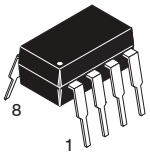
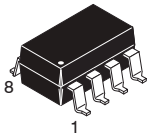
8-Pin Dual Channel Phototransistor Optocoupler

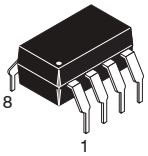
MCT9001



PDIP8 9.655x6.6, 2.54P
CASE 646CQ



PDIP8 GW
CASE 709AF



PDIP8 9.68x6.5, 2.54P
CASE 646CJ

Description

The general purpose optocoupler, MCT9001, has two isolated channels in a standard plastic 8−pin dual−in−line (DIP) package for density applications. Each channel consists of a gallium arsenide infrared emitting diode driving a NPN silicon planar phototransistor. For four channel applications, two packages fit into a standard 16−pin DIP socket.

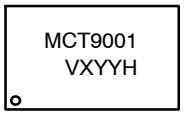
Features

- Two Isolated Channels Per Package
- Safety and Regulatory Approvals:
  - UL1577, 4,170 VAC_{RMS} for 1 Minute
  - DIN−EN/IEC60747−5−5, 890 V Peak Working Insulation Voltage
- These are Pb−Free Devices

Applications

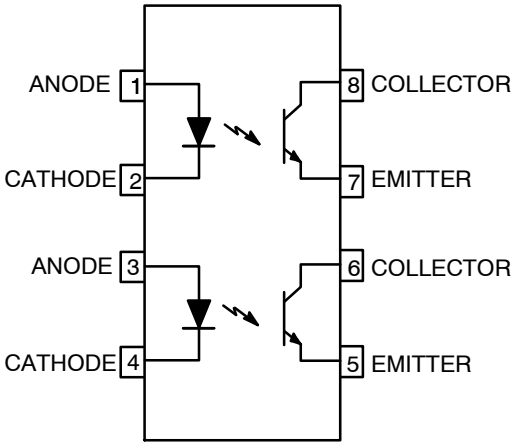
- AC Line/Digital Logic – Isolate High Voltage Transients
- Digital Logic/Digital Logic – Eliminate Spurious Ground
- Digital Logic/AC Triac Control – Isolate High Voltage Transients
- Twisted Pair Line Receiver – Eliminate Ground Loop Feedthrough
- Telephone/Telegraph Line Receiver – Isolate High Voltage Transients
- High Frequency Power Supply Feedback Control – Maintain Floating Grounds and Transients
- Relay Contact Monitor – Isolate Floating Grounds and Transients
- Power Supply Monitor – Isolate Transients

MARKING DIAGRAM



MCT9001 = Device Code
V = DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X = One Digit Year Code
YY = Digit Work Week
H = Assembly Package Code

FUNCTIONAL SCHEMATIC



Equivalent Circuit

ORDERING INFORMATION

See detailed ordering and shipping information in the ordering information section on page 6 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

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SAFETY AND INSULATION RATINGS (As per DIN EN/IEC 60747−5−5, this optocoupler is suitable for "safe electrical insulation" only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.)

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V_{RMS}	I–IV
	< 300 V_{RMS}	I–IV
Climatic Classification		55/115/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V_{PR}	Input−to−Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1424	V_{peak}
	Input−to−Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1668	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	890	V_{peak}
V_{IOTM}	Highest Allowable Over−Voltage	8000	V_{peak}
	External Creepage	≥ 7.0	mm
	External Clearance	≥ 7.0	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T_S	Case Temperature (Note 1)	175	°C
$I_{S,INPUT}$	Input Current (Note 1)	60	mA
$P_{S,OUTPUT}$	Output Power (Note 1)	150	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	> 10^9	Ω

