FODM352

Product Preview

Photodarlington Optocoupler with a Base-Emitter Resistor in a 4-Pin Full Pitch Mini-Flat Package

Description

The FODM352 consists of one gallium arsenide (GaAs) infrared light emitting diode, optically coupled to a photodarlington output with a base−emitter resistor, in a compact, mini−flat, 4−pin package. The input−output isolation voltage, V_{ISO}, is rated at 3,750 VAC_{RMS}.

Features

- Current Transfer Ratio Min 1000% at I_F = 1 mA, V_{CE} = 2 V, T_A = 25°C
- Safety and Regulatory Approvals:
  - UL1577, 3750 VAC_{RMS} for 1 min
  - DIN EN/IEC60747−5−5, 565 V Peak Working Insulation Voltage
- Applicable to Infrared Reflow, 260°C

Typical Applications

- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs
- Programmable Controllers

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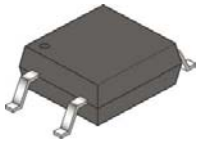

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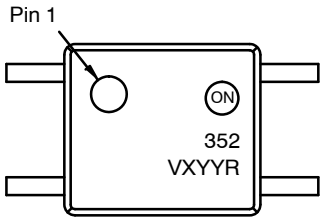
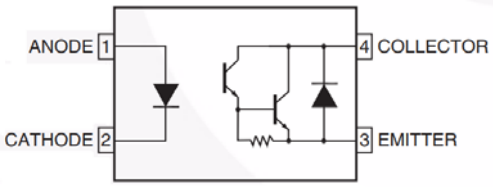
MARKING DIAGRAM



352	= Specific Device Code
V	= DIN EN/IEC60747−5−5 Option
X	= One−Digit Year Code
YY	= Work Week
R	= Assembly Package Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

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Table 1. SAFETY AND INSULATIONS RATING 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–III
Climatic Classification		55/110/21
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	904	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	1060	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	565	V_{peak}
V_{IOTM}	Highest Allowable Over−Voltage	6,000	V_{peak}
	External Creepage	≥ 5	mm
	External Clearance	≥ 5	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T_S	Case Temperature (Note 1)	150	°C
$I_{S,INPUT}$	Input Current (Note 1)	200	mA
$P_{S,OUTPUT}$	Output Power (Note 1)	300	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	> 10^9	Ω

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

Table 2. ABSOLUTE MAXIMUM RATINGS (Note 2) T_A = 25°C unless otherwise specified.

Symbol	Parameter	Value	Units
T_{STG}	Storage Temperature	−55 to +150	°C
T_{OPR}	Operating Temperature	−55 to +110	°C
T_J	Junction Temperature	−55 to +125	°C
T_{SOL}	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10 sec	°C
EMITTER			
$I_{F(average)}$	Continuous Forward Current	50	mA
V_R	Reverse Input Voltage	6	V
PD_{LED}	Power Dissipation (Note 3)	70	mW
DETECTOR			
$I_{C(average)}$	Continuous Collector Current	150	mA
V_{CEO}	Collector−Emitter Voltage	300	V
V_{ECO}	Emitter−Collector Voltage	0.1	V
PD_C	Collector Power Dissipation (Note 3)	150	mW

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.

2. 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.
3. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

Table 3. ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
EMITTER						
V_F	Forward Voltage	I_F = 10 mA		1.2	1.4	V
I_R	Reverse Current	V_R = 4 V			10	μA
C_T	Terminal Capacitance	V = 0 V, f = 1 kHz		30	250	pF
DETECTOR						
BV_{CEO}	Collector−Emitter Breakdown Voltage	I_C = 0.1 mA, I_F = 0 mA	300			V
BV_{ECO}	Emitter−Collector Breakdown Voltage	I_E = 10 μA, I_F = 0 mA	0.1			V
I_{CEO}	Collector Dark Current	V_{CE} = 200 V, I_F = 0 mA			200	nA

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.

