DIP8, 10Mbit/s High Speed Logic Gate Photo Coupler

■ Features

- High isolation 5000 VRMS
- DC input with logic gate output
- Operating temperature range - 55 °C to 110 °C
- RoHS & REACH Compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

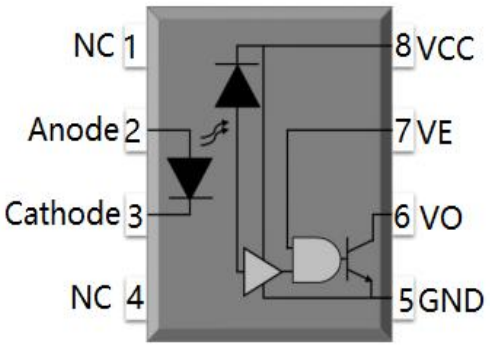
■ Applications

- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supply
- Pulse transformer replacement
- Computer-peripheral interface

■ Description

The 6N137, MPC2601, MPC2611 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed integrated photo-detector logic gate with a strobable output in a plastic DIP8 package with different lead forming options.

■ Schematic



ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
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	
Enable Voltage	V_E	VCC+0.5	V	
Input Power Dissipation	P_I	100	mW	
OUTPUT				
Supply Voltage	V_{CC}	7	V	
Output Voltage	V_O	7	V	
Output Current	I_O	50	mA	
Output Power Dissipation	P_O	85	mW	
COMMON				
Total Power Dissipation	Ptot	200	mW	
Isolation Voltage	Viso	5000	Vrms	3
Operating Temperature	Topr	-55~100	°C	
Storage Temperature	Tstg	-55~125	°C	
Soldering Temperature	Tsol	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

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	TA	-40	100	°C
Supply Voltage	VCC	2.7	3.6	V
	VCC	4.5	5.5	V
Low Level Input Current	IFL	0	250	μA
High Level Input Current	IFH	5	15	mA
Low Level Enable Voltage	VEL	0	0.8	V
High Level Enable Voltage	VEH	2	VCC	V
Output Pull-up Resistor	RL	330	4k	Ω
Fan Out (at RL=1kΩ per channel)	N	-	5	TTL Loads

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V_F	-	1.38	1.8	V	I_F=10mA	
Reverse Current	I_R	-	-	10	μA	V_R=5V	
Input Capacitance	Cin	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I_{CCH}	-	6.3	10	mA	I_F=0mA, V_E=0.5V,V_{CC}=5.5V	
Low Level Supply Current	I_{CCL}	-	8.3	13	mA	I_F=10mA, V_{CC}=5.5V	
High Level Enable Current	I_{EH}	-	-0.52	-1.6	mA	V_E=2.0V, V_{CC}=5.5V	
Low Level Enable Current	I_{EL}	-	-0.75	-1.6	mA	V_E=0.5V, V_{CC}=5.5V	
High Level Enable Voltage	V_{EH}	2.0	-	-	V	I_F=10mA, V_{CC}=5.5V	
Low Level Enable Voltage	V_{EL}	-	-	0.8	V	I_F=10mA, V_{CC}=5.5V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I_{OH}	-	0.73	100	μA	V_{CC}=5.5V, V_O=5.5V, I_F=250μA, V_E=2.0V	
Low Level Output Voltage	V_{OL}	-	0.28	0.6	V	V_{CC}=5.5V, I_F=5mA, V_E=2.0V, I_{CL}=13mA	
Input Threshold Current	I_{FT}	-	2.5	5	mA	V_{CC}=5.5V, V_O=0.6V, V_E=2.0V, I_{OL}=13mA	
Isolation Resistance	Riso	10^12	10^14	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C_{IO}	-	1.0	-	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V_{CC}=5V, I_F=7.5mA unless specified otherwise)								
Propagation Delay Time to Output Low Level		TPHL	-	35	75	ns	C_L=15pF, R_L=350Ω, Ta=25°C	
Propagation Delay Time to Output High Level		TPLH	-	40	75	ns	C_L=15pF, R_L=350Ω, Ta=25°C	
Pulse Width Distortion		|TPHL-TPLH|	-	5	35	ns	C_L=15pF, R_L=350Ω	
Rise Time		tr	-	27	-	ns	C_L=15pF, R_L=350Ω	
Fall Time		tf	-	7	-	ns	C_L=15pF, R_L=350Ω	
Enable Propagation Delay Time to Output Low Level		TEHL	-	15	-	ns	I_F=7.5mA, V_{EH}=3.5V, C_L=15pF, R_L=350Ω	
Enable Propagation Delay Time to Output High Level		TELH	-	15	-	ns	I_F=7.5mA, V_{EH}=3.5V, C_L=15pF, R_L=350Ω	
Common Mode Transient Immunity at Logic High	6N137	CMH	-	-	-	V/μs	I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=10Vp-p	
	MPC2601		5000	-	-		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=50Vp-p	
	MPC2611		10000	-	-		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	CML	-	-	-	V/μs	I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=10Vp-p	
	MPC2601		5000	-	-		I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=50Vp-p	
	MPC2611		10000	-	-		I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=400Vp-p	

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V_F	-	1.38	1.8	V	I_F=10mA	
Reverse Current	I_R	-	-	10	μA	V_R=5V	
Input Capacitance	Cin	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I_{CCH}	-	4.3	10	mA	I_F=0mA, V_E=0.5V,V_{CC}=3.3V	
Low Level Supply Current	I_{CCL}	-	6.4	13	mA	I_F=10mA, V_{CC}=3.3V	
High Level Enable Current	I_{EH}	-	-0.21	-1.6	mA	V_E=2.0V, V_{CC}=3.3V	
Low Level Enable Current	I_{EL}	-	-0.42	-1.6	mA	V_E=0.5V, V_{CC}=3.3V	
High Level Enable Voltage	V_{EH}	2.0	-	-	V	I_F=10mA, V_{CC}=3.3V	
Low Level Enable Voltage	V_{EL}	-	-	0.8	V	I_F=10mA, V_{CC}=3.3V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I_{OH}	-	4.1	100	μA	V_{CC}=3.3V, V_O=3.3V, I_F=250μA, V_E=2.0V	
Low Level Output Voltage	V_{OL}	-	0.29	0.6	V	V_{CC}=3.3V, I_F=5mA, V_E=2.0V, I_{CL}=13mA	
Input Threshold Current	I_{FT}	-	2.2	5	mA	V_{CC}=3.3V, V_O=0.6V, V_E=2.0V, I_{OL}=13mA	
Isolation Resistance	Riso	10^12	10^14	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C_{IO}	-	1.0	-	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V_{CC}=3.3V, I_F=7.5mA unless specified otherwise)								
Propagation Delay Time to Output Low Level		TPHL	-	35	75	ns	C_L=15pF, R_L=350Ω, Ta=25°C	
Propagation Delay Time to Output High Level		TPLH	-	47	75	ns	C_L=15pF, R_L=350Ω, Ta=25°C	
Pulse Width Distortion		|TPHL-TPLH|	-	12	35	ns	C_L=15pF, R_L=350Ω	
Rise Time		tr	-	30	-	ns	C_L=15pF, R_L=350Ω	
Fall Time		tf	-	8.5	-	ns	C_L=15pF, R_L=350Ω	
Enable Propagation Delay Time to Output Low Level		TEHL	-	15	-	ns	I_F=7.5mA, V_{EH}=3.3.3V, C_L=15pF, R_L=350Ω	
Enable Propagation Delay Time to Output High Level		TELH	-	15	-	ns	I_F=7.5mA, V_{EH}=3.3.3V, C_L=15pF, R_L=350Ω	
Common Mode Transient Immunity at Logic High	6N137	CMH	-	-	-	V/μs	I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=10Vp-p	
	MPC2601		5000	-	-		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=50Vp-p	
	MPC2611		10000	-	-		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, Ta=25°C V_{CM}=400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	CML	-	-	-	V/μs	I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=10Vp-p	
	MPC2601		5000	-	-		I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=50Vp-p	
	MPC2611		10000	-	-		I_F = 0mA , V_{OH}=0.8V, R_L=350Ω, Ta=25°C V_{CM}=400Vp-p	