1. Safety limit value − maximum values allowed in the event of a failure.

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

Symbol	Parameter	Value	Unit
T_{STG}	Storage Temperature	−55 to +150	°C
T_{OPR}	Operating Temperature	−55 to +100	°C
T_J	Junction Temperature	−55 to +125	°C
T_{SOL}	Lead Solder Temperature	260 for 10 s	°C
P_D	Total Device Power Dissipation @T_A = 25°C	400	mW
	Derate Above 25°C	4.83	mW/°C
EMITTER (EACH CHANNEL)			
I_F	DC / Average Forward Input Current	60	mA
I_F (pk)	Forward Current − Peak (PW = 1 μs, 300 pps)	3	A
V_R	Reverse Input Voltage	5.0	W
$P_{D(EMITTER)}$	Total Power Dissipation @T_A = 25°C	100	mW
	Derate Above 25°C	1.1	mW/°C
DETECTOR			
I_C	Continuous Collector Current	30	mA
$P_{D(DETECTOR)}$	Total Power Dissipation @T_A = 25°C	150	mW
	Derate Above 25°C	1.67	mW/°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
EMITTER						
V_F	Input Forward Voltage	I_F = 10 mA	–	1.0	1.3	V
I_R	Reverse Leakage Current	V_R = 5 V	–	–	10	μA
C_J	Junction Capacitance	V_F = 0 V, f = 1 MHz	–	50	–	pF
DETECTOR						
BV_{CEO}	Collector–to–Emitter Breakdown Voltage	I_C = 0.5 mA, I_F = 0	55	–	–	V
BV_{ECO}	Emitter–to–Collector Breakdown Voltage	I_E = 100 μA, I_F = 0	7	–	–	V
I_{CEO}	Collector–Emitter Dark Current	V_{CE} = 24 V, I_F = 0	–	5	100	nA
		V_{CE} = 24 V, T_A = 85°C	–	–	50	μA
C_{CE}	Capacitance	V_{CE} = 0 V, f = 1.0 MHz	–	8	–	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TRANSFER CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
DC CHARACTERISTICS						
CTR	Current Transfer Ratio, Collector–to–Emitter	I_F = 5 mA, V_{CE} = 5 V	50	–	600	%
$CTR_{(SAT)}$		I_F = 8 mA, V_{CE} = 0.4 V	30	–	–	%
$VCE_{(SAT)}$	Saturation Voltage, Collector–to–Emitter	I_F = 8 mA, I_C = 2.4 mA	–	–	0.4	V
AC CHARACTERISTICS						
Non–Saturated						
T_{ON}	Turn–On Time	R_L = 100 Ω, I_C = 2 mA, V_{CC} = 10 V	–	3.0	–	μs
T_{OFF}	Turn–Off Time		–	3.0	–	μs
T_R	Rise Time		–	2.4	–	μs
T_F	Fall Time		–	2.4	–	μs
Saturated						
T_{ON}	Turn–On Time	I_F = 16 mA, R_L = 1.9 kΩ, V_{CE} = 5 V	–	2.4	–	μs
T_{OFF}	Turn–Off Time		–	25.0	–	μs

ISOLATION CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input–Output Isolation Voltage	$I_{I-O} \leq 10$ μA, t = 1 min	5,000	–	–	VAC_{RMS}
C_{ISO}	Isolation Capacitance	f = 1 MHz	–	0.5	–	pF
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V_{DC}	10^{11}	–	–	Ω

