FUTEK
ADVANCED SENSOR TECHNOLOGY, INC.

TEDS

Transducer Electronic Datasheet

Manual and Programming Guide

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What is TEDS?

TEDS stands for **Transducer Electronic Data Sheet**. It is an EEPROM device embedded in the sensor or sensor's connector that contains calibration information such as serial number, calibration dates, and other calibration factors.

TEDS was introduced as IEEE P1451.4 in 1997 and established the concept of "smart transducers." These chips store important calibration data that facilitate communications between sensors and their instruments, greatly reducing the calibration and setup work that the user must perform.

It is a convenient technology that allows users to bypass the tedious process of calibrating a sensor with an instrument. This avoids potential confusion, saves time and energy, and makes the sensor a true "plug and play" experience.

ADVANTAGES OF A SYSTEM WITH TEDS

- TEDS streamlines the setup of a sensor with an instrument by allowing you to bypass complicated calibration steps. This gives you a ready-to-go, plug-and-play system and greatly diminishes the opportunity for scaling & calibration errors.
- TEDS facilitates multiple sensors for one instrument, making it cost effective, easy to troubleshoot, and simple to operate.

FUTEK Sensors and Solutions that are compatible with TEDS

SENSORS

TYPE[1]	EXAMPLES
Load	Pancake; S-Beam; Load Buttons; Load Washers; Threaded Rod, Donut Load Cell
Torque	Reaction and Rotary Torque; Socket Extension Torque
Pressure	Miniature; Male/Female Port

SOLUTIONS

TYPE	EXAMPLES
Displays	Digital Panel Mount; Hand Held.
SENSIT	Test and Measurement Software

How is TEDS Implemented?

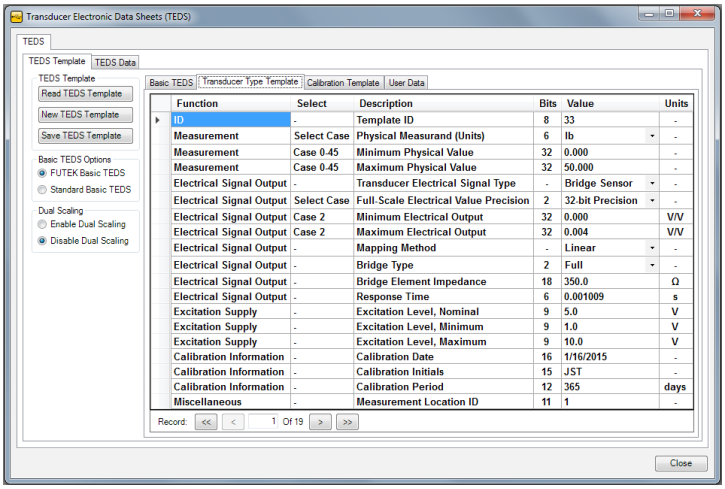
SENSORS

A single TEDS chip is embedded within the sensor's connector, such as DB9 or 12-Pin Binder.

Alternatively, the chip is embedded within the sensor body.

INSTRUMENTS

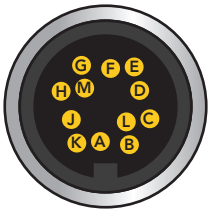
FUTEK displays such as the IPM650 (Intelligent Panel Mount Display) and IHH500 (Intelligent Hand Held Display) are equipped with TEDS during manufacturing, so there is no need for modification. IPM650 and IHH500 can read TEDS data upon startup or by loading it through the menu. Additionally, TEDS data will automatically create a custom channel that is programmed specifically for your sensor, allowing for easy and immediate use.

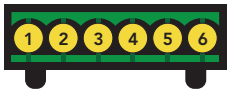


SENSIT™ SOFTWARE

Users of SENSIT™ software have the ability to read and write TEDS information to their sensors by creating new templates. This allows users to edit the data on the TEDS chip if they should require a different setting.

