DTU1552

Keyboard Interface Controller

DATA SHEET

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1. Overview

Feature Highlights

Minimum number of external components
A special “**Shift**” button allowing detection of combinations
Only one host line required
Built-in algorithms for contact de-bouncing and error detection
Simple and consistent rich data output message
RoHS compliant

Typical Applications

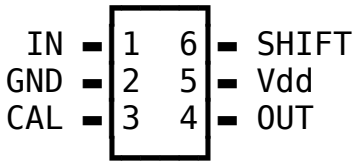
General use in keyboards and other contact detection systems

Ordering Codes

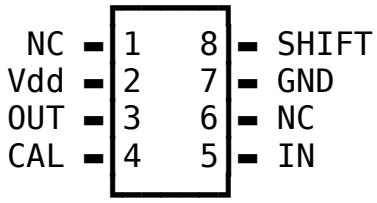
Device	Marking	Package
DTU1552T	**blue dot**	**SOT23-6**
DTU1552P	**DTUP 1552**	**DIP-8**
DTU1552R	**blue dot**	**DFN-8**

2. Pinout

SOT23-6



DIP-8, DFN-8



Pinout Summary

Pin (SOT23)	Pin (DIP, DFN)	Name	Type	Description
1	5	IN	AI	Contact circuit input
2	7	GND	P	Ground
3	4	CAL	AI	Auto-calibration input
4	3	OUT	O	Serial data output 9600 bps, 8N1 protocol
5	2	Vdd	P	DC power supply, positive lead
6	8	SHIFT	I	“Shift” contact input
N/A	1	NC	-	No connection
N/A	6	NC	-	No connection

***Legend**:*
I – input with CMOS levels **O** – digital output **P** – power pin
AI – analogue input

IN

Input sub-circuit. A series of up to 16 resistor/switch pairs forms the switch area. See **Application Circuit** for more detailed information.

CAL

Analogue input for self-calibration voltage. It forms the bottom part of a voltage divider, which top part is formed by the R_1 ... R_n resistors (see **Application Circuit**). By taking an initial measurement of the voltage on this input, DTU1552 is able to determine the total number of resistors (and switches) connected in the input sub-circuit.

In addition to that DTU1552 continuously self-calibrates in order to maintain stable and accurate operation over a wide temperature range.

OUT

Serial data output. The protocol complies with the standard UART **9600 bps, 8-bit word, no parity, one stop bit** interface (transmit only) at TTL level. The line can directly feed the RX input of a microcontroller.

Vdd

Power supply positive lead. In order to assure reliable operation, the power supply must be well filtered with minimum ripples. One or more ceramic decoupling capacitors with total capacitance of at least 0.1uF should be used and placed on the board as close as possible to the pin.

SHIFT

An input for additional “Shift” function switch. The status of this input can read independently and combined with the status of IN port to determine a combination of two simultaneously closed switches.

3. Output Protocol

DTU1552 creates a two-byte output message, which is sent to the host on every 20th millisecond:

Byte 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Error	Shift	Status	0	Code			

Byte 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Time counter (in periods of 20ms). Does not roll-over after reaching value of 255. This counter gets reset upon every change of bits in Byte 1							

Byte 1 bits

Error

This bit is set in one in an error condition has been discovered.

Shift

This bit is set in 1 if the “Shift” contact is detected to be closed. Otherwise is 0.

Status

This bit is set in 1 if any of the contacts in the IN circuit is detected to be closed. Otherwise is 0.

Code

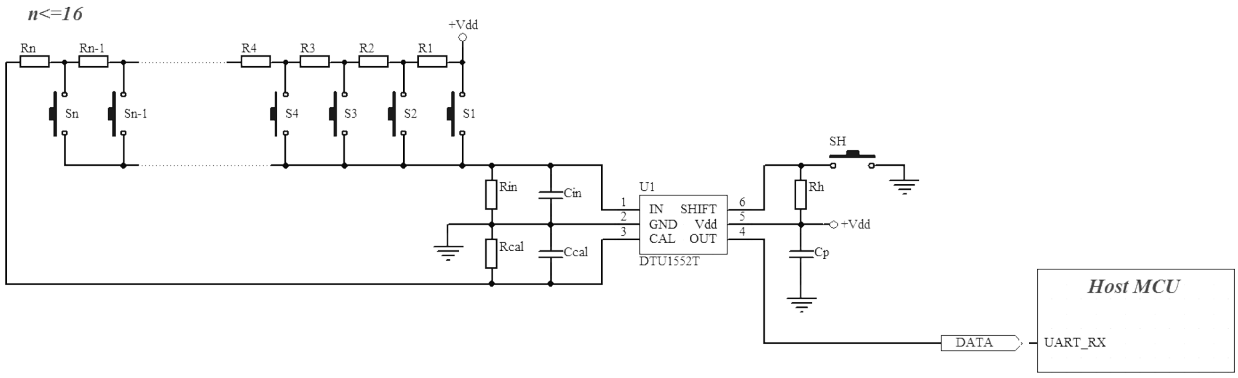
The code of a detected closed contact. Has meaning only if the bit “Status” is 1.

