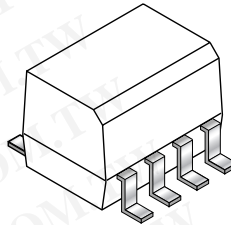


DESCRIPTION

The HCPL-0500, HCPL-0501 and HCPL-0452 optocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector transistor housed in a compact 8-pin smalloutline package.

A separate connection for the bias of the photodiode improves the speed by several orders of magnitude over conventional phototransistor optocouplers by reducing the base-collector capacitance of the input transistor.

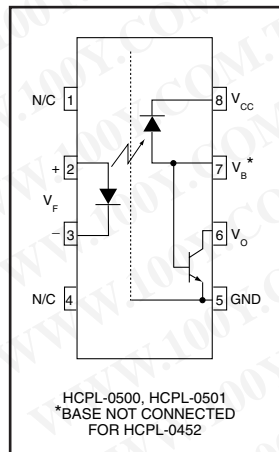


FEATURES

- High speed-1 MBit/s
- Superior CMR-1 kV/μs
- CTR guaranteed 0-70°C
- U.L. recognized (File # E90700)

APPLICATIONS

- Line receivers
- Pulse transformer replacement
- Output interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling

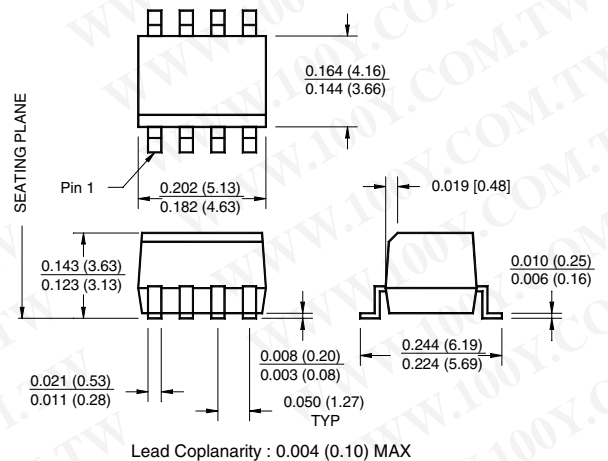


SINGLE-CHANNEL

**HCPL-0500
HCPL-0501**

HCPL-0452

Package Dimensions



NOTE

All dimensions are in inches (millimeters)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Value	Units
Storage Temperature	T _{STG}	-55 to +125	°C
Operating Temperature	T _{OPR}	-55 to +100	°C
Reflow Temperature Profile (Refer to fig. 11)			
EMITTER			
DC/Average Forward Input Current	I _F (avg)	25	mA
Peak Forward Input Current (50% duty cycle, 1 ms P.W.)	I _F (pk)	50	mA
Peak Transient Input Current - (≤ 1 μs P.W., 300 pps)	I _F (trans)	1.0	A
Reverse Input Voltage	V _R	5	V
Input Power Dissipation	P _D	45	mW
DETECTOR			
Average Output Current (Pin 6)	I _O (avg)	8	mA
Peak Output Current	I _O (pk)	16	mA
Emitter-Base Reverse Voltage (Except HCPL-0452)	V _{EBR}	5	V
Supply Voltage	V _{CC}	-0.5 to 30	V
Output Voltage	V _O	-0.5 to 20	V
Base Current (Except HCPL-0452)	I _B	5	mA
Output power dissipation	P _D	100	mW

