

1Mbit/s High Speed Transistor Photo Coupler

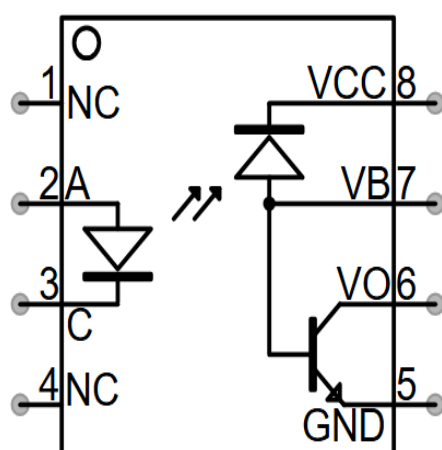
Description

The 6N135/ 6N136 consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector.

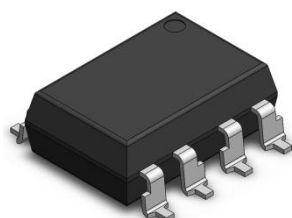
This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. Connection for the bias of the photodiode improves the speed that of a conventional phototransistor coupler by reducing the base-collector capacitances.

The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 1KV

Functional Diagram



6N135/6N136



6N135 6N136/SMD-8

Features

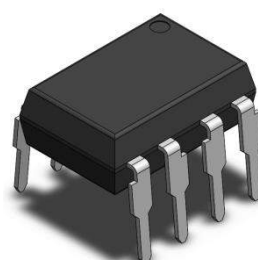
- High speed – 1MBd typical
- High isolation voltage between input and output ($V_{iso}=5000 V_{rms}$)
- Operating temperature range - 55 °C to 100 °C
- Guaranteed performance from 0°C to 70°C

Applications

- Line receivers
- Telecommunication equipment
- Out interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling
- Pulse transformer replacement

Truth Table (Positive Logic)

LED	VO
ON	LOW
OFF	HIGH



6N135 6N136/DIP-8

ABSOLUTE MAXIMUM RATINGS (TA = 25°C unless otherwise noted)

PARAMETER	SYMBOL	VALUE	UNIT	Note
Forward Current	I _F	25	mA	
Peak Forward Current	I _{FP}	50	mA	1
Peak Transient Current	I _{F(trans)}	1	A	2
Reverse Voltage	V _R	5	V	
Input Power Dissipation	P _I	100	mW	
Supply Voltage	V _{CC}	-0.5~30	V	
Output Voltage	V _O	-0.5~20	V	
Output Current	I _O	50	mA	
Emitter-Base Reverse Voltage	V _{EBR}	5	V	
Base Current	I _B	5	mA	
Output Power Dissipation	P _O	100	mW	
Total Power Dissipation	P _{tot}	200	mW	
Isolation Voltage	V _{iso}	5000	V _{rms}	3
Operating Temperature	T _{opr}	-55~100	°C	
Storage Temperature	T _{stg}	-55~150	°C	
Soldering Temperature	T _{sol}	260	°C	4

Note 1. 50% duty, 1ms P.W

Note 2. ≤1μs P.W,300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
INPUT(at Ta=0 to 70°C , unless specified otherwise)							
Forward Voltage	V _F	-	1.45	1.8	V	I _F =16mA	
Reverse Current	I _R	-	-	10	μA	V _R =5V	
Input Capacitance	C _{in}	-	60	-	pF	V=0, f=1MHz	
OUTPUT(at Ta=0 to 70°C , unless specified otherwise)							
High Level Supply Current	I _{CCH}	-	0.01	1	μA	I _F =0mA, V _O =Open, V _{CC} =15V, Ta=25°C	
		-	-	2	μA	I _F =0mA, V _O =Open, V _{CC} =15V	
Low Level Supply Current	I _{CCL}	-	200	-	μA	I _F =16mA, V _O =Open, V _{CC} =15V	
Logic High Output Current	I _{OH}	-	0.001	0.5	μA	I _F =0mA, V _O =V _{CC} =5.5V, Ta=25°C	
		-	0.01	1	μA	I _F =0mA, V _O =V _{CC} =15V, Ta=25°C	
		-	-	50	μA	I _F =0mA, V _O =V _{CC} =15V	

