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July 2018

FODM100x Series Single Channel, DC Sensing Input, Phototransistor Optocoupler In Stretched Body SOP 4-Pin

Features

- ≥ 8 mm Creepage and Clearance Distance, and ≥ 0.4 mm Insulation Distance to Achieve Reliable and High Voltage Insulation
- Safety and Regulatory Approvals
- UL1577, 5,000 VAC_{RMS} for 1 min.
- DIN_EN/IEC60747-5-5, 890 V_{Peak} Working Voltage
- High Breakdown Collector to Emitter Voltage, $BV_{CEO} = 70$ V minimum
- Extended Industrial Temperature Range, -40 to 110°C
- Current Transfer Ratio at $I_F = 5$ mA, $V_{CE} = 5$ V, $T_A = 25^{\circ}\text{C}$
- FODM1007: 80 to 160%
- FODM1008: 130 to 260%
- FODM1009: 200 to 400%

Related Resources

- www.onsemi.com/products/optoelectronics/
- www.onsemi.com/datasheets/HM/HMHA2801.pdf

Description

The FODM100x Series, single channel, DC sensing input, optocoupler consists of one gallium arsenide (GaAs) infrared light emitting diode optically coupled to one phototransistor, in a stretched body SOP 4-pin package. The input-output isolation voltage, V_{ISO} , is rated at 5,000 VAC_{RMS}.

Applications

- Primarily suited for DC-DC Converters
- For ground loop isolation, signal to noise isolation
- Communications – adapters, chargers
- Consumer – appliances, set top boxes
- Industrial – power supplies, motor control, programmable logic control

Schematic

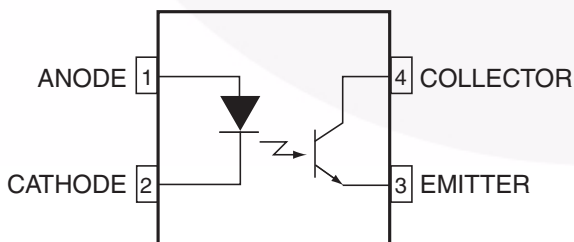


Figure 1. Schematic

Package

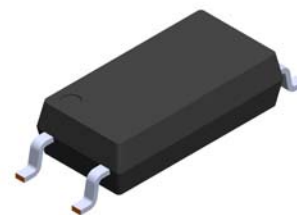


Figure 2. Package Outline

FODM100x Series Single Channel, DC Sensing Input, Phototransistor Optocoupler In Stretched Body SOP 4-Pin

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–III |
| Climatic Classification | | 40/110/21 |
| 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} × 1.6 = V _{PR} , Type and Sample Test with t _m = 10 s, Partial Discharge < 5 pC | 1,426 | V _{peak} |
| | Input-to-Output Test Voltage, Method B, V _{IORM} × 1.875 = V _{PR} , 100% Production Test with t _m = 1 s, Partial Discharge < 5 pC | 1,671 | V _{peak} |
| V _{IORM} | Maximum Working Insulation Voltage | 890 | V _{peak} |
| V _{IOTM} | Highest Allowable Over-Voltage | 6,000 | V _{peak} |
| | External Creepage | ≥ 8.0 | mm |
| | External Clearance | ≥ 8.0 | mm |
| DTI | Distance Through Insulation (Insulation Thickness) | ≥ 0.4 | mm |
| T _S | Case Temperature ⁽¹⁾ | 150 | °C |
| I _{S,INPUT} | Input Current ⁽¹⁾ | 200 | mA |
| P _{S,OUTPUT} | Output Power ⁽¹⁾ | 300 | mW |
| R _{IO} | Insulation Resistance at T _S , V _{IO} = 500 V ⁽¹⁾ | > 10 ⁹ | Ω |

Note:

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

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. $T_A = 25^\circ\text{C}$ unless otherwise specified.