CHARACTERISTIC CURVES

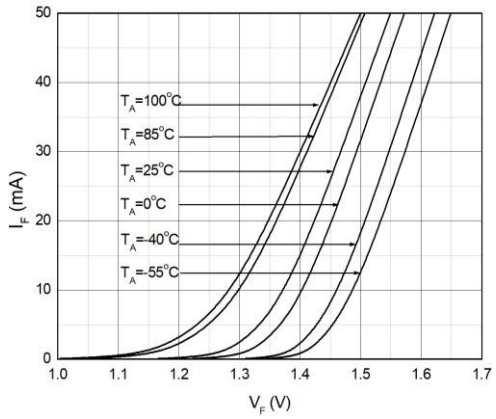


Fig.1 Forward Current vs. Forward Voltage

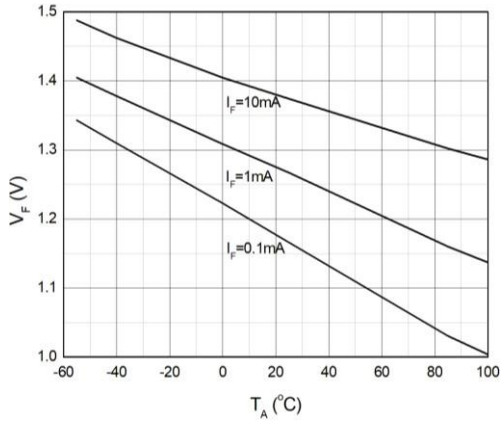


Fig.2 Forward Voltage vs. Ambient Temperature

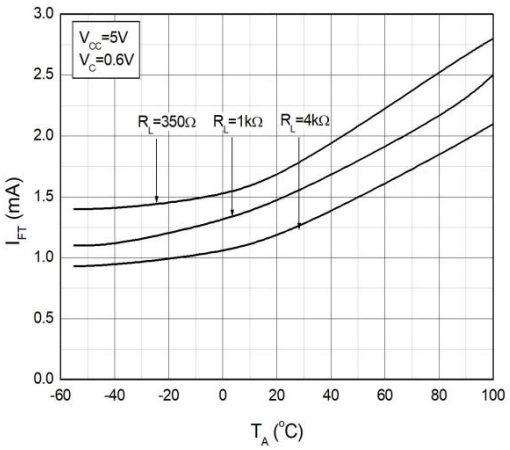


Fig.3 Input Threshold Current vs. Ambient Temperature

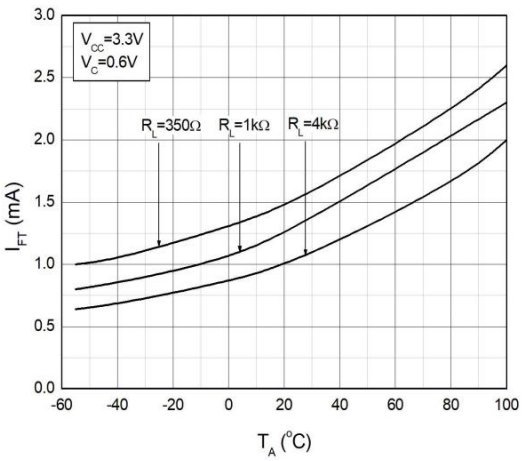


Fig.4 Input Threshold Current vs. Ambient Temperature

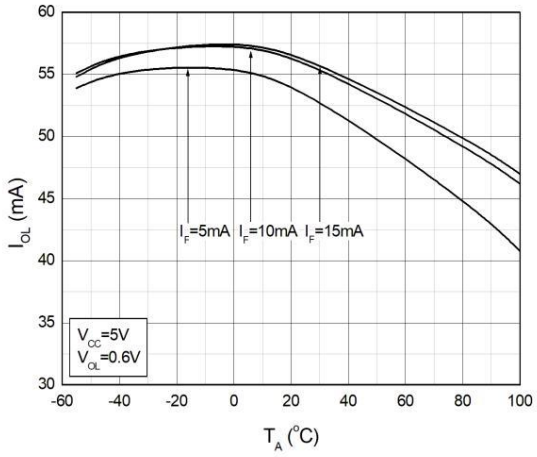


Fig.5 Low Level Output Current vs. Ambient Temperature

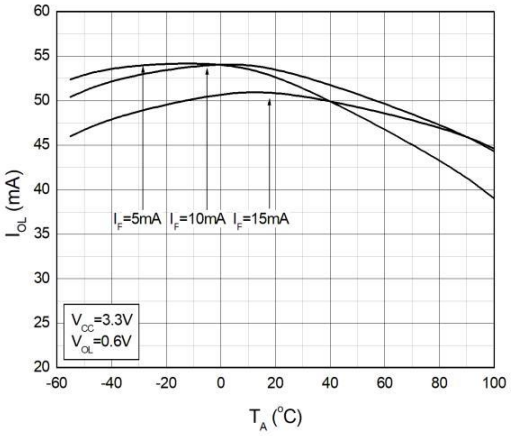


Fig.6 Low Level Output Current vs. Ambient Temperature

CHARACTERISTIC CURVES

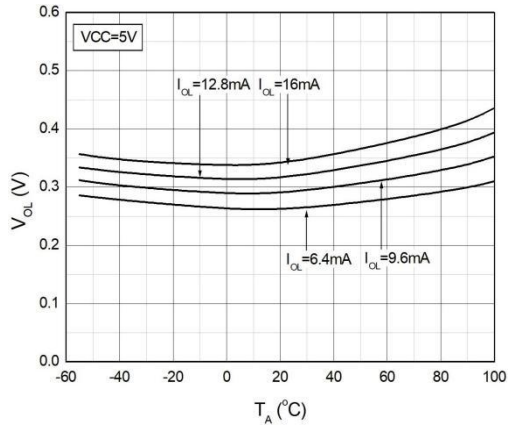


Fig.7 Low Level Output Voltage vs. Ambient Temperature

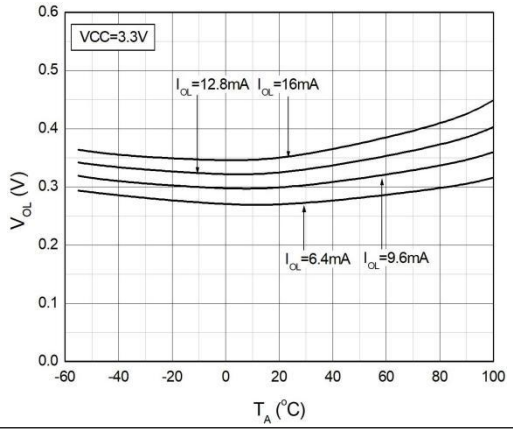


Fig.8 Low Level Output Voltage vs. Ambient Temperature

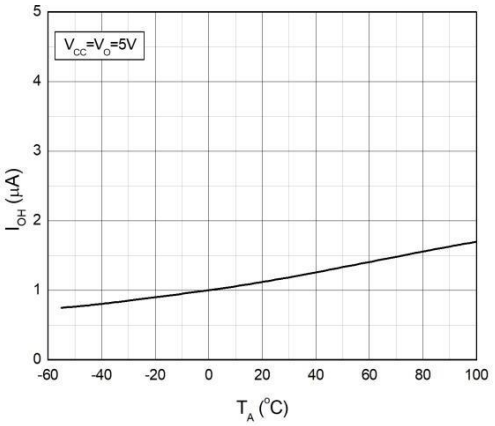


Fig.9 High Level Output Current vs. Ambient Temperature