ELECTRICAL OPTICAL CHARACTERISTICS (TA = 25°C unless otherwise noted)							
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
TRANSFER CHARACTERISTICS(at Ta=0 to 70°C , unless specified otherwise)							
Current Transfer Ratio	6N135	7	-	50	μA	I _F = 16mA ,V _O = 0.4V, V _{CC} =4.5V, Ta=25°C	
	6N136	19	-	50			
	6N135	5	-	-		I _F = 16mA ,V _O = 0.5V, V _{CC} =4.5V	
	6N136	15	-	-			
Logic Low Output Voltage	6N135	-	0.18	0.4	μA	I _F = 16mA ,I _O = 1.1mA, V _{CC} =4.5V, Ta=25°C	
	6N136	-	0.25	0.4		I _F = 16mA ,I _O = 3mA, V _{CC} =4.5V, Ta=25°C	
	6N135	-	-	-		I _F = 16mA ,I _O =0.8mA, V _{CC} =4.5V	
	6N136	-	-	-		I _F = 16mA ,I _O =2.4mA, V _{CC} =4.5V	
Isolation Resistance	Riso	10 ¹²	10 ¹⁴	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C _{IO}	-	0.3	1	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS								
PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS(at Ta=0 to 70°C, IF=16mA ,VCC=5V, unless specified otherwise)								
Propagation Delay Time to Logic Low	6N135	TPHL	-	0.35	1.5	μs	RL=4.1kΩ,TA=25°C	Fig.13
			-	-	2		RL=4.1kΩ	
	6N136		-	0.35	0.8		RL=1.9kΩ,TA=25°C	
			-	-	1.0		RL=1.9kΩ	
Propagation Delay Time to Logic High	6N135	TPLH	-	0.5	1.5	μs	RL=4.1kΩ,TA=25°C	Fig.13
			-	-	2		RL=4.1kΩ	
	6N136		-	0.3	0.8		RL=1.9kΩ,TA=25°C	
			-	-	1.0		RL=1.9kΩ	
Common Mode Transient Immunity at Logic High	6N135	CMH	1000	-	-	V/μs	IF = 0mA , VCM=10Vpp, RL=4.1kΩ, TA =25°C	Fig.14
	6N136		1000	-	-		IF = 0mA , VCM=10Vpp, RL=1.9kΩ, TA =25°C	
Common Mode Transient Immunity at Logic Low	6N135	CML	1000	-	-	V/μs	IF = 16mA , VCM=10Vpp, RL=4.1kΩ, TA =25°C	Fig.14
	6N136		1000	-	-		IF = 16mA , VCM=10Vpp, RL=1.9kΩ, TA=25°C	

