



GENERAL DESCRIPTION

The TX9158 is an 8-bit microprocessor embedded device tailored to the USB Gamepad application. It includes an 8-bit RISC CPU core, 192-byte SRAM, Low Speed USB Interface and an 8K x 14 internal program OTP-ROM.

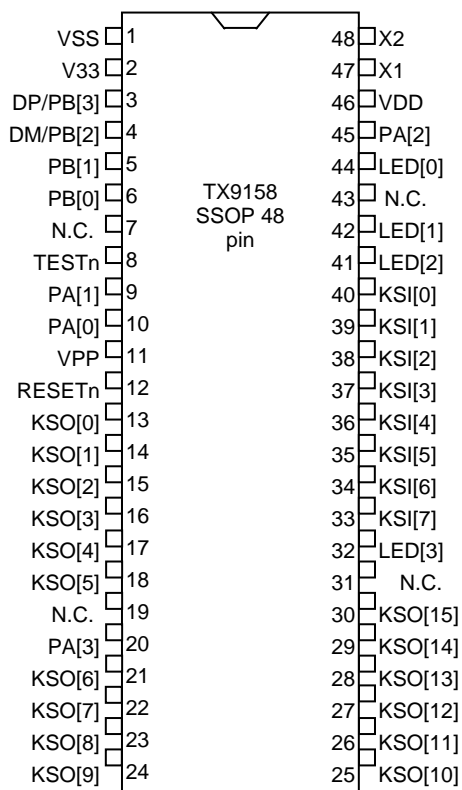
FEATURE

- Compliance with the Universal Serial Bus specification v1.1
- Built-in USB Transceiver and 3.3V regulator
- Support USB Suspend and Resume function
- One Control IN/OUT and two Interrupt IN endpoints
- 192 byte internal SRAM
- 8K x 14 internal program OTP-ROM
- 8-bit RISC CPU core with only 36 instruction
- 3MHz instruction rate with 6MHz crystal oscillation
- 48 pin package
- Turbo and Slow motion Function
- Turbo Function
 - Turbo support button 1~10.
 - The pressed button has turbo function when Turbo button is pressed and any button are pressed simultaneously. The pressed button lost turbo function when Clear button is pressed and any button are pressed simultaneously.
 - Turbo running, Turbo LED flashes at same speed.

PIN DESCRIPTION

Name	I/O	Description
VDD	P	5V Power from USB cable
VSS	P	Ground
X1	I	Crystal in (6MHz)
X2	O	Crystal out
RESETn	I	Chip reset (active low)
TESTn	I	Test Mode control (active low)
DP/PB[3]	I/O	USB positive data signal / General purpose I/O (pseudo open-drain)
DM/PB[2]	I/O	USB negative data signal / General purpose I/O (pseudo open-drain)
KSI [0]	I	Button 1
KSI [1]	I	Button 2
KSI [2]	I	Button 3
KSI [3]	I	Button 4
KSI [4]	I	Button 5
KSI [5]	I	Button 6
KSI [6]	I	Button 7
KSI [7]	I	Button 8 /Turbo/Clear/Slow scan input (with built-in pull-up resistor)
KSO [0]	O	Button 8 scan output(open drain with pull up resistor)
KSO [1]	O	Button Turbo scan output(open drain with pull up resistor)
KSO [0]	O	Button Clear scan output(open drain with pull up resistor)
KSO [0]	O	Button Slow scan output(open drain with pull up resistor)
PA [0]	I/O	UP
PA [1]	I/O	Down
PA [2]	I/O	Left
PA [3]	I/O	Right
PB [0]	I/O	Button 9
PB [1]	I/O	Button 10
LED[0]	O	Turbo LED output (with serial 450 ohm resistor)
LED[1]	O	Slow LED output(with serial 450 ohm resistor)
VPP	I	OTP programming power
V33	O	3.3V regulator output

