UMW TLP250H

2.5 Amp Output Current IGBT Gate Drive Optocouple

1.Description

The TLP250H is a gate driven optocoupler with an output current of 2.5A, with an AlGaAs LED, which is coupled to a photosensitive integrated circuit through infrared light. This optocoupler can drive most low-power IGBTs and MOSFETs. In the motor control inverter and high-performance power system applications, it is very suitable for fast switching drive power IGBTs and MOSFETs.

2.Applications

- Uninterrupted Power Supply
- IGBT isolation / power MOSFET gate drive
- Induction heating
- Industrial inverters

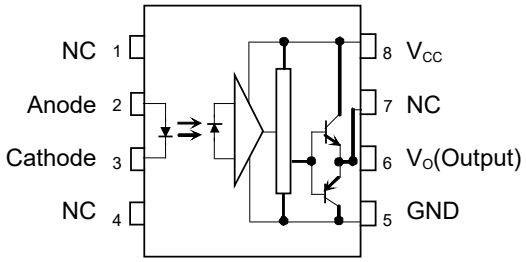
3.Features

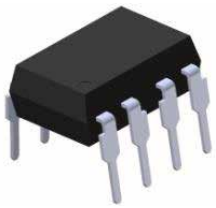
- 35kV/μs minimum Common Mode Rejection
- 2.5A maximum peak output current
- Wide operating V_{CC} Range: 10V~30V
- 400ns maximum propagation delay
- 100ns of pulse width distortion
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Operating temperature range: -40°C~ +125°C

4.Truth Table

Input	LED	M1	M2	Output
H	ON	ON	OFF	H
L	OFF	OFF	ON	L

5.Pinning Information





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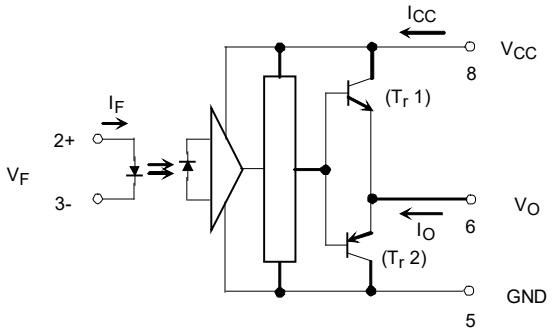
6.Schmatic



A 0.1μF bypass capcitor must be connected between pin 8 and 5

7.Insulation And Safety Related Specifications

Parameter	Symbol	Note	Value	Unit
Creepage Distance	L	Measured from input terminals to output terminals, shortest distance path along body	≥7	mm
Clearance Distance	L	Measured from input terminals to output terminals, shortest distance through air	≥7	mm
Insulation Thickness	DTI	Insulation thickness between emitter and detector	≥0.4	mm
Peak Isolation Voltage	V_{IORM}	DIN/EN/IEC EN60747-5-5.	1500	V_{peak}
Transient Isolation Voltage	V_{IOTM}	DIN/EN/IEC EN60747-5-5.	7000	V_{peak}
Isolation Voltage	V_{ISO}	For 1 min	5000	V_{rms}

8.Absolute Maximum Ratings T_A= 25°C

Parameter		Symbol	Value	Units
Input	Forward Input Current (1)	I_{FM}	25	mA
	Reverse Voltage	V_R	5	V
	Input Power Dissipation	P_D	40	mW
Output	Peak Output Current (2)	$I_{O(PEAK)}$	2.5	A
	Supply Voltage	V_{CC}	35	V
	Output Voltage	V_O	35	V
	Output Power Dissipation	P_O	260	mW
Isolation Voltage		V_{ISO}	5000	V_{rms}
Total Power Consumption		P_{tot}	300	mW
Operating Temperature		T_{opr}	-40 to 125	°C
Storage Temperature		T_{stg}	-55 to 130	°C
Soldering Temperature (3)		T_{sol}	260	°C

Note:

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions "/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Pulse width (PW)≤ 1μs, 300 pps

Note 2: Exponential waveform. Pulse width ≤ 0.2μs, f ≤ 15 kHz, V_{CC} = 20 V, T_a = -40 to 125°C Exponential waveform. Pulse width ≤ 0.08μs, f ≤ 25 kHz, V_{CC} = 15V, T_a = -40 to 125°C.