CHARACTERISTIC CURVES

Fig.1 Input Threshold Current vs. Ambient Temperature

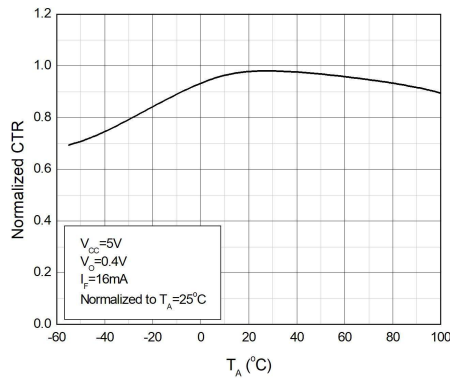


Fig.2 Low Level Output Current vs. Ambient Temperature

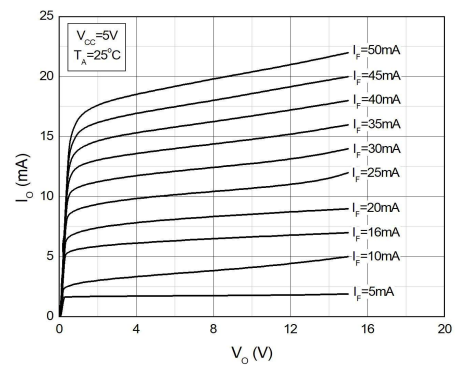


Fig.3 Low Level Output Current vs. Ambient Temperature

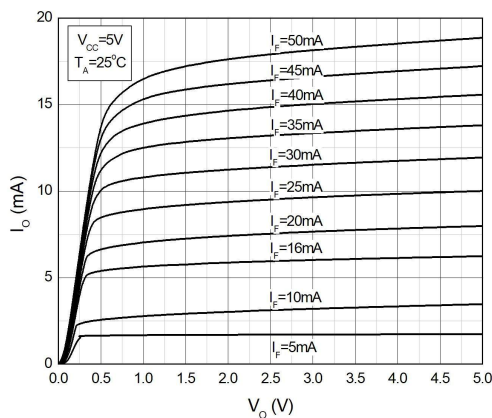


Fig.4 Forward Current vs. Forward Voltage

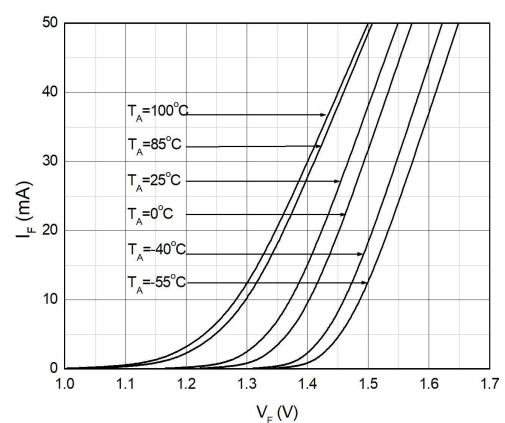


Fig.5 Forward Voltage vs. Ambient Temperature

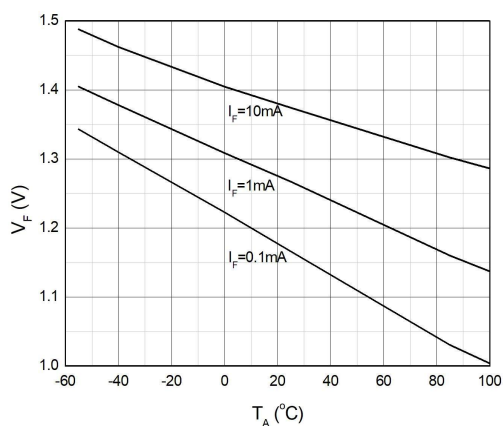
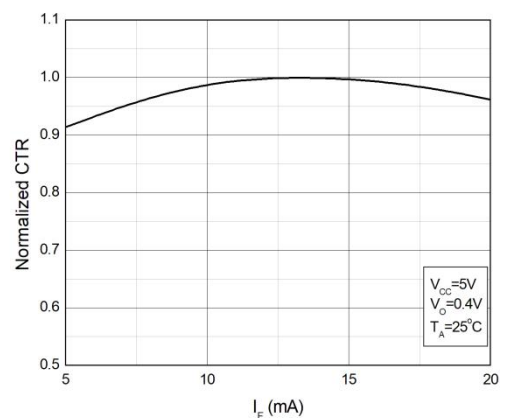


