UMW TLP350

2.5 Amp Output Current IGBT Gate Drive Optocouple

1.Description

The TLP350 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

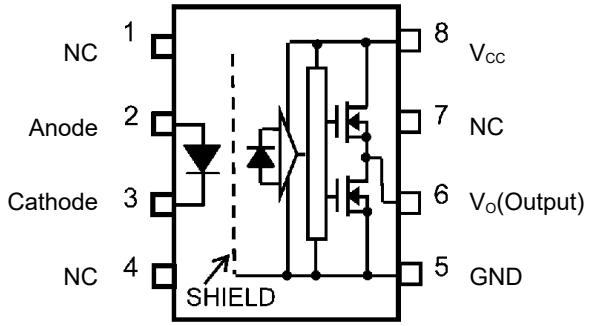
3.Features

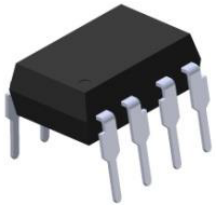
- 35kV/μs minimum Common Mode Rejection
- 2.5A maximum peak output current
- Wide operating V_{CC} Range: 15V~30V
- 400ns maximum propagation delay
- 100ns of pulse width distortion
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Operating temperature range: -40°C~ +110°C

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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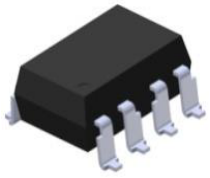


SOP- 8

Note: 0.1uF bypass capacitor must be connected between pins 5 and 8.

6.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}

7.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
	Input Power Dissipation	P_D	40	mW
Output	Peak Output Current (1)	$I_{O(PEAK)}$	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 110	°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).

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.

(1): Exponential waveform. Pulse width ≤ 0.3μs, f ≤ 15 kHz.

(2) ≥ 2 mm below seating plane.

8.Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Power Supply Voltage	V_{CC} - V_{SS}	15	30	V
Input Current (ON) (1)	$I_{F(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.8	V
Operating Temperature	T_A	-40	110	°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 data sheet should also be considered.

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

9.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_{CC}=30V, and V_{EE}=GND.

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Forward Voltage	V_F	I_F=10mA		1.2	1.5	1.8	V
Reverse Current	I_R	V_R=5V				10	μA
High Level Output Current (1)	I_{OH}	V_{CC}=30V, I_F=5mA, V_{8-6}=3.5V		-1	-2	-2.5	A
		V_{CC}=15V, I_F=5mA, V_{8-6}=7V		-2		-2.5	A
Low Level Output Current (1)	I_{OL}	V_{CC}=30V, I_F=0mA, V_{6-5}=2.5V		1	2	2.5	A
		V_{CC}=15V, I_F=0mA, V_{6-5}=7V		2		2.5	A
High Level Output Voltage	V_{OH}	I_F=10mA	I_O=-2.5A	V_{CC}-6.25V	V_{CC}-2.5V		V
			I_O=-100mA	V_{CC}-0.3V	V_{CC}-0.1V		V
Low Level Output Voltage	V_{OL}	I_F=0mA	I_O=2.5A		V_{EE}+2.5V	V_{EE}+6.25V	V
			I_O=100mA		V_{EE}+0.1V	V_{EE}+0.3V	V
High Level Power Supply Current	I_{ccH}	V_O=Open, I_F=7 to 16mA			1.8	3.8	mA
Low Level Power Supply Current	I_{ccL}	V_O=Open, I_F=0 to 0.8V			2.1	3.8	mA
Input The Tum On Current	I_{FLH}	I_O=0mA, V_O>5V			2.8	5	mA
Input The Turn Off Voltage	V_{FHL}	I_O=0mA, V_O<5V		0.8			V
UVLO Threshold	V_{UVLO+}	I_F=10mA, V_O>5V		11.5	12.7	13.5	V
	V_{UVLO-}	I_F=10mA, V_O<5V		10	11.2	12	V
UVLO Hysteresis	$UVLO_{HYS}$				1.5		V
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
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	P_{DD}			-250		250	ns

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Rise Time(10% To 90%)(1)	T_R	I_F=7mA to 16mA,Rg=10Ω,Cg=10NF		80		ns
Output Drop Time(90%~10%)(1)	T_F	F=10KHZ, Duty Cycle=50%		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: f = 25 kHz, duty = 50 %, input current t_r= t_f = 5 ns, 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).