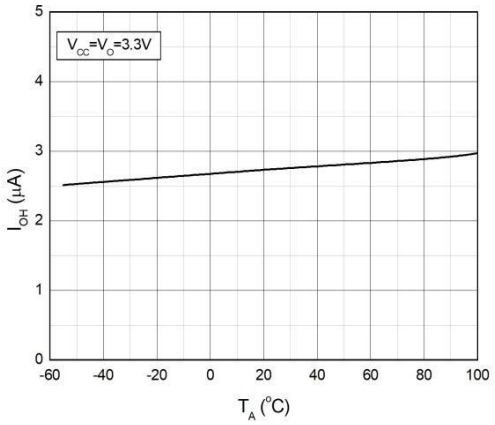


Fig.10 High Level Output Current vs. Ambient Temperature

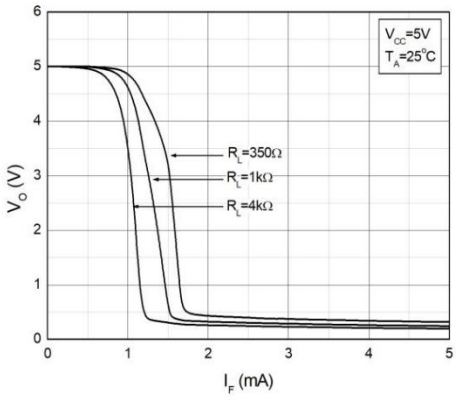


Fig.11 Output Voltage vs. Forward Current

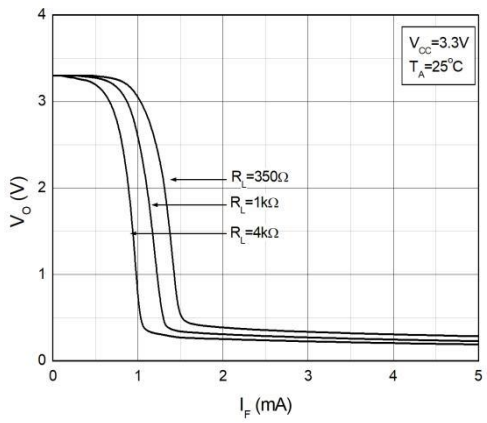


Fig.12 Output Voltage vs. Forward Current

CHARACTERISTIC CURVES

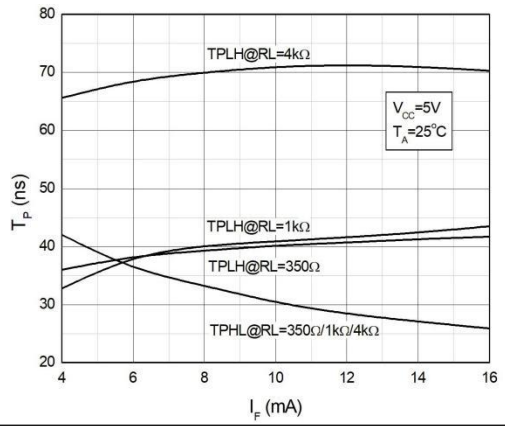


Fig.13 Propagation Delay vs. Forward Current

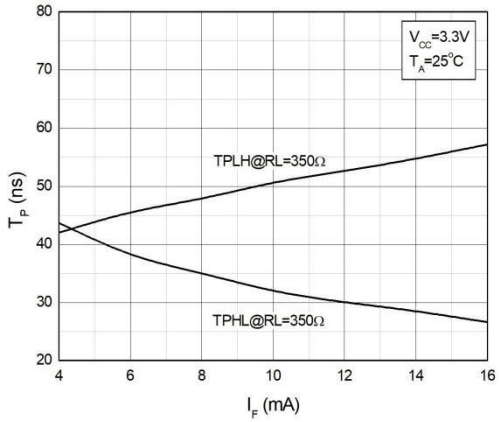


Fig.14 Propagation Delay vs. Forward Current

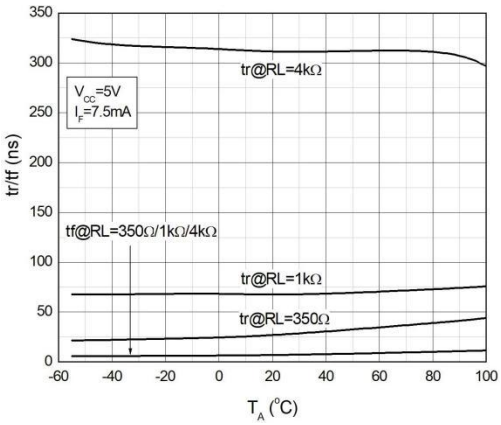


Fig.15 Rise and Fall Time vs. Ambient Temperature

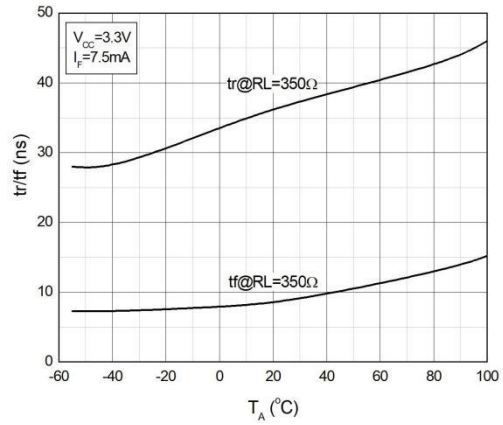


Fig.16 Rise and Fall Time vs. Ambient Temperature

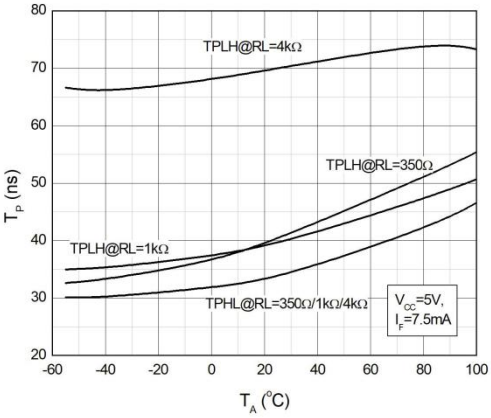


Fig.17 Propagation Delay vs. Ambient Temperature

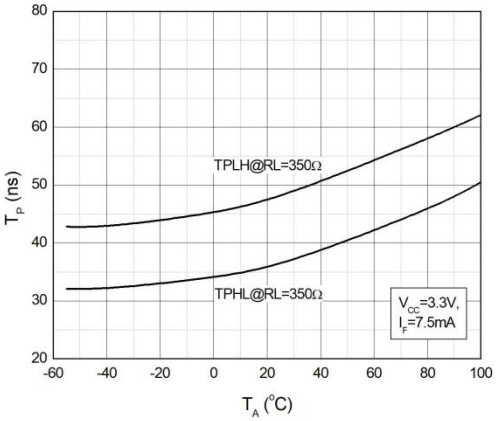


Fig.18 Propagation Delay vs. Ambient Temperature

CHARACTERISTIC CURVES

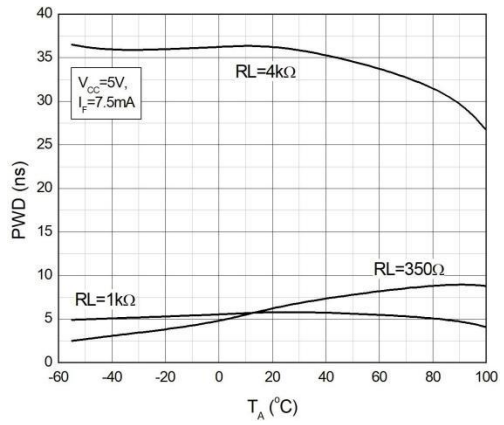


