8 Digits Calculator with TAX calculation

The is a single chip CMOS. It has the functions of 8 digits calculator with 1 memory, 4 arithmetic operations, percentage calculation and TAX calculation

FEATURES

- 8 digit display with minus sign, error indicator and also memory load indicator
- TAX calculation with user set TAX rate
- +, -, × and ÷ functions
- Percentage operation with discount
- Thousand separator
- Memory store and recall function
- Error display
- 2-key roll over
- Operating Voltage : 1.2V to 1.7V

OPERATIONS

Constant Operations

The has implied constant mode on +, -, ×, ÷ and % operations. The calculation is performed automatically by pressing "=", "%" or "%" key without a constant for addition, subtraction and division while the first operand is the constant for multiplication.

Number Entering

Up to 8-digit can be entered.

Memory Protection

In any error detection, the memory contents present before the error detection are protected.

Memory Storage

If the memory content is non-zero number, "M" is indicated in the sign-digit position when pressing “M+” or “M-” key (memory calculation). To recall the memory, press “MRC” once. When the memory is now recalling and press “MRC” again will clear the memory

Auto Power Off

If no key is pressed for a specific period of time, the LCD will automatically turn off. The time interval will be up to 600 sec depending the deviation of frequency of the RC oscillation.

KEYBOARD DESCRIPTIONS

Equal key (=)

- Performs keyed-in operation and maintains that operation for possible use
- Establishes power/reciprocation calculation

Multiplication Key (×)

- Enters multiplicand
- Performs previous operation and displays result

Division Key (÷)

- Enters dividend
- Performs previous operation and displays result

Addition Key (+)

- Conditions machine for an addition
- Performs previous operation and displays result

Subtraction Key (-)

- Conditions machine for a subtraction
- Performs previous operation and displays result

Percent Key (%)

The percent key performs the calculation of add-on and discount. Determination of add-on requires the principal amount to be the first entry followed by the "+" or "×" key, with the percentage being the second entry. Depression of the percent key yields the amount to add on, such as tax or interest. Press the "=" key adds this amount to the principal.

Change Sign Key (+/-)

Press the "+/-" key in succession causes the corresponding minus sign to appear and disappear. During digit entry, this function changes the sign of the entered factor.

Power On / All Clear Key (ON/AC)

When DL5543 is in off mode, pressing this key will turn the power on and the LCD will display "0". During the entry of digits, a press of this key will clear all the operating register with LCD will reset to “0”

Clear Entry / Clear Key (CE/C)

During the digit entry, press this key will clear the entry register and the LCD displays the previous enter number again. The second pressing will clear all registers.

Square Root Key (√)

Extracts the square root of a positive number displayed in the entry register.

Memory Addition Key (M+)

Adds the current display to the contents of memory. Pressing this key will terminate a number entry.

Memory Subtraction Key (M-)

Subtracts the current display from the contents of memory. Pressing this key will terminate a number entry.

Memory Recall / Clear Key (MRC)

When it is pressed in normal calculation mode, it will recall the contents of the memory register and display on the LCD. During it is in memory recall, pressing this key will clear the memory.

Numeric Keys and Decimal Key ("0 – 9", "•")

The first number key entered in a sequence will clear the LCD display and enter the digit in the right most of the LCD display. Successive entries will shift the digits left and enters the data in display register. Only the first decimal point entered is effective. An attempted entry of more than 8 digits or 7 decimal places will be ignored.

Tax Add-up (TAX+)

Execute TAX add-up calculation of the displayed number using the tax rate stored in TAX memory. During the normal arithmetic operation, TAX add-up calculation will not break the intermediate result and so TAX+ can be used in expression.

When pressing [RATE] key, the displayed number will be stored in TAX memory.

Tax Exclusion (TAX-)

Execute TAX exclusion calculation of the displayed number using the tax rate stored in TAX memory. During the normal arithmetic operation, TAX exclusion calculation will not break the intermediate result and so TAX- can be used in expression.

Tax Rate Set Key (RATE)

Pressing this key will save the entry number as tax rate.