How to Program TEDS





IHH500 SENSOR CONNECTIONS

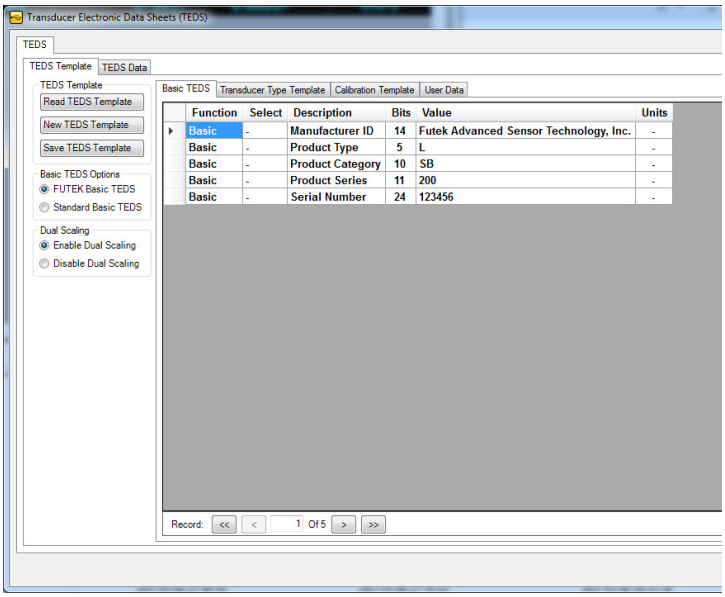
PIN	SYMBOL	DESCRIPTION
A	+E	+Excitation
B	+S	+Signal
C	–E	–Excitation, TEDS return
D	–S	–Signal
E	TEDS_IO	TEDS Data
F	24_OUT	24V output
G	GND_OUT	Ground/Shield
H	5_OUT	5V Output
J	–V	–V and –mA Amplified Input Connections
K	+V	+V and +mA Amplified Input Connections
L	PLEAD	Leading pulse from sensor
M	PLAG	Lagging pulse from sensor

IPM650 STRAIN GAUGE INPUT

PIN	SYMBOL	DESCRIPTION
1	G	Ground/Shield
2	TEDS	TEDS Data
3	–S	–Signal
4	+S	+Signal
5	–E	–Excitation
6	+E	+Excitation

NECESSARY COMPONENTS

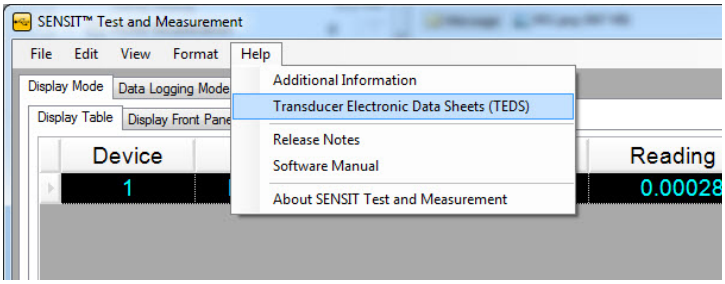
- TEDs chip
- IHH500/IPM650
- SENSIT™ Test and Measurement Software
- IHH500 USB Cable (FSH03570) or IPM650 USB Cable (GOD04123)



TEDS TEMPLATE

This SENSIT™ software tab allows the user to read and write to a TEDS Chip. The table displays information related to the Basic TEDS Information and the TEDS Template Information.

How to Program TEDS

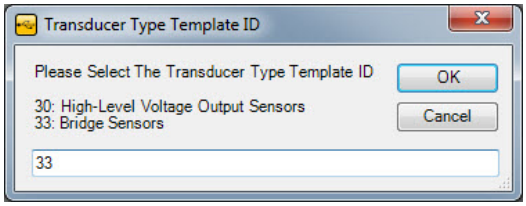


HOW TO ACCESS TEDS TEMPLATE

Open the SENSIT™ software, verify serial number displayed in initial loading window, click Help tab, and then Transducer Electronic Datasheets (TEDS). This will open a new window allowing access to the TEDS template to read or write to the TEDS chip.

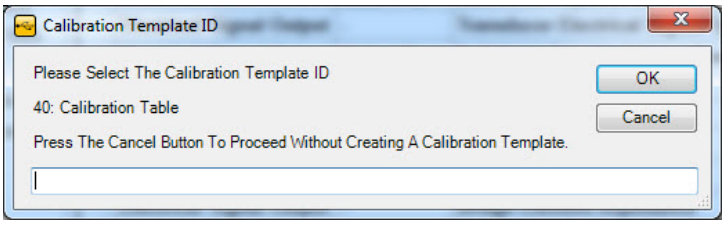
HOW TO READ TEDS TEMPLATE INFORMATION

Click **Read TEDS Template**.