Note 3: ≥ 2 mm below seating plane.

9.Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Power Supply Voltage	V_{CC} - V_{SS}	10	30	V
Input Current (ON) (1)	$I_{F(ON)}$	7	10	mA
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.8	V
Operating Temperature	T_A	-20	85	°C

Note: The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this datasheet should also be considered.

Note: A ceramic capacitor (0.1μF) should be connected between pin 8 and pin 5 to stabilize the operation of a highgain linear amplifier. Otherwise, this photocoupler may not switch properly. The bypass capacitor should be placed within 1 cm of each pin.

Note : If the rising slope of the supply voltage (V_{CC}) for the detector is steep, stable operation of the internal circuits cannot be guaranteed. Be sure to set 3.0 V/μs or less for a rising slope of the V_{CC}.

Note 1: The rise and fall times of the input on-current should be less than 0.5μs

10.Electro-optical Characteristics (T_A=25°C)

All minimum and maximum specifications are at recommended operating conditions, unless otherwise noted
All typical values are at T_A=25°C, V_{DD}=30V, and V_{SS}=GND.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input forward voltage	V_F	I_F=10mA, T_A=25°C	1.4	1.55	1.7	V
Input forward voltage temperature coefficient	$\Delta V_F/\Delta T_A$	I_F=10mA		-2		mV/°C
Input reverse current	I_R	V_R=5V, T_A=25°C			10	μA
Input capacitance	C_t	V=0V, f=1MHz, T_A=25°C		95		pF
Peak high-level output current (1)	I_{OPH}	I_F=5mA, V_{CC}=30V, V_{8-6}=-3.5V		-1.6	-1	A
		I_F=5mA, V_{CC}=15V, V_{8-6}=-7V			-2	A
Peak low-level output current (1)	I_{OPL}	I_F=0mA, V_{CC}=30V, V_{6-5}=2.5V	1	1.6		A
		I_F=0mA, V_{CC}=15V, V_{6-5}=7V	2			A
High-level output voltage	V_{OH}	I_F=5mA, R_L=200Ω, V_{CC1}=15V, V_{EE1}=-15V	11	13.7		V
Low-level output voltage	V_{OL}	I_F=0.8V, R_L=200Ω, V_{CC1}=15V, V_{EE1}=-15V		-14.9	-12.5	V
High-level supply current	I_{CCH}	I_F=10mA, V_{CC}=30V, V_O=Open		1.5	3	mA
Low-level supply current	I_{CCL}	I_F=0mA, V_{CC}=30V, V_O=Open		1.5	3	mA
Threshold input current (L/H)	I_{FLH}	V_{CC}=15V, V_O>1V		1	5	mA
Threshold input voltage (H/L)	V_{FHL}	V_{CC}=15V, V_O<1V	0.8			V
Supply voltage	V_{CC}		10		30	V
UVLO threshold voltage	V_{UVLO+}	I_F=5mA, V_O>2.5V	7.5	9	9.5	V
	V_{UVLO-}	I_F=5mA, V_O<2.5V	6.7	9.1	9.5	V
UVLO hysteresis	$UVLO_{HYS}$			0.1		V
Isolation Resistance	R_{ISO}	V_{I-O}=500V, 40~60%R.H.	$1x10^{12}$			Ω
Isolation Resistance	C_{ISO}	V_{I-O}=0V, Freq=1MHZ	1			pF