| Symbol | Parameter | Value | Unit |
|----------------------|--|-------------|----------------------------|
| TOTAL PACKAGE | | | |
| T_{STG} | Storage Temperature | -55 to +150 | $^\circ\text{C}$ |
| T_{OPR} | Operating Temperature | -40 to +110 | $^\circ\text{C}$ |
| T_J | Junction Temperature | -40 to +125 | $^\circ\text{C}$ |
| EMITTER | | | |
| I_F (avg) | Continuous Forward Current | 50 | mA |
| I_F (pk) | Peak Forward Current (1 μs pulse, 300 pps) | 1 | A |
| V_R | Reverse Input Voltage | 6 | V |
| PD_{LED} | LED Power Dissipation @ $T_A = 25^\circ\text{C}$ ⁽²⁾ | 100 | mW |
| | Derate Above 25°C | 0.9 | $\text{mW}/^\circ\text{C}$ |
| DETECTOR | | | |
| I_C | Continuous Collector Current | 50 | mA |
| V_{CEO} | Collector-Emitter Voltage | 70 | V |
| V_{ECO} | Emitter-Collector Voltage | 7 | V |
| PD_C | Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ ⁽²⁾ | 150 | mW |
| | Derate Above 25°C | 1.47 | $\text{mW}/^\circ\text{C}$ |

Note:

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

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise specified.

Individual Component Characteristics

| Symbol | Parameter | Device | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------|---|--------|---|------|------|------|---------------|
| EMITTER | | | | | | | |
| V_F | Forward Voltage | All | $I_F = 50\text{ mA}$ | | 1.4 | 1.6 | V |
| I_R | Reverse Current | All | $V_R = 4\text{ V}$ | | | 10 | μA |
| DETECTOR | | | | | | | |
| BV_{CEO} | Breakdown Voltage Collector to Emitter | All | $I_C = 1\text{ mA}, I_F = 0$ | 70 | | | V |
| BV_{ECO} | Emitter to Collector | All | $I_E = 0.1\text{ mA}, I_F = 0$ | 7 | | | V |
| I_{CEO} | Collector Dark Current | All | $V_{CE} = 70\text{ V}, I_F = 0$ | | | 100 | nA |
| C_{CE} | Capacitance | All | $V_{CE} = 0\text{ V}, f = 1\text{ MHz}$ | | 5 | | pF |

DC Transfer Characteristics

| Symbol | Parameter | Device | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|---------------------------|----------|--|------|------|------|------|
| CTR | DC Current Transfer Ratio | FODM1007 | $I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$ | 80 | | 160 | % |
| | | FODM1008 | | 130 | | 260 | |
| | | FODM1009 | | 200 | | 400 | |
| $V_{CE(SAT)}$ | Saturation Voltage | All | $I_F = 10\text{ mA}, I_C = 1\text{ mA}$ | | | 0.3 | V |

AC Transfer Characteristics

| Symbol | Parameter | Device | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|---------------------------|--------|---|------|------|------|---------------|
| t_r | Rise Time (Non-Saturated) | All | $I_C = 2\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\ \Omega$ | | 5.7 | 18.0 | μs |
| t_f | Fall Time (Non-Saturated) | All | $I_C = 2\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\ \Omega$ | | 8.5 | 18.0 | |

Isolation Characteristics

| Symbol | Parameter | Device | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------|-----------------------------------|--------|---|-------|------|------|----------------|
| V_{ISO} | Steady State Isolation Voltage | All | $T_A = 25^\circ\text{C}, \text{R.H.} < 50\%, t = 1.0\text{ minute}, I_{I-O} \leq 20\ \mu\text{A}$ | 5,000 | | | $V_{AC_{RMS}}$ |

