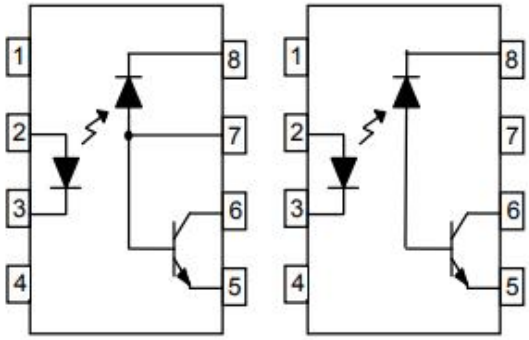
■ Package

Schematic



Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. V_B
8. V_{CC}

Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. No Connection
8. V_{CC}

■ Description

The 6N135, 6N136 and 4502 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor.

The devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option.

■ Features

- High speed 1Mbit/s
- High isolation voltage between input and output (Viso=5000 Vrms)
- Guaranteed performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Pb free and RoHS compliant
- UL approved
- VDE approved
- CQC approved

■ Applications

- Line receivers
- Telecommunication equipments
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

■ Product Nomenclature

The product name is designated as below:

HT-6N13X -X X- X X- XX
HT-4502 -X X- X X -XX
① ② ③ ④ ⑤

Designation:

HT =Hengtuo Technology Co.,LTD.
6N13X/4502= Product Series
① = Lead form option(1)
② = Tape and Reel option(2)
③ = VDE order option(fixed code "V")
④ = Halogen free option(fixed code"G")
⑤= Customer code

Notes

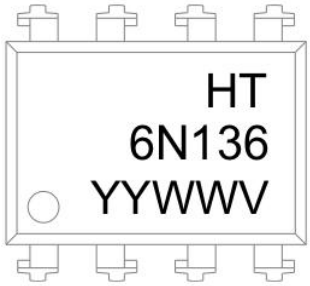
1. Lead form option:

Symbol	Description
S1	DIP-S1
M	DIP-M
NONE	DIP/SOP Normal

2. Tape and Reel option:

Symbol	Description
TP&TP1	Tape and Reel Type
NONE	DIP&SOP Type

■ Marking Information



Designation:

HT	denotes Hengtuo
6N136	denotes Device
YY	denotes year code
WW	denotes week code
V	denotes VDE

■ Maximum Ratings(Ta=25℃)

	Parameter	Symbol	Values	Unit
Input	Forward Current	I_F	25	mA
	Peak forward current (50% duty, 1ms P.W)	I_{FP}	50	mA
	Peak transient Current (≤1μs P.W,300pps)	I_{Ftrans}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P_{IN}	45	mW
Output	Power dissipation	P_O	100	mW
	Emitter-Base reverse voltage 6N135 6N136	V_{EBR}	5	V
	Base current 6N135 6N136	I_B	5	mA
	Average Output current	IO(AVG)	8	mA
	Peak Output current	O(PK)	16	mA
	Output voltage	V_O	-0.5 to 20	V
	Supply voltage	V_{CC}	-0.5 to 30	V
Isolation voltage(1)		V_{ISO}	5000	V rms
Operating temperature		T_{OPR}	-40 ~ +100	°C
Storage temperature		T_{STG}	-55 ~ +125	°C
Soldering temperature (2)		T_{SOL}	260	°C

Notes:
(1). AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3 & 4 are shorted together, and pins 5, 6, 7 & 8 are shorted together.
(2).For 10 seconds

■ Electronic Optical Characteristics

(TA = 0 to 70°C unless specified otherwise)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditon
Input	Forward Voltage	V_F	-	1.45	1.8	V	I_F=1.6mA
	Reverse voltage	V_R	5.0	-	-	V	I_R=10μA,
	Temperature coefficient of forward voltage	ΔVF/ΔTA	-	-1.9	-	mV/°C	I_F =16mA
Output	Logic High Output Current	I_{OH}	-	0.001	0.5	μA	I_F=0mA, V_O=V_{CC}=5.5V, T_A=25°C
			-	0.01	1		I_F =0mA, V_O = V_{CC} =15V, T_A =25°C
			-	-	50		I_F =0mA, V_O = V_{CC} =15V
	Logic Low Supply Current	I_{CCL}	-	140	200	μA	I_F =16mA, V_O =Open, V_{CC} =15V
	Logic High Supply Current	I_{CCH}	-	0.01	1	μA	I_F =0mA, V_O =Open, V_{CC} =15V, TA=25°C
			-	-	2		I_F =0mA, V_O =Open, V_{CC} =15V