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TYPICAL PERFORMANCE CURVES

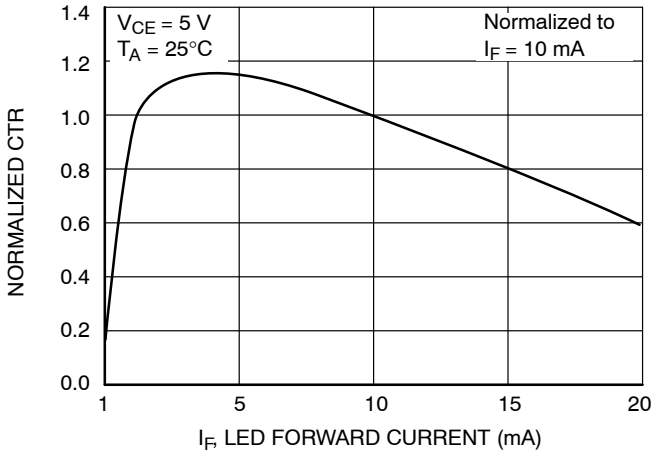


Figure 1. Normalized CTR vs. Forward Current

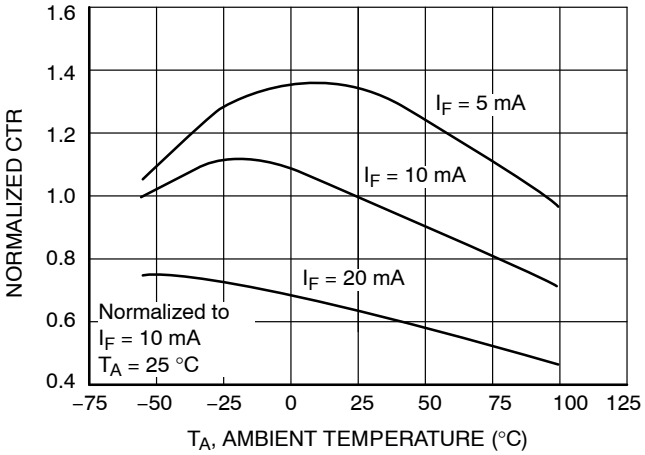


Figure 2. Normalized CTR vs. Ambient Temperature

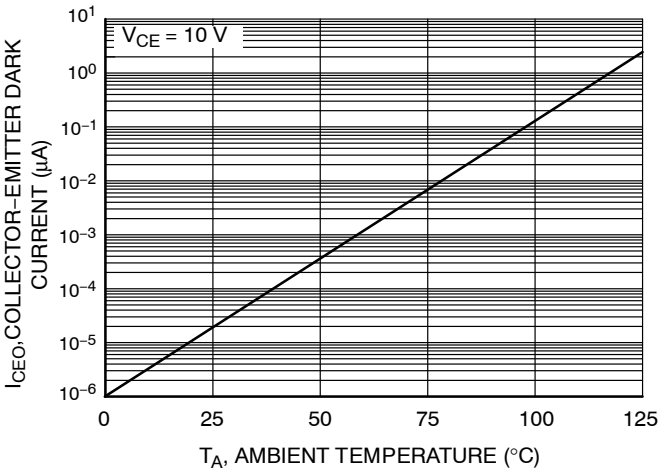


Figure 3. Dark Current vs. Ambient Temperature

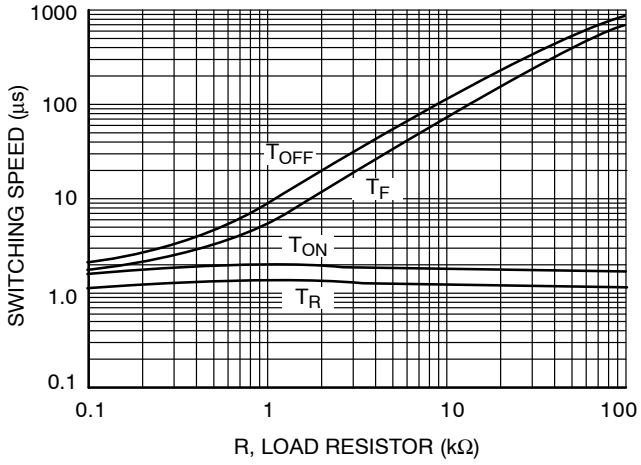


Figure 4. Switching Speed vs. Load Resistor

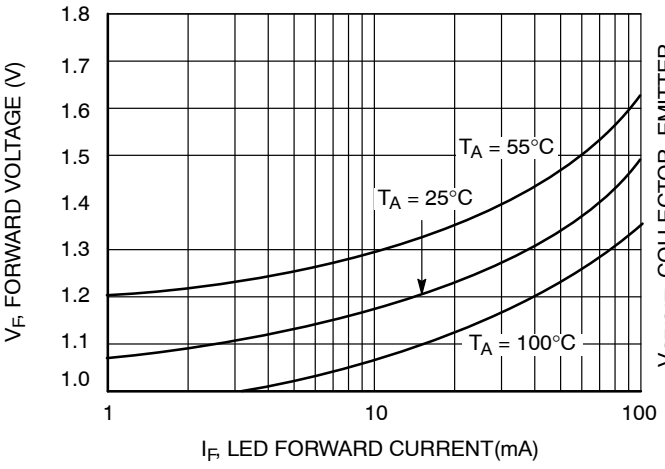


Figure 5. LED Forward Voltage vs. Forward Current

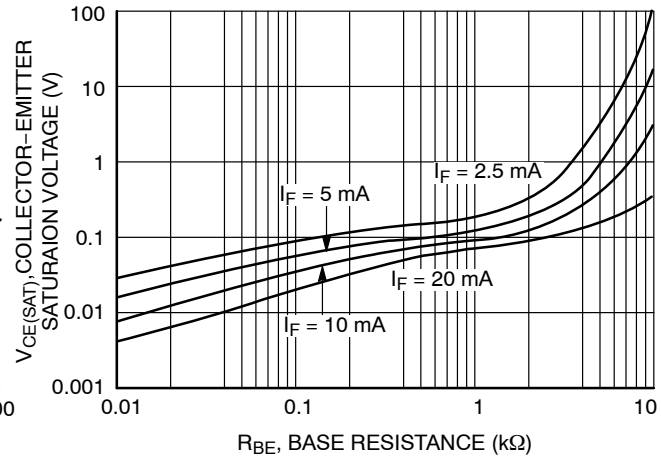


Figure 6. Collector−Emitter Saturation Voltage vs. Collector Current

