



THE DATASHEET OF TLP521





TLP521, TLP521-2, TLP521-4



DESCRIPTION

The TLP521, TLP521-2 and TLP521-4 series of optically coupled isolator consist of an infrared light emitting diode and an NPN silicon photo transistor in a space efficient Dual In Line Plastic Package.

FEATURES

- AC Isolation Voltage 5300V_{RMS}
- CTR Selections Available
- Wide Operating Temperature Range
-30°C to +100°C
- Lead Free and RoHS Compliant
- UL File E91231 Package Code "EE"
- VDE Approval Certificate No. 40028086

APPLICATIONS

- Computer Terminals
- Industrial System Controllers
- Measuring Instruments
- Signal Transmission between Systems of Different Potentials and Impedances

ORDER INFORMATION

- Add X after PN for VDE Approval
- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel
(Available for TLP521SM and TLP521-2SM)
- Optional Order Part No. TLP521-1 for TLP521
- Consult Factory for Tape and Reel version of TLP521-4SM

TLP521



TLP521-2



TLP521-4



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Input

| | |
|-------------------|------|
| Forward Current | 50mA |
| Reverse Voltage | 6V |
| Power dissipation | 70mW |

Output

| | |
|--|-------|
| Collector to Emitter Voltage BV _{CEO} | 55V |
| Emitter to Collector Voltage BV _{ECO} | 6V |
| Collector Current | 50mA |
| Power Dissipation | 150mW |

Total Package

| | |
|-------------------------------------|----------------------|
| Isolation Voltage | 5300V _{RMS} |
| Total Power Dissipation | 200mW |
| Operating Temperature | -30 to 100 °C |
| Storage Temperature | -55 to 125 °C |
| Lead Soldering Temperature (10s) | 260°C |

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ELECTRICAL CHARACTERISTICS (Ambient Temperature = 25°C unless otherwise specified)

INPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------------|--------|----------------------------------|-----|------|-----|---------------|
| Forward Voltage | V_F | $I_F = 10\text{mA}$ | 1.0 | 1.15 | 1.3 | V |
| Reverse Voltage | V_R | $I_R = 10\mu\text{A}$ | 6.0 | | | V |
| Reverse Leakage | I_R | $V_R = 4\text{V}$ | | | 10 | μA |
| Terminal Capacitance | C_t | $V = 0\text{V}, f = 1\text{KHz}$ | | 30 | 250 | pF |

OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------------|------------|--|-----|------|-----|------|
| Collector—Emitter breakdown Voltage | BV_{CEO} | $I_C = 0.5\text{mA}, I_F = 0\text{mA}$ | 55 | | | V |
| Emitter—Collector breakdown Voltage | BV_{ECO} | $I_E = 100\mu\text{A}, I_F = 0\text{mA}$ | 6 | | | V |
| Collector-Emitter Dark Current | I_{CEO} | $V_{CE} = 20\text{V}, I_F = 0\text{mA}$ | | | 100 | nA |



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ELECTRICAL CHARACTERISTICS (Ambient Temperature = 25°C unless otherwise specified)

COUPLED

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|---------------|---|-----|------|------------|---------------|
| Current Transfer Ratio | CTR | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$ | 50 | | 600 | % |
| | | Optional CTR Grades | | | | |
| | | GR | 100 | | 300 | |
| | | BL | 200 | | 600 | |
| | | GB | 100 | | 600 | |
| | | GB ($I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$) | 30 | | | |
| Collector—Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_F = 8\text{mA}, I_C = 2.4\text{mA}$ GB ($I_F = 1\text{mA}, I_C = 0.2\text{mA}$) | | | 0.4 0.4 | V |
| Output Rise Time | t_r | $V_{CE} = 2\text{V},$ $I_C = 2\text{mA},$ $R_L = 100\Omega$ | | 4 | | μs |
| Output Fall Time | t_f | | | 3 | | |
| Turn-on Time | t_{on} | | | 3 | | |
| Turn-off Time | t_{off} | | | 3 | | |
| Turn-on Time | t_{ON} | $V_{CC} = 5\text{V},$ $I_F = 16\text{mA},$ $R_L = 1.9\text{k}\Omega$ | | 2 | | μs |
| Turn-off Time | t_{OFF} | | | 25 | | |

ISOLATION

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|-----------|---------------------------------------|--------------------|------|-----|-----------|
| Input to Output Isolation Voltage | V_{ISO} | AC 1 minute, RH = 40 to 60% Note 1 | 5300 | | | V_{RMS} |
| Input to Output Isolation Resistance | R_{ISO} | $V_{IO} = 500\text{V}$ Note 1 | 5×10^{10} | | | Ω |

Note 1 : Measure with input leads shorted together and output leads shorted together.