* Typical values at TA = 25°C

■ Transfer Characteristics

(Ta=0 to 70°C unless specified otherwise)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditon
Current Transfer Ratio	6N135	CTR	7	-	50	%	I_F = 16mA , V_O = 0.4V, V_{CC} =4.5V, T_A =25°C
	6N136 HT4502		19	-	50		
	6N135		5	-	-		I_F = 16mA , V_O = 0.5V, V_{CC} =4.5V
	6N136 HT4502		15	-	-		
Logic Low Output Voltage	6N135	V_{OL}	-	0.18	0.4	V	I_F = 16mA , I_O = 1.1mA, V_{CC} =4.5V, T_A =25°C
	6N136 HT4502		-	0.18	0.4		I_F = 16mA , I_O = 3mA, V_{CC} =4.5V, T_A =25°C
	6N135		-	-	0.5		I_F = 16mA , I_O = 0.8mA, V_{CC} =4.5V
	6N136 HT4502		-	-	0.5		I_F =16mA , I_O =2.4mA, V_{CC} =4.5V

■ Switching Characteristics

(Ta=0 to 70°C unless specified otherwise, IF=16mA,V_{CC}=5V)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditon
Propagation Delay Time to Logic Low (Fig. 8)	6N135	T_{PHL}	-	0.35	1.5	μs	R_L=4.1KΩ, T_A =25°C
			-	-	2.0		R_L =4.1KΩ
	6N136 HT4502		-	0.35	0.8		R_L =1.9kΩ, T_A =25°C
			-	-	1.0		R_L =1.9kΩ
Propagation Delay Time to Logic High (Fig. 8)	6N135	T_{PLH}	-	0.5	1.5	μs	R_L =4.1KΩ, T_A =25°C
			-	-	2.0		R_L =4.1KΩ
	6N136 HT4502		-	0.3	0.8		R_L =1.9KΩ, T_A =25°C
			-	-	1.0		R_L =1.9KΩ
Common Mode Transient Immunity at Logic High (Fig.9)(3)	6N135	CM_H	1000	-	-	V/μs	I_F = 0mA , V_{CM}=10 V_{p-p}, R_L =4.1KΩ, T_A =25°C
	6N136 HT4502		1000	-	-		I_F = 0mA , V_{CM}=10 V_{p-p}, R_L =1.9KΩ, T_A =25°C
Common Mode Transient Immunity at Logic Low (Fig.9)(3)	6N135	CM_L	1000	-	-	V/μs	I_F = 16mA , V_{CM} =10 V_{p-p}, R_L =4.1KΩ, T_A =25°C
	6N136 HT4502		1000	-	-		I_F = 16mA , V_{CM} =10V_{p-p}, R_L =1.9KΩ, T_A =25°C

