Output pins other than Xout, output : off	0 to 15	V
Allowable Power Dissipation	Pd max	Ta ≦ 65°C	550	mW
Allowable Power Dissipation of Segment Outputs	Pd seg 1	$\overline{PM}$ V_{DD} = 4.5 to 6V, I_{OL} = 50mA	35	mW
	Pd seg 2	$\overline{b\&e}$ V_{DD} = 4.5 to 6V, I_{OL} = 33mA	30	mW
	Pd seg 3	Other outputs V_{DD} = 4.5 to 6.5V, I_{OL} = 16.5mA	15	mW
	Pd seg 4	$\overline{PM}$ V_{DD} = 6.0 to 10V, I_{OL} = 54mA	38	mW
	Pd seg 5	$\overline{b\&e}$ V_{DD} = 6.0 to 10V, I_{OL} = 36mA	25	mW
	Pd seg 6	Other outputs V_{DD} = 6.0 to 10V, I_{OL} = 18mA	13	mW
Operating Temperature	Topg		−30 to +65	°C
Storage Temperature	Tstg		−40 to +125	°C

Allowable Operating Conditions at Ta = 25°C, V_{SS} = 0V, V_{DD} = 4.5 to 10V

			min	typ	max	unit
Supply Voltage	V_{DD}		4.5		10	V
Input "H"-Level Voltage	V_{IH} 1	$\overline{INH}$, CTR/CLK, DEMAND	0.8V_{DD}		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 1	$\overline{INH}$, CTR/CLK, DEMAND	0		0.2V_{DD}	V
Input "H"-Level Voltage	V_{IH} 2	SET, FM/AM	0.85V_{DD}		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 2	SET, FM/AM	0		0.15V_{DD}	V
Input "H"-Level Voltage	V_{IH} 3	FIF1, FIF2, FIF3 AIF1, AIF2, 12H/24H	0.9V_{DD}		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 3	FIF1, FIF2, FIF3 AIF1, AIF2, 12H/24H	0		0.1V_{DD}	V
Input "M"-Level Voltage	V_{IM} 1	SET	0.45V_{DD}		0.55V_{DD}	V
Input Frequency	f_{IN} 1	FMI, sine wave, capacitive coupling, V_{IN} 1 = 0.7Vp-p	1		18	MHz
	f_{IN} 2	AMI, sine wave, capacitive coupling, V_{IN} 2 = 0.5Vp-p	0.5		3	MHz
	f_{IN} 3	XIN, sine wave, capacitive coupling, V_{IN} 3 = 1Vp-p	0.2		7.5	MHz
Input Amplitude	V_{IN} 1	FMI, sine wave, capacitive coupling, f_{IN} 1 = 1 to 18MHz	0.7		0.9V_{DD}	Vp-p
	V_{IN} 2	AMI, sine wave, capacitive coupling, f_{IN} 2 = 0.5 to 3MHz	0.5		0.9V_{DD}	Vp-p
	V_{IN} 3	XIN, sine wave, capacitive coupling, f_{IN} 3 = 0.2 to 7.5MHz	1.0		0.9V_{DD}	Vp-p
Segment Current (1)	Iseg 1	$\overline{PM}$			45	mA
Segment Current (2)	Iseg 2	$\overline{b\&e}$			30	mA
Segment Current (3)	Iseg 3	Other outputs seg			15	mA

Electrical Characterisitcs at V_{DD} = 4.5 to 10V, V_{SS} = 0V

			min	typ	max	unit
Input "H"-Level Current	I_{IH} 1	FIF1 to FIF3, AIF1 to AIF2, SET, FM/AM, 12H/24H CTR/CLK, V_I = V_{DD}	0		10	μA
Input "L"-Level Current	I_{IL} 1	FIF1 to FIF3, AIF1 to AIF2, SET, FM/AM, 12H/24H CTR/CLK, V_I = V_{SS}	−10		0	μA

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			min	typ	max	unit
Input "H"-Level Current	I_{IH} 2	$\overline{INH}$,$V_I = V_{SS}$	40		1000	μA
Input Floating Voltage	V_{IF} 1	$\overline{INH}$,V_I = open	0		0.2	V
Input "H"-Level Current	I_{IH} 3	DEMAND,$V_I = V_{DD}$	40		1000	μA
Input Floating Voltage	V_{IF} 2	DEMAND,V_I = open	0		$0.1V_{DD}$	V
Output "L"-Level Voltage	V_{OL} 1	$\overline{PM}$,V_{DD} = 4.5 to 10V,I_{OL} = 45mA	0		1.0	V
	V_{OL} 2	$\overline{b\&e}$,V_{DD} = 4.5 to 10V,I_{OL} = 30mA	0		1.0	V
	V_{OL} 3	Other outputs seg V_{DD} = 4.5 to 10V,I_{OL} = 15mA	0		1.0	V
Output Off Leakage Current	I_{OFF} 1	All segments output pins,Vout = 13V	0		10	μA
Current Dissipation	I_{DD} 1	FM mode,FM/AM = V_{DD} f_{IN} 1 = 18MHz,0.7Vp-p or [AM mode,FM/AM = V_{SS}, f_{IN} 2 = 3MHz,0.5Vp-p] f_{IN} 3 = 7.2MHz,1Vp-p FIF1,FIF2,FIF3 = V_{DD} AIF1,AIF2 = V_{DD} 12H/24H,CTR/CLK,$\overline{INH}$,DEMAND = V_{DD}			18	mA