10.1 Typical Characteristic

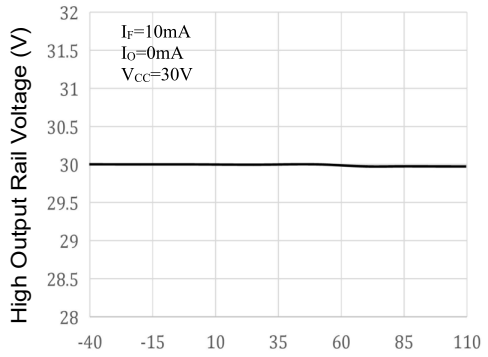


Figure 1: High Output Rail Voltage vs Ambient Temperature

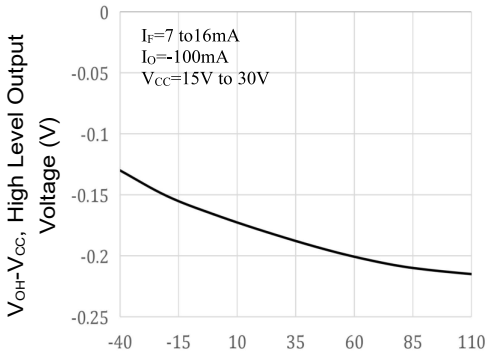


Figure 2: High Level Output Voltage vs Ambient Temperature

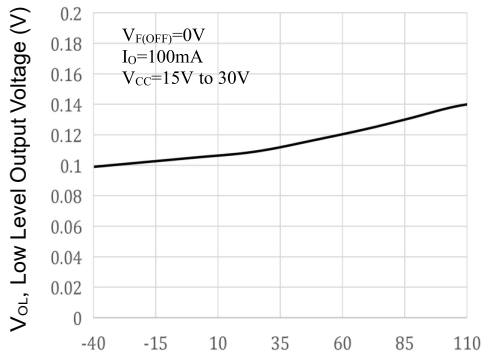


Figure 3: Low Level Output Voltage vs Ambient Temperature

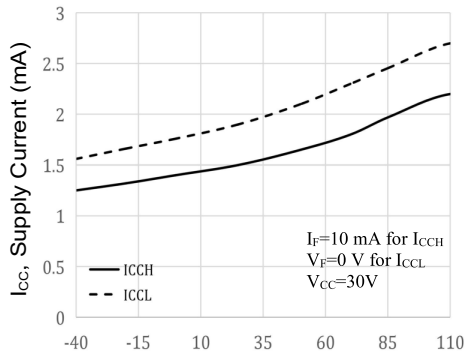


Figure 4: Supply Current vs Ambient Temperature