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ELECTRICAL CHARACTERISTICS ($T_A = 0$ to 70°C Unless otherwise specified)							
INDIVIDUAL COMPONENT CHARACTERISTICS							
Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
EMITTER	($I_F = 16$ mA, $T_A = 25^\circ\text{C}$)	V_F	All		1.45	1.7	V
Input Forward Voltage	($I_F = 16$ mA)					1.8	
Input Reverse Breakdown Voltage	($I_R = 10$ μA)	BV_R	All	5.0			V
Temperature coefficient of forward voltage	($I_F = 16$ mA)	$(\Delta V_F / \Delta T_A)$	All		-1.6		mV/ $^\circ\text{C}$
DETECTOR	($I_F = 0$ mA, $V_O = V_{CC} = 5.5$ V) ($T_A = 25^\circ\text{C}$)	I_{OH}	All		0.001	0.5	μA
Logic high output current	($I_F = 0$ mA, $V_O = V_{CC} = 15$ V) ($T_A = 25^\circ\text{C}$)		All		0.005	1	
	($I_F = 0$ mA, $V_O = V_{CC} = 15$ V)		All			50	
Logic low supply current	($I_F = 16$ mA, $V_O = \text{Open}$) ($V_{CC} = 15$ V)	I_{CCL}	All		120	200	μA
Logic high supply current	($I_F = 0$ mA, $V_O = \text{Open}$, $V_{CC} = 15$ V) ($T_A = 25^\circ\text{C}$)	I_{CCH}	All		0.01	1	μA
	($I_F = 0$ mA, $V_O = \text{Open}$) ($V_{CC} = 15$ V)		All			2	

TRANSFER CHARACTERISTICS ($T_A = 0$ to 70°C Unless otherwise specified)							
Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
COUPLED	($I_F = 16$ mA, $V_O = 0.4$ V) ($V_{CC} = 4.5$ V, $T_A = 25^\circ\text{C}$)	CTR	HCPL-0500	7	27	50	%
Current transfer ratio (Note 5)			HCPL-0452	19	27	50	
			HCPL-0501				
			HCPL-0500	5	30		
			HCPL-0452				
			HCPL-0501				
Logic low output voltage output voltage	($I_F = 16$ mA, $I_O = 1.1$ mA) ($V_{CC} = 4.5$ V, $T_A = 25^\circ\text{C}$)	V_{OL}	HCPL-0500		0.18	0.4	V
	($I_F = 16$ mA, $I_O = 3$ mA) ($V_{CC} = 4.5$ V, $T_A = 25^\circ\text{C}$)		HCPL-0452		0.25	0.4	
			HCPL-0501				
	($I_F = 16$ mA, $I_O = 0.8$ mA) ($V_{CC} = 4.5$ V)		HCPL-0500		0.13	0.5	
	($I_F = 16$ mA, $I_O = 2.4$ mA) ($V_{CC} = 4.5$ V)		HCPL-0452		0.23	0.5	
			HCPL-0501				

** All typicals at $T_A = 25^\circ\text{C}$

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HCPL-0500 HCPL-0452
HCPL-0501**

SWITCHING CHARACTERISTICS ($T_A = 0$ to 70°C unless otherwise specified., $V_{CC} = 5\text{ V}$)								
Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit	
Propagation delay time to logic low	$T_A = 25^\circ\text{C}$, ($R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 6) (Fig. 9)	T_{PHL}	HCPL-0500		0.45	1.5	μs	
	$(R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 7) (Fig. 9)		HCPL-0452		0.45	0.8		
			HCPL-0501					
	$T_A = 25^\circ\text{C}$		$(R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 6) (Fig. 9)	HCPL-0500				2.0
			$(R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 7) (Fig. 9)	HCPL-0452				1.0
HCPL-0501								
Propagation delay time to logic high	$T_A = 25^\circ\text{C}$, ($R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 6) (Fig. 9)	T_{PLH}	HCPL-0500		0.5	1.5	μs	
	$(R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 7) (Fig. 9)		HCPL-0452		0.3	0.8		
			HCPL-0501					
	$T_A = 25^\circ\text{C}$		$(R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 6) (Fig. 9)	HCPL-0500				2.0
			$(R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$) (Note 7) (Fig. 9)	HCPL-0452				1.0
HCPL-0501								
Common mode transient immunity at logic high	$(I_F = 0\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 4.1\text{ k}\Omega$) (Note 8) (Fig. 10) $T_A = 25^\circ\text{C}$	ICM_{HI}	HCPL-0500		1,000		$\text{V}/\mu\text{s}$	
			HCPL-0452		1,000			
			HCPL-0501					
Common mode transient immunity at logic low	$(I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 4.1\text{ k}\Omega$) (Note 8) (Fig. 10) $T_A = 25^\circ\text{C}$	ICM_{LI}	HCPL-0500		1,000		$\text{V}/\mu\text{s}$	
			HCPL-0452		1,000			
			HCPL-0501					

