UMW TLP250

1.5 Amp Output Current IGBT Gate Drive Optocouple

1.Description

The TLP250 is a gate driven optocoupler with an output current of 1.5A, 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

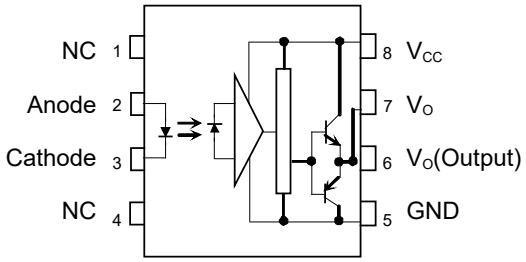
3.Features

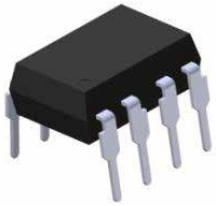
- 35kV/μs minimum Common Mode Rejection
- 1.5A maximum peak output current
- Wide operating V_{CC} Range: 10V~35V
- 400ns maximum propagation delay
- 100ns of pulse width distortion
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Operating temperature range: -20°C~ +85°C

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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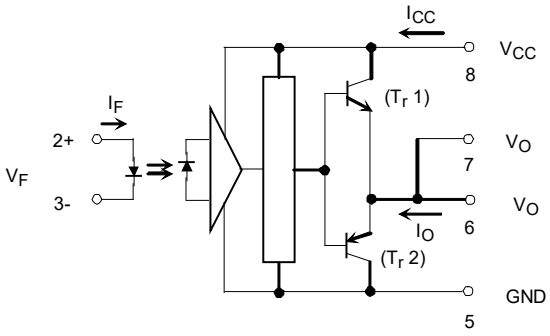
6.Schmatic



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	I_{FM}	25	mA
	Reverse Voltage	V_R	5	V
Output	Peak Output Current (1)	$I_{O(PEAK)}$	1.5	A
	Supply Voltage	V_{CC}	35	V
	Output Voltage	V_O	35	V
Isolation Voltage		V_{ISO}	5000	V_{rms}
Total Power Consumption		P_{tot}	200	mW
Operating Temperature		T_{opr}	-20 to 85	°C
Storage Temperature		T_{stg}	-55 to 125	°C
Soldering Temperature (2)		T_{sol}	260	°C

Note:

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. 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).

1. Exporenential wavefom.

2. ≥ 2 mm below seating plane.

9.Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Power Supply Voltage (1)	V_{CC}	15	30	V
Input Current (ON) (2)	$I_{F(ON)}$	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: Denotes the operating range, not the recommended operating condition.

Note 2: 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			1.6	1.8	V
Temperature coefficient of forward voltage			$\Delta V_F/\Delta T_A$	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			45	250	pF
Output current (1)	Test 1	"H" level	I_{OPH}	V_{CC}=30V	I_F=10mA, V_{8-6}=4V	-0.5	-1.5		A
	Test 2	"L" level	I_{OPL}		I_F=0mA, V_{6-5}=2.5V	0.5	2		A
Output voltage	Test 3	"H" level	V_{OH}	V_{CC1}=15V, V_{EE1}=-15V, R_L=200Ω, I_F=5mA		11	12.8		V
	Test 4	"L" level	V_{OL}	V_{CC1}=15V,V_{EE1}=-15V,R_L=200Ω,I_F=0.8mA			-14.2	-12.5	V
Supply current		"H" level	I_{CCH}	V_{CC}=30V, I_F=10mA, T_A=25°C			7		mA
				V_{CC}=30V, I_F=10mA				11	mA
		"L" level	I_{CCL}	V_{CC}=30V, I_F=0mA, T_A=25°C			7.5		mA
				V_{CC}=30V, I_F=0mA				11	mA
Threshold input current		"Output L→H"	I_{FLH}	V_{CC1}=15V, V_{EE1}=-15V R_L=200Ω, V_O>0V			1.2	5	mA
Threshold input voltage		"Output H→L"	V_{FHL}	V_{CC1}=15V, V_{EE1}=-15V R_L=200Ω, V_O<0V		0.8			V
Supply voltage			V_{CC}			10		35	V
Capacitance (input-output)(1)			C_S	V_S=0V, f=1MHz, T_A=25°C			1	2	pF
Resistance (input-output)(1)			R_S	V_S=500V, T_A=25°C, R.H.≤ 60 %		1×10^{12}	10^{14}		Ω
Isolation Resistance			R_{ISO}	V_{I-O}=500V, 40~60%R.H.			10^{11}		Ω
Isolation Capacitance			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
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.