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Propagation Delay Time to Low Output Level (1)	T_{PHL}	I_F=7mA to 16mA,Rg=10Ω,Cg=10nF F=10KHZ, Duty Cycle=50%		100	300	ns
Propagation Delay Time to High Output Level (1)	T_{PLH}			100	300	ns
Pulse Width Distortion	PWD			3	100	ns
Propagation Delay Difference Between Any Two Parts	PDD		-250		250	ns
Output Rise Time(10% To 90%)(1)	T_R	I_F=7mA to 16mA,Rg=10Ω,Cg=10NF F=10KHZ, Duty Cycle=50%		80		ns
Output Drop Time(90%~10%)(1)	T_F			80		ns
UVLO Turn On Delay	$T_{UVLO\ ON}$	I_F=10mA, V_O>5V		1.6		μs
UVLO Turn Off Delay	$T_{UVLO\ OFF}$	I_F=10mA, V_O<5V		0.4		μs
Output High Level Common Mode Transient Immunity (2)	$\|CM_H\|$	T_A=25°C, V_{DD}=30V V_{CM}=2000V, I_F=7~16mA, V_F=0V	35	50		KV/μs
Output Low Level Common Mode Transient Immunity (3)	$\|CM_L\|$	T_A=25°C, V_{DD}=30V V_{CM}=2000V, I_F=7~16mA, V_F=0V	35	50		KV/μs

Note: All typical values are at T_a=25°C.

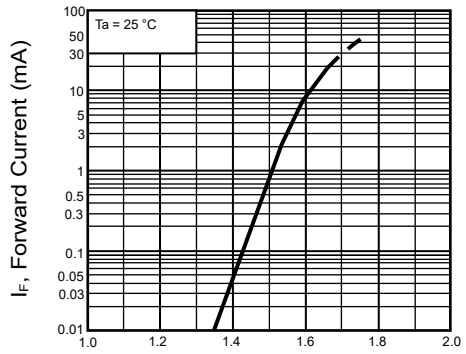
Note 1: Input signal (f = 250 kHz, duty = 50 %, t_r= t_f= 5 ns or less).

C_L is approximately 15 pF which includes probe and stray wiring capacitance.

Note 2: CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O > 26 V).

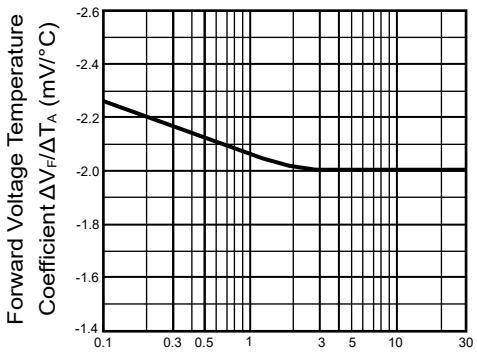
Note 3: CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 1 V).

11.Typical Characteristic



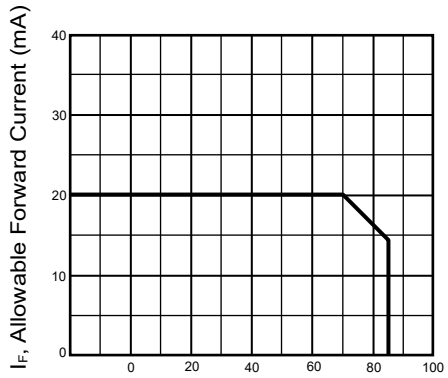
V_F, Forward Voltage (V)

Figure 1: I_F - V_F



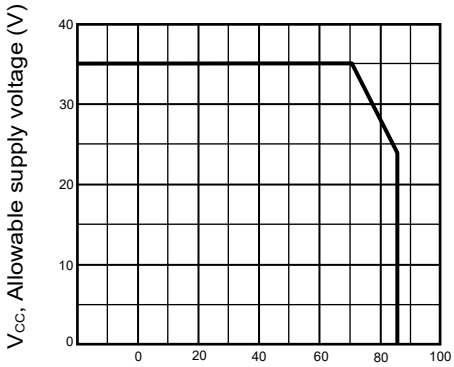
I_F, Forward Current (mA)

Figure 2: $\Delta V_F/\Delta T_A$ – I_F



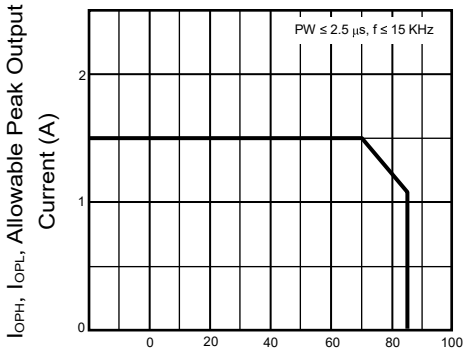
T_A, Ambient Temperature (°C)