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Fig 1 Forward Current vs T_A



Fig 2 Collector Power Dissipation vs T_A

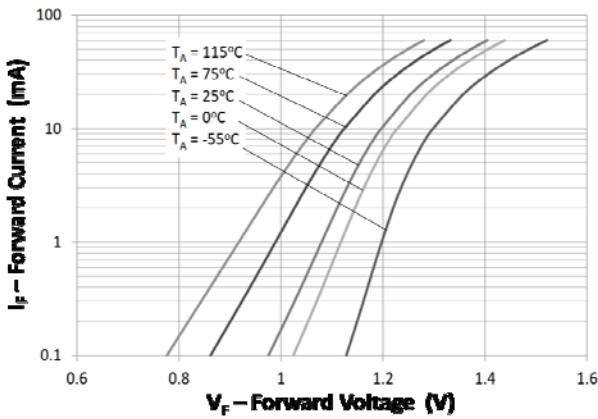


Fig 3 Forward Current vs Forward Voltage



Fig 4 Collector Current vs Collector-Emitter Voltage

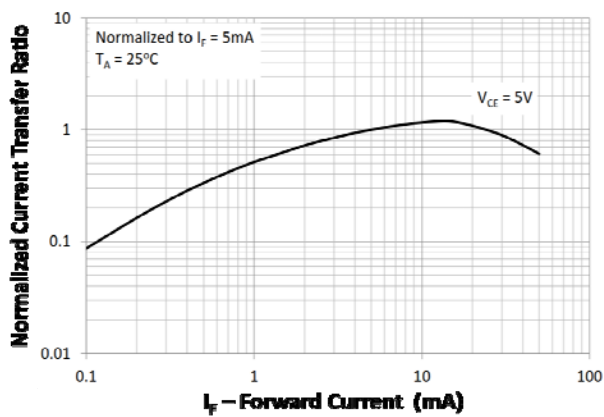


Fig 5 Normalized Current Transfer Ratio vs Forward Current



Fig 6 Normalized Current Transfer Ratio vs Ambient Temperature



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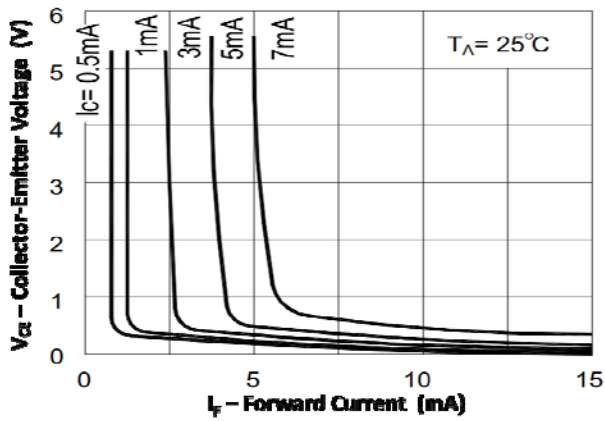


Fig 7 Collector-Emitter Voltage vs Forward Current

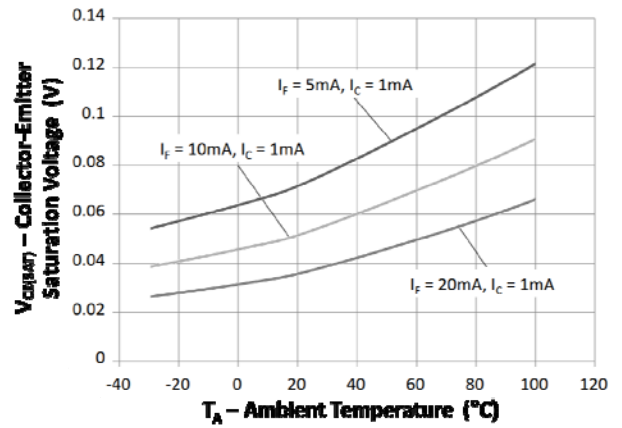


Fig 8 Collector-Emitter Voltage vs Ambient Temperature



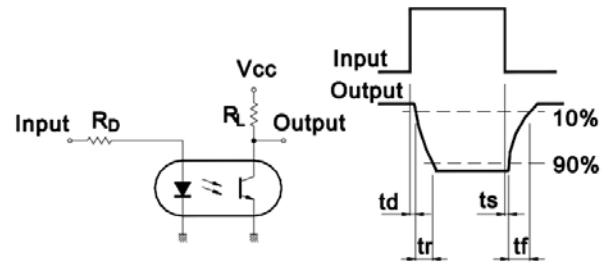
Fig 9 Collector Dark Current vs Ambient Temperature



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Fig 7 Response Time vs Load Resistance