[LC7268]

Absolute Maximum Ratings at V_{SS} = 0V

				unit
Maximum Supply Voltage	V_{DD} max		−0.3 to +11	V
Input Voltage	V_{IN}		−0.3 to V_{DD} + 0.3	V
Output Voltage	V_O (1)	Xout	−0.3 to V_{DD} + 0.3	V
	V_O (2)	Output pins other than Xout, output : off	V_{DD} − 20 to V_{DD} + 0.3	V
Allowable Power Dissipation	Pd max	Ta ≦ 75°C	300	mW
Allowable Power Dissipation of Segment Outputs	Pd seg 1	PM $\lvert -I_{OH}\rvert$ < 12mA,Ta ≦ 75°C	9	mW
	Pd seg 2	b&e $\lvert -I_{OH}\rvert$ < 6mA,Ta ≦ 75°C	3	mW
	Pd seg 3	Other outputs $\lvert -I_{OH}\rvert$ < 3mA,Ta ≦ 75°C	1.5	mW
Operating Temperature	Topg		−30 to +75	°C
Storage Temperature	Tstg		−40 to +125	°C

Allowable Operating Conditions at Ta = 25°C,V_{SS} = 0V,V_{DD} = 4.5 to 10V

			min	typ	max	unit
Supply Voltage	V_{DD}		4.5		10	V
Input "H"-Level Voltage	V_{IH} 1	$\overline{INH}$,CTR/CLK,DEMAND	$0.8V_{DD}$		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 1	$\overline{INH}$,CTR/CLK,DEMAND	0		$0.2V_{DD}$	V
Input "H"-Level Voltage	V_{IH} 2	SET,FM/AM	$0.85V_{DD}$		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 2	SET,FM/AM	0		$0.15V_{DD}$	V
Input "H"-Level Voltage	V_{IH} 3	FIF1,FIF2,FIF3 AIF1,AIF2,12H/24H	$0.9V_{DD}$		V_{DD}	V
Input "L"-Level Voltage	V_{IL} 3	FIF1,FIF2,FIF3 AIF1,AIF2,12H/24H	0		$0.1V_{DD}$	V
Input "M"-Level Voltage	V_{IM} 1	SET	$0.45V_{DD}$		$0.55V_{DD}$	V
Input Frequency	f_{IN} 1	FMI,sine wave,capacitive coupling, V_{IN} 1 = 0.7Vp-p	1		18	MHz
	f_{IN} 2	AMI,sine wave,capacitive coupling, V_{IN} 2 = 0.5Vp-p	0.5		3	MHz
	f_{IN} 3	XIN,sine wave,capacitive coupling, V_{IN} 3 = 1Vp-p	0.2		7.5	MHz
Input Amplitude	V_{IN} 1	FMI,sine wave,capacitive coupling, f_{IN} 1 = 1 to 18MHz	0.7		$0.9V_{DD}$	Vp-p
	V_{IN} 2	AMI,sine wave,capacitive coupling, f_{IN} 2 = 0.5 to 3MHz	0.5		$0.9V_{DD}$	Vp-p
	V_{IN} 3	XIN,sine wave,capacitive coupling, f_{IN} 3 = 0.7 to 7.5MHz	1.0		$0.9V_{DD}$	Vp-p

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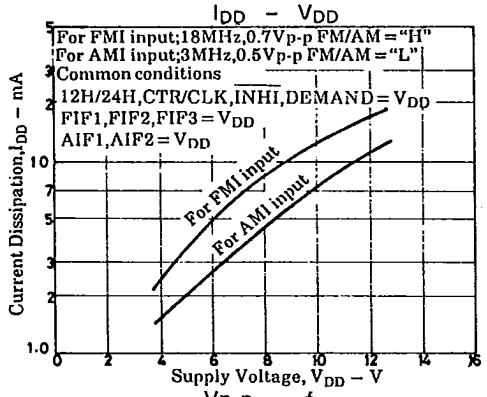
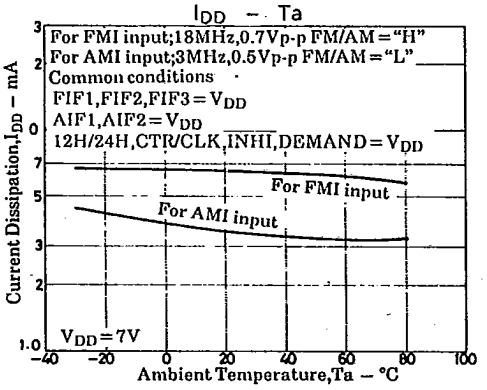
			min	typ	max	unit
Segment Current (1)	Iseg 1	PM	0		9	mA
Segment Current (2)	Iseg 2	b&e	0		3	mA
Segment Current (3)	Iseg 3	Other outputs seg	0		1.5	mA