ISOLATION CHARACTERISTICS ($T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ Unless otherwise specified.)							
Characteristics	Test Conditions	Symbol	Min	Typ**	Max	Unit	
Input-Output Isolation Voltage	($f = 60\text{ Hz}$, $t = 1.0\text{ min}$) (9,10)	V_{ISO}	2500	—	—	Vac_{RMS}	
Isolation Resistance	($V_{I-O} = 500\text{ V}$) (9)	R_{ISO}	10^{11}	—	—	Ω	
Isolation Capacitance	($V_{I-O} = 0$, $f = 1.0\text{ MHz}$) (9)	C_{ISO}	—	0.2	—	pF	

** All typicals at $T_A = 25^\circ\text{C}$

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NOTES

1. Derate linearly above 70°C free-air temperature at a rate of 0.8 mA/°C.
2. Derate linearly above 70°C free-air temperature at a rate of 1.6 mA/°C.
3. Derate linearly above 70°C free-air temperature at a rate of 0.9 mW/°C.
4. Derate linearly above 70°C free-air temperature at a rate of 2.0 mW/°C.
5. Current Transfer Ratio is defined as a ratio of output collector current, I_O , to the forward LED input current, I_F , times 100%.
6. The 4.1 k Ω load represents 1 LSTTL unit load of 0.36 mA and 6.1k Ω pull-up resistor.
7. The 1.9 k Ω load represents 1 TTL unit load of 1.6 mA and 5.6 k Ω pull-up resistor.
8. Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse signal V_{CM} , to assure that the output will remain in a logic high state (i.e., $V_O > 2.0$ V). Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal, V_{CM} , to assure that the output will remain in a logic low state (i.e., $V_O < 0.8$ V).
9. Device is considered a two terminal device: Pins 1, 2, 3 and 4 are shorted together and Pins 5, 6, 7 and 8 are shorted together.
10. 2500 VAC RMS for 1 minute duration is equivalent to 3000 VAC RMS for 1 second duration.

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Fig. 1 Input Forward Current vs. Input Forward Voltage