PIN ASSIGNMENT

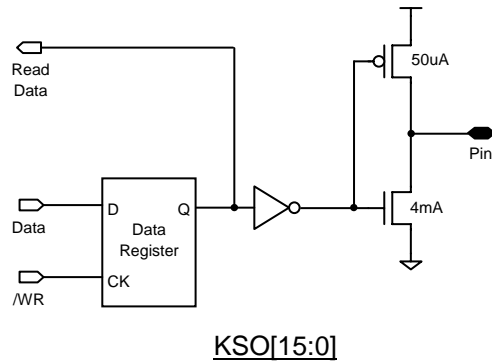


FUNCTIONAL DESCRIPTION

I/O Port

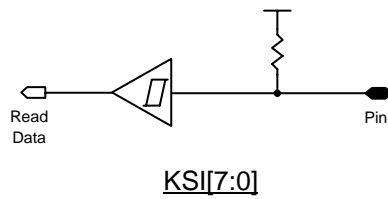
1. **KSO[15:0]**

These pins are used as keyboard scan outputs. They have at least 4mA drive and sink strength.



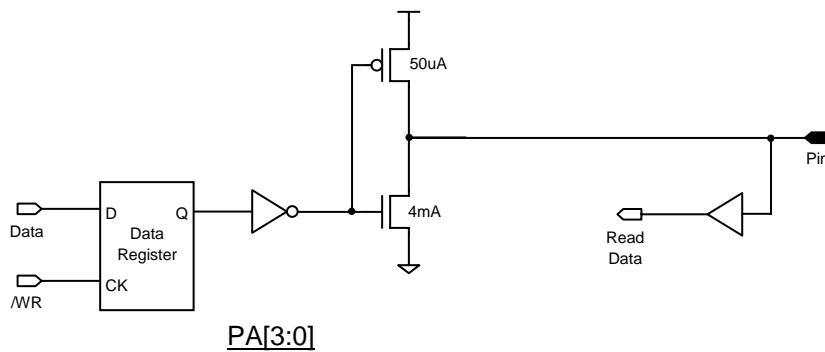
2. **KSI[7:0]**

These pins are used as keyboard scan inputs. Each one of them has a pull up resistor. In addition, each KSI pin can cause Keyboard interrupt (KBDint) if the corresponding interrupt mask bit (KBDmask) is 0. The KBDint is asserted at the falling edge of KSI pin.



3. **PA[3:0]**

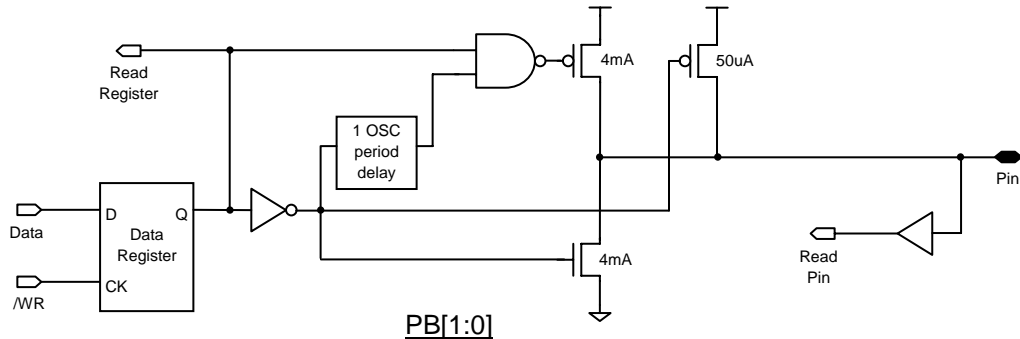
These pins are similar to KSO pins, except data are read from pin. They can be used as input or open drain output.



4. PB[1:0]

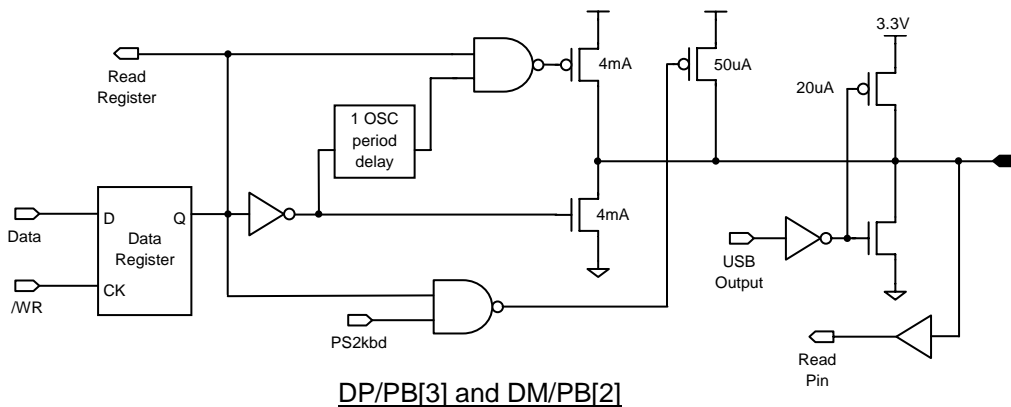
These pins are “Pseudo-Open-Drain” structure. In “Read-Modify-Write” instruction, CPU actually reads the output data register. In the others instructions, CPU reads the pin data. The so-called “Read-Modify-Write” instruction includes BSF, BCF and all instructions using F-Plane as destination.