4. Electrical Parameters

Parameter	MIN.	TYP.	MAX.	Dim.
Power supply voltage on pin Vdd with respect to GND	2		5.5	V
Input voltage applied to IN, CAL and SHIFT pins with respect to GND	Vdd-0.5		Vdd+0.5	V
Digital logic “high” voltage	0.8Vdd			V
Digital logic “low” voltage			0.8	V
Maximum current into Vdd			80	mA
Current sunk by any pin			20	mA
Current sourced by any pin			20	mA
Power supply current[(1)]		620		µA
Ambient temperature	-40		+125	°C
Storage temperature	-65		+150	°C

(1) Environment temperature +25°C

5. Application Circuit



The recommended values of the components may vary but are an important factor in the overall power consumption of the circuit. The two capacitors C_{in} and C_{cal} are optional, however their existence sharply improves the stability and accuracy of the inputs. Best results are achieved with C_{in} and C_{cal} in the range 500pF through 5nF.

The actual number of switches and resistors can be determined as a number "***n***", where ***0≦n≦16***.
For normal operation the resistors R_1 … R_n, as well as R_{cal}, **must** be all of the same value, while R_{in} **must** be of value much bigger than the sum of the other resistors:

$R_1 = R_2 = R_3 = \ldots = R_{(n-1)} = R_n = R_{cal}$, where $0 \leqq n \leqq 16$

and

$R_{in} \gg (\sum(R_1,R_n) + R_{cal})$

Resistor R_h and switch SH are optional and required only in case the "Shift" function is used. The value of R_h is not of a great importance (except for the total power consumption) as long as it is kept within the range 2k though 200k. For BOM optimisation, this resistor could have the same value as R_{cal}.

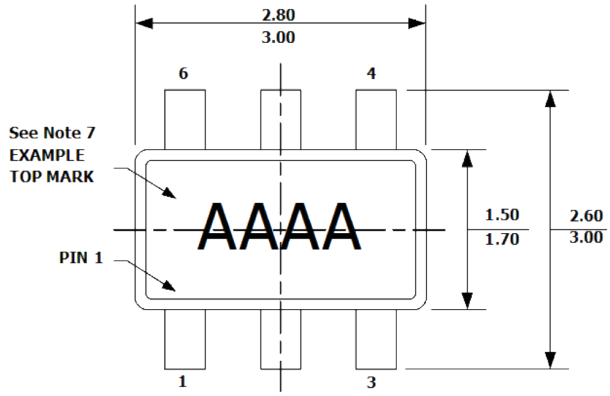
Capacitor C_p is for power decoupling. It should be physically located on the board as close to the Vdd pin as possible. Recommended values are in the range 100n through 10uF. A ceramic capacitor can be used with success.

Recommended values:

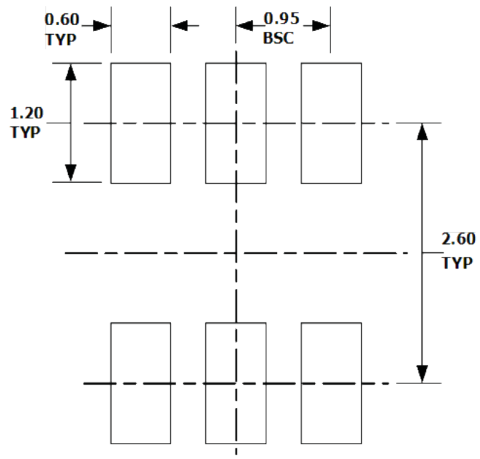
$R_{cal} \approx (75000/n)$ [Ohm], where 'n' is the number of switches in the circuit
$R_1 \ldots R_n = R_{cal}$
C_{cal} =1n
R_{in} =1M
C_{in} =1n
R_h =100k
C_p =1µ

6. Packaging

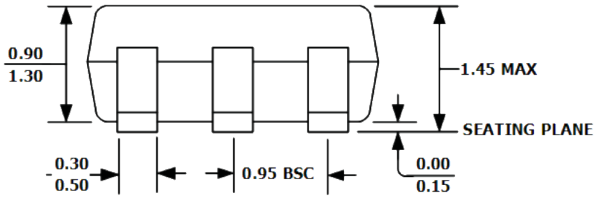
Package “**T**” (SOT23-6)