Fig.19 Pulse Width Distortion vs. Ambient Temperature

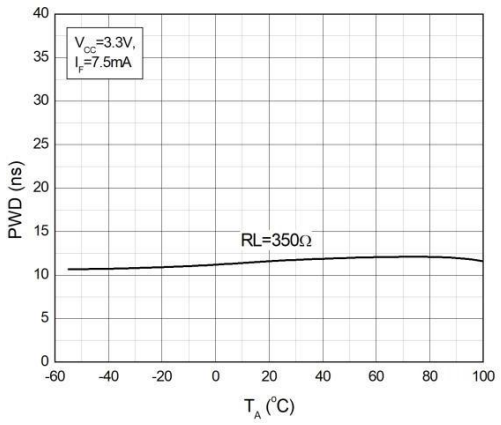


Fig.20 Pulse Width Distortion vs. Ambient Temperature

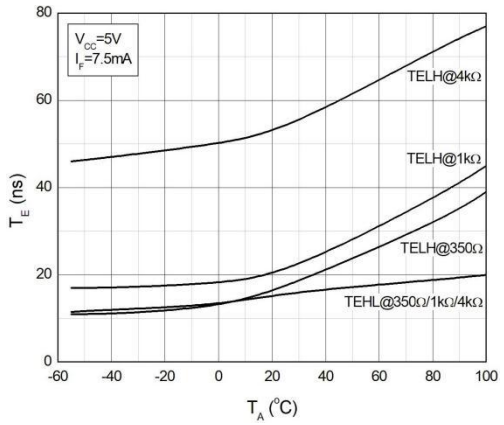


Fig.21 Enable Propagation Delay vs. Ambient Temperature

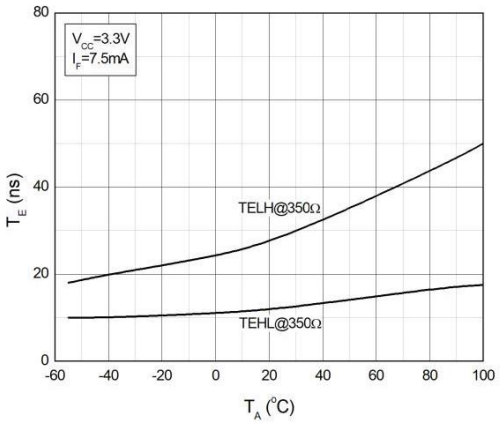


Fig.22 Enable Propagation Delay vs. Ambient Temperature

TEST CIRCUITS

Fig.23 Test Circuits for TPHL, TPLH, tr, t

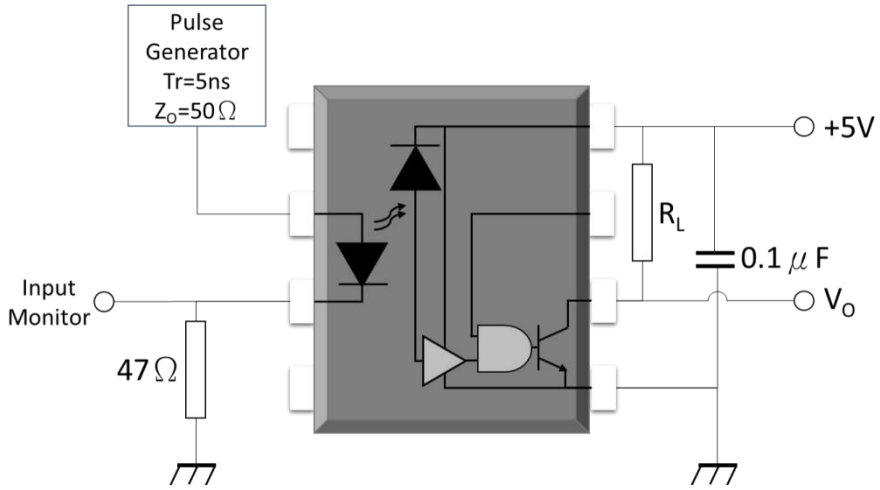
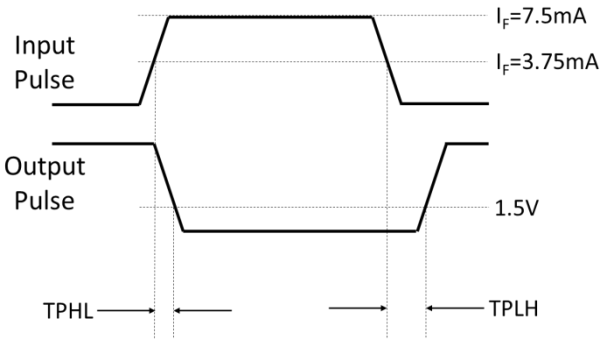
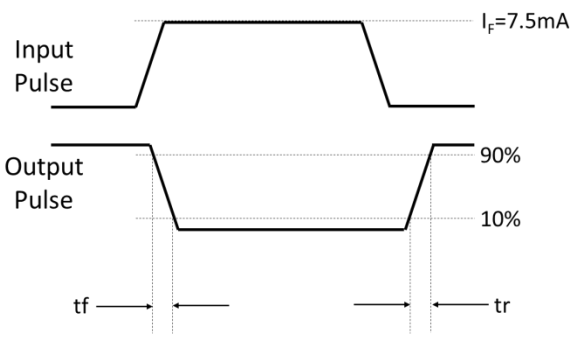


Fig.24 Waveforms of TPHL, TPLH, tr, tf





TEST CIRCUITS

Fig.25 Test Circuits for TEHL, TELH

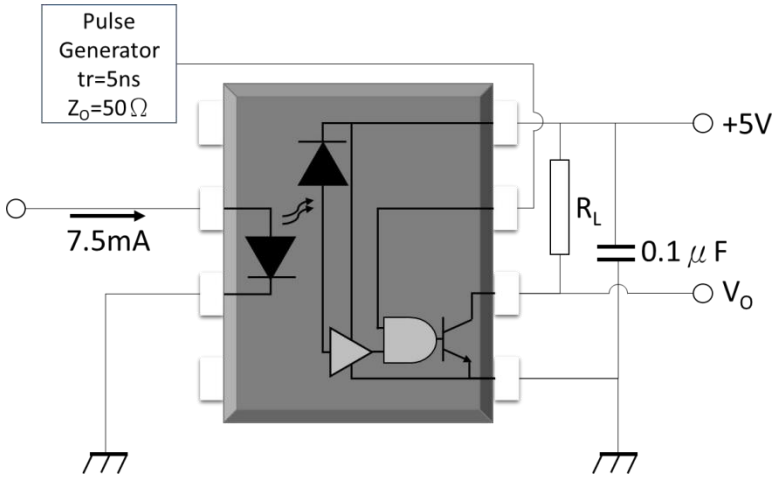
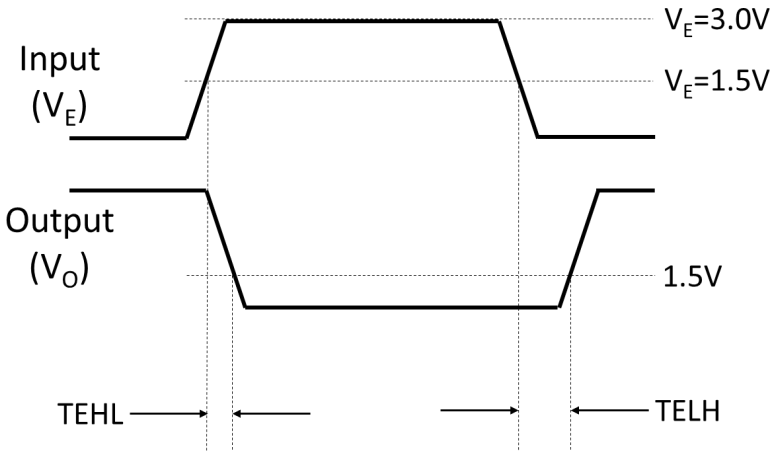


Fig.26 Waveforms of TEHL, TELH



TEST CIRCUITS

Fig.25 Test Circuits for Common Mode Transient Immunity

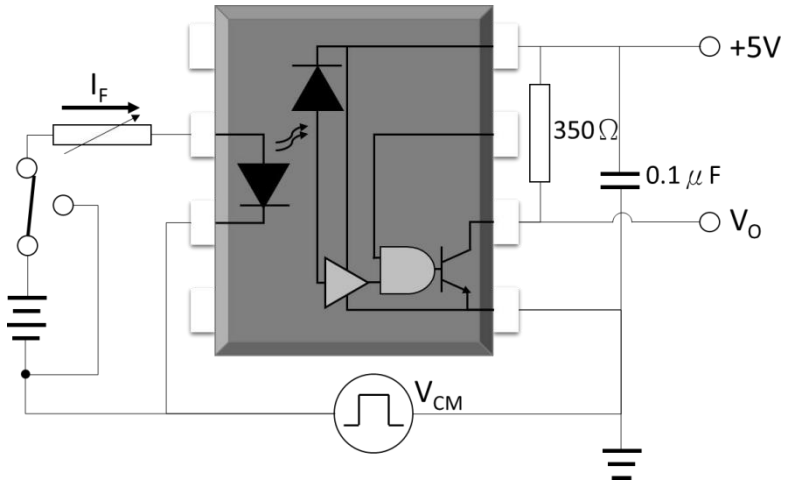
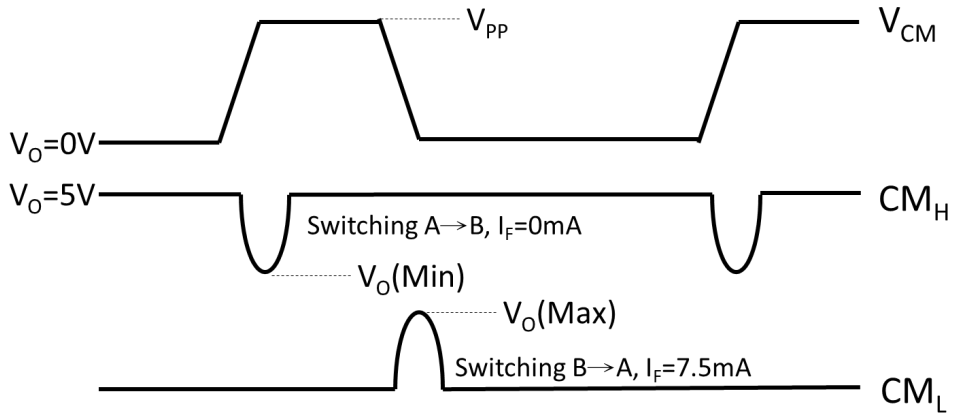
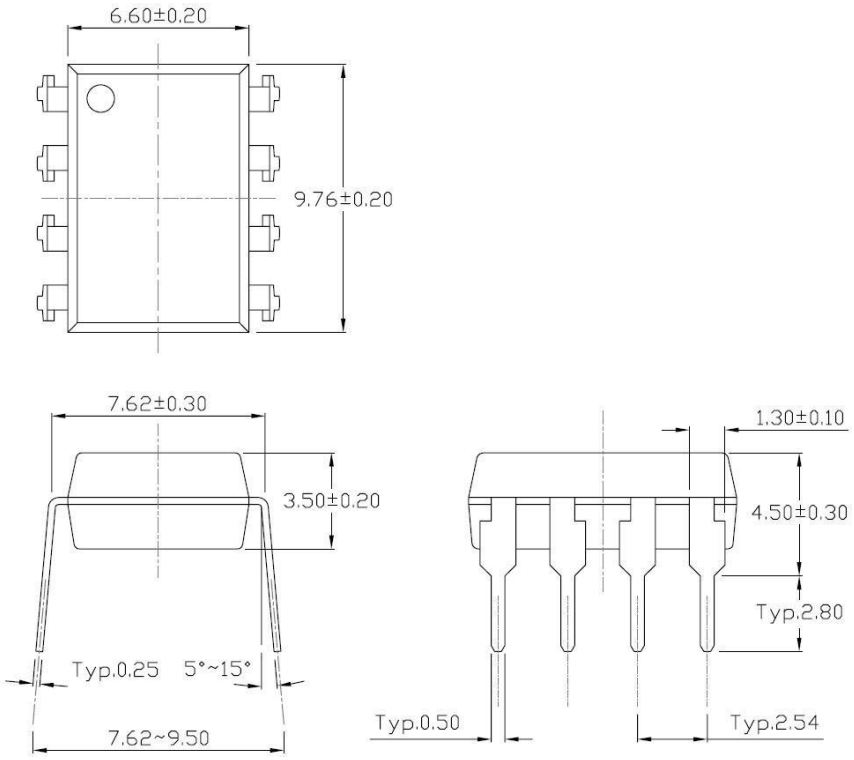