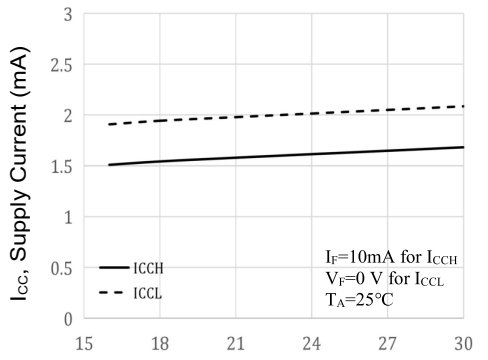


Figure 5: Supply Current vs supply Voltage

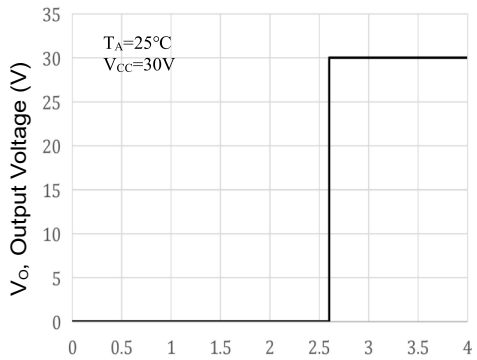


Figure 6: Output Voltage vs Threshold input Current Low to High

10.2 Typical Characteristic

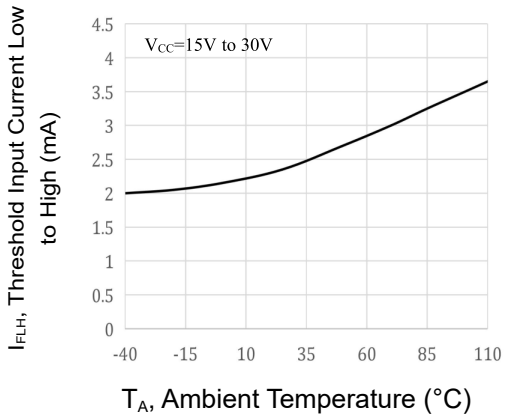


Figure 7: Threshold Input Current Low to High vs Ambient Temperature

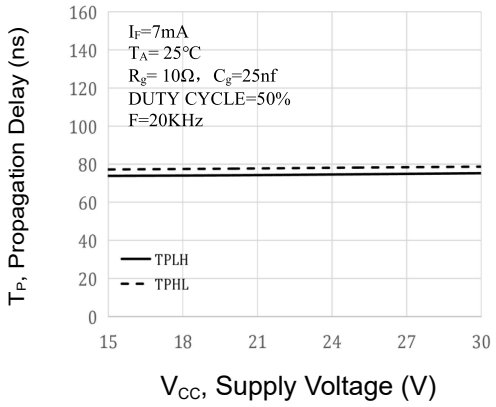


Figure 8: Propagation Delay vs Supply Voltage