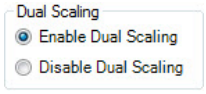


HOW TO CREATE NEW TEDS TEMPLATE INFORMATION

1. Click New TEDS Template and specify the Template ID number in the input box below. (Type 33 for Bridge Sensors and 30 for High Voltage Amplified output sensors. Both follow the same procedure with different inputs.)

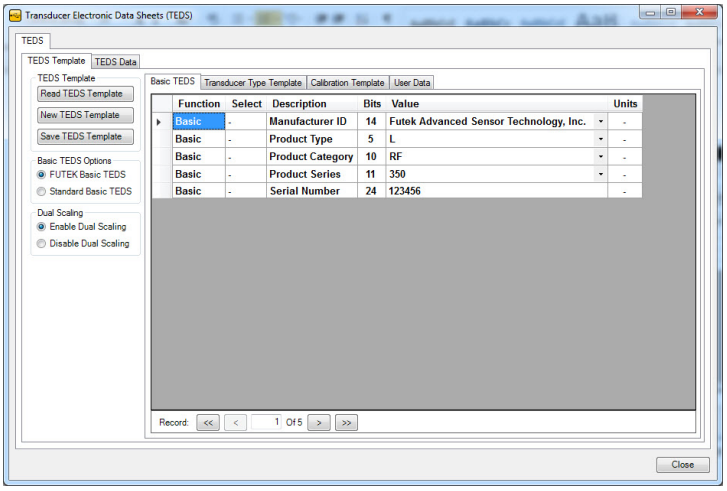


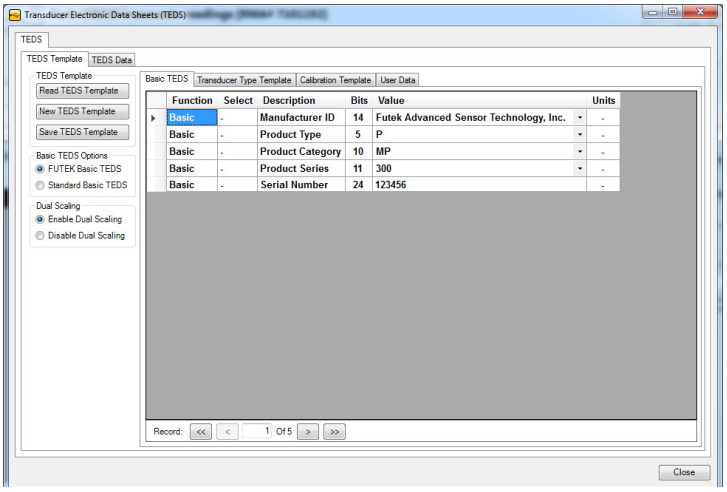
2. Specify the Calibration Template ID. In the new window press OK with no input. **Note:** In the following steps a LRF350 500lbs 2 mV/V output will be used as an example for template 33 and a PMP300 50 PSI 0-10 VDC Output for template 30.



3. For sensors with dual direction output click Enable Dual Scaling or else leave as Disable Dual Scaling ONLY if dual direction output value available. Dual Direction output will be input later in User Data.

How to Program TEDS





4. Input Product Type, Product Category, Product Series, and Serial number for unit in **Basic TEDS** Tab. (LRF350 and PMP300 used as examples for reference.)