Fig.6 Input Threshold Current vs. Ambient Temperature



CHARACTERISTIC CURVES

Fig.7 Output Voltage vs. Forward Current

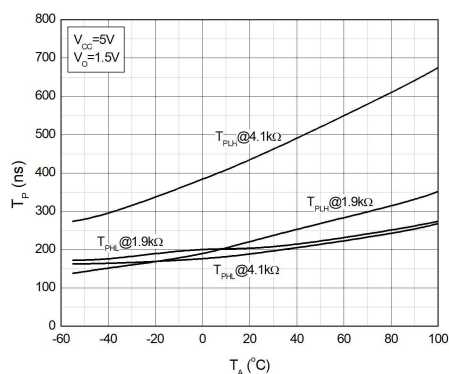


Fig.8 Output Voltage vs. Forward Current

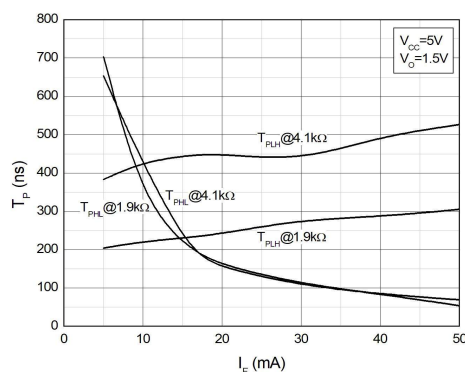


Fig.9 High Level Output Current vs. Ambient Temperature

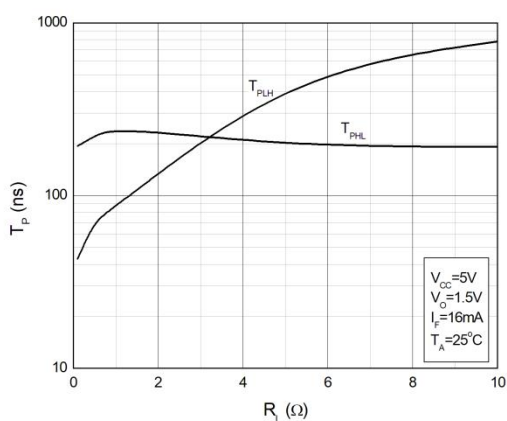


Fig.10 High Level Output Current vs. Ambient Temperature

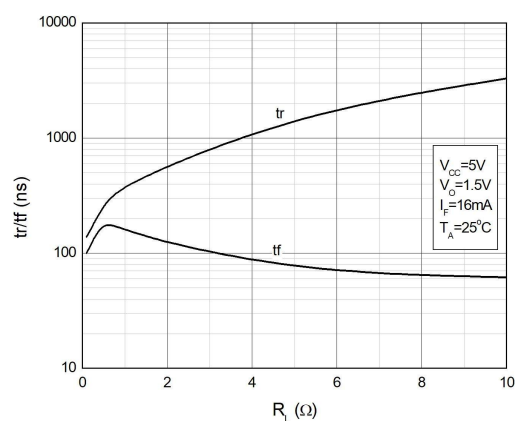


Fig.11 Low Level Output Voltage vs. Ambient Temperature

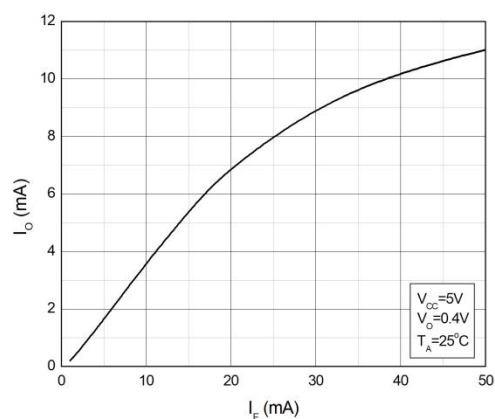
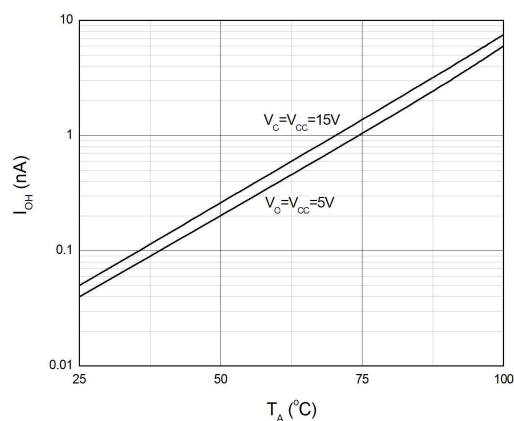