* Typical values at T_A = 25°C

■ Typical Electro-Optical Characteristics Curves

Fig.1 Forward Current vs. Forward Voltage

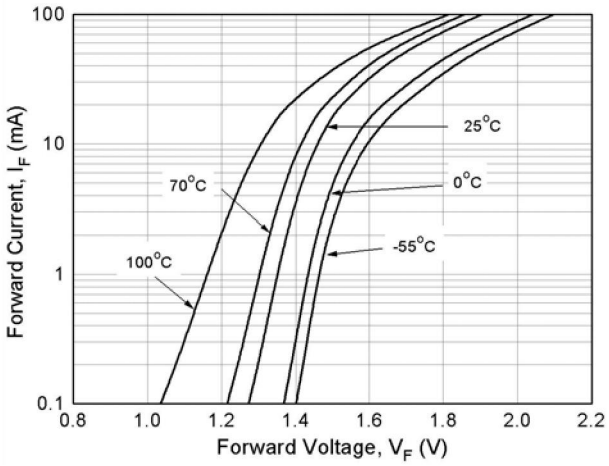


Fig.2 Normalized Current Transfer Ratio vs. Forward Current

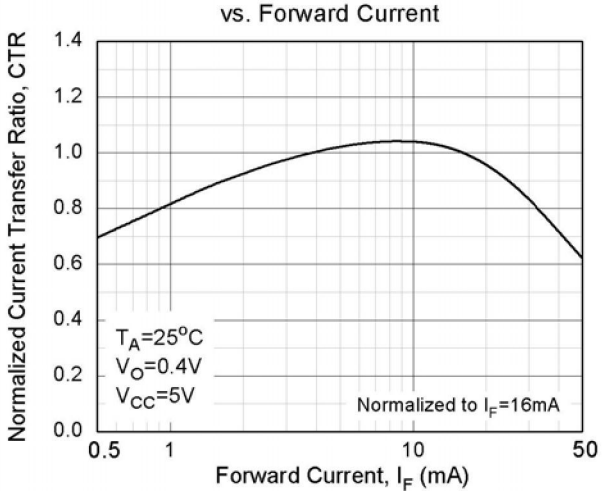


Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

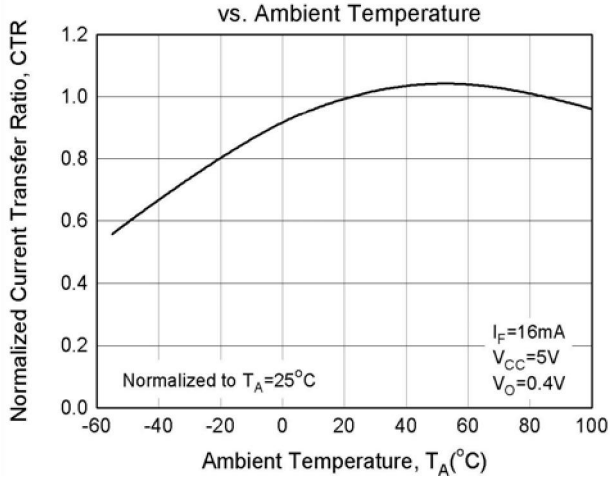


Fig.4 Output Current vs Output Voltage