Typical Performance Characteristics

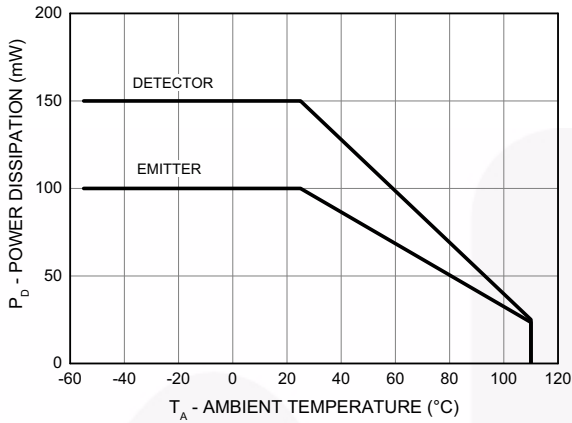


Figure 3. Power Dissipation vs. Ambient Temperature

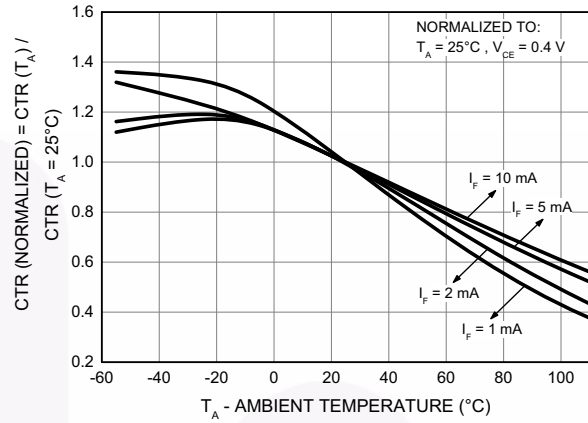


Figure 4. Saturated Normalized Current Transfer Ratio vs. Ambient Temperature

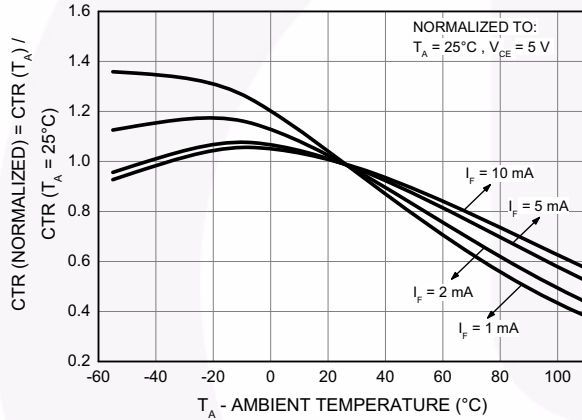


Figure 5. Non-Saturated Normalized Current Transfer Ratio vs. Ambient Temperature