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SWITCHING TIME TEST CIRCUIT AND WAVEFORMS

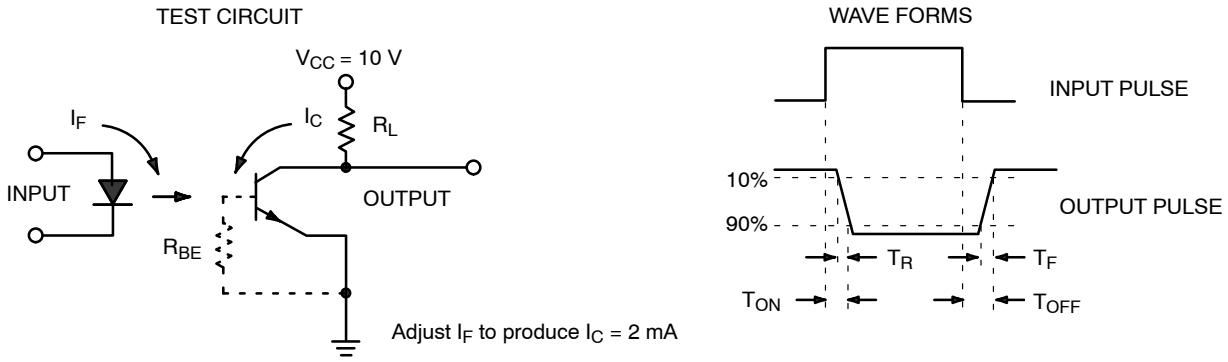


Figure 7. Switching Time Test Circuit and Waveforms

REFLOW PROFILE

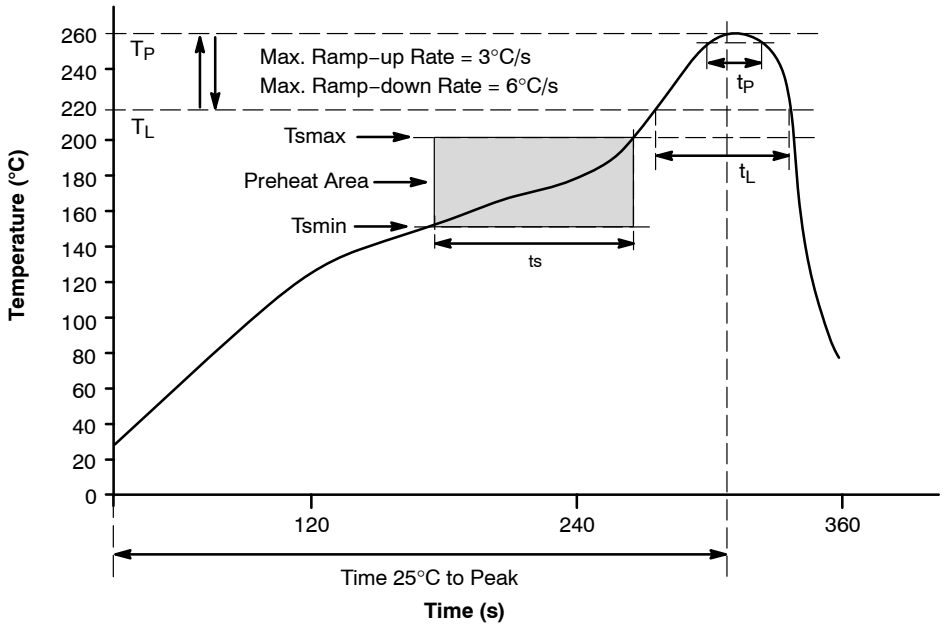


Figure 8. Reflow Profile

REFLOW PROFILE

Profile Feature	Pb−Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60 – 120 s
Ramp−up Rate (t_L to t_P)	3°C/s max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 s
Peak Body Package Temperature	260°C +0°C / −5°C
Time (t_P) within 5°C of 260°C	30 s
Ramp−down Rate (T_P to T_L)	6°C / s max.
Time 25°C to Peak Temperature	8 min max.