Fig.26 Waveforms of Common Mode Transient Immunity

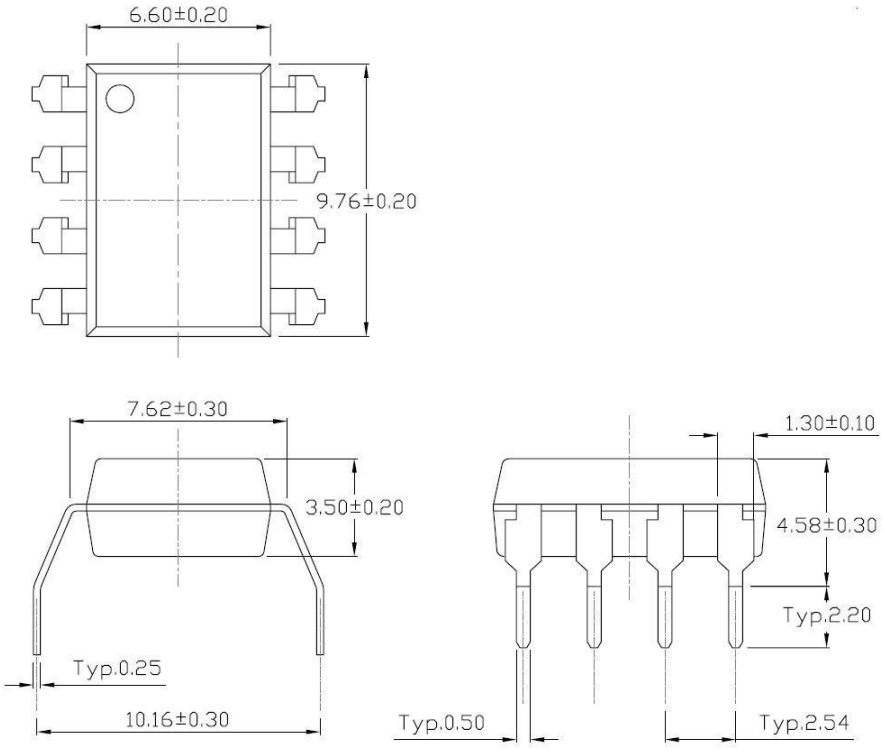


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Standard DIP – Through Hole (DIP Type)

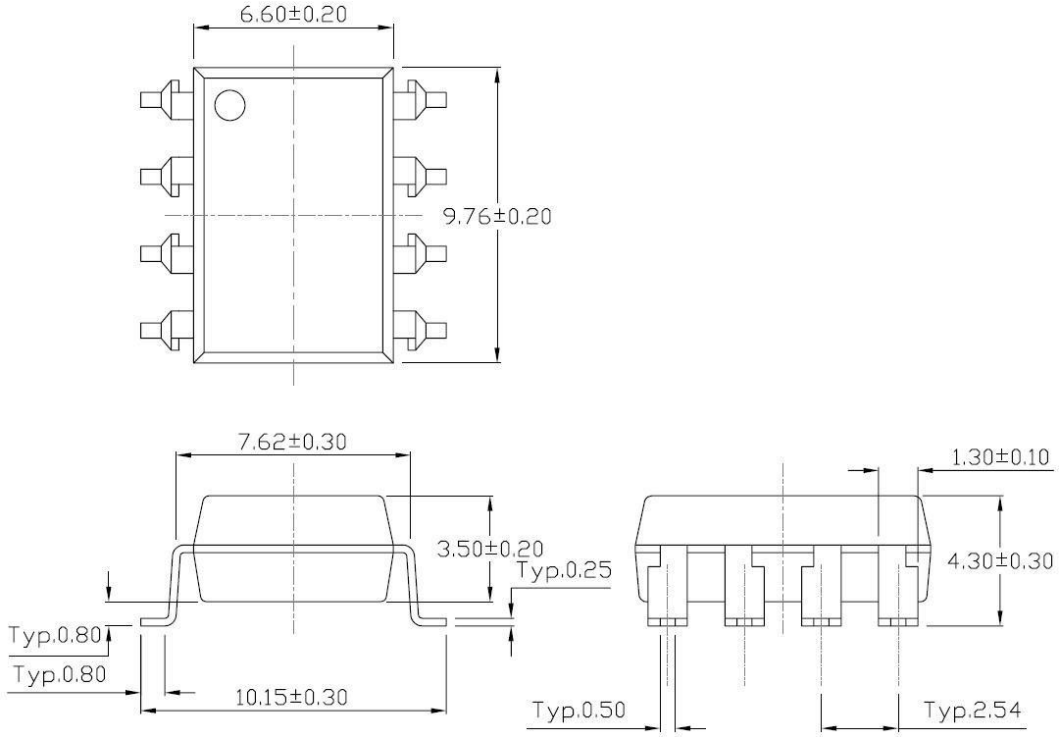


Gullwing (400mil) Lead Forming – Through Hole (M Type)