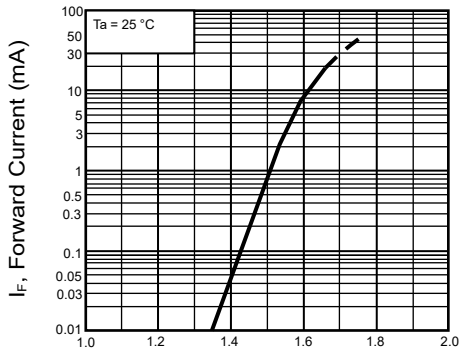
Note 1: Input signal (f = 250 kHz, duty = 50 %, t_r= t_f= 5 ns or less).

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).

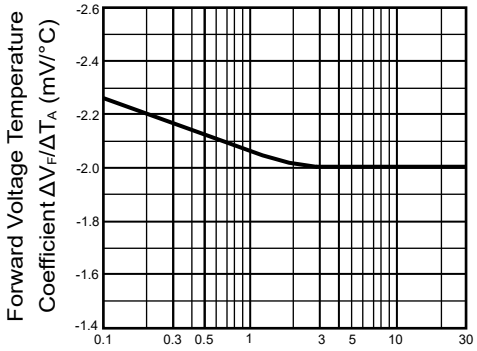
Note 3: CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 1 V).

11.Typical Characteristic



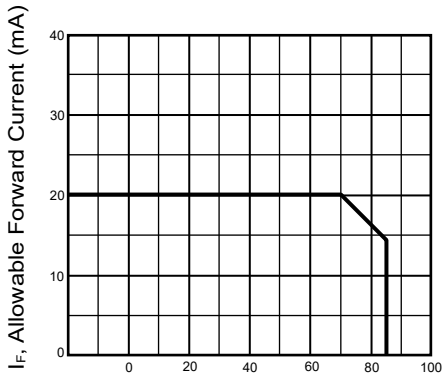
V_F, Forward Voltage (V)

Figure 1: I_F - V_F



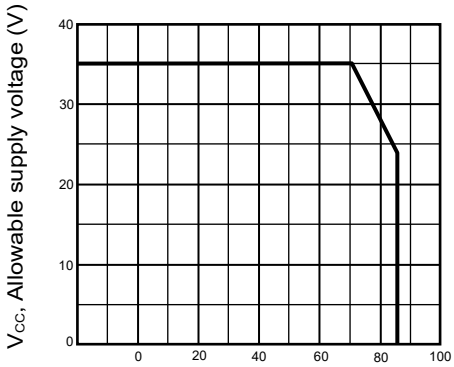
I_F, Forward Current (mA)

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



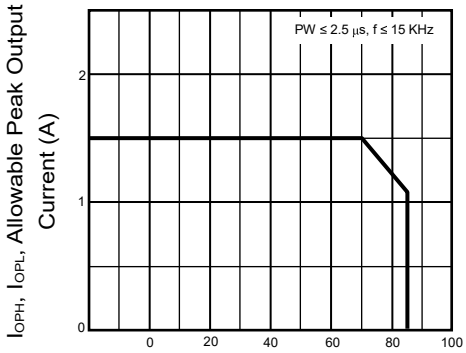
T_A, Ambient Temperature (°C)

Figure 3: I_F - T_A



T_A, Ambient Temperature (°C)