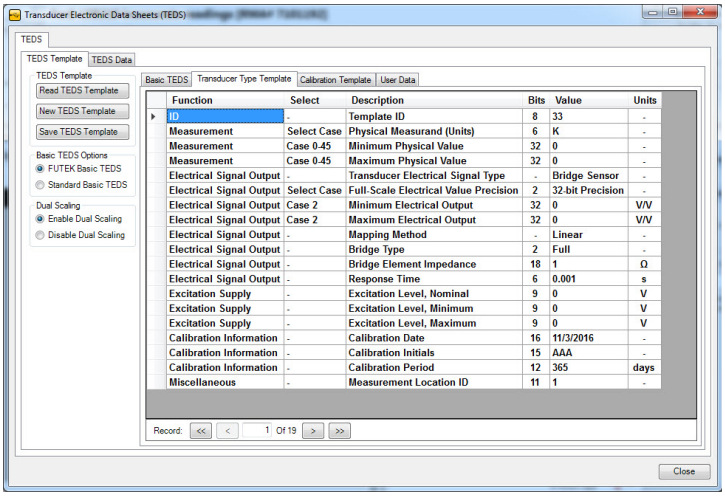
PRODUCT TYPE	
SYMBOL	**PRODUCT**
L	Load Cell
T	Torque Sensor
P	Pressure Sensor
M	Multi-Axis Sensor

Product Category: Letters specifying which product family sensor is part of. (Ex: RF for LRF350 and MP for PMP300)

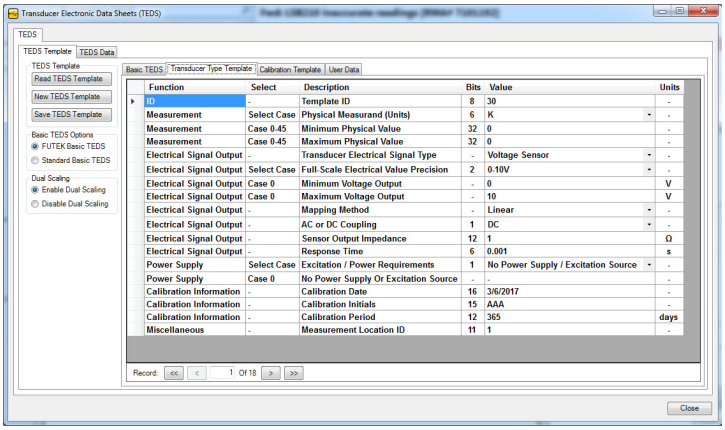
Product Series: Numbers used to specify sensor model. Ex: 350 for LRF350 and 300 for PMP300

How to Program TEDS

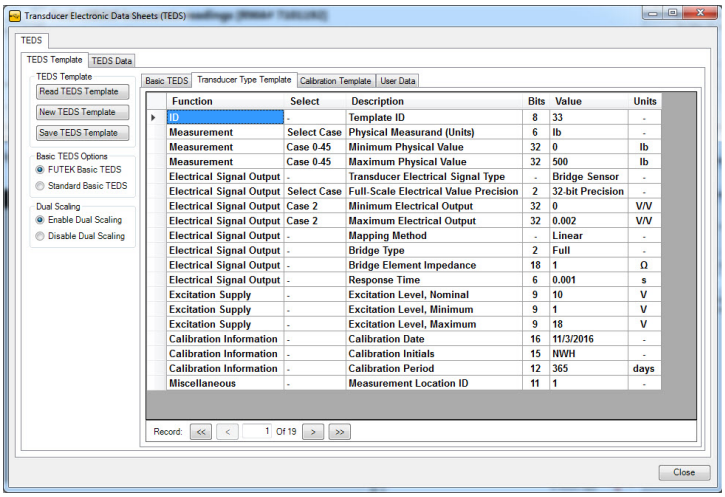
5. On **Transducer Type** Template, Input sensor information corresponding to specs.
   - Template ID, Full Scale Electrical Value Precision, Mapping Method, Bridge Type, Bridge Element Impedance, Response Time, and Measurement Location ID can be left untouched with template provided values.
   - Maximum Electrical Output must be converted from mV/V to V/V. (Example: 2 mV/V would be 0.002 V/V.)
   - Excitation Levels, voltage that will be supplied to sensor for power, can be found on Unit spec sheet. Nominal excitation level can be stated using Calibration excitation on spec sheet.