Table 4. TRANSFER CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_C	Collector Current	I_F = 1 mA, V_{CE} = 2 V	10			mA
CTR	Current Transfer Ratio	I_F = 1 mA, V_{CE} = 2 V	1000	5000		%
$V_{CE(SAT)}$	Collector−Emitter Saturation Voltage	I_F = 20 mA, I_C = 100 mA			1.2	V

Table 5. SWITCHING CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_R	Output Rise Time (10% −90%)	I_F = 20 mA, V_{CC} = 2 V, R_L = 100 Ω		20	100	μs
t_F	Output Fall Time (90% −10%)	I_F = 20 mA, V_{CC} = 2 V, R_L = 100 Ω		100	300	μs

Table 6. ISOLATION CHARACTERISTICS

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{ISO}	Input−Output Isolation Voltage	Freq = 60 Hz, t = 1.0 min, $I_{I-O} \leq$ 10 μA (Notes 4, 5)	3,750			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V (Note 4)	5×10^{10}			Ω
C_{ISO}	Isolation Capacitance	Frequency = 1 MHz		0.6	1.0	pF

4. Device is considered a two terminal device: Pin 1 and 2 are shorted together and Pins 3 and 4 are shorted together.
5. 3,750 VAC_{RMS} for 1 minute duration is equivalent to 4,500 VAC_{RMS} for 1 second duration.

ORDERING INFORMATION

Part Number	Package	Packing Method
FODM352	SOP 4−Pin	Tube (100 units)
FODM352R2	SOP 4−Pin	Tape and Reel (2500 units)
FODM352V	SOP 4−Pin, DIN EN/IEC60747−5−5 Option (pending approval)	Tube (100 units)
FODM352R2V	SOP 4−Pin, DIN EN/IEC60747−5−5 Option (pending approval)	Tape and Reel (2500 units)

†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.