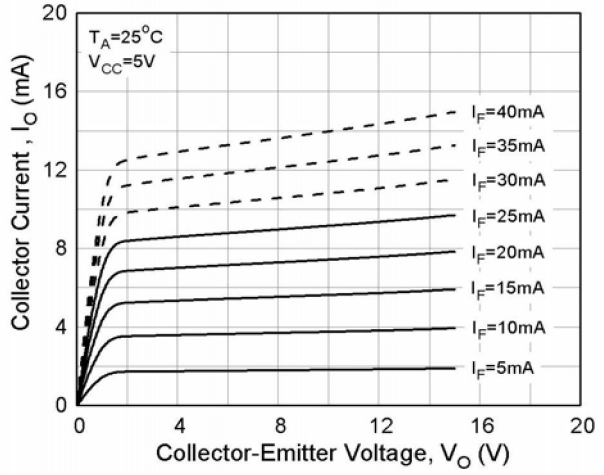


Fig.5 Logic High Output Current vs. Temperature

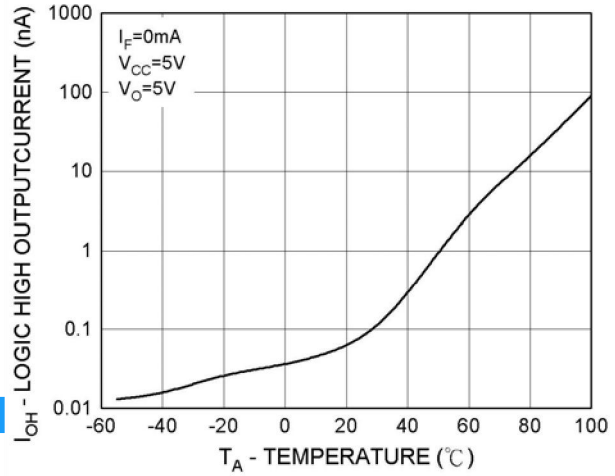


Fig.6 Propagation Delay vs. Load Resistance

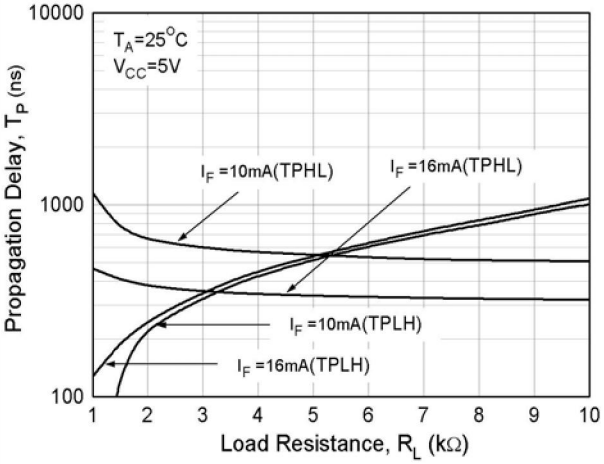


Fig.7 Propagation Delay vs. Temperature

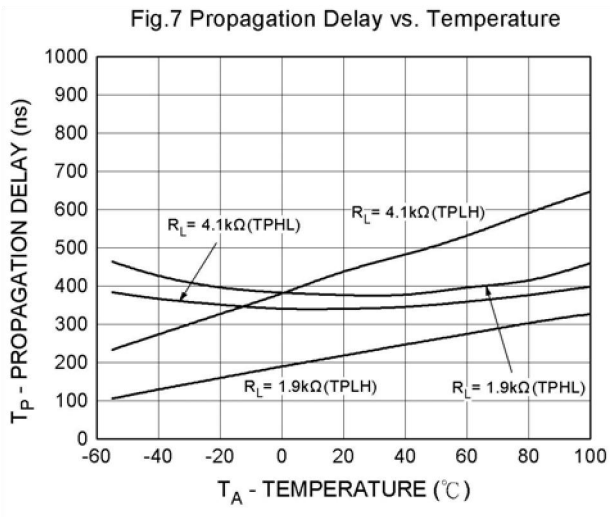


Figure 8 Switching Time Test Circuit & Waveform

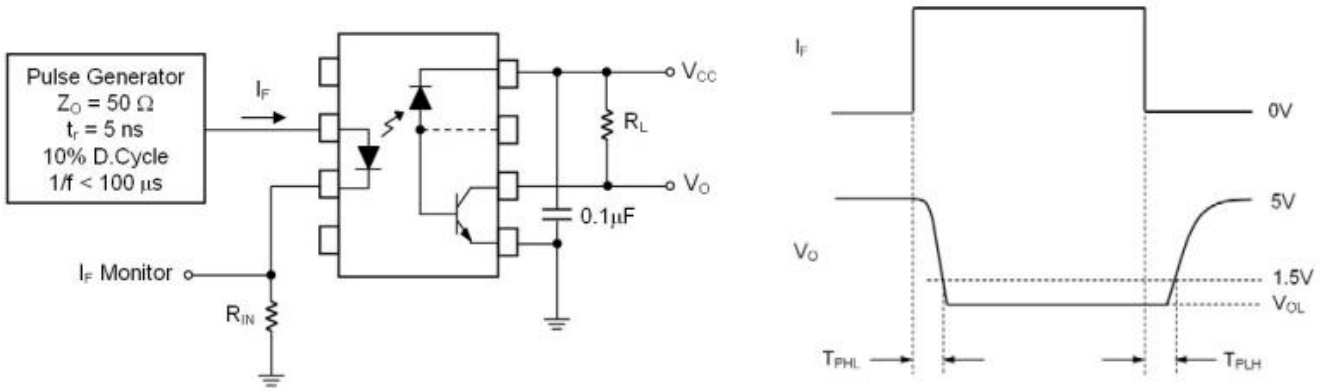
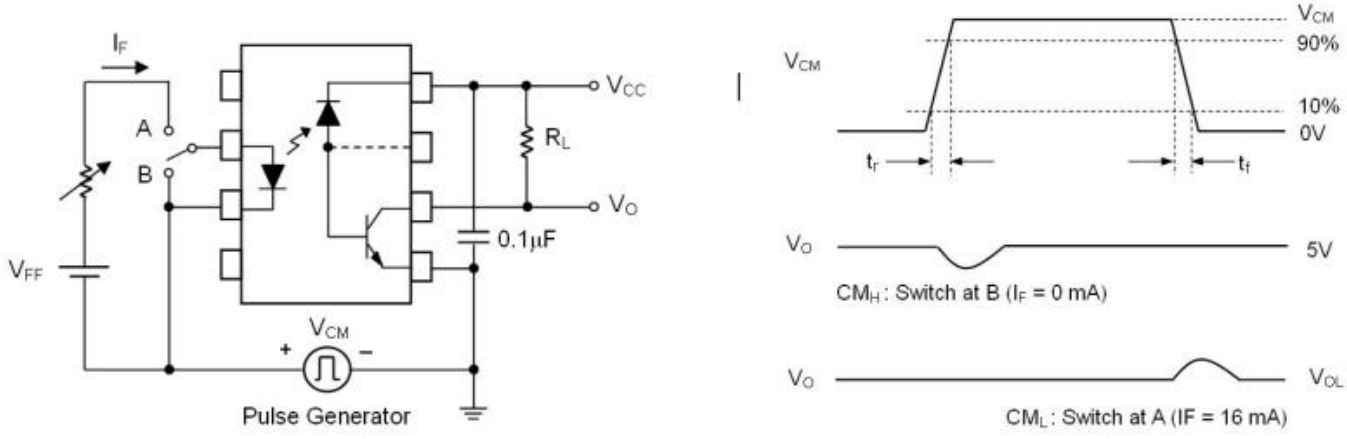