Electrical Characterisitcs at V_{DD} = 4.5 to 10V, V_{SS} = 0V			min	typ	max	unit
Input "H"-Level Current	I_{IH} 1	FIF1 to FIF3, AIF1 to AIF2, SET, FM/AM, 12H/24H CTR/CLK, $V_I = V_{DD}$	0		10	µA
Input "L"-Level Current	I_{IL} 1	FIF1 to FIF3, AIF1 to AIF2, SET, FM/AM, 12H/24H CTR/CLK, $V_I = V_{SS}$	−10		0	µA
Input "H"-Level Current	I_{IH} 2	$\overline{INHI}$, $V_I = V_{SS}$	40		1000	µA
Input Floating Voltage	V_{IF} 1	$\overline{INHI}$, V_I = open	0		0.2	V
Input "H"-Level Current	I_{IH} 3	DEMAND, $V_I = V_{DD}$	40		1000	µA
Input Floating Voltage	V_{IF} 2	DEMAND, $V_I = V_{SS}$	0		$0.1V_{DD}$	V
Output "H"-Level Voltage	V_{OH} 1	$\overline{PM}$, I_{OH} = −2mA	$V_{DD}-1$		V_{DD}	V
	V_{OH} 2	$\overline{b\&e}$, I_{OH} = −1mA	$V_{DD}-1$		V_{DD}	V
	V_{OH} 3	Other outputs seg I_{OH} = −0.5mA	$V_{DD}-1$		V_{DD}	V
Output Off Leakage Current	I_{OFF} 1	All segments output pins, Vout = $(V_{DD}-18)$V	−3		0	µA
Current Dissipation	I_{DD} 1	FM mode, FM/AM = V_{DD}, f_{IN} 1 = 18MHz, 0.7Vp-p or [AM mode, FM/AM = V_{SS}, f_{IN} 2 = 3MHz, 0.5Vp-p] f_{IN} 3 = 7.2MHz, 1Vp-p FIF1, FIF2, FIF3 = V_{DD} AIF1, AIF2 = V_{DD} 12H/24H, CTR/CLK, $\overline{INHI}$, DEMAND = V_{DD}			18	mA