TYPICAL CHARACTERISTICS

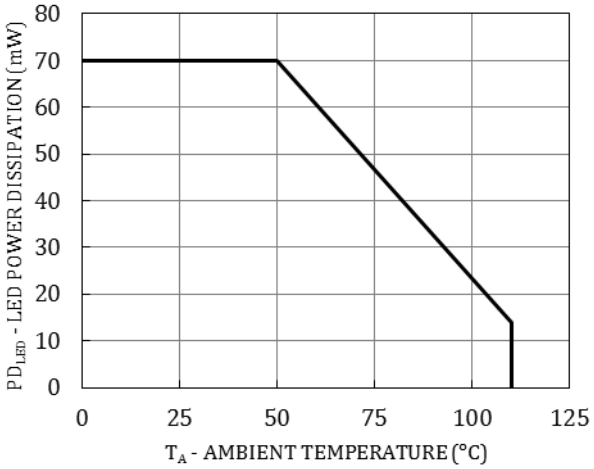

Figure 1. LED Power Dissipation vs. Ambient Temperature

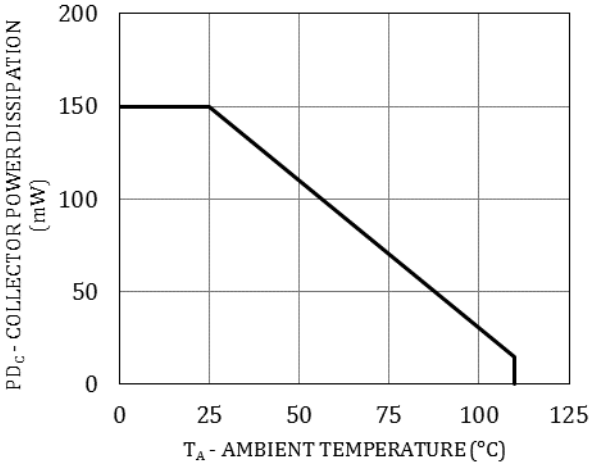

Figure 2. Collector Power Dissipation vs. Ambient Temperature

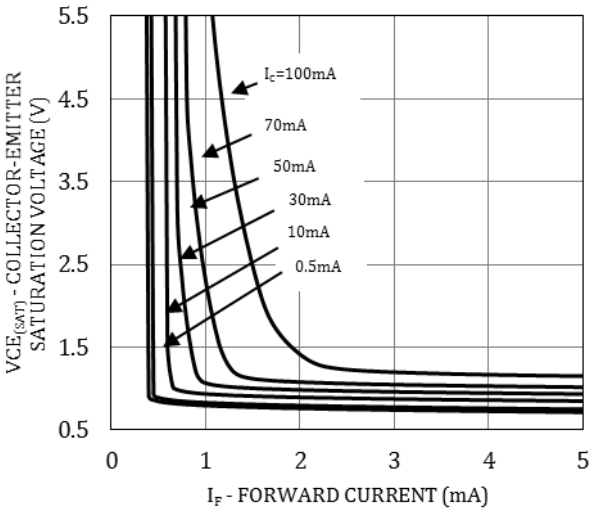

Figure 3. Collector Emitter Saturation Voltage vs. Forward Current

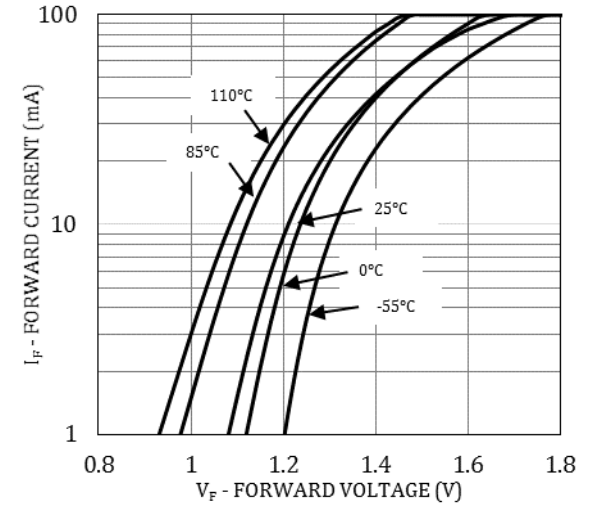

Figure 4. Forward Current vs. Forward Voltage

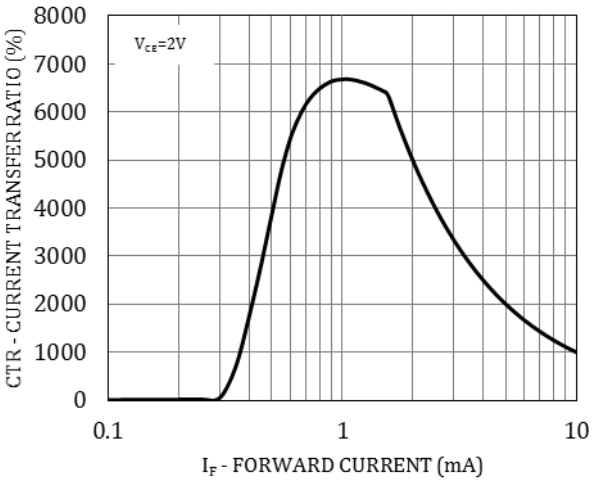