Fig.12 Low Level Output Voltage vs. Ambient Temperature



TEST CIRCUITS

Fig.13 Test Circuits for TPHL, TPLH, tr, tf

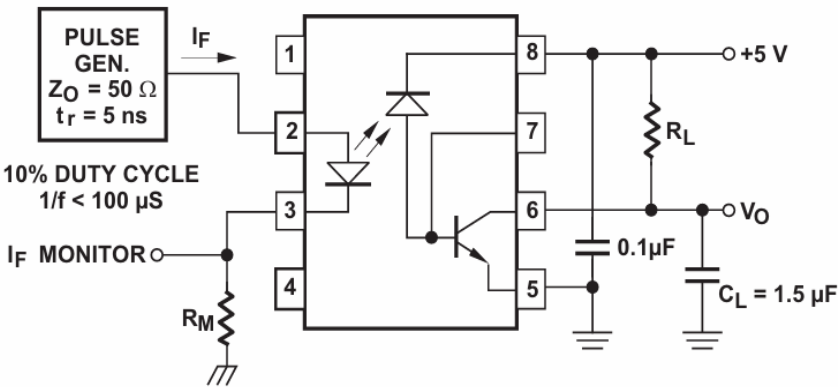
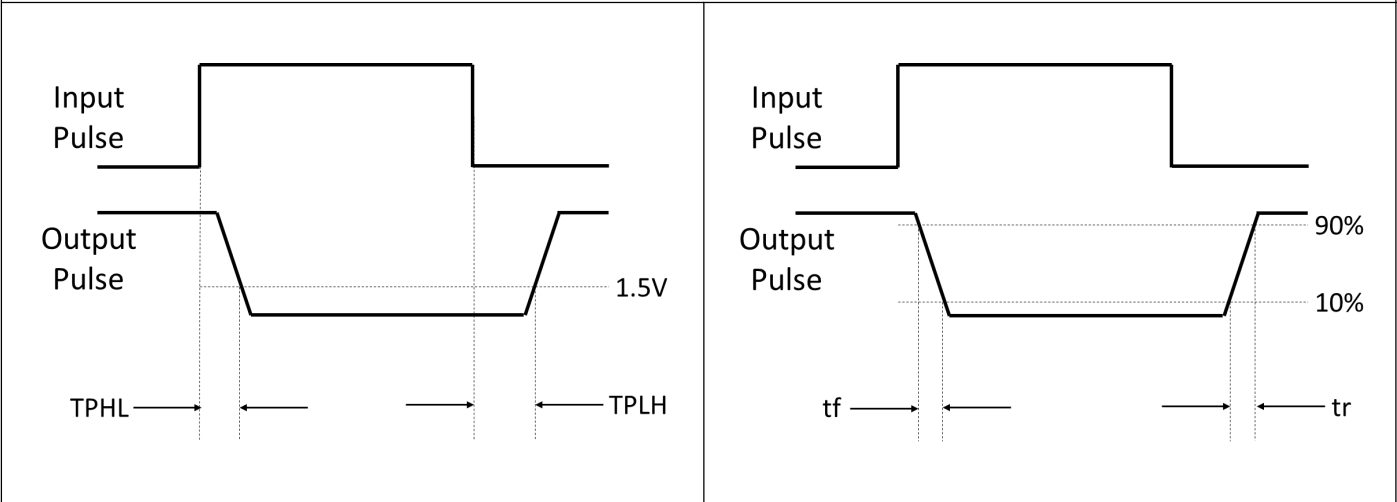