ERROR INIDICATOR

Error Indicator Display

System errors occur when:

- The integral part of any calculation result exceeds 8 digits
- The integral part of any memory calculation result exceeds 8-digit or when the integral part of any addend or subtrahend to memory exceeds 8-digit
- A division by zero is attempted.

When the error is occurred, the LCD will display as follows:

- "0" is indicated in the first-digit position and "E" in the sign-digit position
- The high-order 8-digit of a calculation result is indicated together with "E". The location of the decimal point corresponds to the result of calculation times le-8, and no zero shift is performed

Error Release Operation

A system error can be released by pressing ON/AC key or CE/C key. However the calculation result is not cleared by CE/C key and it will be retained on the LCD.

ABSOLUTE MAXIMUM RATINGS

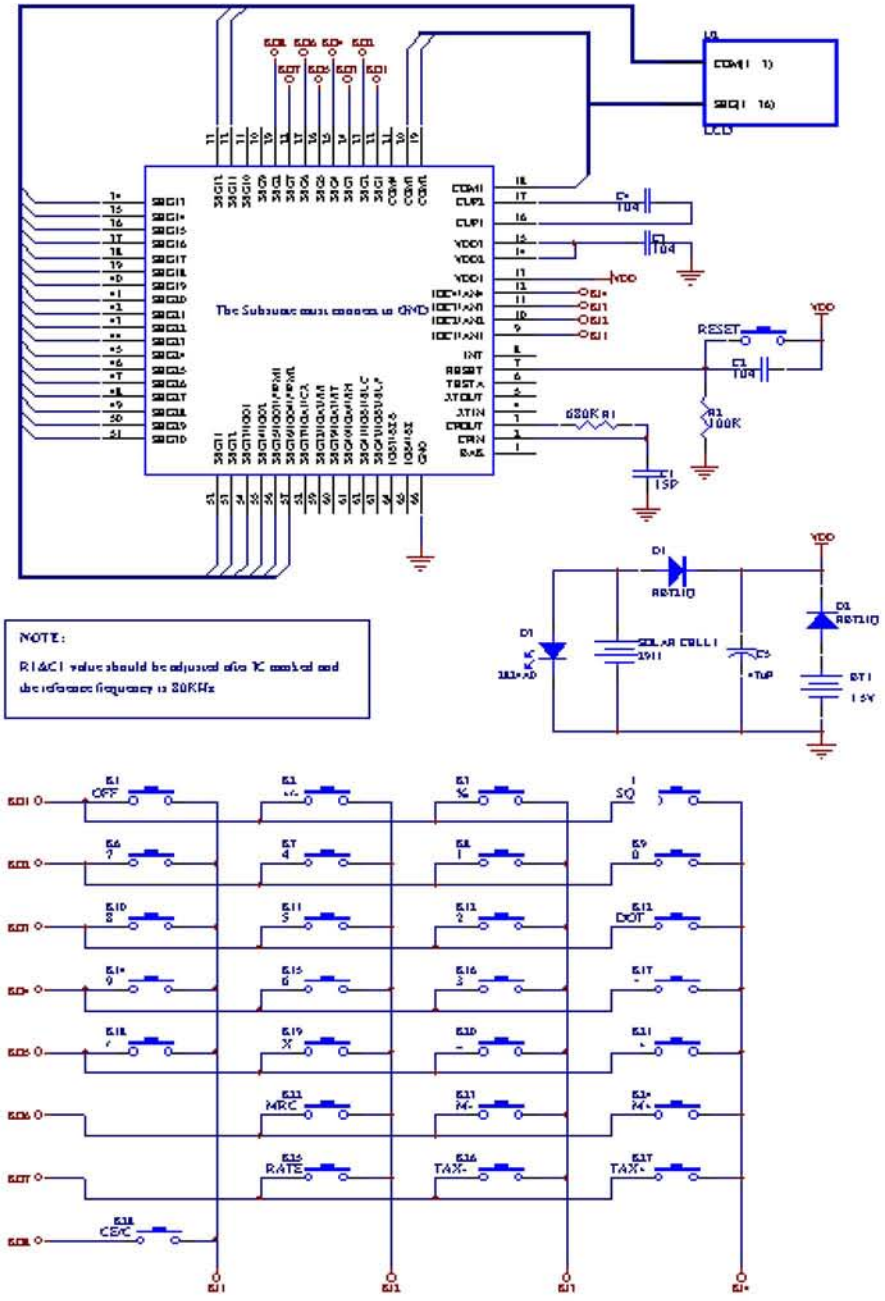
Parameters	**Symbol**	**Min.**	**Max.**	**Unit**
Supply Voltage	VDD	-0.3	4.4	V
Input Voltage	Vin	-0.3	VDD + 0.3	V
Operating Temperature	Top	0	+ 70	°C
Storage Temperature	Tstg	-25	+ 125	°C