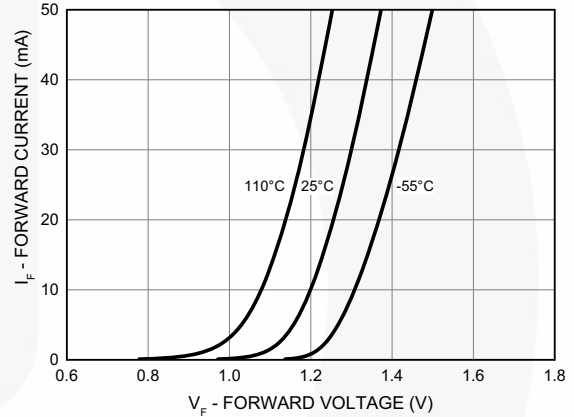


Figure 6. Forward Current vs. Forward Voltage

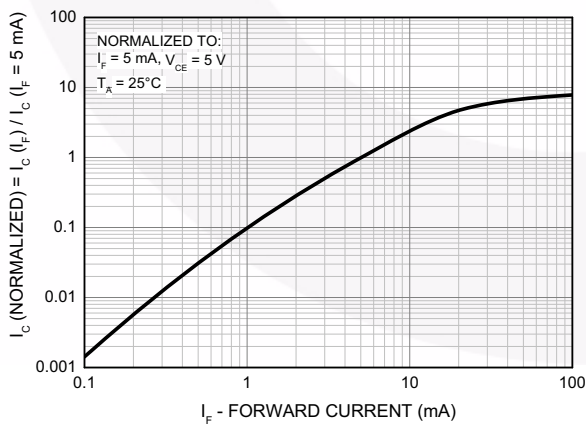


Figure 7. Normalized Current Collector vs. Forward Current

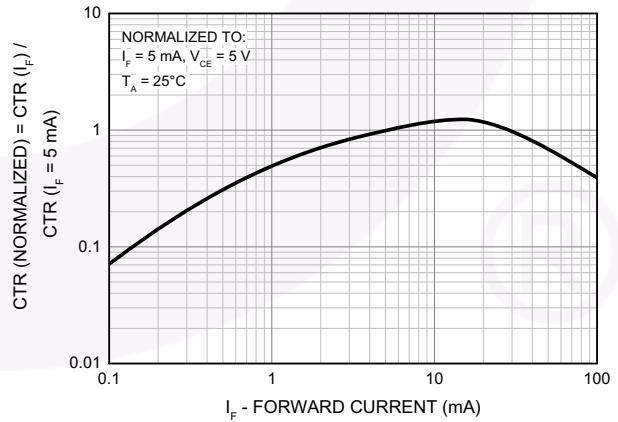


Figure 8. Normalized Current Transfer Ratio vs. Forward Current

Typical Performance Characteristics (Continued)