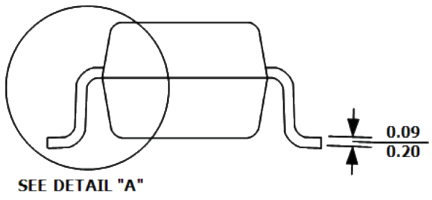
TOP VIEW



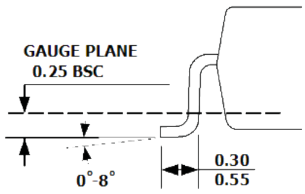
RECOMMENDED FOOTPRINT



FRONT VIEW



SIDE VIEW

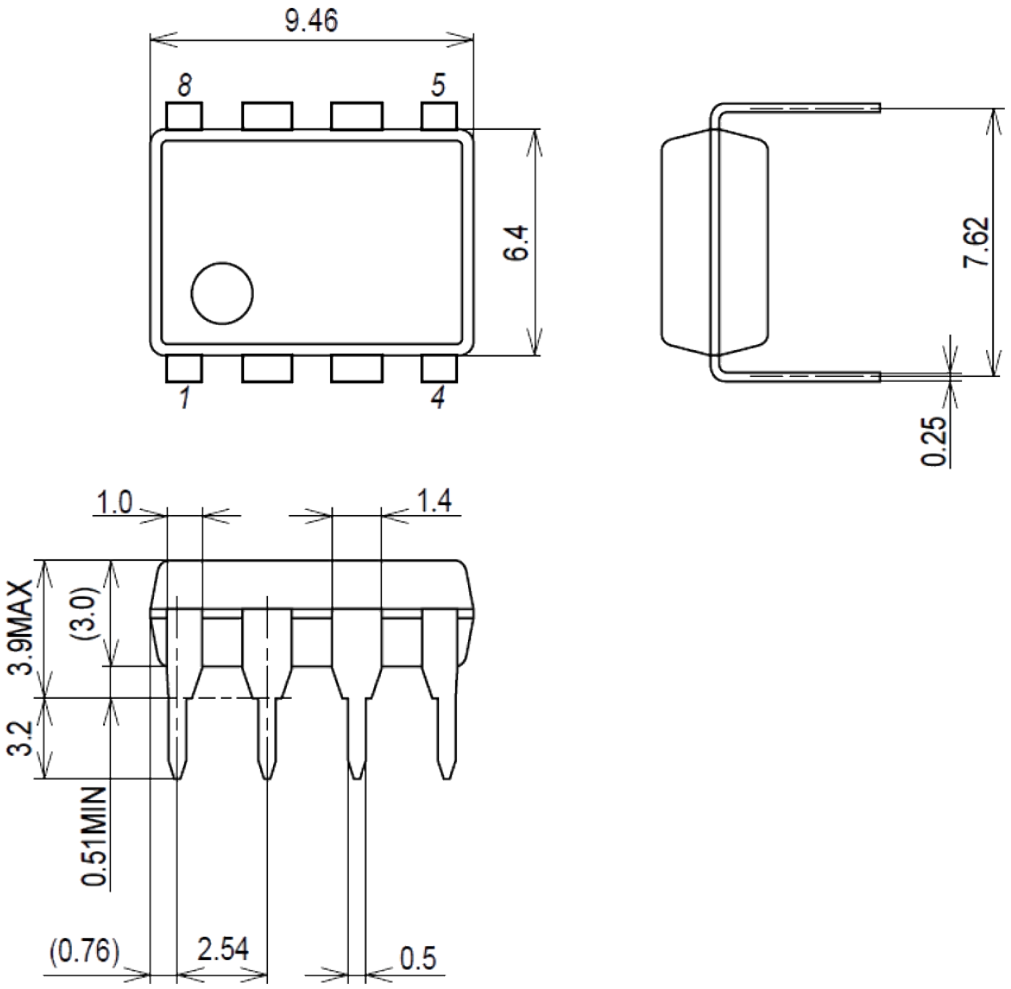


DETAIL “A”