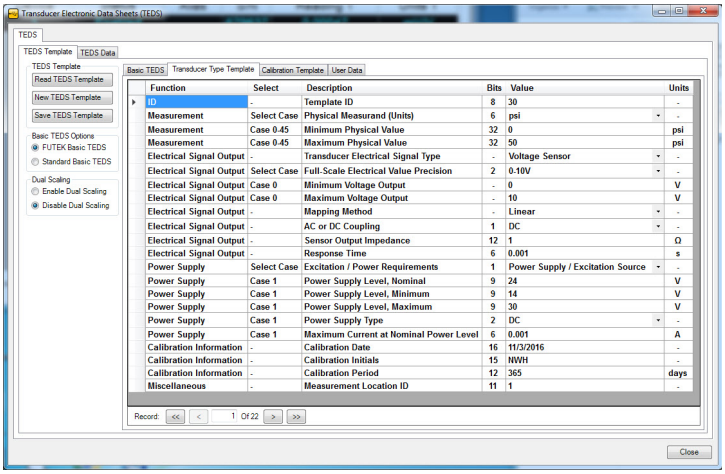
Template 33 before Sensor information input



Template 30 before Sensor information input

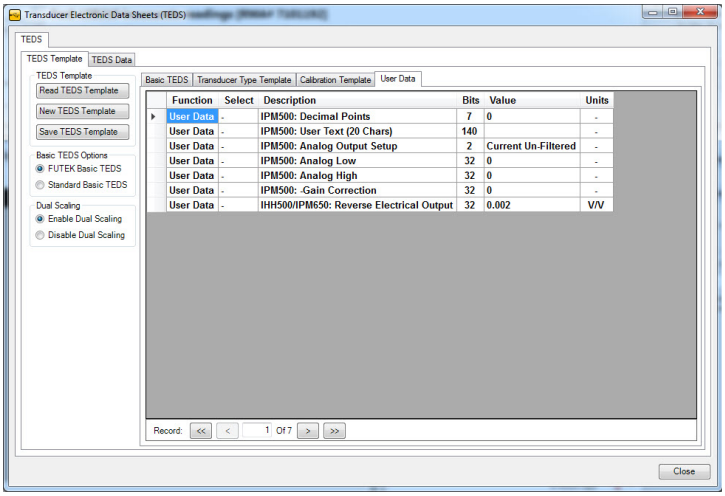


Template 33 after Sensor information input



Template 30 after Sensor information input

How to Program TEDS



6. On User Data tab, if reverse direction output is known input value in IHH500/IPM650: Reverse Electrical Output. Verify Enable Dual Scaling is enabled on Dual Scaling option.