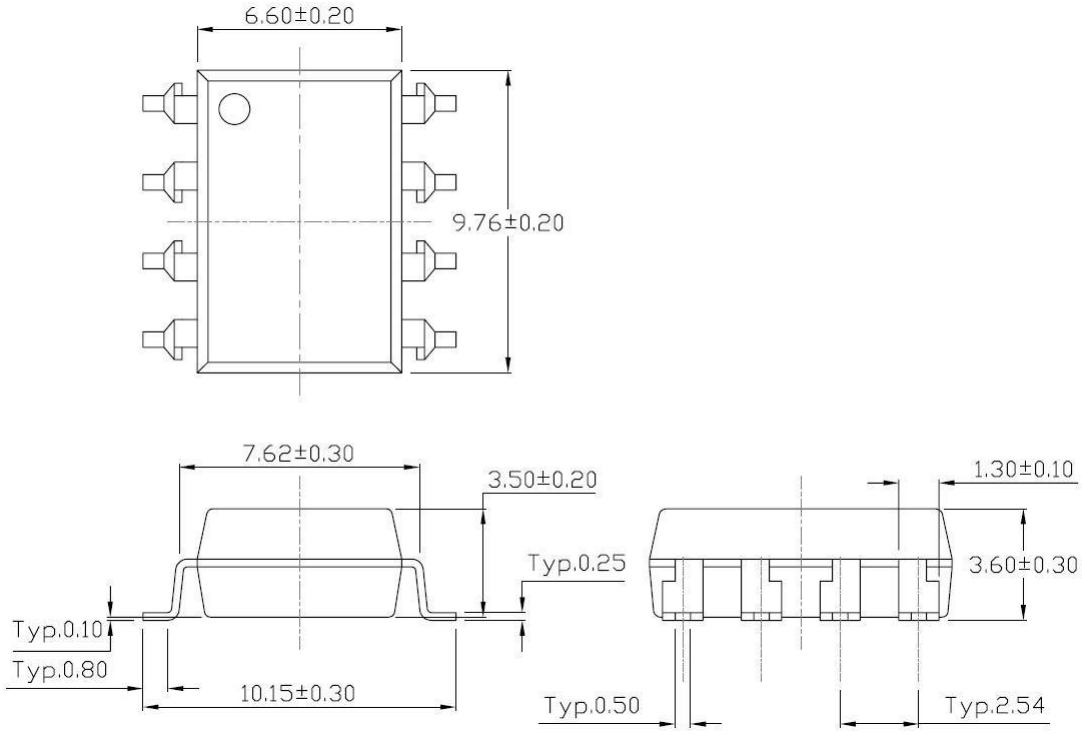


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (S Type)

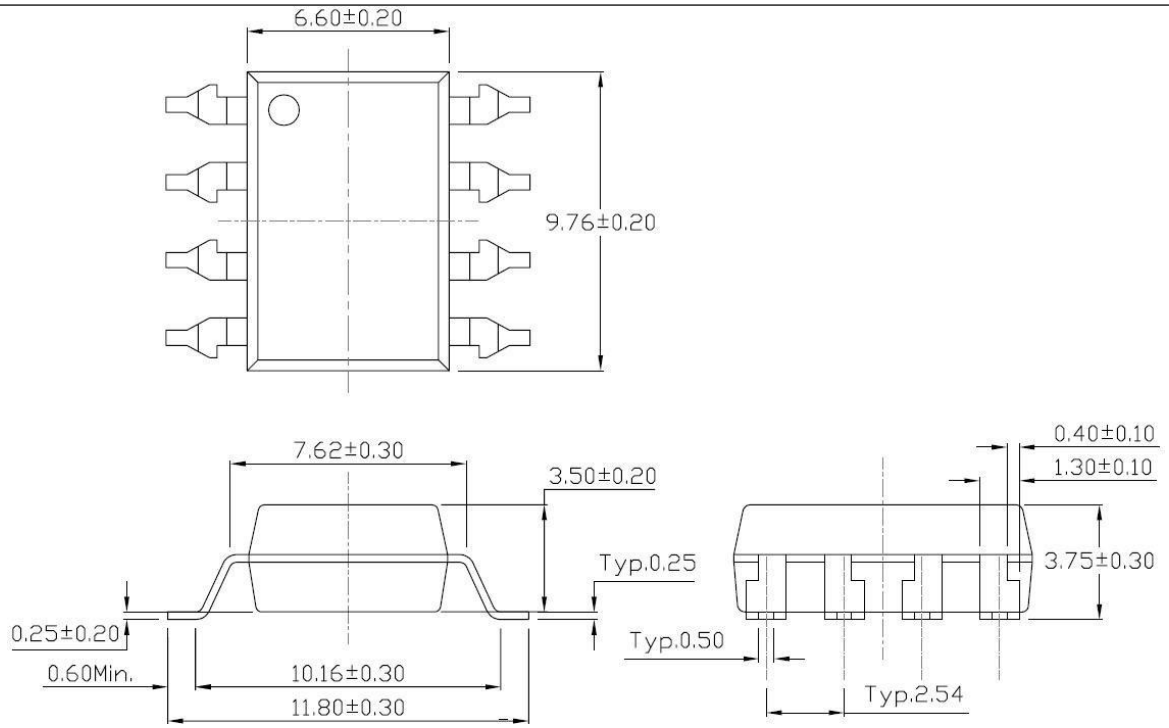


Surface Mount (Low Profile) Lead Forming (SL Type)



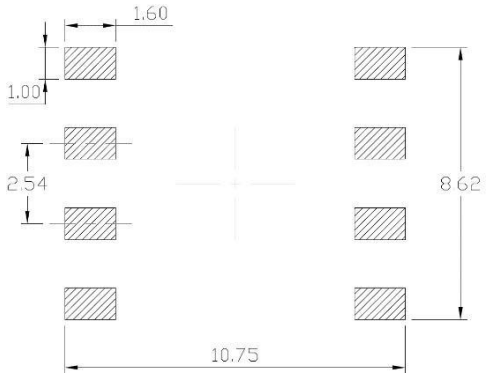
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount (Gullwing) Lead Forming (SLM Type)

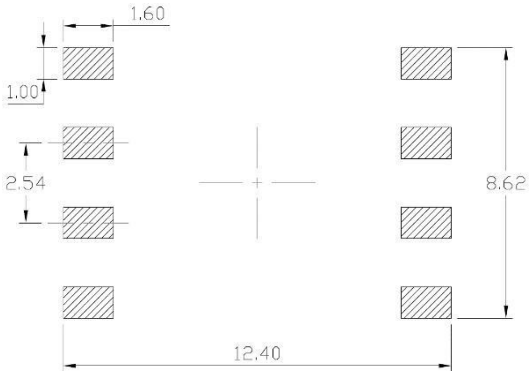


Recommended Solder Mask (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming

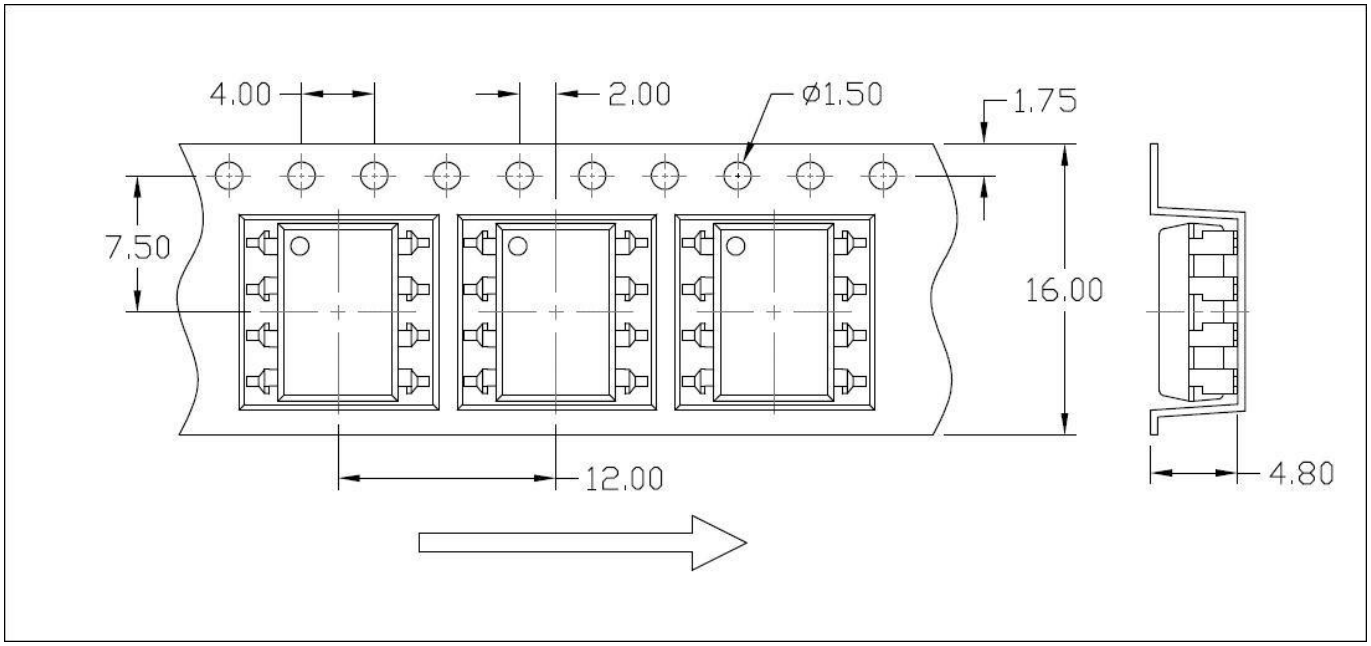


Surface Mount (Gullwing) Lead Forming

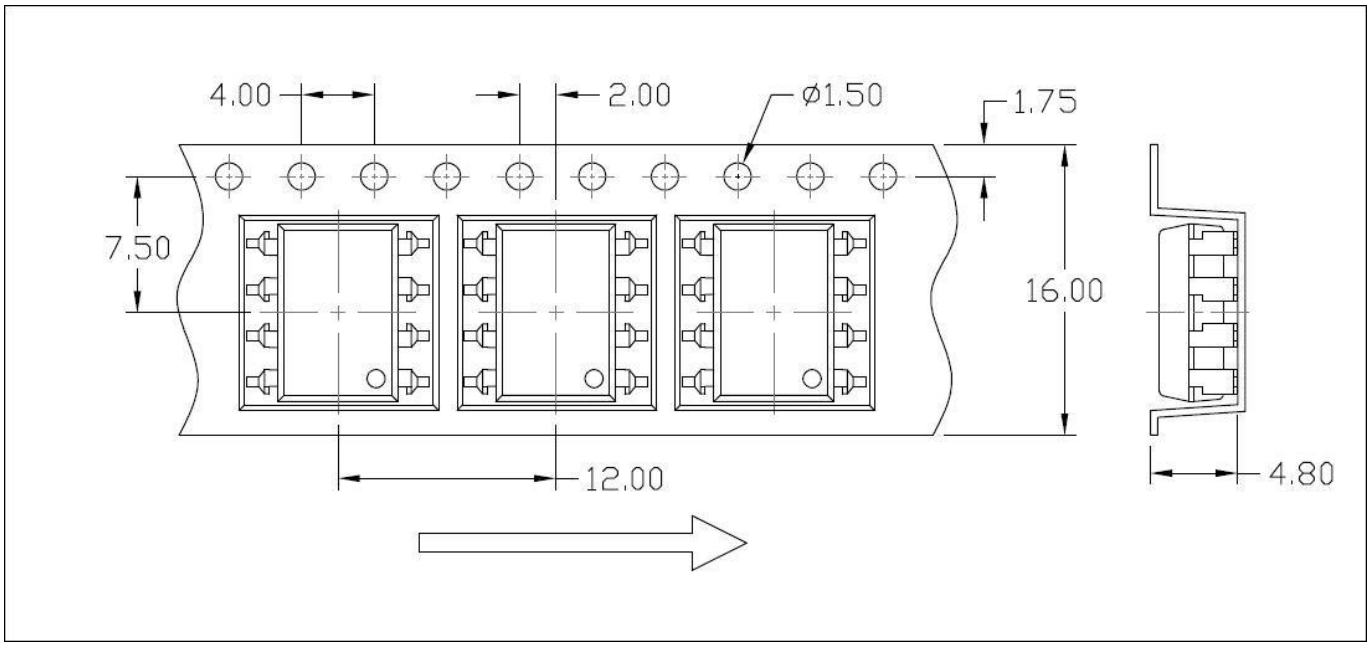


Carrier Tape Specifications (Dimensions in mm unless otherwise stated)

Option S(T1) & SL(T1)

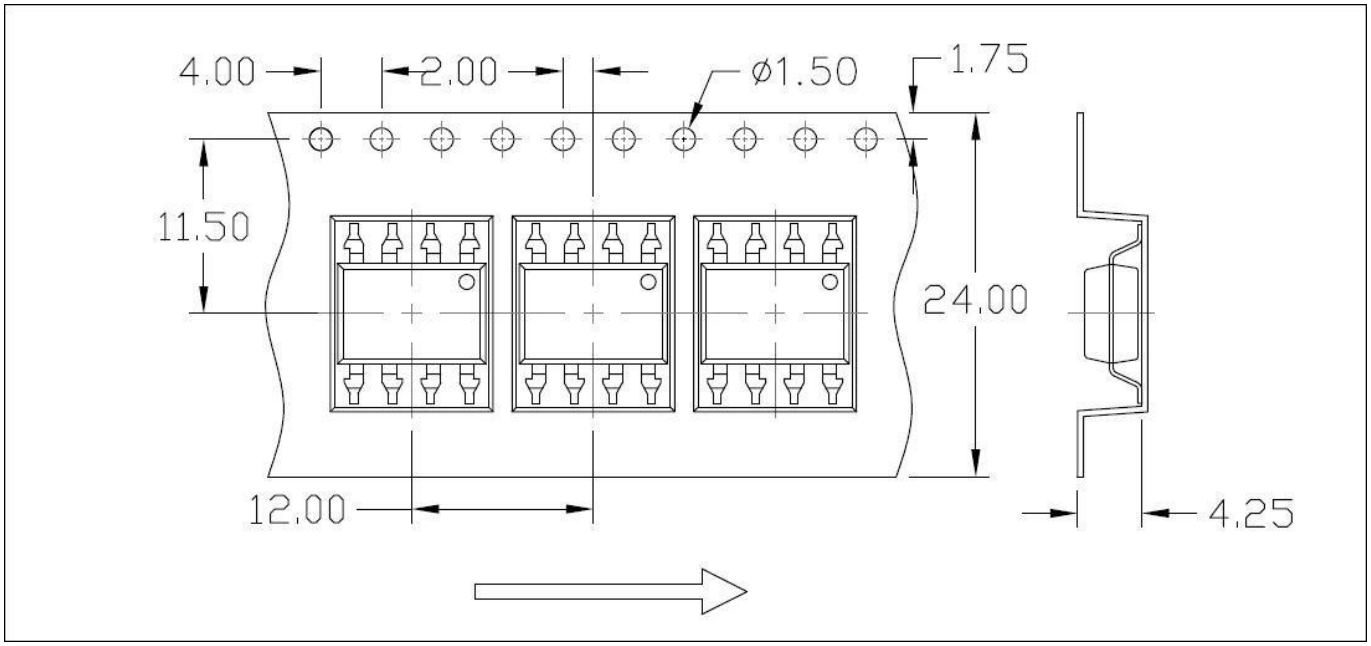


Option S(T2) & SL(T2)

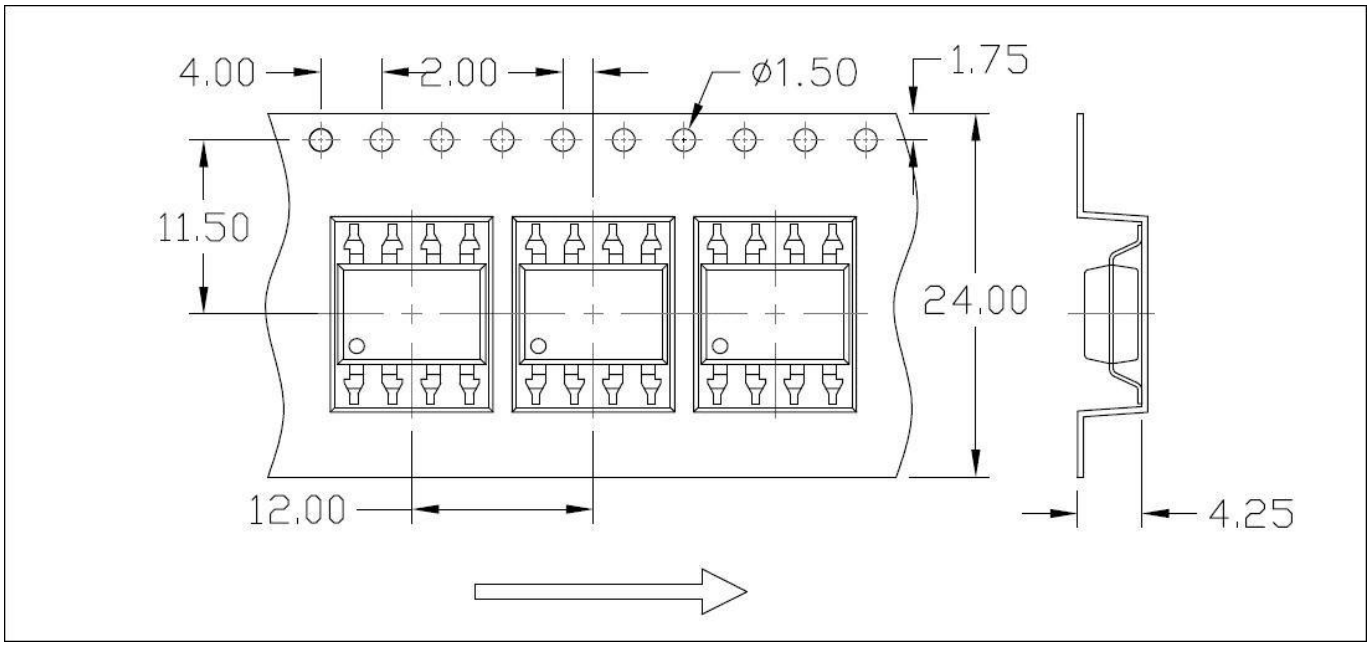


Carrier Tape Specifications (Dimensions in mm unless otherwise stated)