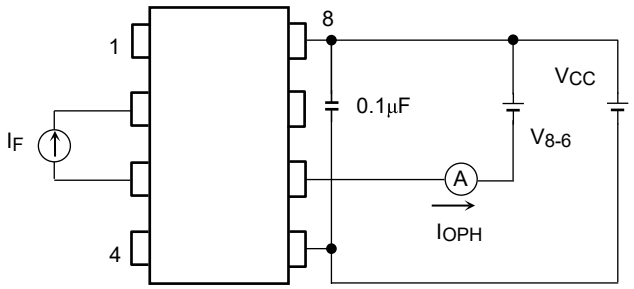
Figure 4: V_{CC} - T_A



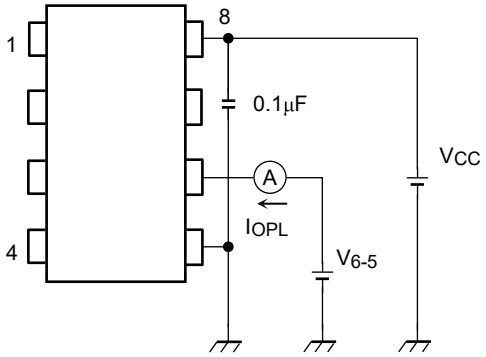
T_A, Ambient Temperature (°C)

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

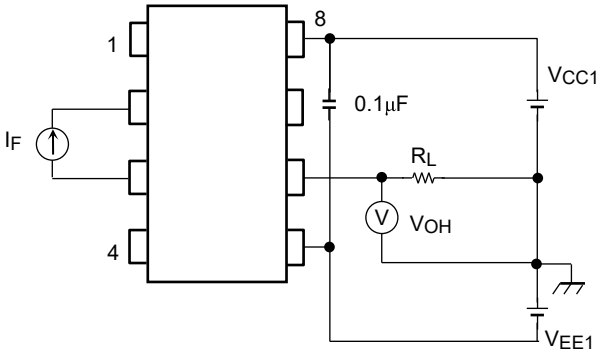
12.Typical Electro-Optical Characteristics Curves