HOW TO SAVE TEDS TEMPLATE INFORMATION

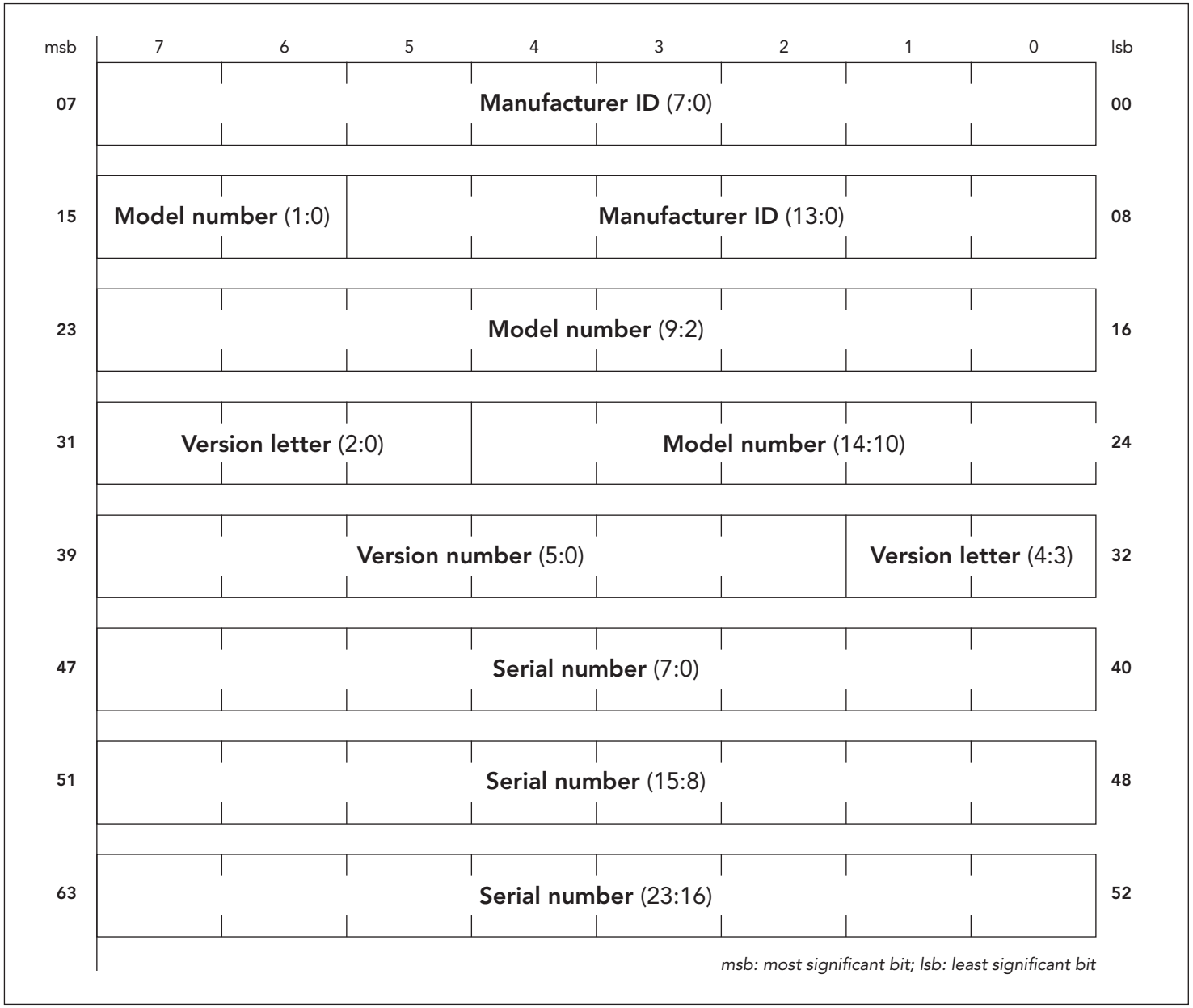
After you have filled in all of the required Basic TEDS Information and TEDS Template Information, click Save TEDS Template.

Please Note: When writing to the TEDS Chip, the data will be overwritten. Please be cautious as there is no way to retrieve the information once it has been overwritten.

TEDS Layout

The following information is as found in the IEEE 21451-4 First Edition International Standard manual reference number ISO/IEC/IEEE 21451-4:2010(E)

As per the IEEE 1451.4 TEDS standard basic TEDS information shall occupy the Application Register and have the following format and information starting at the first byte of TEDS Memory.



Memory map, IEEE 1451.4 Basic TEDS

TEDS Layout

FUTEK utilizes template 30 for amplified voltage output sensors and 33 for non-amplified sensors.

HIGH-LEVEL VOLTAGE OUTPUT TEMPLATE (ID = 30) SUMMARY

FUNCTION	SELECT	PROPERTY/ COMMAND	DESCRIPTION	ACCESS	BITS	DATA TYPE (AND RANGE)	UNITS
ID	—	`TEMPLATE`	Template ID	—	8	Integer (value = 30)	—
Measurement	Select Case—Physical Measurand				6	Select Case	—
	Cases 0–45	`%MinPhysVal`	Minimum physical value	CAL	32	Single	Various[a]
		`%MaxPhysVal`	Maximum physical value	CAL	32	Single	Various[a]
Electrical signal output	—	`%ElecSigType`	Transducer Electrical Signal Type	ID	—	Assign = 0, "Voltage Sensor"	—
	Select Case—Full-Scale Electrical Value Precision				2	Select Case	—
	Case 0	`%MinElecVal`	Minimum voltage output	CAL	—	Assign = 0.0	V
		`%MaxElecVal`	Maximum voltage output	CAL	—	Assign = 10.0	V
	Case 1	`%MinElecVal`	Minimum voltage output	CAL	—	Assign = -10.0	V
		`%MaxElecVal`	Maximum voltage output	CAL	—	Assign = 10.0	V
	Case 2	`%MinElecVal`	Minimum voltage output	CAL	11	ConRes (–20.5 to 20.4, step 0.02)	V
		`%MaxElecVal`	Maximum voltage output	CAL	11	ConRes (–20.5 to 20.4, step 0.02)	V
	Case 3	`%MinElecVal`	Minimum voltage output	CAL	32	Single	V
		`%MaxElecVal`	Maximum voltage output	CAL	32	Single	V
	—	`%MapMeth`	Mapping Method	ID	—	Assign = 0, "Linear"	—
	—	`%ACDCCoupling`	AC or DC coupling	ID	1	Enumeration: DC | AC	—
	—	`%SensorImped`	Sensor output impedance	ID	12	ConRelRes (1 to 1.1M, ±0.17%)	Ω
	—	`%RespTime`	Response Time	ID	6	ConRelRes (1E-6 to 7.9, ±15%)	s
Power supply	Select Case—Excitation/Power Requirements				1	Select Case	—
	Case 0	–	No power supply or excitation source	—	—	—	—
	Case 1	`%ExciteAmplNom`	Power-supply level, nominal	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
		`%ExciteAmplMin`	Power-supply level, min.	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
		`%ExciteAmplMax`	Power-supply level, max	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
		`%ExciteType`	Power-supply type	ID	2	Enumeration: DC | Bipolar DC | AC	—
		`%ExciteCurrentDraw`	Max current at nominal power level	ID	6	ConRelRes (1E-6 to 1.6, ±13%)	A