Fig.14 Waveforms of TPHL, TPLH, tr, tf



TEST CIRCUITS

Fig.15 Test Circuits for Common Mode Transient Immunity

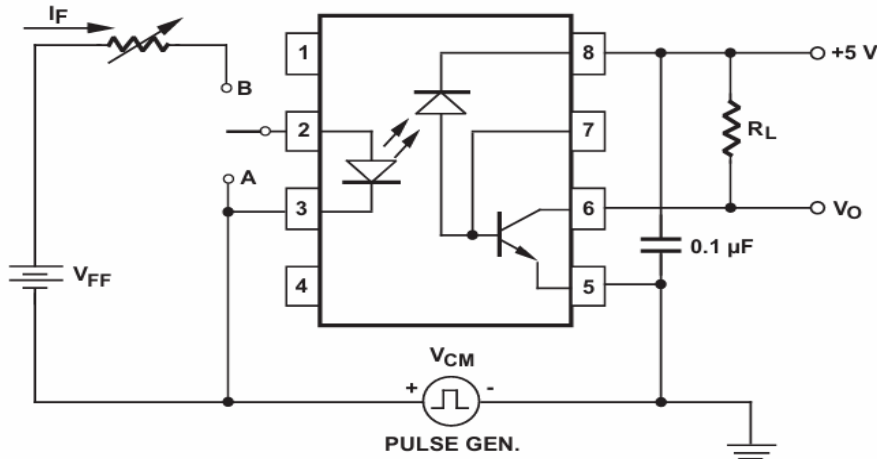
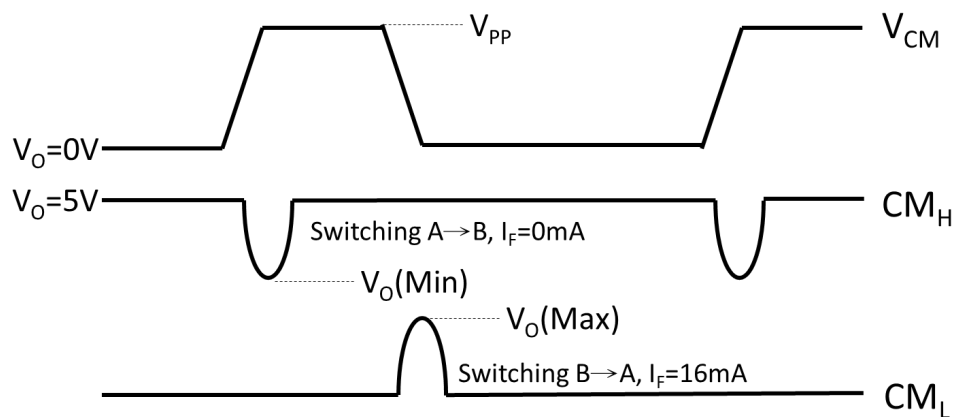
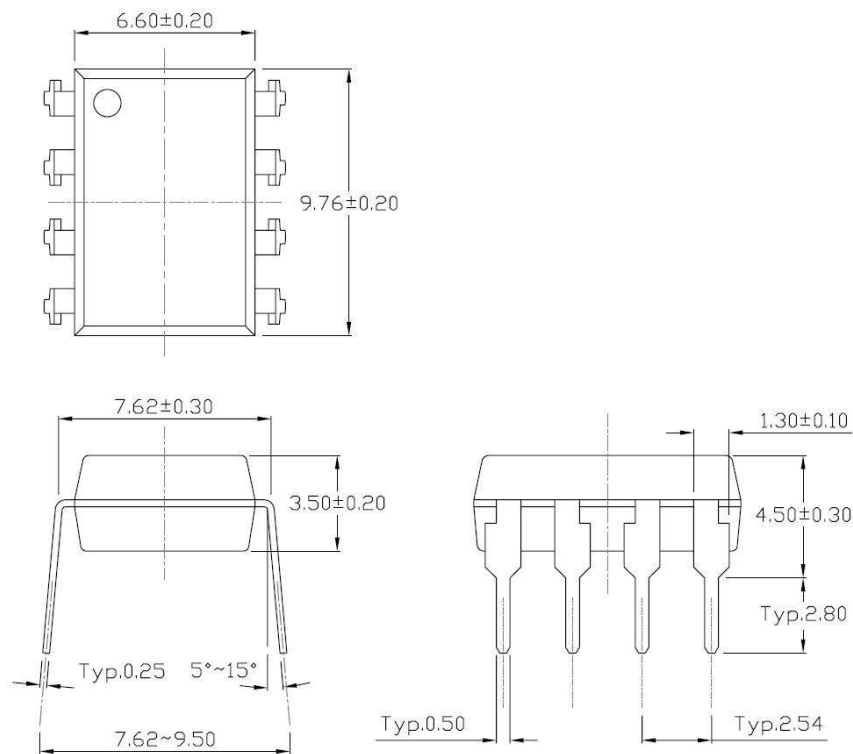