The PB[0] pin can also generate interrupt (PB0int) at its falling edge.



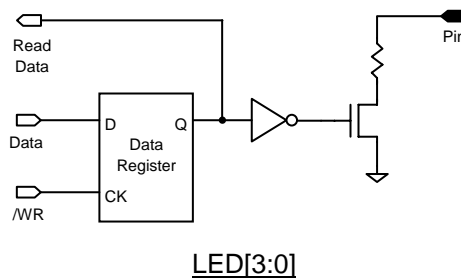
5. DP/PB[3] and DM/PB[2]

These pins are similar to PB[1:0], except they share the pin with USB function. An extra control bit “PS2kbd” is used to enable the small pull-up current.

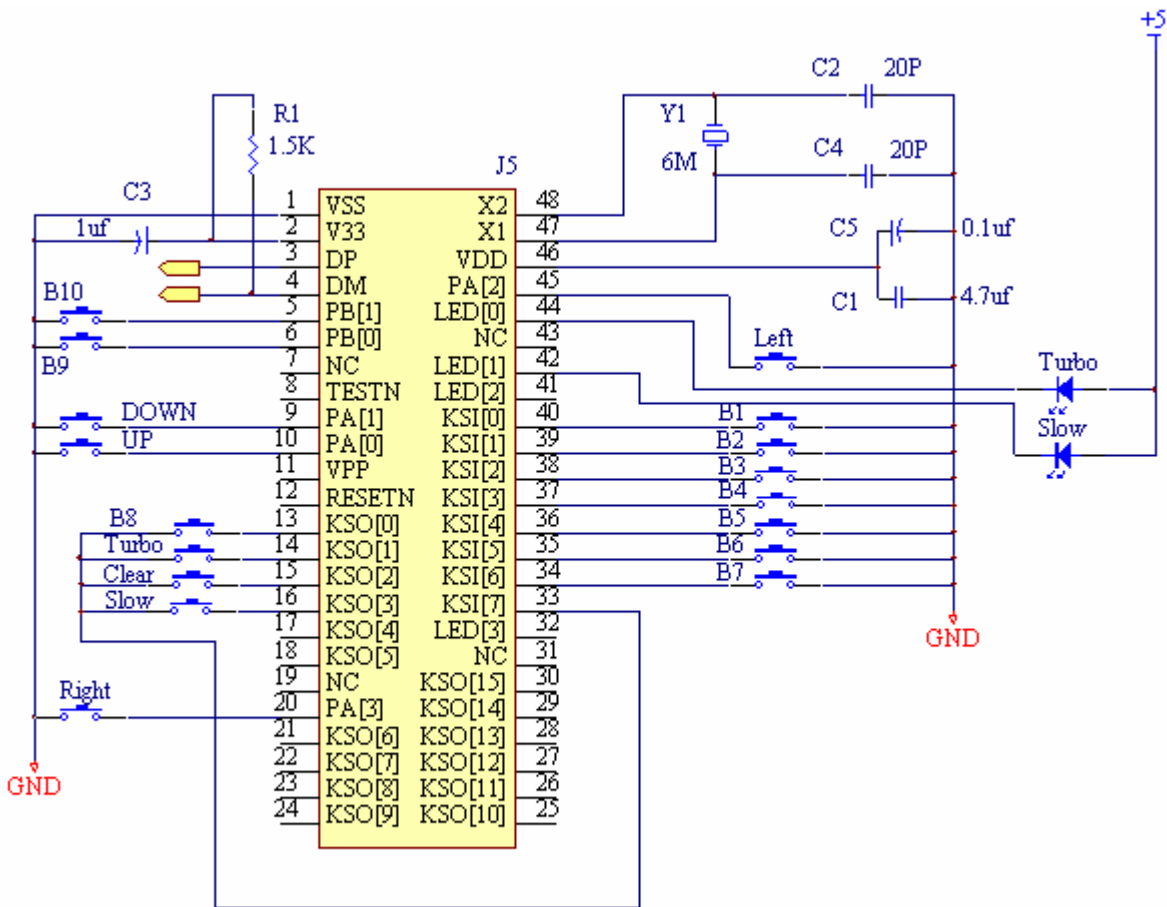


6. LED[3:0]

These pins are used to drive LED. They are open-drain structure with a serial resistor. The typical resistor value is 420 ohm.



APPLICATION CIRCUIT



NOTE: If you need programming on board, please pull out the Programming PIN
 The Programming PIN (VPP, VCC, X1, RSTN, TESTN, PB[0], KSI[3], KSI[6], KSI[7], VSS)

ABSOLUTE MAXIMUM RATINGS

GND= 0V

Name	Symbol	Range	Unit
Maximum Supply Voltage	VDD	-0.3 to 5.5	V
Maximum Input Voltage	Vin	-0.3 to VDD+0.3	V
Maximum output Voltage	Vout	-0.3 to VDD+0.3	V