HIGH-LEVEL VOLTAGE OUTPUT TEMPLATE (ID = 30) SUMMARY							
FUNCTION	SELECT	PROPERTY/ COMMAND	DESCRIPTION	ACCESS	BITS	DATA TYPE (AND RANGE)	UNITS
Calibration information	—	`%CalDate`	Calibration Date	CAL	16	DATE	—
	—	`%CalInitials`	Calibration initials	CAL	15	CHR5	—
	—	`%CalPeriod`	Calibration period	CAL	12	UNINT	days
Misc.	—	`%MeasID`	Measurement location ID	USR	11	UNINT	—
			Total bits required for TEDS (range):			154 to 253 bits	

[a]Units for %MinPhysVal and %MaxPhysVal are determined by value of the Select Case "Physical Measurand" as summarized in Table A.22.

TEDS Layout

BRIDGE SENSORS TEMPLATE (ID = 33) SUMMARY

FUNCTION	SELECT	PROPERTY/ COMMAND	DESCRIPTION	ACCESS	BITS	DATA TYPE (AND RANGE)	UNITS
ID	—	`TEMPLATE`	Template ID		8	Integer (value = 33)	—
Measurement	Select Case—Physical Measurand			—	6	Select Case	—
	Cases 0–45	`%MinPhysVal`	Minimum physical value	CAL	32	Single	Variousa
		`%MaxPhysVal`	Maximum physical value	CAL	32	Single	Variousa
Electrical signal output	—	`%ElecSigType`	Transducer Electrical Signal Type	ID	—	Assign = 3, "Bridge Sensor"	—
	Select Case—Full-Scale Electrical Value Precision				2	Select Case	—
	Case 0	`%MinElecVal`	Minimum electrical output	CAL	11	ConRes (±1, step 1E-3)	V/V
		`%MaxElecVal`	Maximum electrical output	CAL	11	ConRes (±1, step 1E-3)	V/V
	Case 1	`%MinElecVal`	Minimum electrical output	CAL	19	ConRes (±6.55E-3, step 25E-9)	V/V
		`%MaxElecVal`	Maximum electrical output	CAL	19	ConRes (±6.55E-3, step 25E-9)	V/V
	Case 2	`%MinElecVal`	Minimum electrical output	CAL	32	Single	V/V
		`%MaxElecVal`	Maximum electrical output	CAL	32	Single	V/V
	—	`%MapMeth`	Mapping Method	ID	—	Assign = 0, "Linear"	—
Excitation supply	—	`%BridgeType`	Bridge Type	ID	2	Enumeration: Quarter | Half | Full	—
	—	`%SensorImped`	Bridge element impedance	ID	18	ConRes (1 to 26.2k, step 0.1)	Ω
	—	`%RespTime`	Response Time	ID	6	ConRelRes (1E-6 to 7.9, ±15%)	s
	—	`%ExciteAmplNom`	Excitation level, nominal	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
	—	`%ExciteAmplMin`	Excitation level, min.	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
	—	`%ExciteAmplMax`	Excitation level, max	ID	9	ConRes (0.1 to 51.1, step 0.1)	V
Calibration information	—	`%CalDate`	Calibration Date	CAL	16	DATE	—
	—	`%CalInitials`	Calibration initials	CAL	15	CHR5	—
	—	`%CalPeriod`	Calibration period	CAL	12	UNINT	days
Misc.	—	`%MeasID`	Measurement location ID	USR	11	UNINT	—
				Total bits required for TEDS (range):	209 to 251 bits		