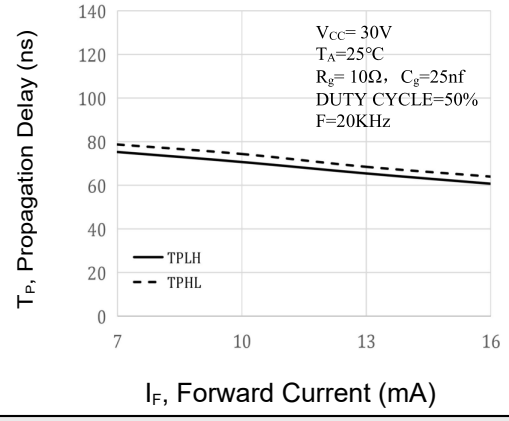


Figure 9: Propagation Delay vs Forward Current

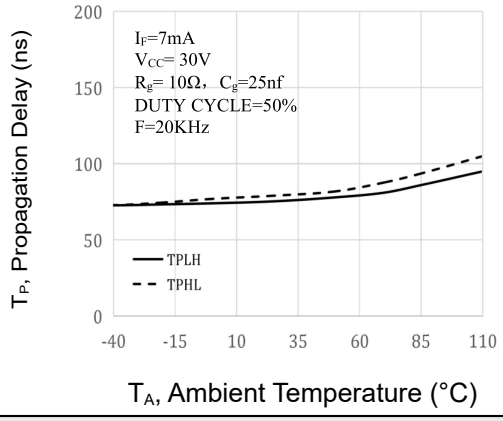


Figure 10: Propagation Delay vs Ambient Temperature

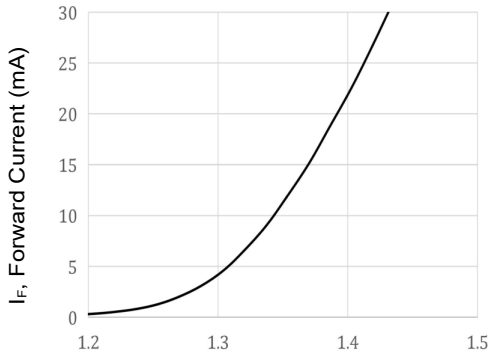


Figure 11: Forward Current vs Forward Voltage

11.Test Circuits Diagrams

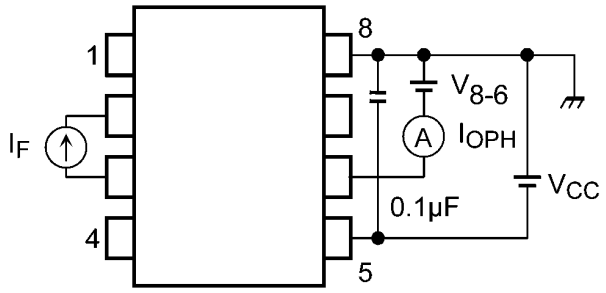


Figure 12: I_{OH} Test Circuit

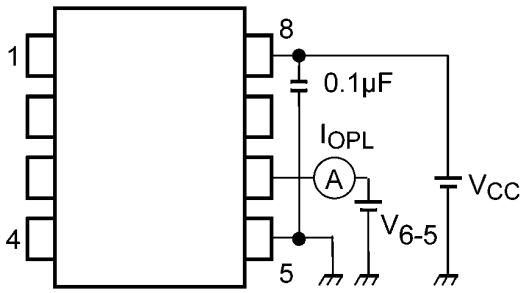