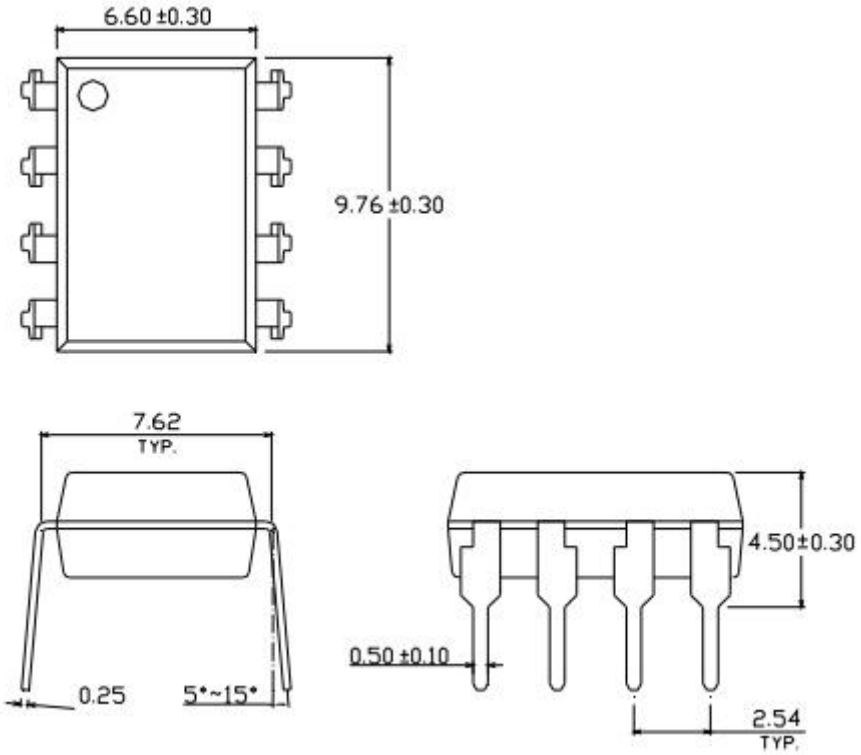
Figure 9 Transient Immunity Test Circuit & Waveform



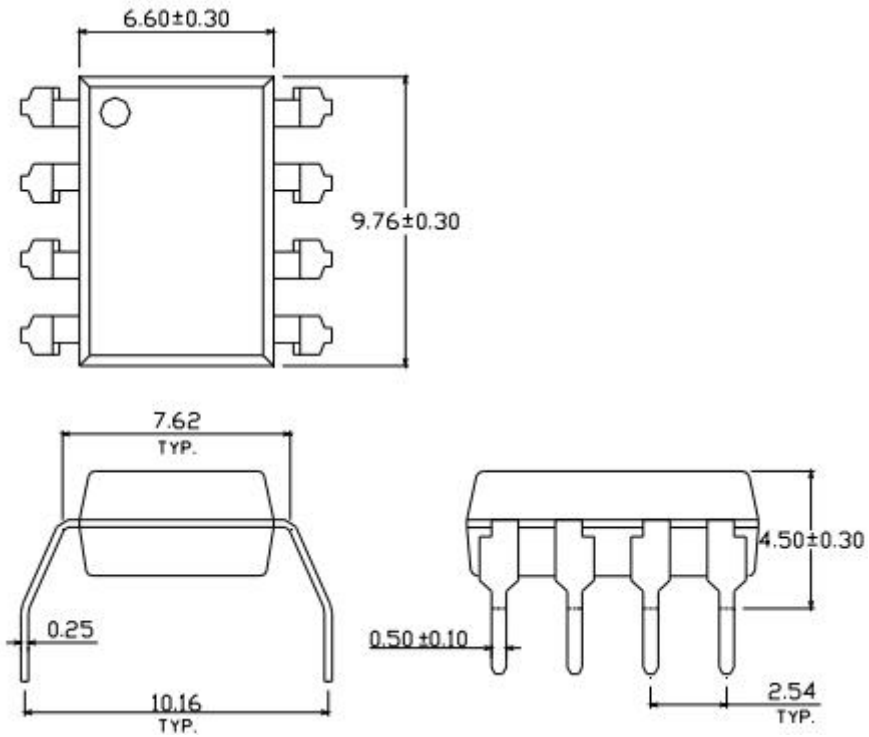
Note:
(3) Common mode transient immunity in logic high level is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode pulse signal VCM, to assure that the output will remain in a logic high state (i.e., VO > 2.0V). Common mode transient immunity in logic low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, VCM, to assure that the output will remain in a logic low state (i.e., VO < 0.8V).