Figure 5. Current Transfer Ratio vs. Forward Current

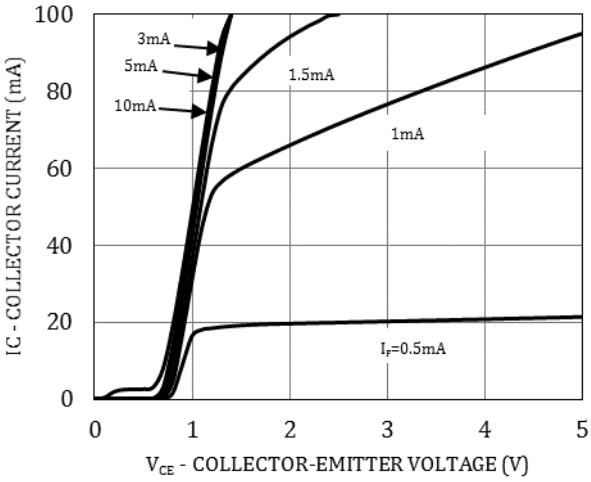

Figure 6. Collector Current vs. Collector Emitter Voltage

TYPICAL CHARACTERISTICS

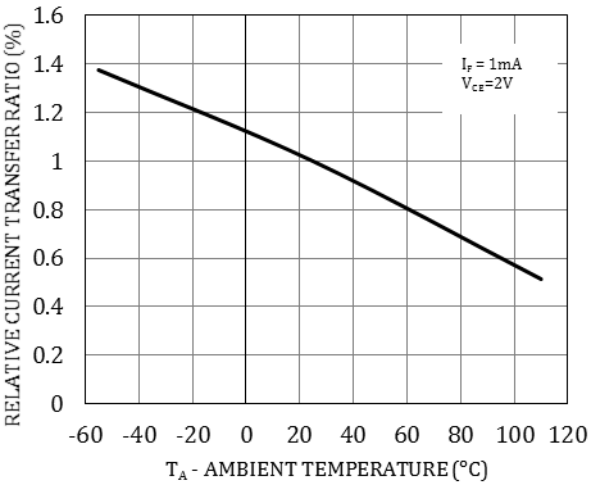

Figure 7. Relative Current Transfer Ratio vs. Ambient Temperature

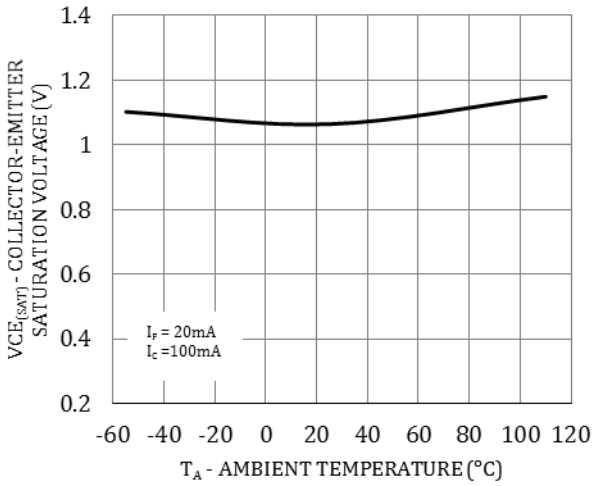

Figure 8. Collector Emitter Saturation Voltage vs. Ambient Temperature

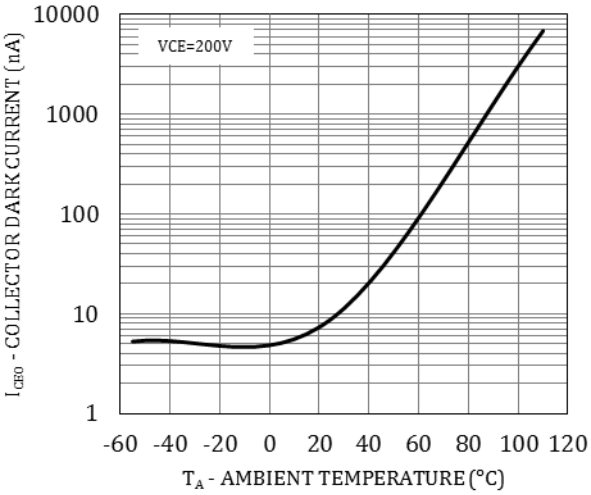

Figure 9. Collector Dark Current vs. Ambient Temperature