[a]Units for %MinPhysVal and %MaxPhysVal are determined by value of the Select Case "Physical Measurand" as summarized in Table A.22.

TEDS Layout

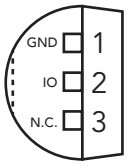
FUTEK utilizes the additional memory locations in the TEDS chip for IIPM500 legacy support and IHH500 and IPM650 dual direction support as shown below for use with Template 30 and Template 33.

FUTEK USER DATA TEMPLATE (ID = 1) SUMMARY

FUNCTION	SELECT	PROPERTY/ COMMAND	DESCRIPTION	ACCESS	BITS	DATA TYPE (AND RANGE)	UNITS
User Data	—	IPM500: Decimal Points	IPM500: Decimal Points	CAL	7	ASCII	—
	—	IPM500: User Text (20 Chars)	IPM500: Decimal Points	CAL	140	ASCII	—
	—	IPM500: Analog Output Setup	IPM500: Analog Output Setup	CAL	2	Enumeration: Current Un-Filtered | Current Filtered | Voltage Un-Filtered | Voltage Filtered	—
	—	IPM500: Analog Low	IPM500: Analog Low	CAL	32	Single	—
	—	IPM500: Analog High	IPM500: Analog High	CAL	32	Single	—
	—	IPM500: -Gain Correction	IPM500: -Gain Correction	CAL	32	Single	—
	—	IHH500/IPM650: Reverse Voltage Output	IHH500/IPM650: Reverse Voltage Output	CAL	32	Single	—
			Total bits required for TEDS (range):		277 bits		

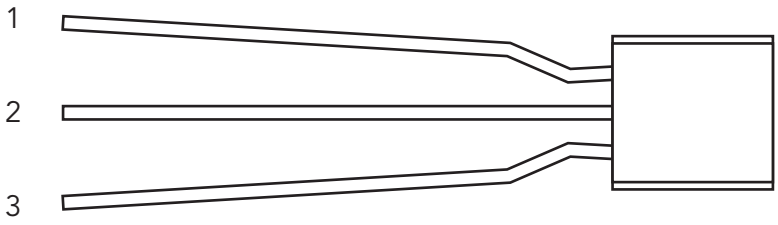
TEDS EEPROM Chip

FUTEK utilizes the Maxim DS24B33 Chip. The template utilized by FUTEK can also be utilized for the DS2430, DS2431, DS2432 and DS2433.

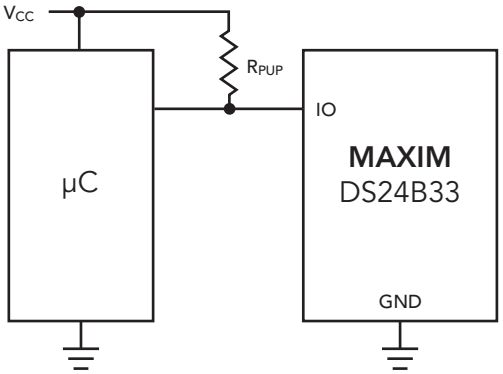


Side view

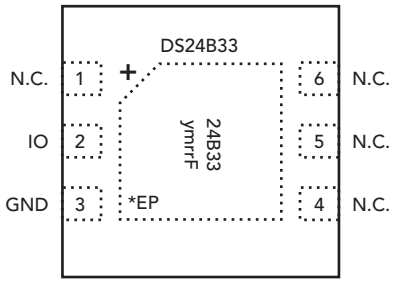
Front view



Front view (T&R version)



Top view



TDFN (3mm × 3mm)

*Exposed pad

Operating Range: +2.8V to +5.25V, -40°C to +85°C

Drawing Number: EM1049

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