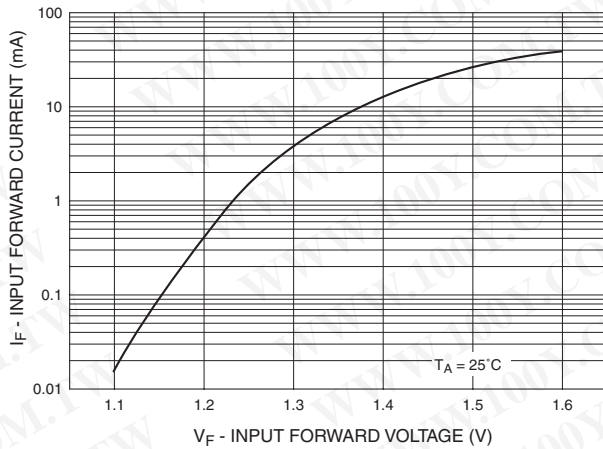


Fig. 2 Current Transfer Ratio vs. Input Current

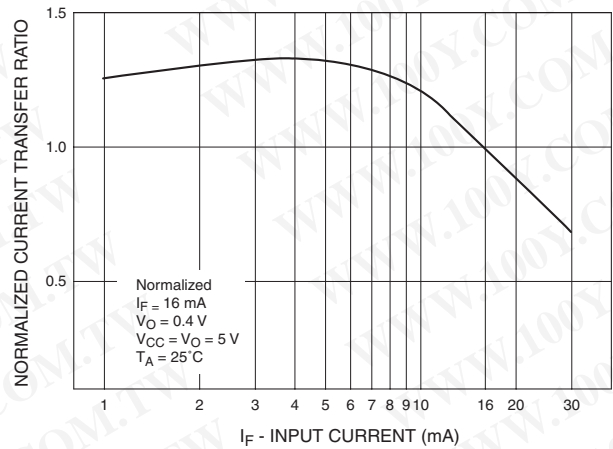


Fig. 3 Current Transfer Ratio vs. Input Forward Current

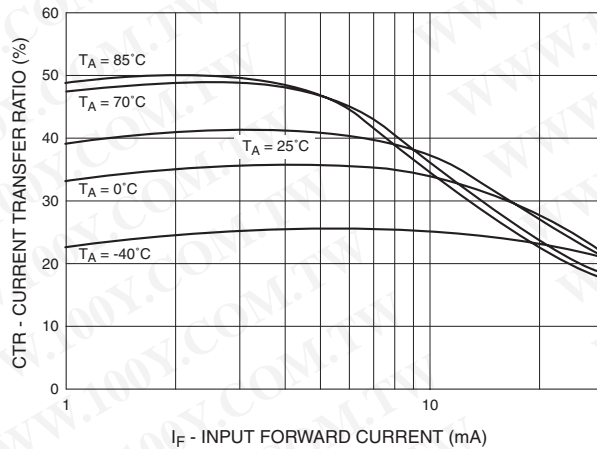
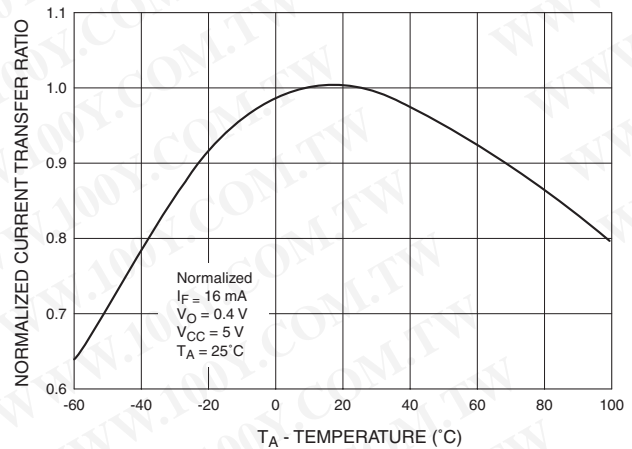


Fig. 4 Current Transfer Ratio vs. Temperature



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Fig. 5 DC Transfer Characteristics