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ORDERING INFORMATION

Device	Description	Shippping†
MCT9001	DIP 8−Pin	1000 Units / Tube
MCT9001S	SMT 8−Pin (Lead Bend)	1000 Units / Bulk
MCT9001SD	SMT 8−Pin	1000 Units / Tape & Reel

DISCONTINUED (Note 2)

MCT9001300	DIN EN/IEC 60747−5−5 Option	50 Units / Tube
MCT90013S	SMT 8−Pin (Lead Bend); DIN EN/IEC 60747−5−5 Option	50 Units / Tube
MCT90013SD	SMT 8−Pin; DIN EN/IEC 60747−5−5 Option	1000 Units / Tape & Reel
MCT9001300W	0.4” Lead Spacing; DIN EN/IEC 60747−5−5 Option	50 Units / Tube

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

2. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

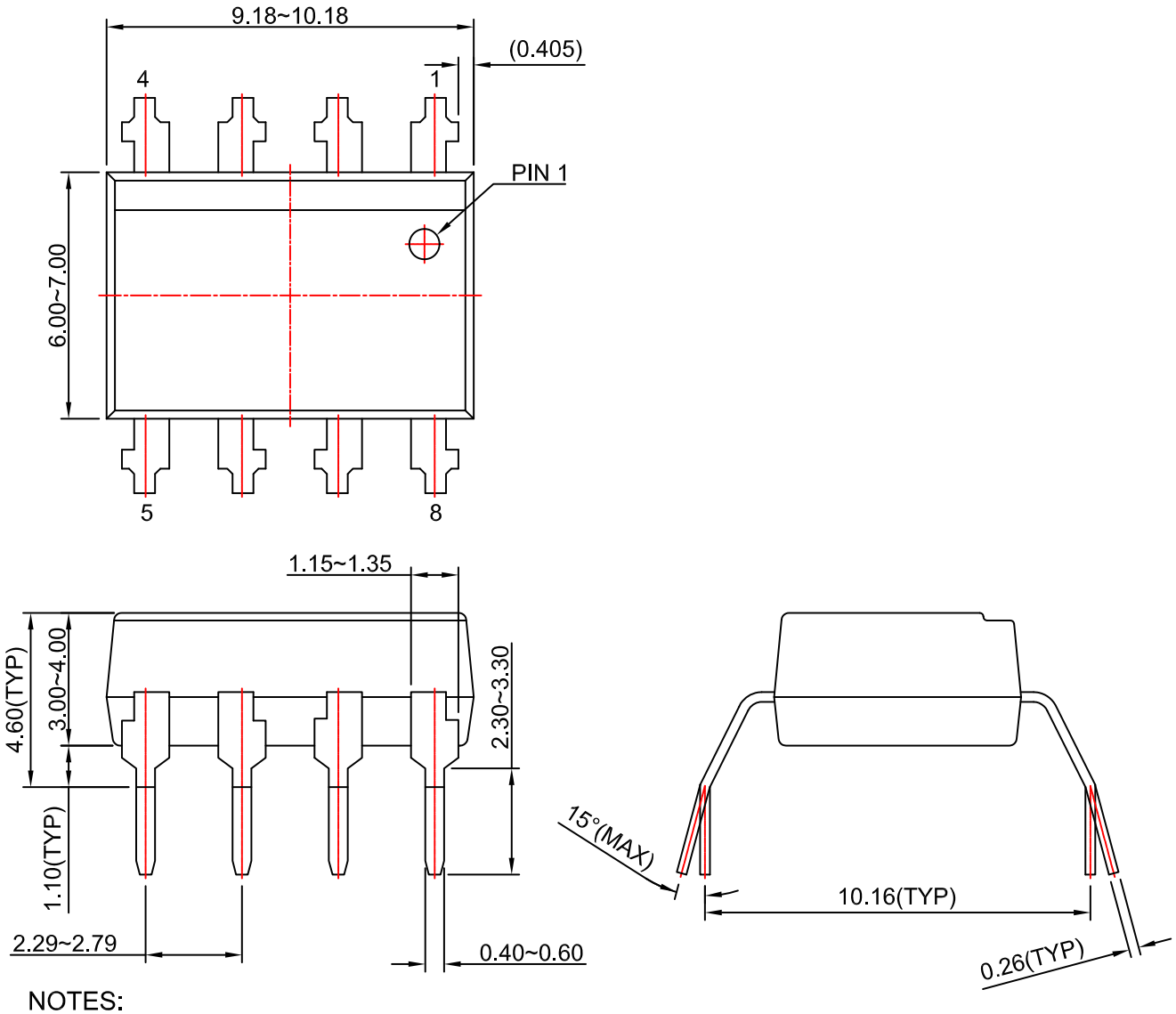
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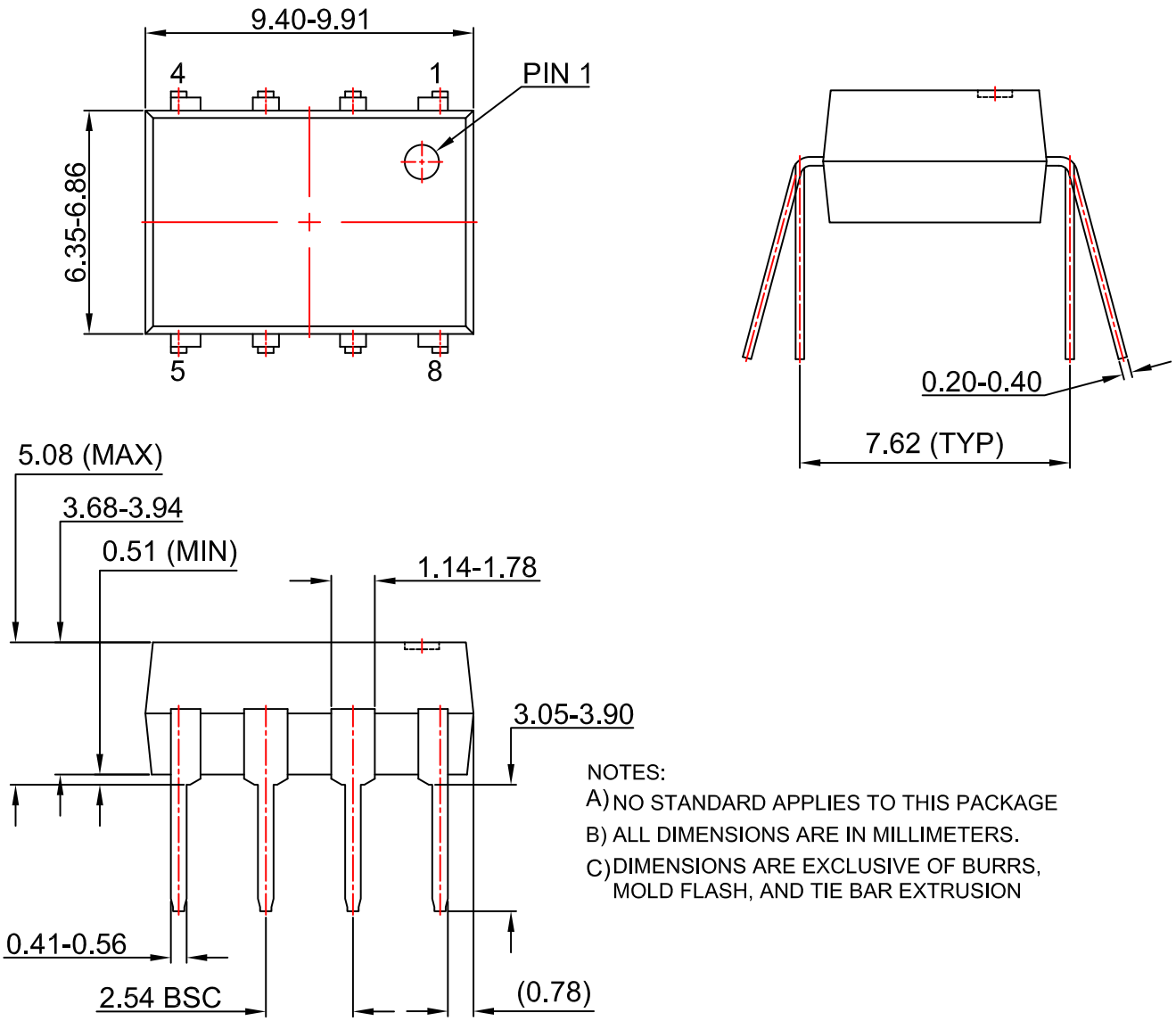
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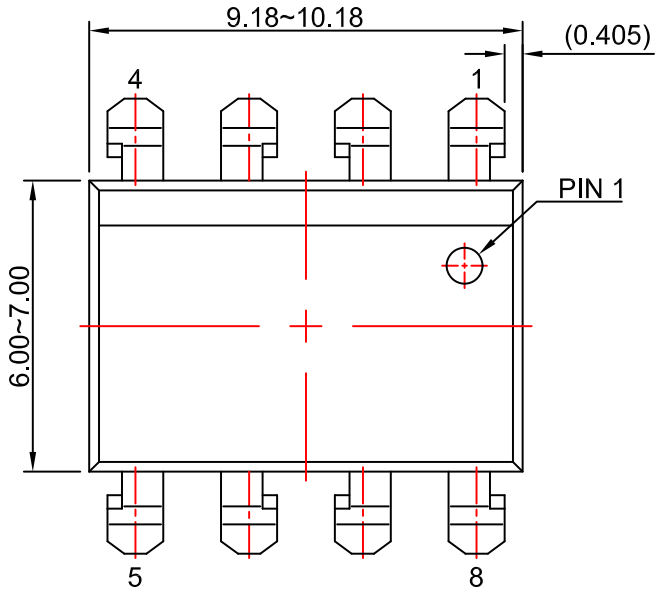