Figure 14: I_{OL} Test Circuit

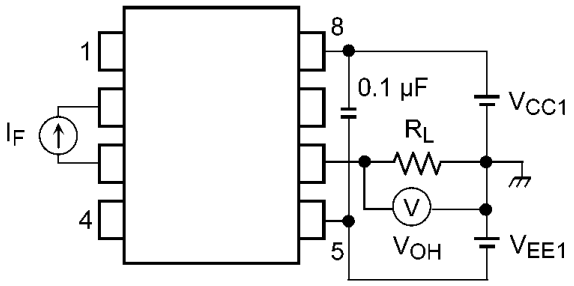


Figure 15: V_{OH} Test Circuit

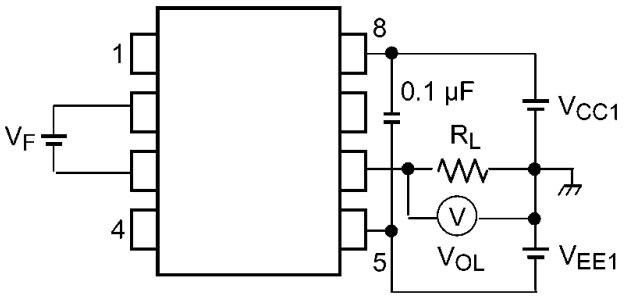


Figure 16: V_{OL} Test Circuit

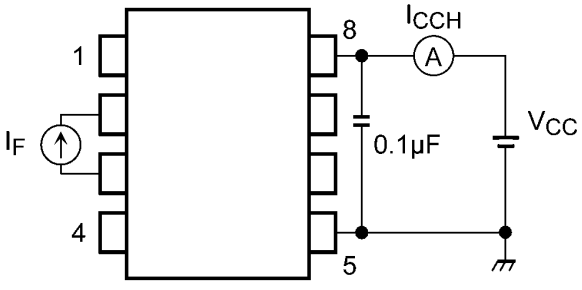


Figure 17: I_{CCH} Test Circuit

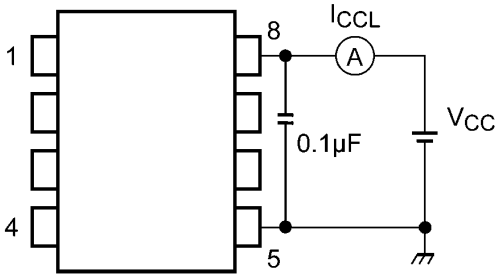


Figure 18: I_{CCL} Test Circuit

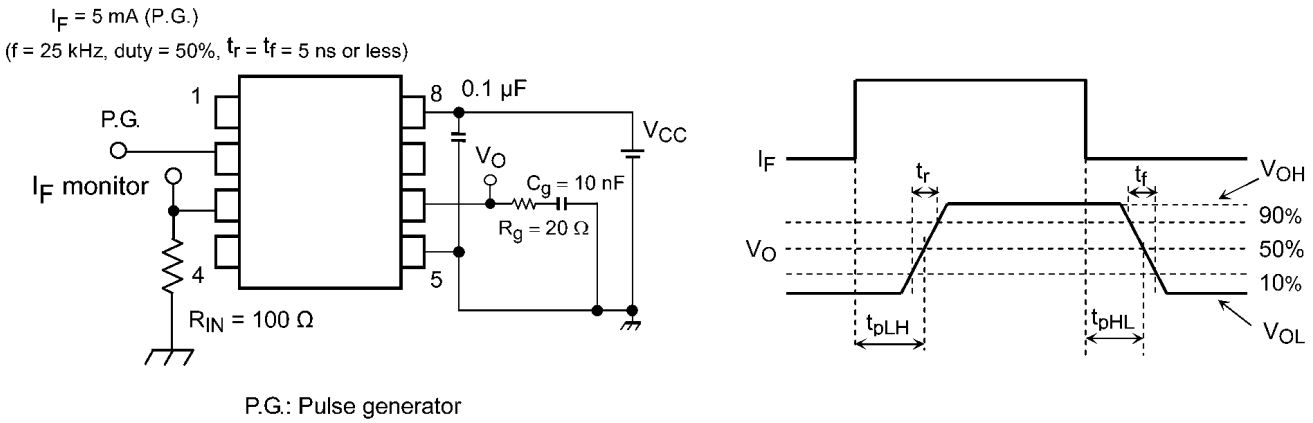
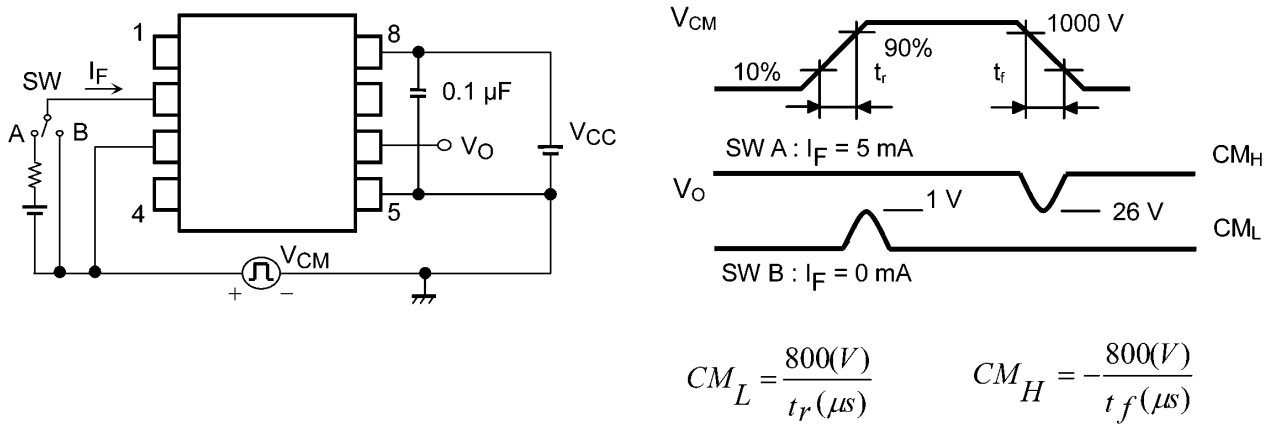