Figure 3: I_F - T_A



T_A, Ambient Temperature (°C)

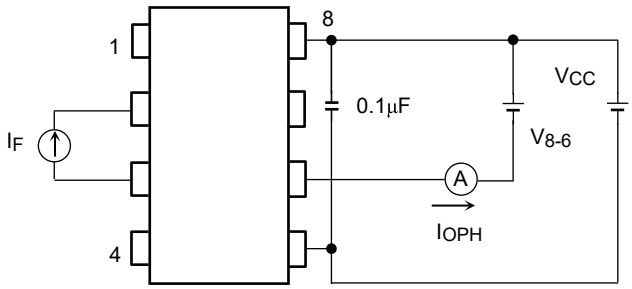
Figure 4: V_{CC} - T_A



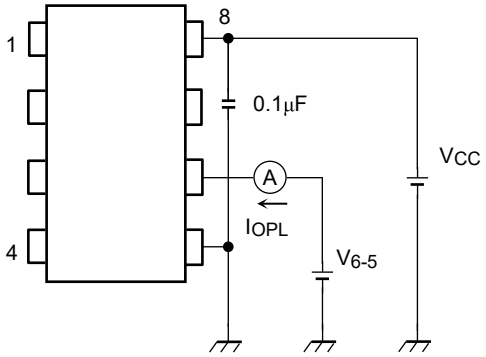
T_A, Ambient Temperature (°C)

Figure 5: I_{OPH},I_{OPL} - T_A

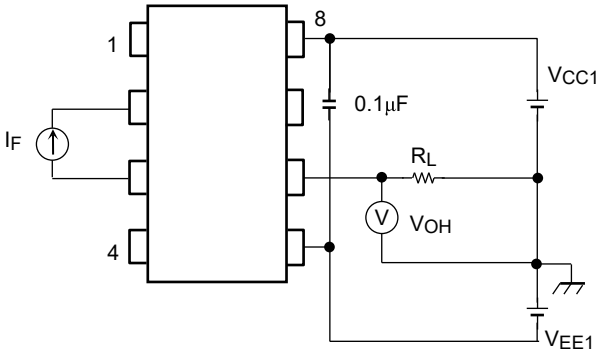
12.Typical Electro-Optical Characteristics Curves