Maximum Operating Temperature	Topg	-5 to +70	°C
Maximum Storage Temperature	Tstg	-25 to +125	°C

RECOMMEND OPERATING CONDITION

at Ta=-20°C to 70°C, GND= 0V

Name	Symb.	Min.	Max.	Unit
Supply Voltage	VDD	4.5	5.5	V
Input "H" Voltage	Vih	3.5	5.5	V
Input "L" Voltage	Vil1	0	0.8	V

DC CHARACTERISTICS

at Ta=-25 °C, VDD=5.0V, VSS= 0V, Fosc=6MHz

Name	Symb.	Min.	Typ.	Max.	Unit	Condition
Operating current	Icc		5.5		mA	Fosc=6MHz
Suspend current	Isus		360		uA	No load
Output High Voltage	Voh1		4.0		V	Ioh=30uA
	Voh2		4.5		V	Ioh=4mA
Output Low Voltage	Vol		0.4		V	Iol=15mA
RESET pull up resistor	Rrst		31		Kohm	(Vrst=3.38v)
KSI pull up resistor	Rksi		46		Kohm	
LED sink current	Iled		5.5		mA	Vled=3.2V
V33 output voltage	V33		3.28		V	

AC CHARACTERISTICS

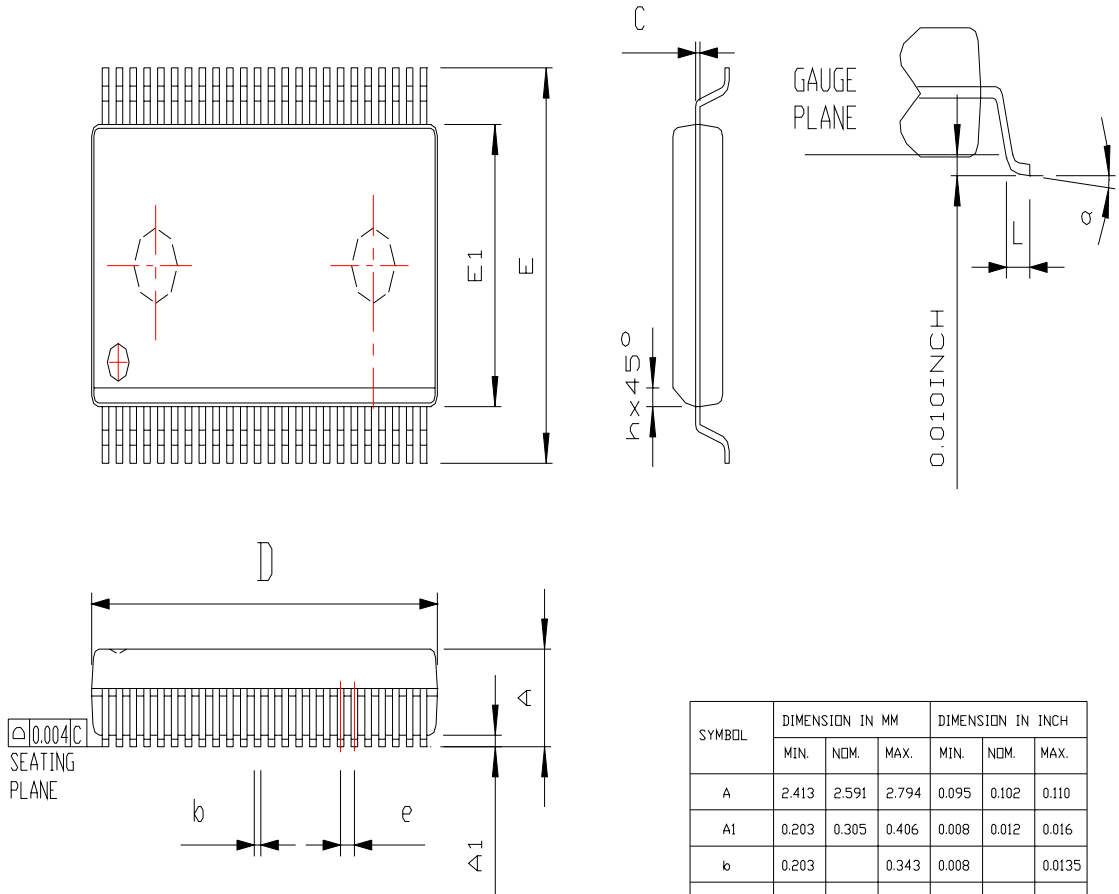
at Ta=-25 °C, VDD=5.0V, VSS= 0V, Fosc=6MHz