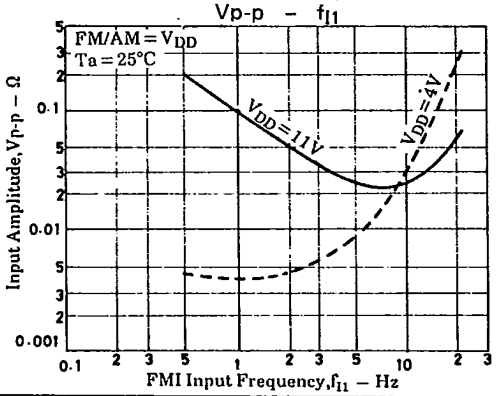
I_{DD} – V_{DD}



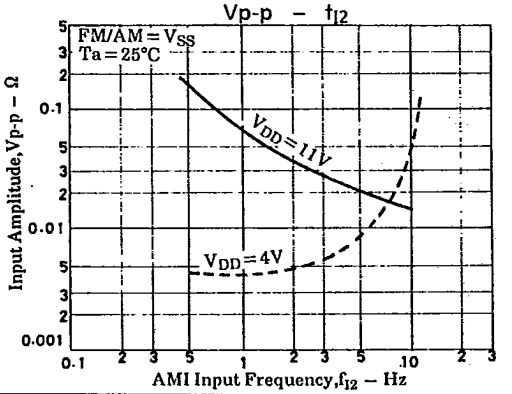
I_{DD} – Ta



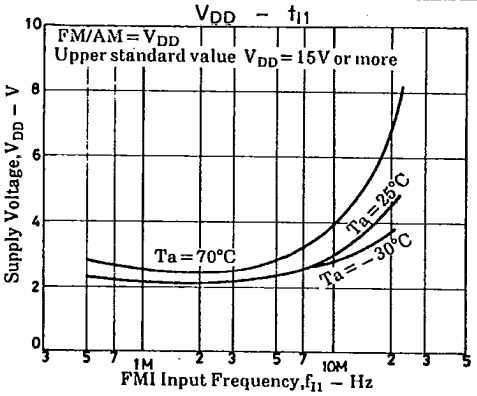
Vp-p – f_{I1}



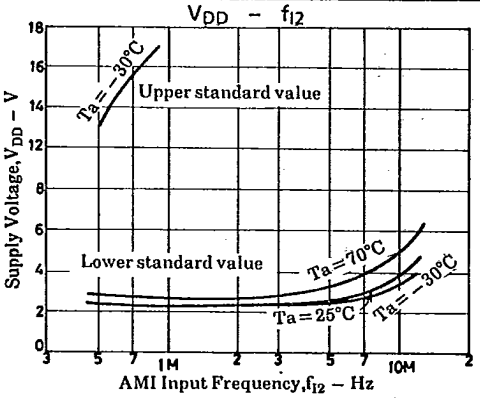
Vp-p – f_{I2}



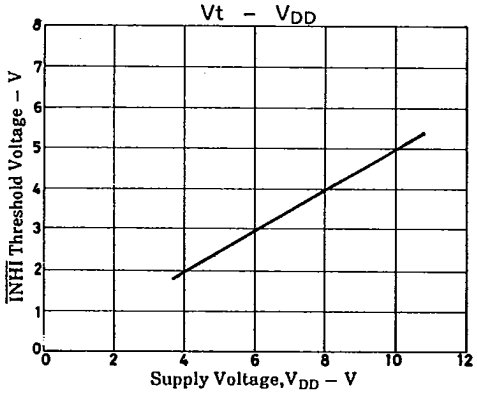
V_{DD} – f_{I1}



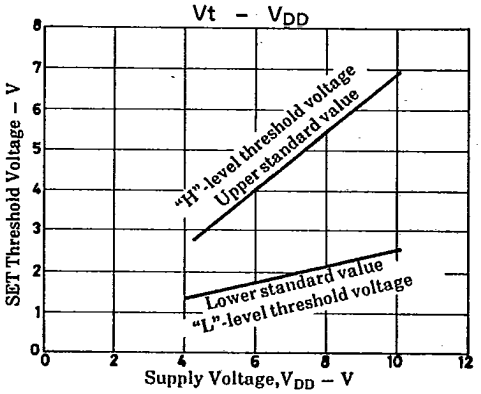
V_{DD} – f_{I2}



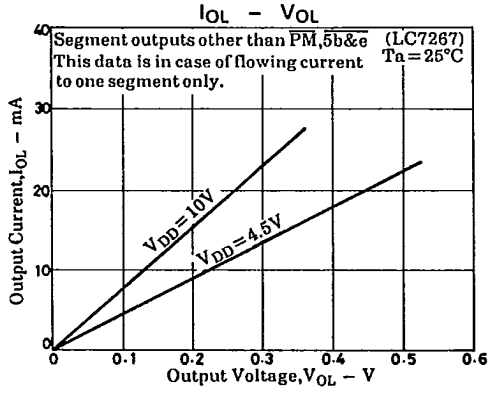
Vt – V_{DD}



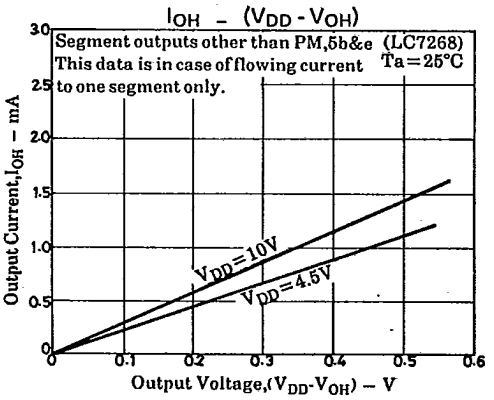
Vt – V_{DD}



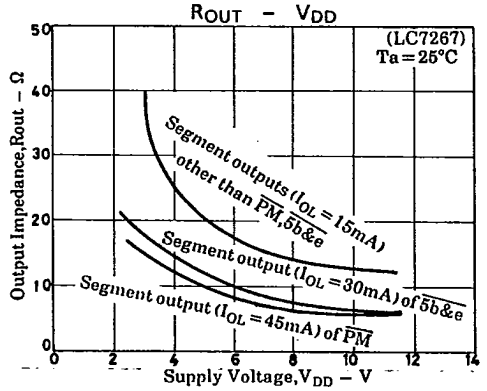
I_{OL} – V_{OL}



I_{OH} – (V_{DD} - V_{OH})



R_{OUT} – V_{DD}



R_{OUT} – V_{DD}