Option SLM(T1)

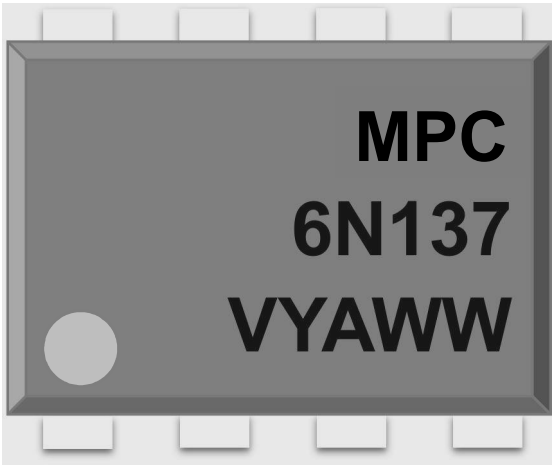


Option SLM(T2)



ORDERING AND MARKING INFORMATION

MARKING INFORMATION



MPC : Company Abbr.

6N137 : Part Number

V : VDE Option

Y : Fiscal Year

A : Manufacturing Code

WW : Work Week

ORDERING INFORMATION

6N137(Y)(Z)-GV

MPC – Company Abbr.

6N137 – Part Number

Y – Lead Form Option (M/S/SL/SLM/None)

Z – Tape and Reel Option (T1/T2)

G – Material Option (G: Green, None: Non-Green)

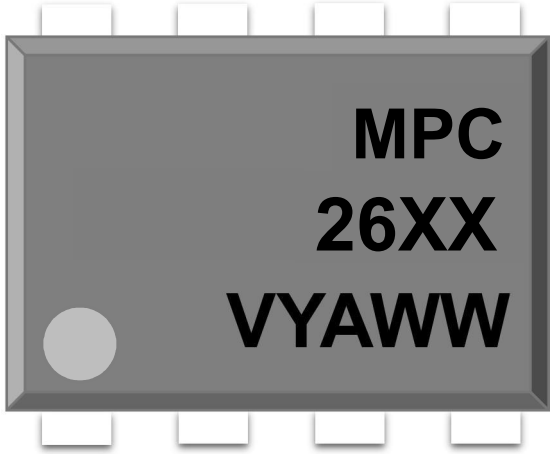
V – VDE Option (V or None)

PACKING QUANTITY

Option	Description	Quantity
None	Standard 8 Pin Dip	50Units/Reel
M	Gullwing(400mil) Lead Forming	50Units/Reel
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000Units/Tube
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000Units/Tube
SL(T1)	Surface Mount Lead Forming(Low Profile) – With Option 1 Taping	1000Units/Tube
SL(T2)	Surface Mount Lead Forming(Low Profile) – With Option 2 Taping	1000Units/Tube

ORDERING AND MARKING INFORMATION

MARKING INFORMATION



MPC : Company Abbr.

26XX : Part Number

V : VDE Option

Y : Fiscal Year

A : Manufacturing Code

WW : Work Week

ORDERING INFORMATION

MPC26XX(Y)(Z)-GV

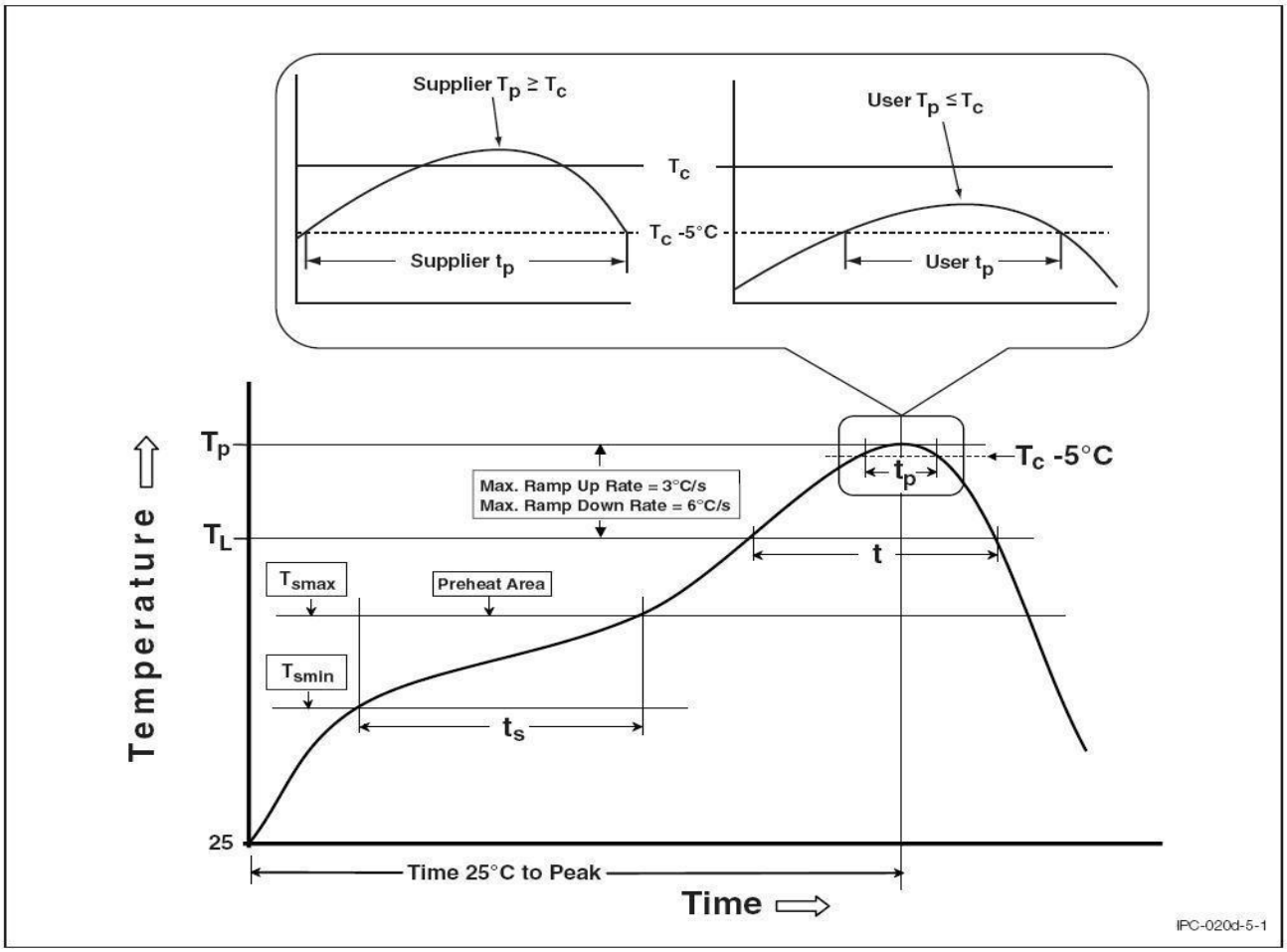
MPC – Company Abbr.
26XX – Part Number
Z – Tape and Reel Option (T1/T2)
G – Material Option (G: Green, None: Non-Green)
V – VDE Option (V or None)

PACKING QUANTITY

Option	Description	Quantity
None	Standard 8 Pin Dip	50Units/Reel
M	Gullwing(400mil) Lead Forming	50Units/Reel
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000Units/Tube
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000Units/Tube
SL(T1)	Surface Mount Lead Forming(Low Profile) – With Option 1 Taping	1000Units/Tube
SL(T2)	Surface Mount Lead Forming(Low Profile) – With Option 2 Taping	1000Units/Tube

REFLOW INFORMATION

REFLOW PROFILE



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	100	150°C
Temperature Max. (Tsmax)	150	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.	3°C/second max.
Liquidous Temperature (TL)	183°C	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

DISCLAIMER

- Our company is continually improving the quality, reliability, function and design. Our company reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Immerge unit's body in solder paste is not recommended.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.

■ Revision History

Version	Date	Subjects (major changes since last revision)
1.0	2018-12-21	Datasheet Complete