Name	Symb.	Min.	Max.	Unit	Note
DP/DM rising time	Trise	75	300	ns	
DP/DM falling time	Tfall	75	300	ns	
DP,DM cross point	Vx	1.3	2.0	V	

Note: All USB transceiver characteristics can meet USB1.1 spec.

Package Diagrams

48 PIN SSOP



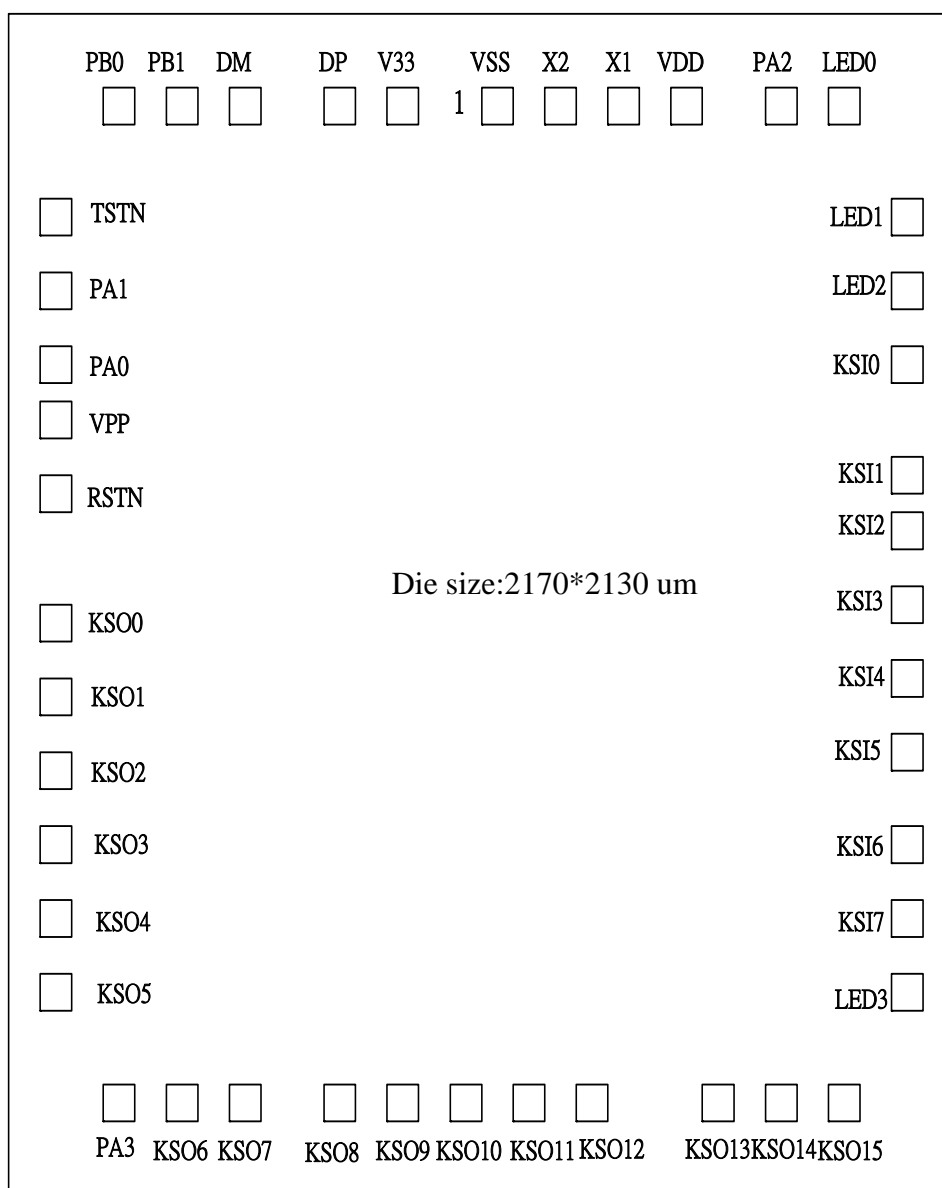
NOTE:

1. DIMENSION "D" DONE NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
2. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.006 INCH(0.1524mm) PER SIDE.

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.413	2.591	2.794	0.095	0.102	0.110
A1	0.203	0.305	0.406	0.008	0.012	0.016
b	0.203		0.343	0.008		0.0135
c	0.127		0.254	0.005		0.010
e	0.635BASIC			0.025BASIC		
E	10.033		10.668	0.395		0.420
E1	7.391	7.493	7.595	0.291	0.295	0.299
h	0.381		0.635	0.015		0.025
L	0.508		1.016	0.020		0.040
a	0	8	2.473	0		8

N	DIMENSION(IN INCH)			JEDEC
48	0.620	0.625	0.630	MO-118(AA)
56	0.720	0.725	0.730	MO-118(AB)

PAD locations



(2170,2130)um

Probe Number	Pad Name	X Coordinate	Y Coordinate	Probe Number	Pad Name	X Coordinate	Y Coordinate
1	VSS	1150.50	2021.00	23	KSO10	1087.50	109.00
2	V33	902.50	2021.00	24	KSO11	1205.50	109.00
3	DP	782.50	2021.00	25	KSO12	1335.50	109.00
4	DM	588.50	2021.00	26	KSO13	1575.50	109.00
5	PB1	467.50	2021.00	27	KSO14	1708.50	109.00
6	PB0	334.50	2021.00	28	KSO15	1829.50	109.00
7	TSTN	109.00	1795.50	29	LED3	2061.00	336.50
8	PA1	109.00	1678.50	30	KSI7	2061.00	467.50
9	PA0	109.00	1506.50	31	KSI6	2061.00	587.50
10	VPP	109.00	1386.50	32	KSI5	2061.00	826.50
11	RSTN	109.00	1246.50	33	KSI4	2061.00	946.50
12	KSO0	109.00	1006.5	34	KSI3	2061.00	1066.50
13	KSO1	109.00	874.50	35	KSI2	2061.00	1186.50
14	KSO2	109.00	754.50	36	KSI1	2061.00	1306.50
15	KSO3	109.00	622.50	37	KSI0	2061.00	1542.50
16	KSO4	109.00	492.50	38	LED2	2061.00	1662.50
17	KSO5	109.00	334.50	39	LED1	2061.00	1793.50
18	PA3	334.50	109.00	40	LED0	1835.50	2021.00
19	KSO6	467.50	109.00	41	PA2	1714.50	2021.00
20	KSO7	588.50	109.00	42	VDD	1514.50	2021.00
21	KSO8	836.50	109.00	43	X1	1393.50	2021.00
22	KSO9	957.50	109.00	44	X2	1271.50	2021.00

Ordering Information

Ordering Code	Package Type	Operating Range
TMU3100CC	Chip	Commercial
TMU3100SSC	48 Pin SSOP Package	Commercial