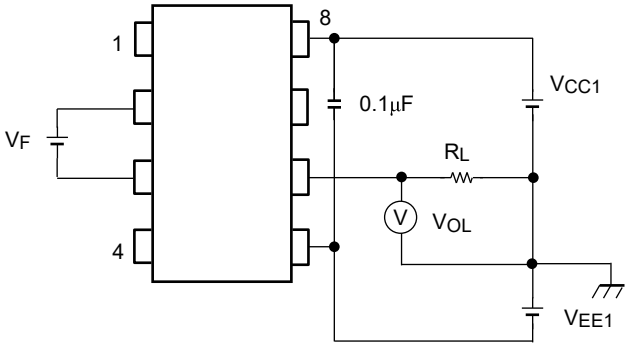
Test Circuit 1 : I_{OPH}



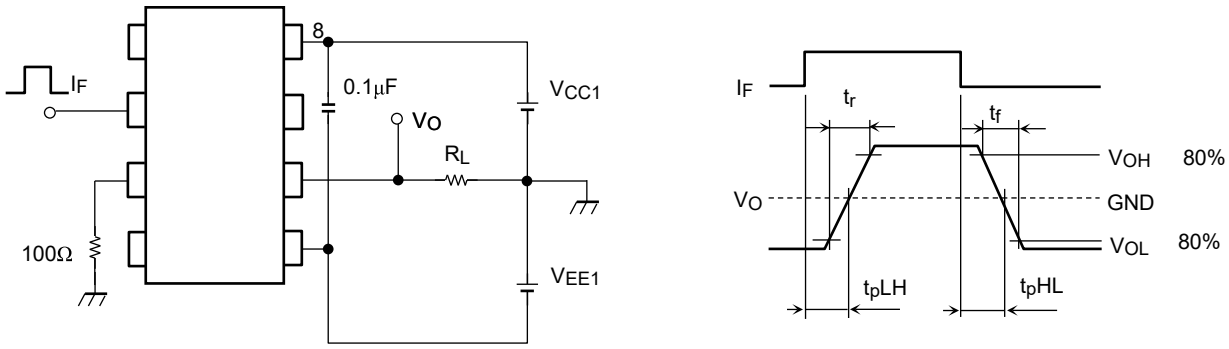
Test Circuit 2 : I_{OPL}



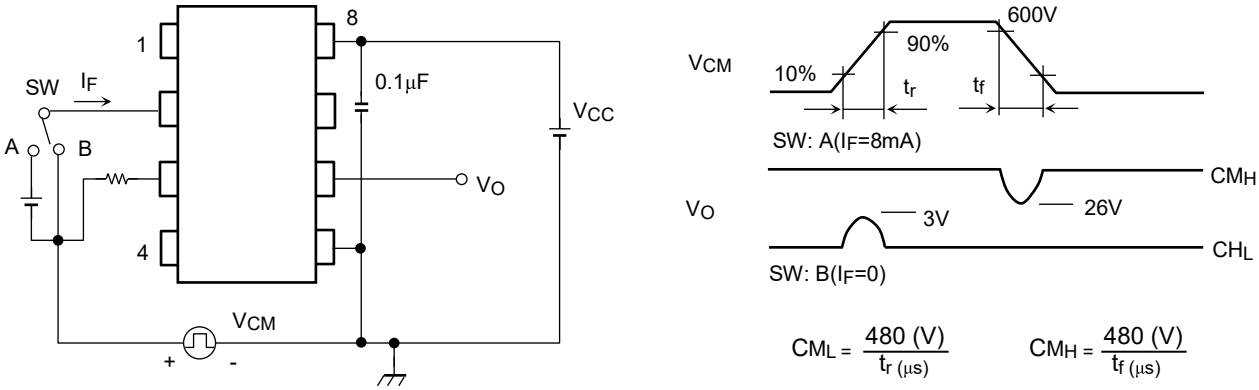
Test Circuit 3 : V_{OH}



Test Circuit 4 : V_{OL}



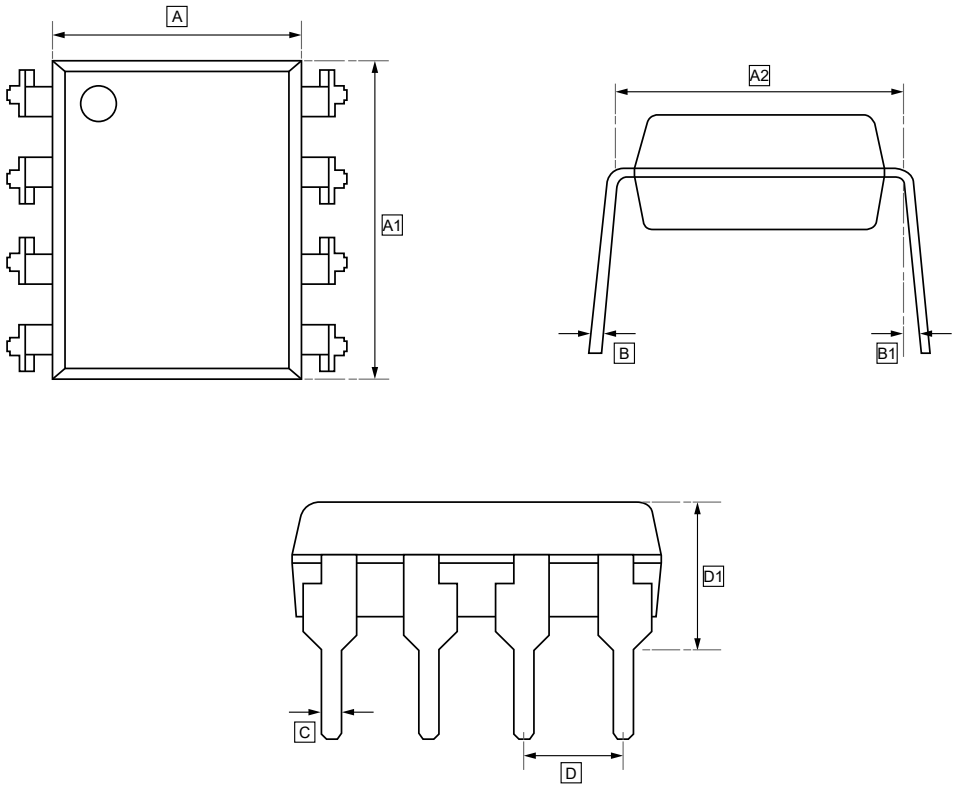
Test Circuit 5: t_{pLH}, t_{pHL}, t_r t_f