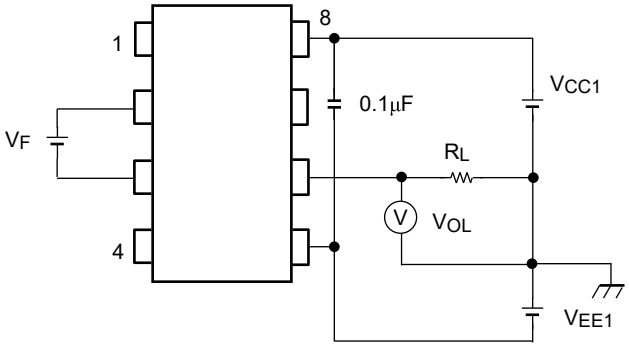
Test Circuit 1 : I_{OPH}



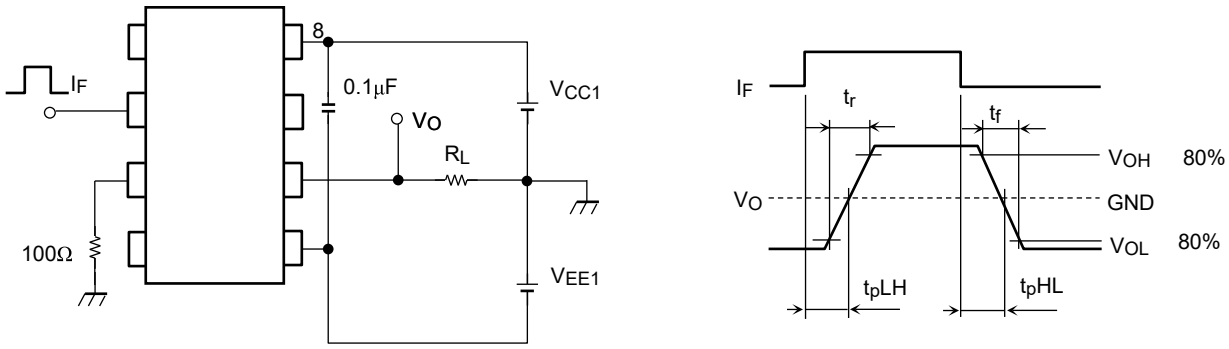
Test Circuit 2 : I_{OPL}



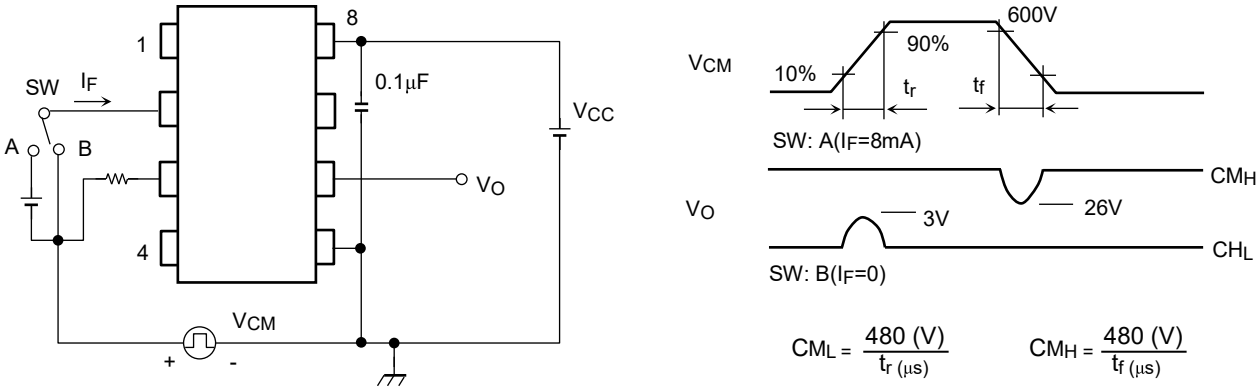
Test Circuit 3 : V_{OH}



Test Circuit 4 : V_{OL}



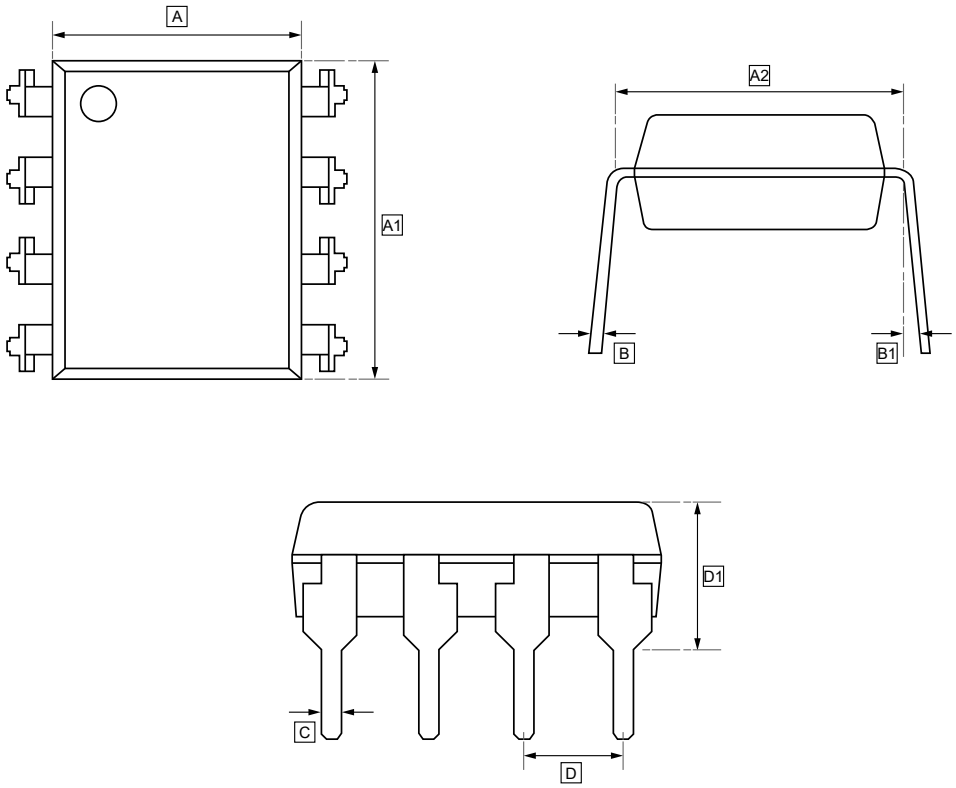
Test Circuit 5: t_{pLH}, t_{pHL}, t_r t_f