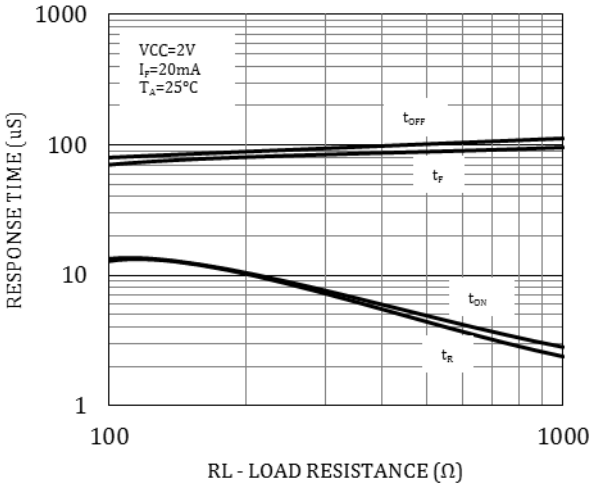

Figure 10. Response Time vs. Load Resistance

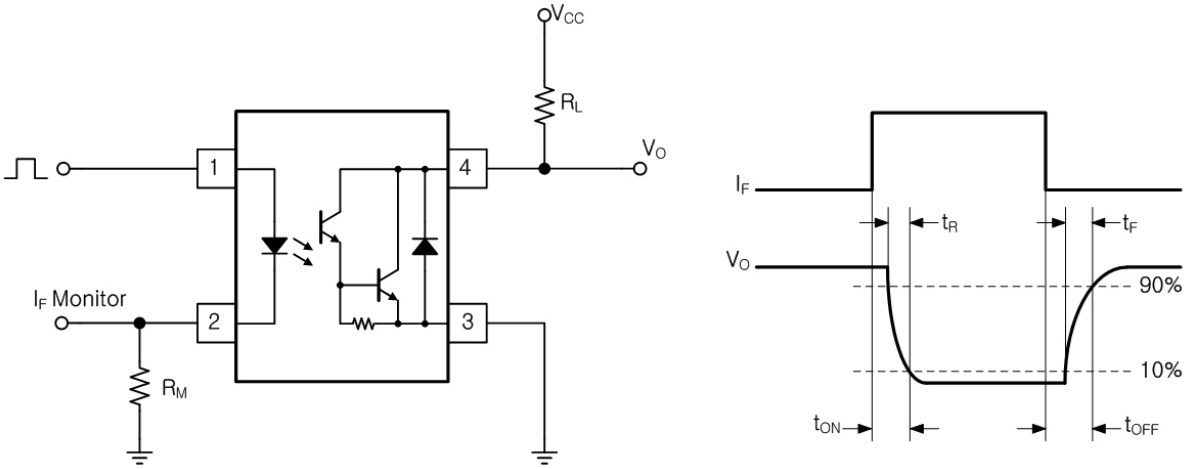

Figure 11. Test Circuit for Switching Time

REFLOW PROFILE

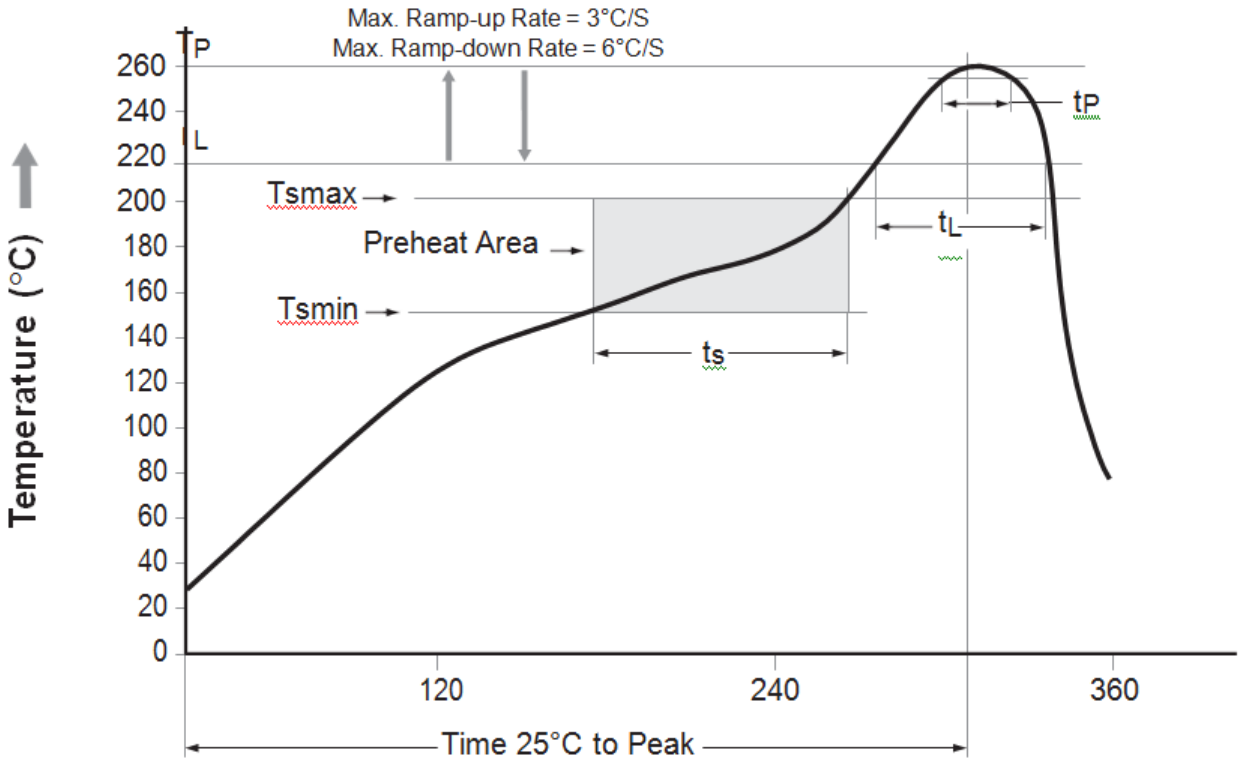

Figure 12. Reflow Profile

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 seconds
Ramp−up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / −5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp−down Rate (T_P to T_L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