Figure 19: Switching Time Test Circuit and Waveform

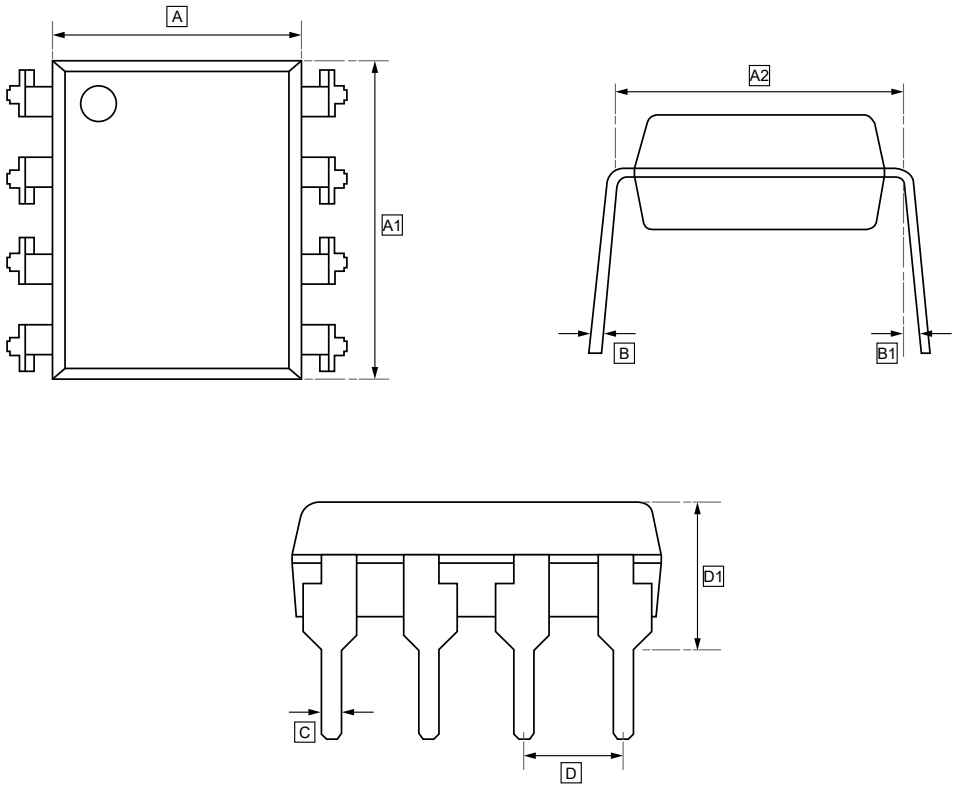


$$CM_L = \frac{800(V)}{t_r(\mu s)} \qquad CM_H = -\frac{800(V)}{t_f(\mu s)}$$

CM_L (CM_H) 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.

Figure 20: Common-Mode Transient Immunity Test Circuit and Waveform

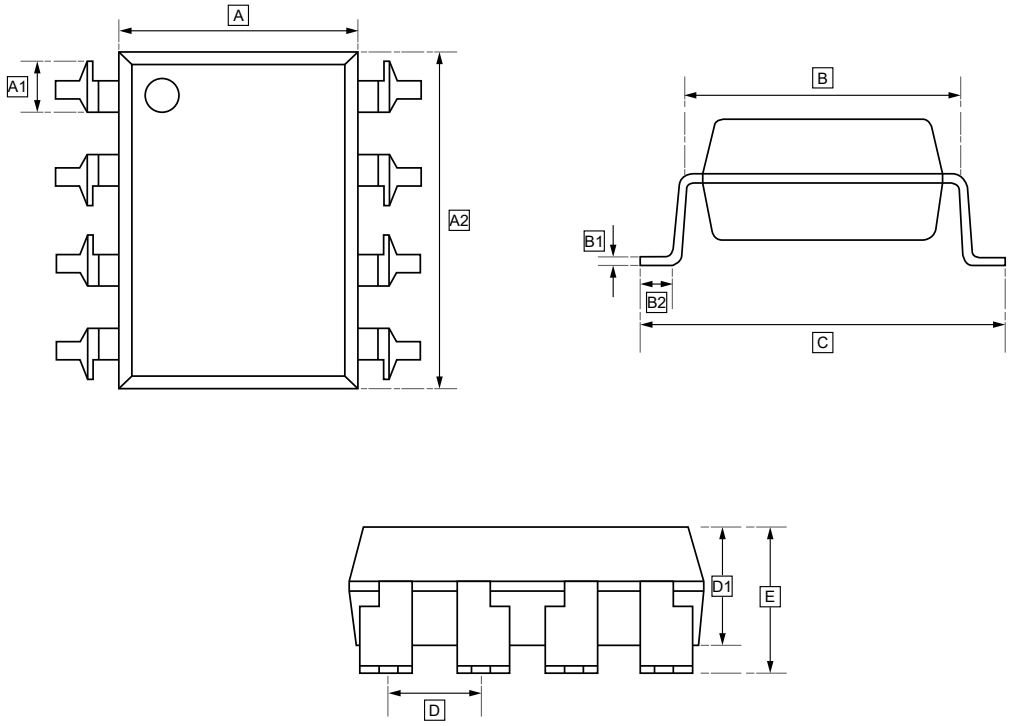
12.1 DIP-8 Package Outline Dimensions



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

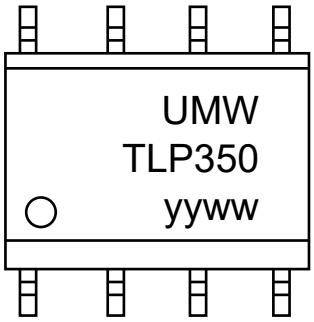
12.2 SOP-8 Package Outline Dimensions



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

13.Ordering Information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TLP350	TLP350	SOP-8	1000	Tape and reel
UMW TLP350F	TLP350F	DIP-8	2250	Tube and box

14.Disclaimer

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