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.

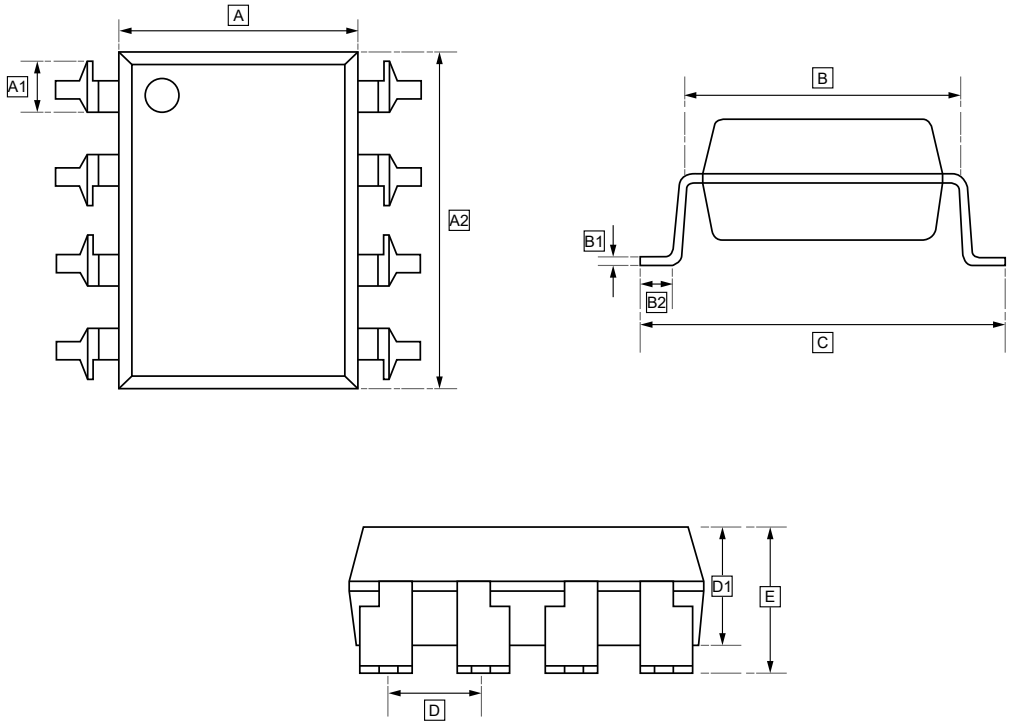
13.1 DIP-8 Package Outline Dimensions



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

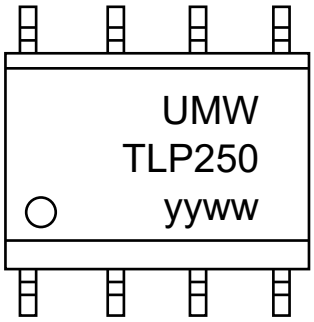
13.2 SOP-8 Package Outline Dimensions



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 TLP250	TLP250	SOP-8	1000	Tape and reel
UMW TLP250F	TLP250F	DIP-8	2250	Tube and box

15.Disclaimer

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