ELECTRICAL CHARACTERISTICS

(VDD=1.5V, GND=0V, TA=25 °C)

Parameter	Symbol	Min.	Max.	Unit
Operating Voltage	Vop	1.1	1.7	V
Oscillator Startup Voltage	Vosc	1.2		V
Oscillation Frequency	Fop	100	150	KHz
IC Off Current	Ioff		1	μA
IC On Current	Ion		6	μA
IC Operating Current	Iop		11	μA

Application Circuit

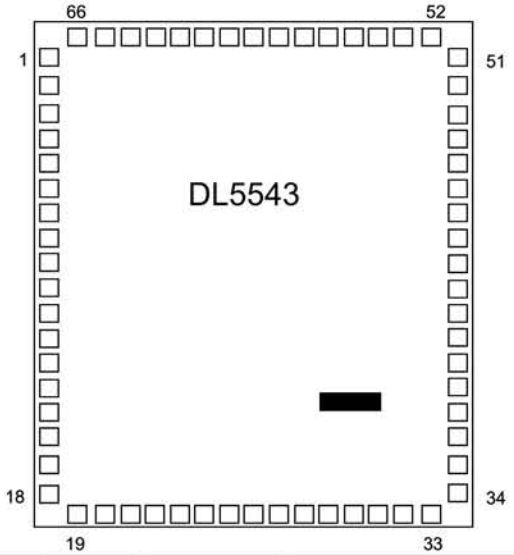


Dice Diagram

Chip Size : 2040 x 2335um

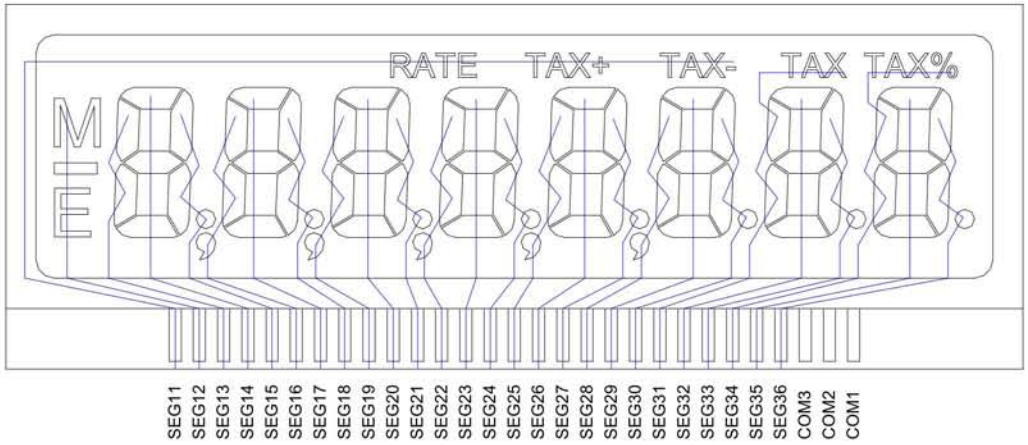
Pad Size : 90 x 90 um

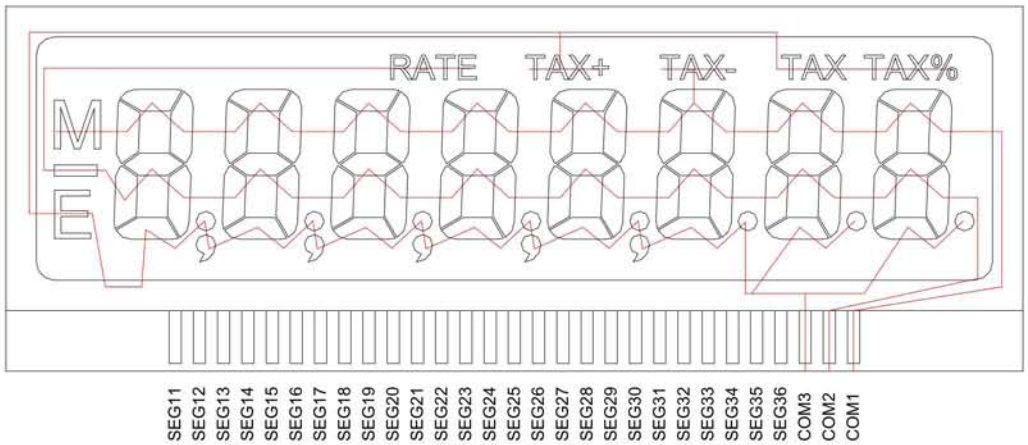
Pad Pitch : 115um



Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	BAK	70	2175	34	SEG13	1970	160
2	CFIN	70	2045	35	SEG14	1970	290
3	CFOUT	70	1915	36	SEG15	1970	420
4	XTIN	70	1800	37	SEG16	1970	535
5	XTOUT	70	1685	38	SEG17	1970	650
6	TESTA	70	1570	39	SEG18	1970	765
7	RESET	70	1455	40	SEG19	1970	880
8	INT	70	1340	41	SEG20	1970	995
9	IOC1/AN1	70	1225	42	SEG21	1970	1110
10	IOC2/AN2	70	1110	43	SEG22	1970	1225
11	IOC3/AN3	70	995	44	SEG23	1970	1340
12	IOC4/AN4	70	880	45	SEG24	1970	1455
13	VDD1	70	765	46	SEG25	1970	1570
14	VDD2	70	650	47	SEG26	1970	1685
15	VDD3	70	535	48	SEG27	1970	1800
16	CUP1	70	420	49	SEG28	1970	1915