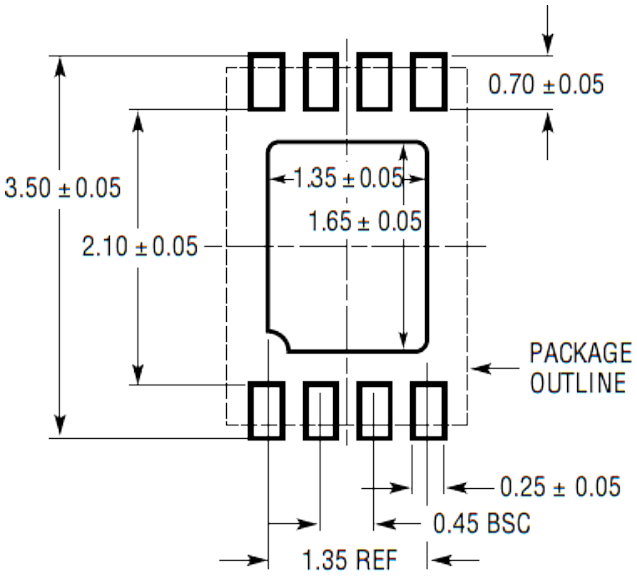
NOTE:

1) ALL DIMENSIONS ARE IN MILLIMETERS.
2) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR.
3) PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION.
4) LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.10 MILLIMETERS MAX.
5) DRAWING CONFORMS TO JEDEC MO-178, VARIATION AB.
6) DRAWING IS NOT TO SCALE.
7) PIN 1 IS LOWER LEFT PIN WHEN READING TOP MARK FROM LEFT TO RIGHT, (SEE EXAMPLE TOP MARK)

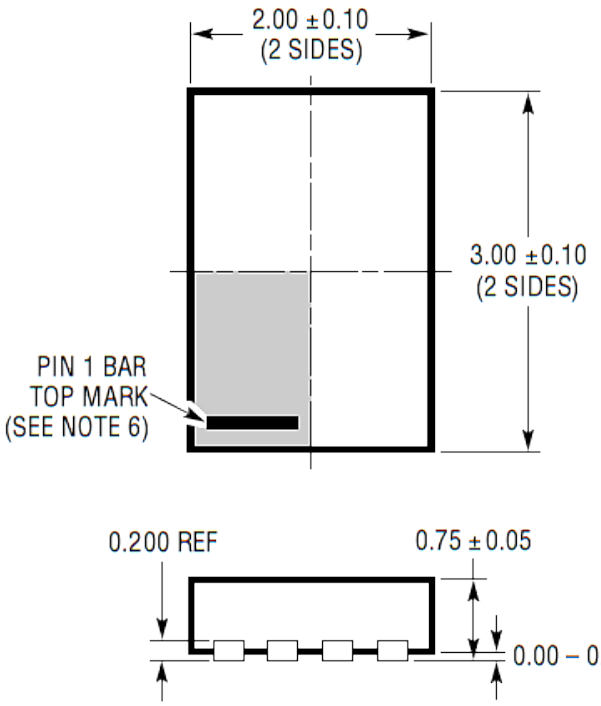
Package “**P**” (DIP8)

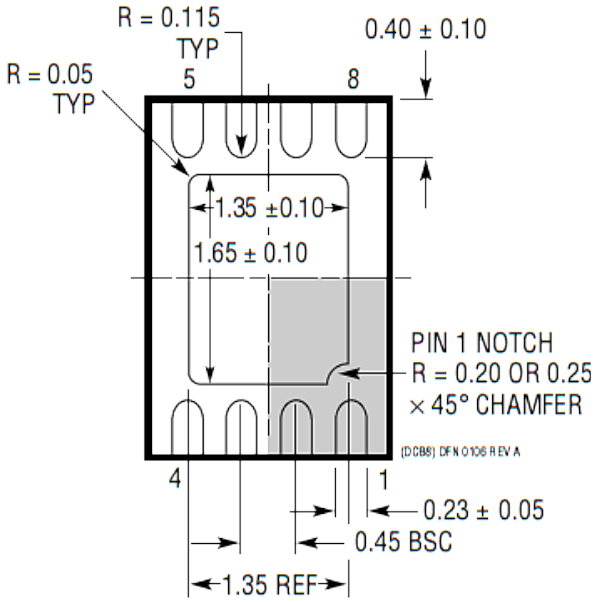


Package “**R**” (DFN8)



RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS
APPLY SOLDER MASK TO AREAS THAT ARE NOT SOLDERED





BOTTOM VIEW—EXPOSED PAD

NOTE:
1. DRAWING IS NOT A JEDEC PACKAGE OUTLINE
2. DRAWING NOT TO SCALE
3. ALL DIMENSIONS ARE IN MILLIMETERS
4. DIMENSIONS OF EXPOSED PAD ON BOTTOM OF PACKAGE DO NOT INCLUDE MOLD FLASH. MOLD FLASH, IF PRESENT, SHALL NOT EXCEED 0.15mm ON ANY SIDE
5. EXPOSED PAD SHALL BE SOLDER PLATED
6. SHADED AREA IS ONLY A REFERENCE FOR PIN 1 LOCATION ON THE TOP AND BOTTOM OF PACKAGE