Fig.16 Waveforms of Common Mode Transient Immunity

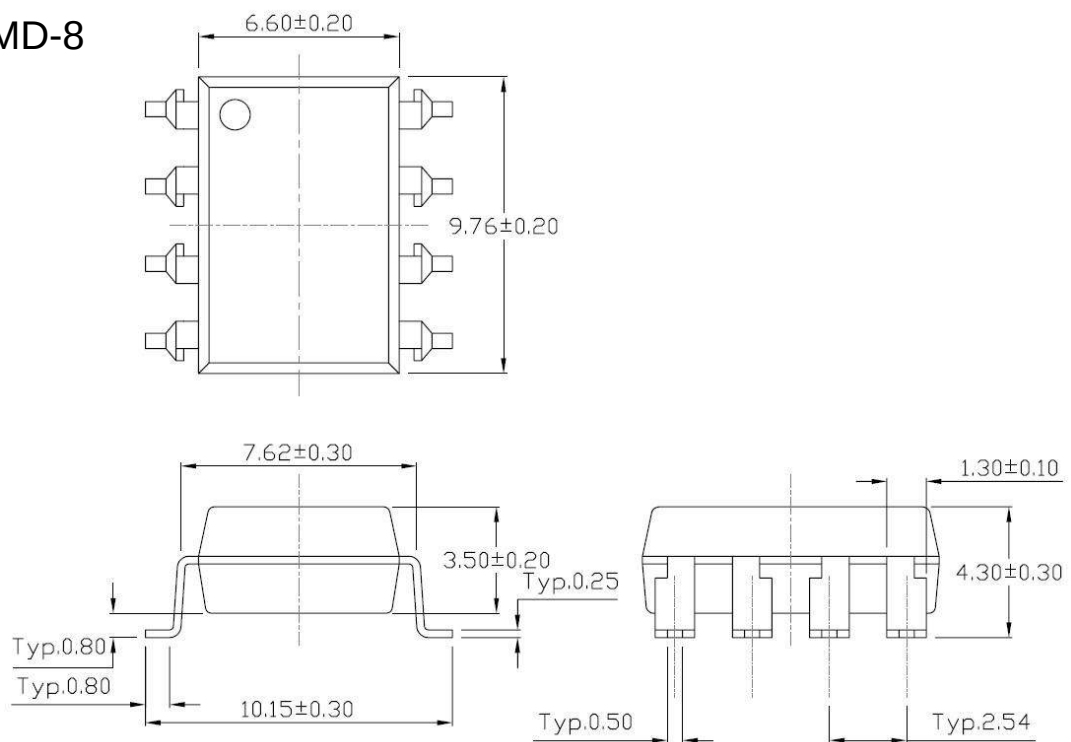


PACKAGE DIMENSIONS Dimensions in mm unless otherwise stated

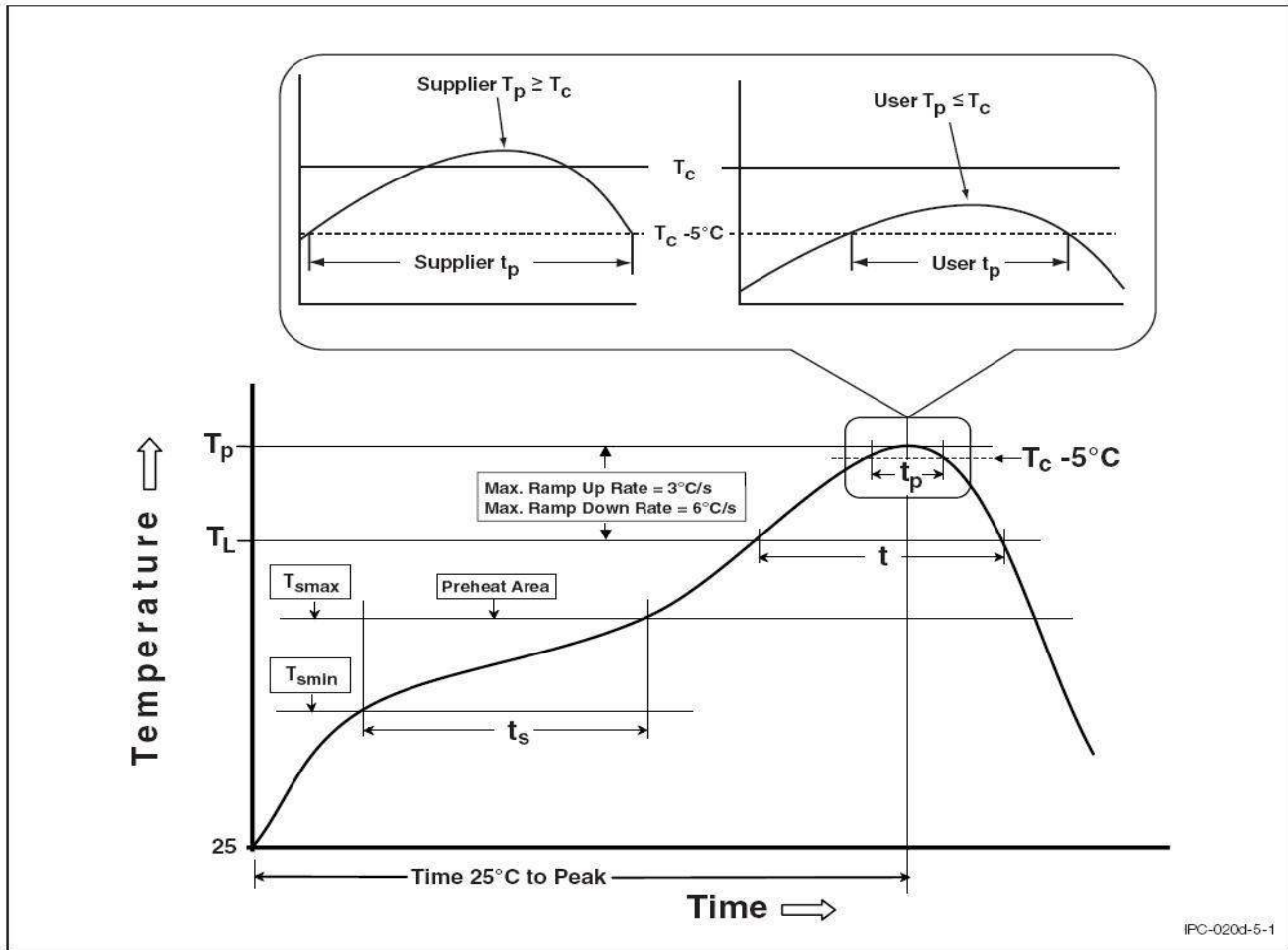
DIP-8



SMD-8



REFLOW INFORMATION



REFLOW PROFILE

Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	100	150°C
Temperature Max. (T _{smax})	150	200°C
Time (t _s) from (T _{smin} to T _{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.	3°C/second max.
Liquidous Temperature (T _L)	183°C	217°C
Time (t _L) Maintained Above (T _L)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T _P to T _L)	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.