17	CUP2	70	290	50	SEG29	1970	2045
18	COM1	70	160	51	SEG30	1970	2175
19	COM2	200	70	52	SEG31	1840	2265
20	COM3	330	70	53	SEG32	1710	2265
21	COM4	445	70	54	SEG33/IOD1	1595	2265
22	SEG1	560	70	55	SEG34/IOD2	1480	2265
23	SEG2	675	70	56	SEG35/IOD3/PWM1	1365	2265
24	SEG3	790	70	57	SEG36/IOD4/PWM2	1250	2265
25	SEG4	905	70	58	SEG37/IOA1/CX	1135	2265
26	SEG5	1020	70	59	SEG38/IOA2/RR	1020	2265
27	SEG6	1135	70	60	SEG39/IOA3/RT	905	2265
28	SEG7	1250	70	61	SEG40/IOA4/RH	790	2265
29	SEG8	1365	70	62	SEG41/IOB1/ELC	675	2265
30	SEG9	1480	70	63	SEG42/IOB2/ELP	560	2265
31	SEG10	1595	70	64	IOB3/BZB	445	2265
32	SEG11	1710	70	65	IOB4/BZ	330	2265
33	SEG12	1840	70	66	GND	200	2265

LCD Layout


RATE
TAX+
TAX-
TAX
TAX%
M
E
SEG11 SEG12 SEG13 SEG14 SEG15 SEG16 SEG17 SEG18 SEG19 SEG20 SEG21 SEG22 SEG23 SEG24 SEG25 SEG26 SEG27 SEG28 SEG29 SEG30 SEG31 SEG32 SEG33 SEG34 SEG35 SEG36 COM3 COM2 COM1


RATE
TAX+
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SEG11 SEG12 SEG13 SEG14 SEG15 SEG16 SEG17 SEG18 SEG19 SEG20 SEG21 SEG22 SEG23 SEG24 SEG25 SEG26 SEG27 SEG28 SEG29 SEG30 SEG31 SEG32 SEG33 SEG34 SEG35 SEG36 COM3 COM2 COM1