■ Outline Dimension

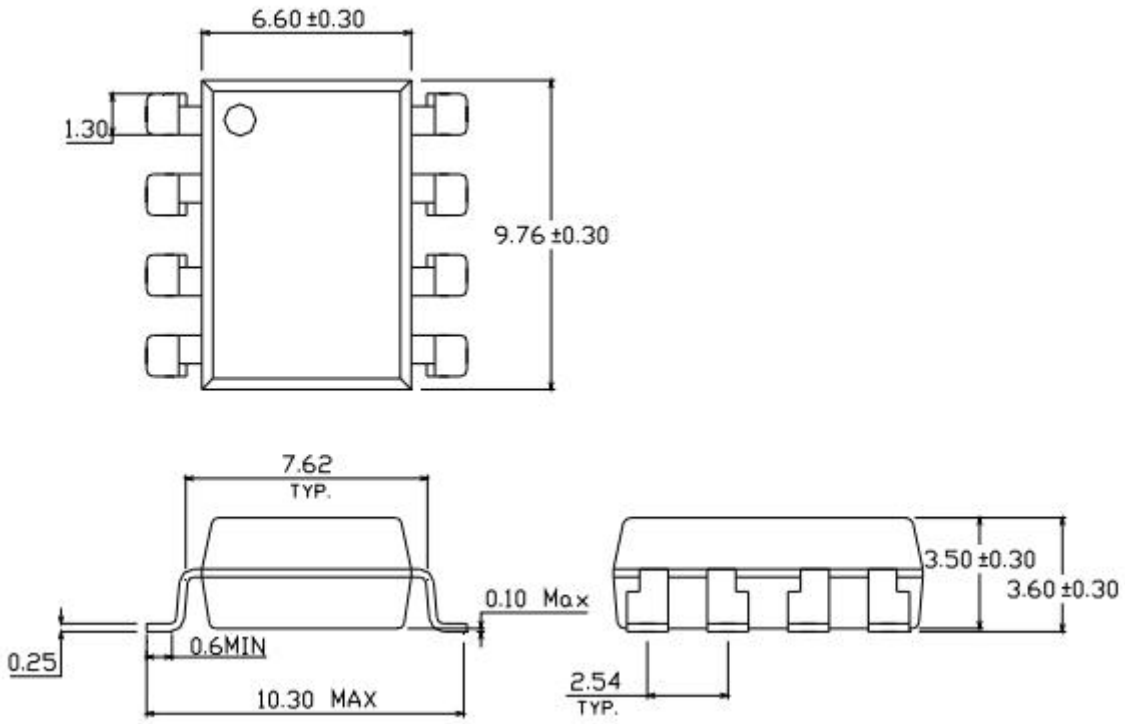
Standard DIP Type



Option M Type

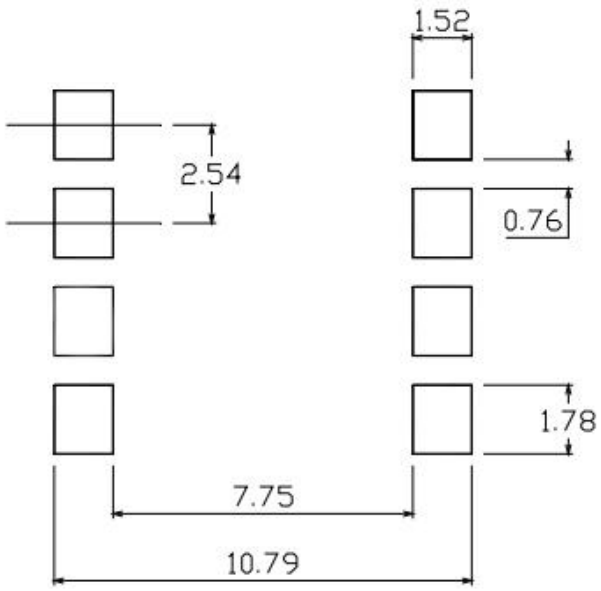


Option S1 Type



Unit: mm
Tolerance: ±0.1mm