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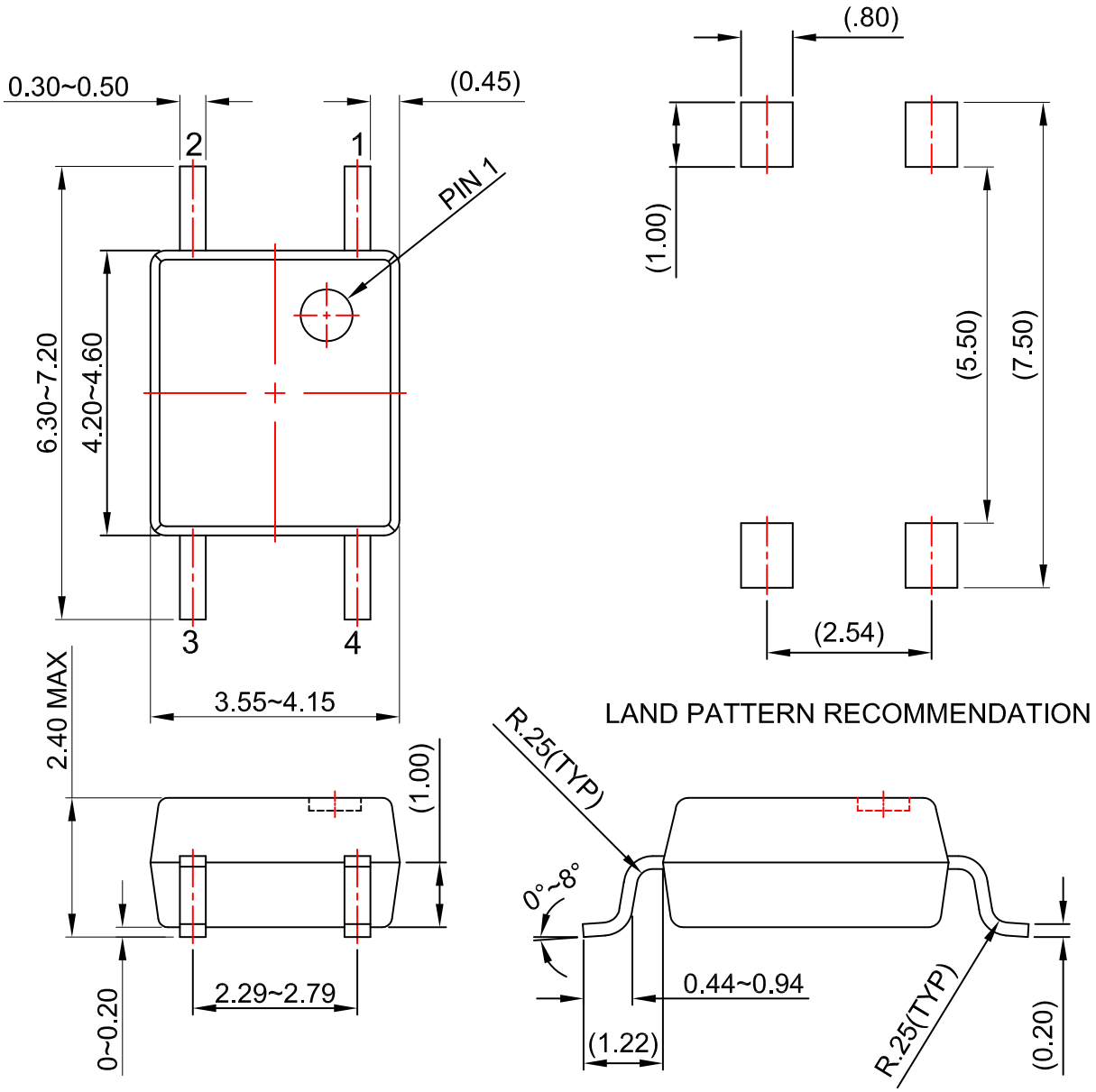

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