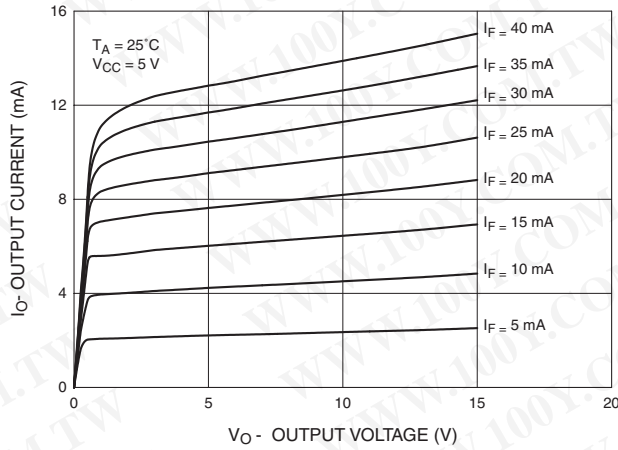


Fig. 6 Logic Low Supply Current vs. Input Current

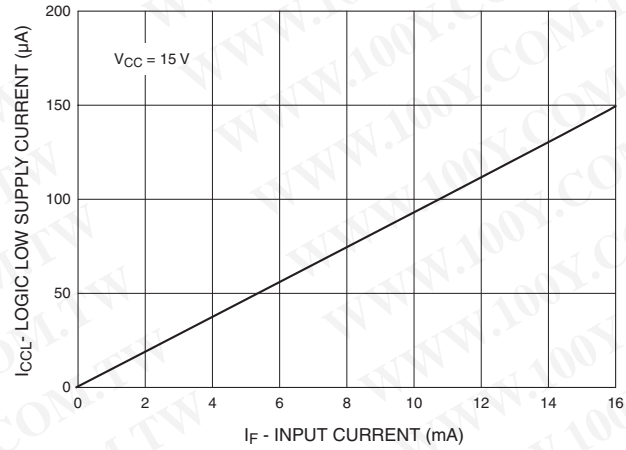


Fig. 7 Logic High Output Current vs. Temperature

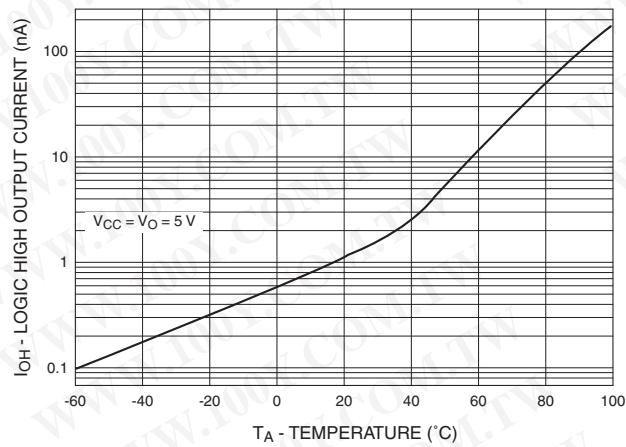
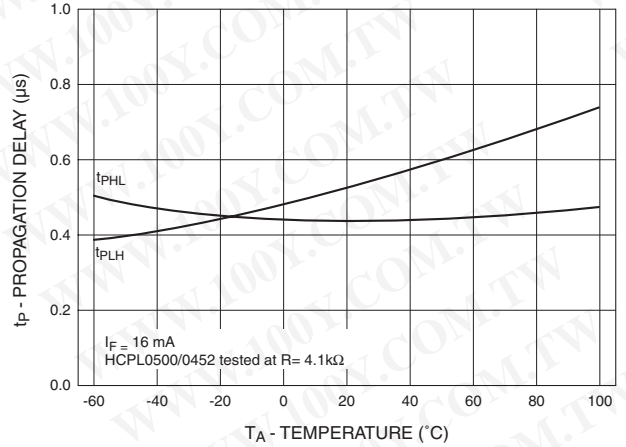


Fig. 8 Propagation Delay vs. Temperature



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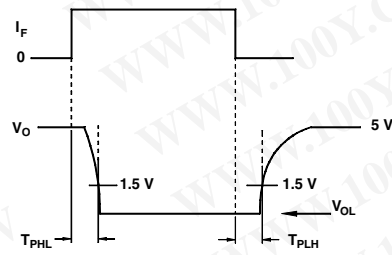
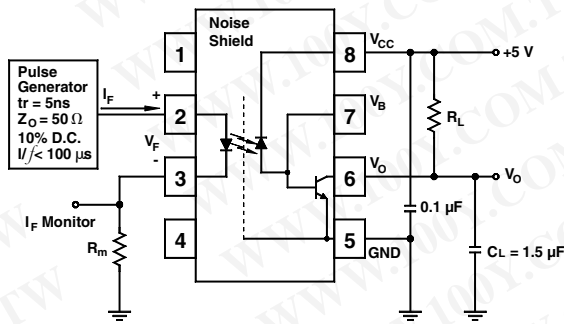