■ Recommended solder pad Design



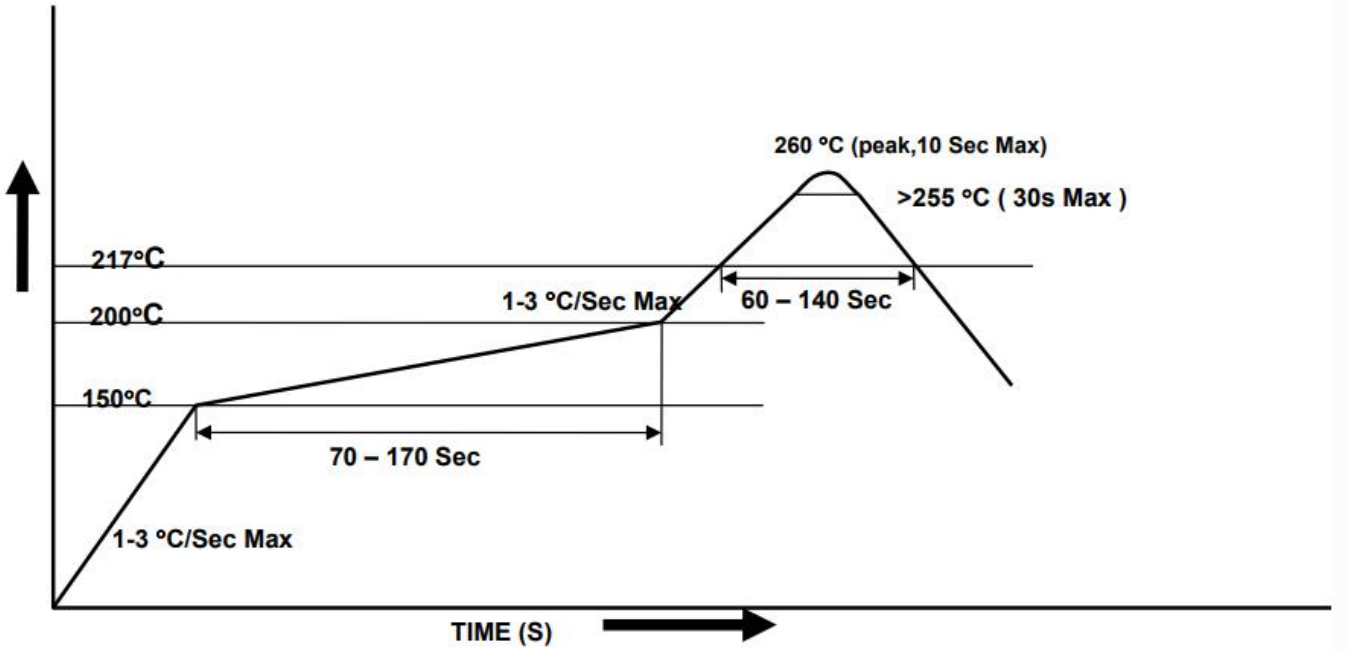
Unit: mm

■ Temperature Profile Of Soldering

1. IR Reflow soldering

(IPC/JEDEC J-STD-020D compliant)