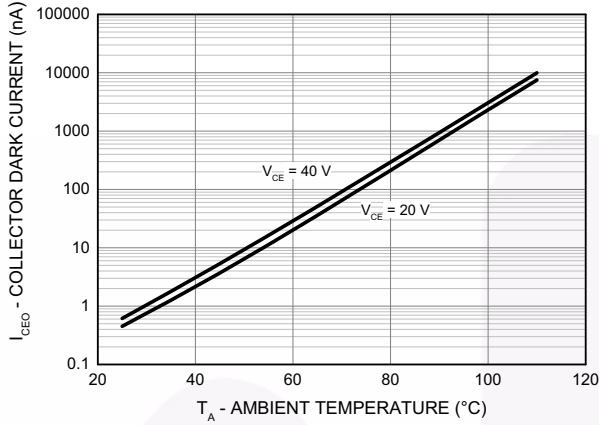


Figure 9. Collector Dark Current vs. Ambient Temperature

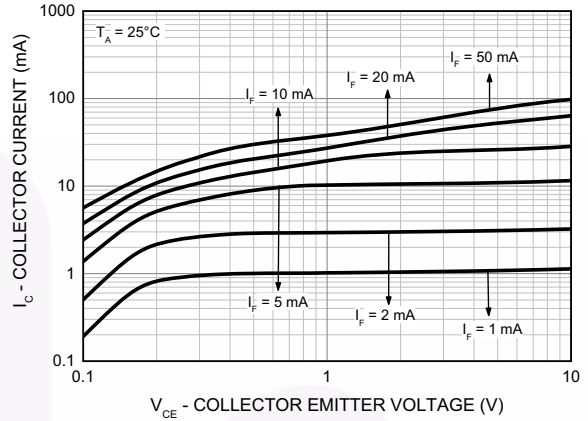


Figure 10. Collector Current vs. Collector Emitter Voltage

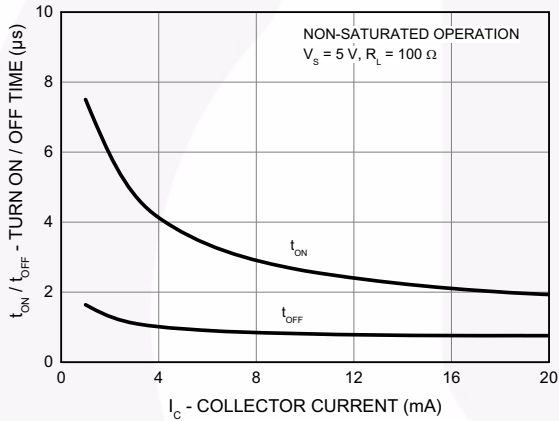


Figure 11. Turn On/ Turn Off Time vs. Collector Current

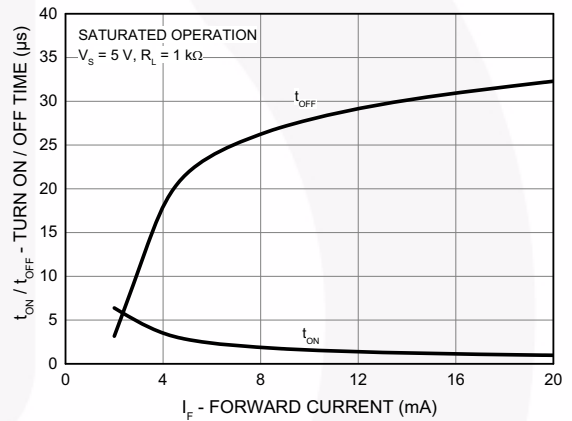
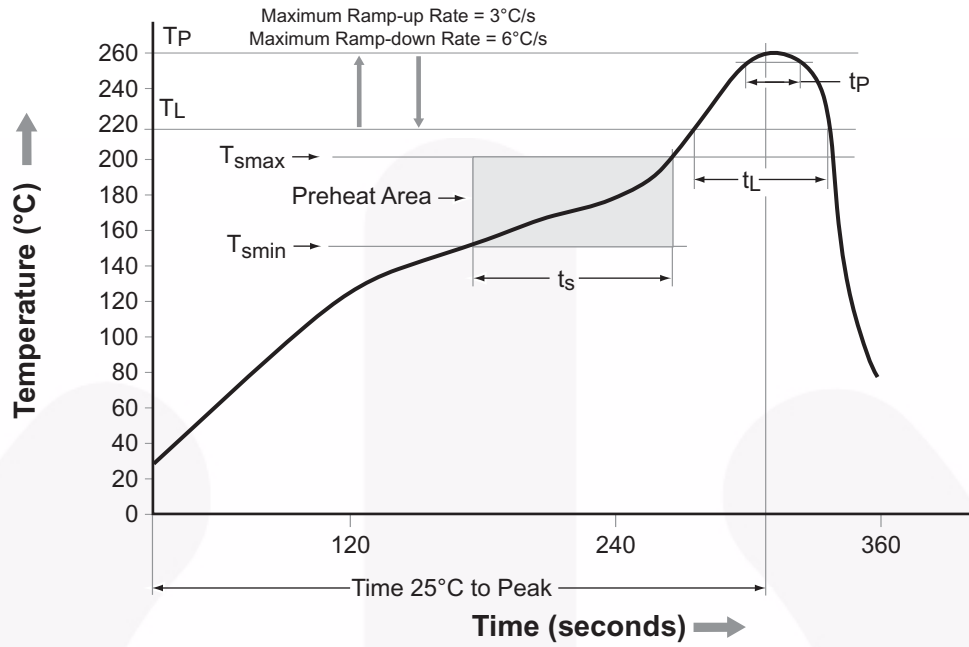


Figure 12. Turn On/ Turn Off Time vs. Forward Current

Reflow Profile



| Profile Feature | Pb-Free Assembly Profile |
|--|--------------------------|
| Temperature Minimum (T_{smin}) | 150°C |
| Temperature Maximum (T_{smax}) | 200°C |
| Time (t_s) from (T_{smin} to T_{smax}) | 60 s to 120 s |
| Ramp-up Rate (t_L to t_P) | 3°C/second maximum |
| Liquidous Temperature (T_L) | 217°C |
| Time (t_L) Maintained Above (T_L) | 60 s to 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 maximum |
| Time 25°C to Peak Temperature | 8 minutes maximum |