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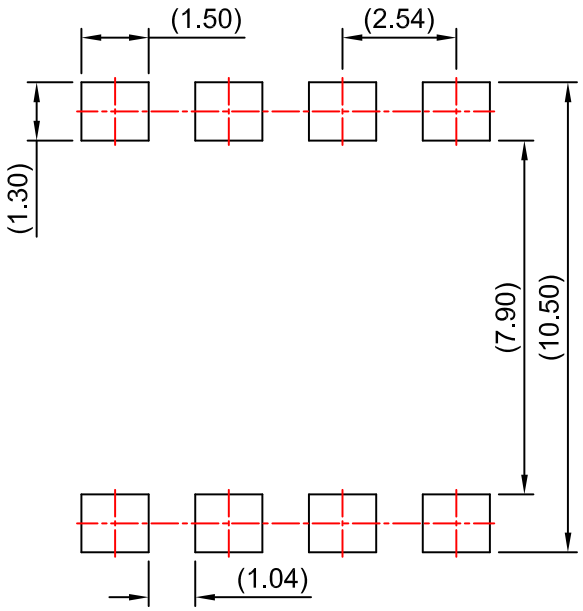
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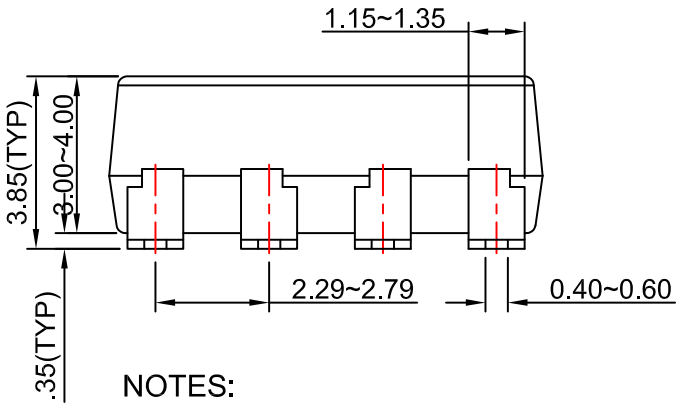
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CASE 709AF
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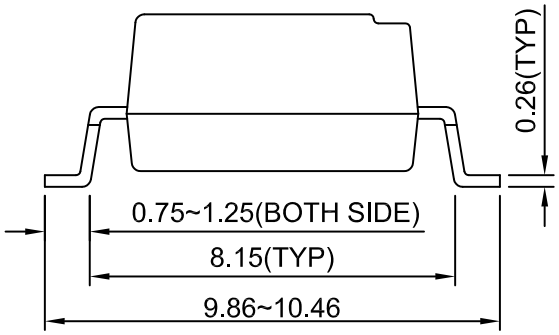
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