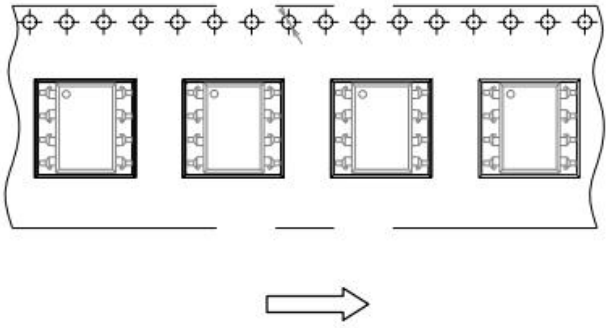
Profile item	Conditon
Preheat	
Temperature min (T_{smin})	150 °C
Temperature max (T_{smax})	200°C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max
Other	
Liquidus Temperature (T_L)	217 °C
Time above Liquidus Temperature (t_L)	60-100 sec
Peak Temperature (T_P)	260°C
Time within 5 °C of Actual Peak Temperature: T_P - 5°C	30 s
Ramp- Down Rate from Peak Temperature	6°C /second max.
Time 25°C to peak temperature	8 minutes max.
Reflow times	3 times



■ Packing

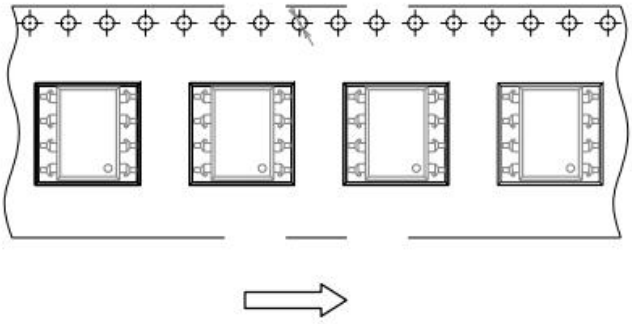
Tape and Reel

Option TP:



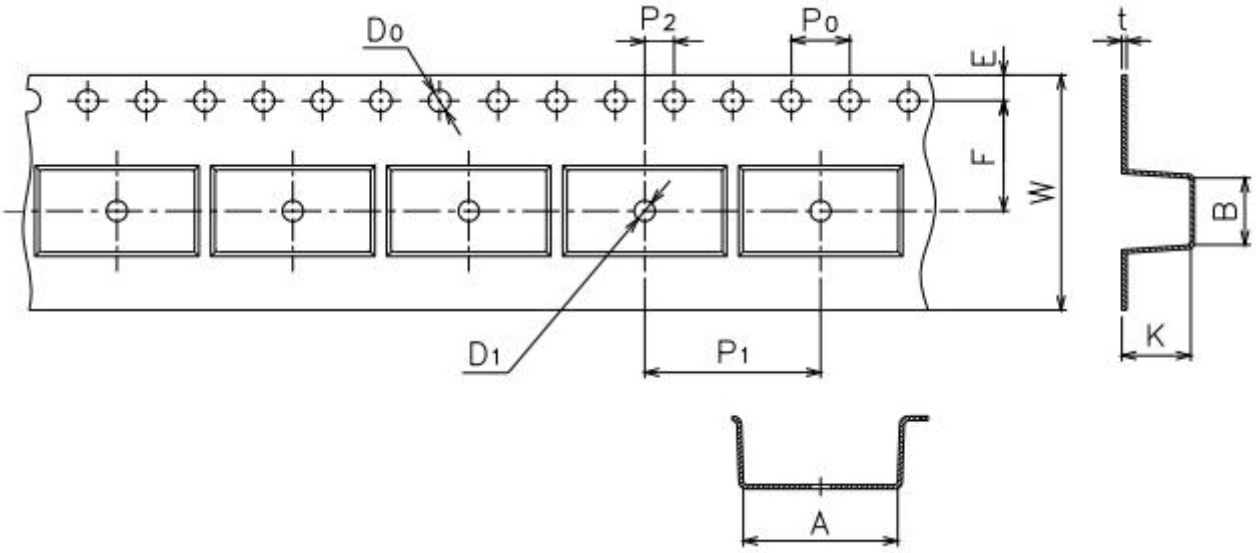
Direction of feed from reel

Option TP1:



Direction of feed from reel

Tape dimension



Demension/mm	A	B	Do	D1	E	F
Packagetype:S	10.4±0.1	10.0±0.1	1.5+0.1	1.5±0.1	1.75±0.1	7.5±0.1

Demension/mm	Po	P1	P2	t	W	K
Packagetype:S	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0±0.3/-0.1	4.5±0.1