Figure 13. Reflow Profile

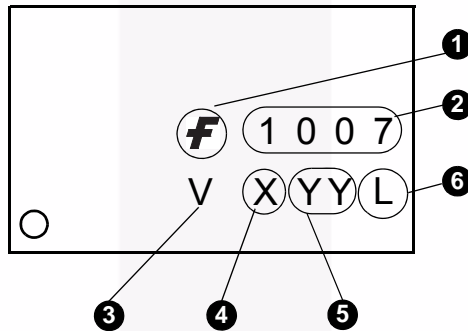
Ordering Information

| Part Number | Package | Packing Method |
|-------------|---|--------------------------------------|
| FODM1007 | Stretched Body SOP 4-Pin | Tube (100 units per tube) |
| FODM1007R2 | Stretched Body SOP 4-Pin | Tape and Reel (3,000 units per reel) |
| FODM1007V | Stretched Body SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tube (100 units per tube) |
| FODM1007R2V | Stretched Body SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tape and Reel (3,000 units per reel) |

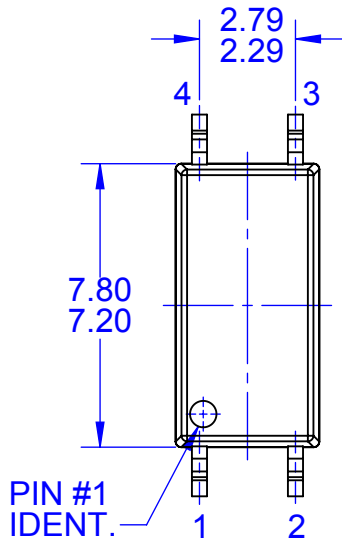
Note:

2. The product orderable part number system listed in this table also applies to the FODM1008, and FODM1009 products.

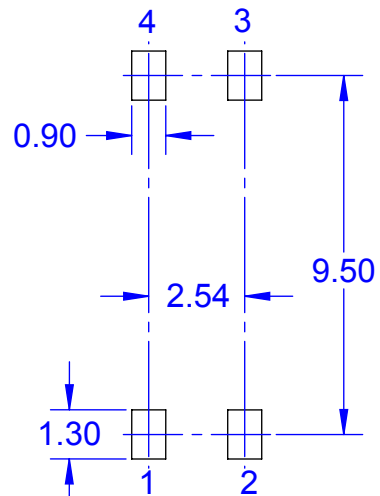
Marking Information



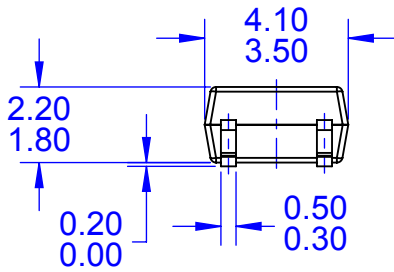
| Definitions | |
|-------------|---|
| 1 | Fairchild Logo |
| 2 | Device Number, e.g. 1007 |
| 3 | DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option) |
| 4 | Last Digit Year Code, e.g. '6' |
| 5 | Two Digit Work Week Ranging from '01' to '53' |
| 6 | Assembly Package Code |



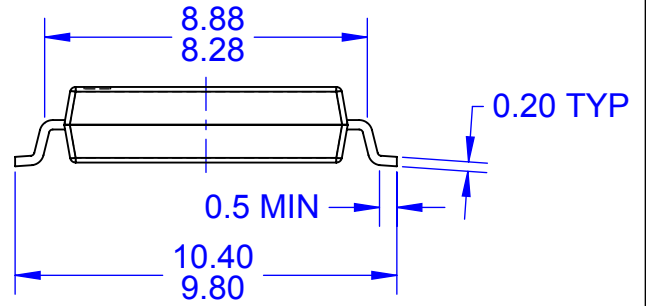
TOP VIEW



LAND PATTERN RECOMMENDATION



FRONT VIEW



SIDE VIEW

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