Fig. 9 Switching Time Test Circuit

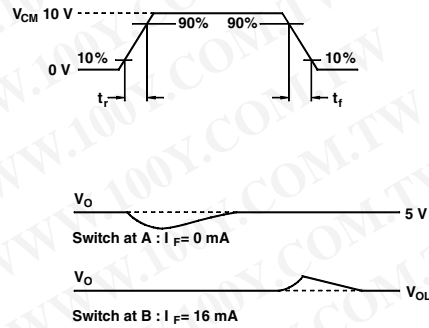
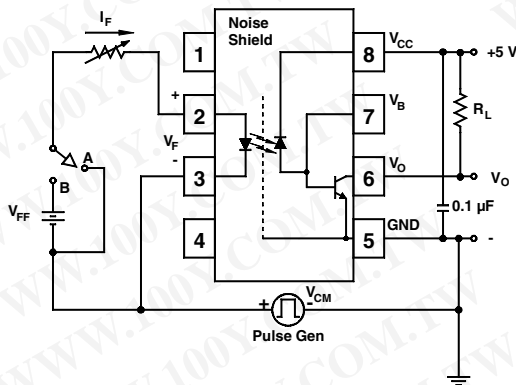


Fig. 10 Common Mode Immunity Test Circuit

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ORDERING INFORMATION

Option	Order Entry Identifier	Description
R1	.R1	Tape and Reel (500 per reel)
R2	.R2	Tape and Reel (2500 per reel)

QT Carrier Tape Specifications

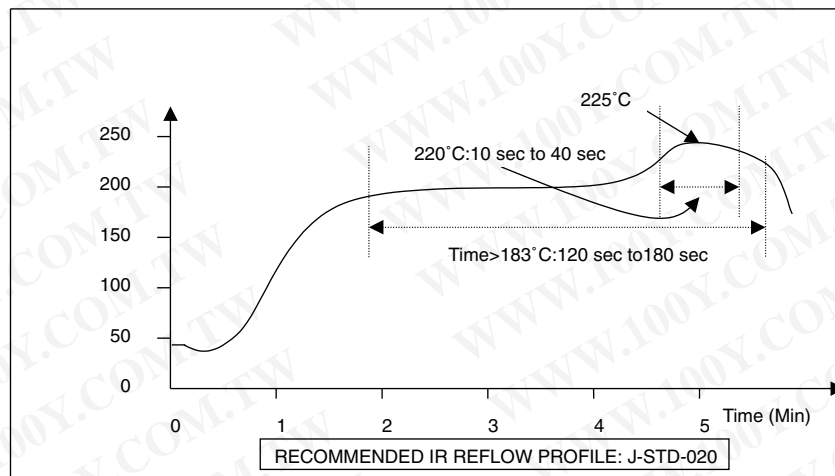
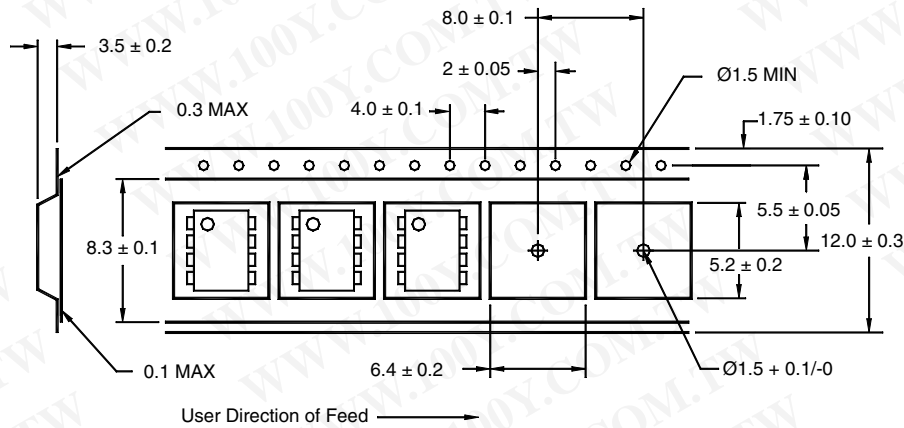


Fig. 11 JEDEC Reflow Profile

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.