Test Circuit 6: CM_H, CM_L

CML(CMH) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

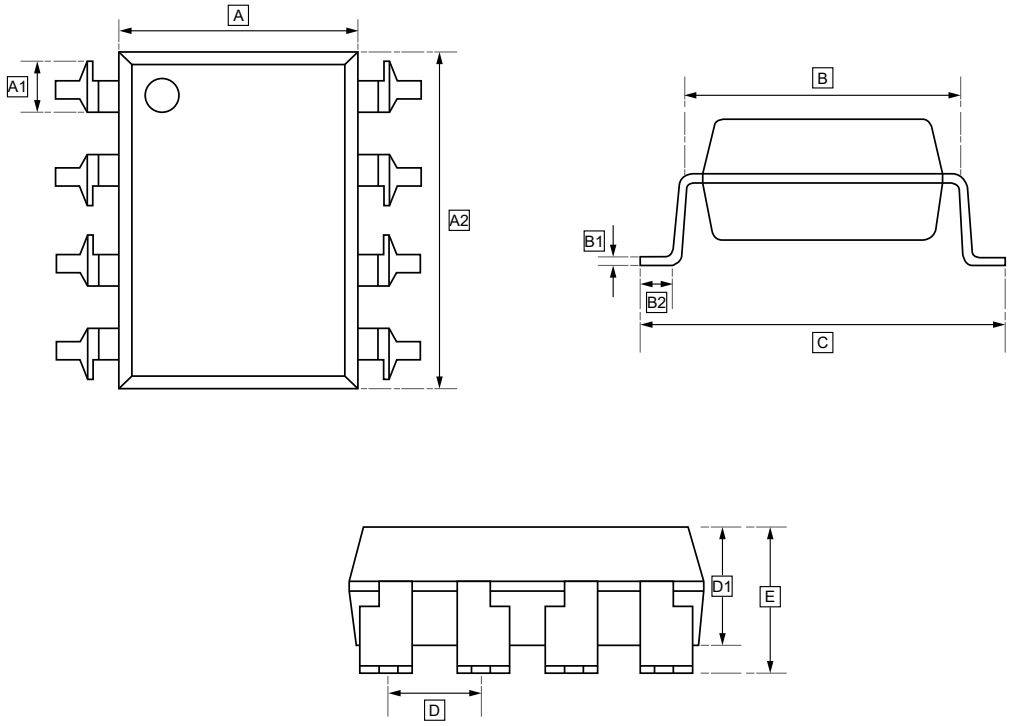
13.1 DIP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	C	D	D1
Min	6.30	9.46	7.62	0.25	5°	0.40	2.54	4.20
Max	6.90	10.06	TYP.		15°	0.60	TYP.	4.80

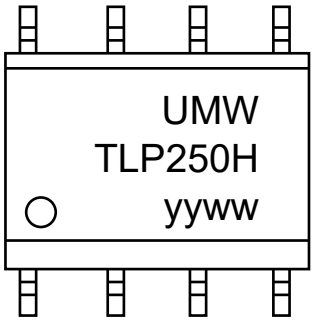
13.2 SOP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	B2	C	D	D1	E
Min	6.30	1.45	9.46	7.62	0.25	0.6	-	2.54	3.20	4.00
Max	6.90		10.06	TYP		-	10.3	TYP	3.80	4.60

14.Ordering Information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TLP250H	TLP250H	SOP-8	1000	Tape and reel
UMW TLP250HF	TLP250HF	DIP-8	2250	Tube and box

15.Disclaimer

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