Response Time Test Circuit

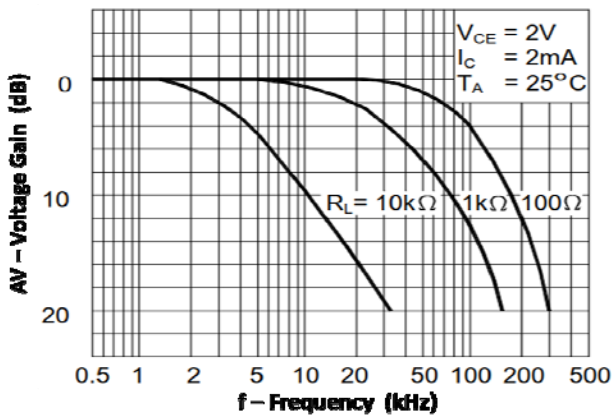


Fig 9 Frequency Response



Frequency Response Test Circuit



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ORDER INFORMATION

| TLP521X, TLP521-1X (UL and VDE Approvals) | | | |
|---|--|---------------------------|-------------------|
| After PN | PN | Description | Packing quantity |
| None | TLP521X, TLP521-1X TLP521XGR, TLP521-1XGR TLP521XBL, TLP521-1XBL, TLP521XGB, TLP521-1XGB | Standard DIP4 | 100 pcs per tube |
| G | TLP521XG, TLP521-1XG, TLP521XGRG, TLP521-1XGRG, TLP521XBLG, TLP521-1XBLG TLP521XGBG, TLP521-1XGBG | 10mm Lead Spacing | 100 pcs per tube |
| SM | TLP521XSM, TLP521-1XSM, TLP521XGRSM, TLP521-1XGRSM, TLP521XBLSM, TLP521-1XBLSM, TLP521XGBSM, TLP521-1XGBSM | Surface Mount | 100 pcs per tube |
| SMT&R | TLP521XSMT&R, TLP521-1XSMT&R TLP521XGRSMT&R, TLP521-1XGRSMT&R, TLP521XBLSMT&R, TLP521-1XBLSMT&R, TLP521XGBSMT&R, TLP521-1XGBSMT&R | Surface Mount Tape & Reel | 1000 pcs per reel |

Note : Optional Order Part No. TLP521-1 for TLP521.

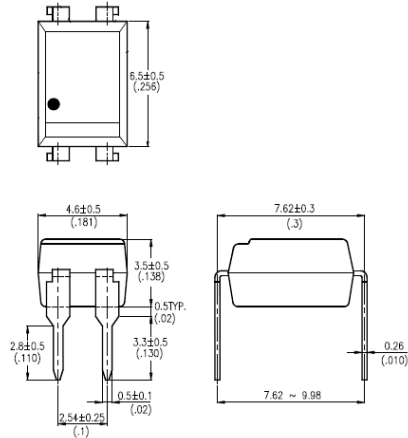


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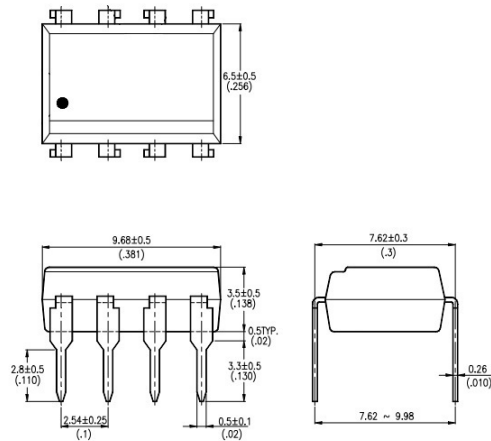
PACKAGE DIMENSIONS in mm (inch)

DIP

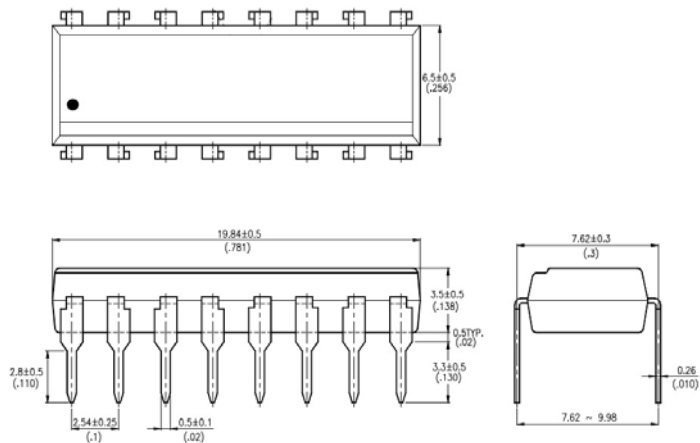
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TLP521-2



TLP521-4





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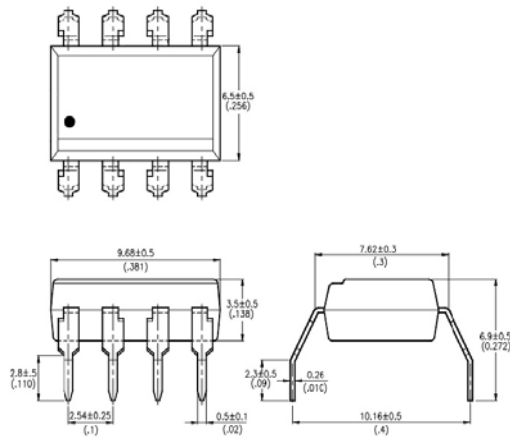
PACKAGE DIMENSIONS in mm (inch)

G Form

TLP521G



TLP521-2G



TLP521-4G





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PACKAGE DIMENSIONS in mm (inch)

SMD

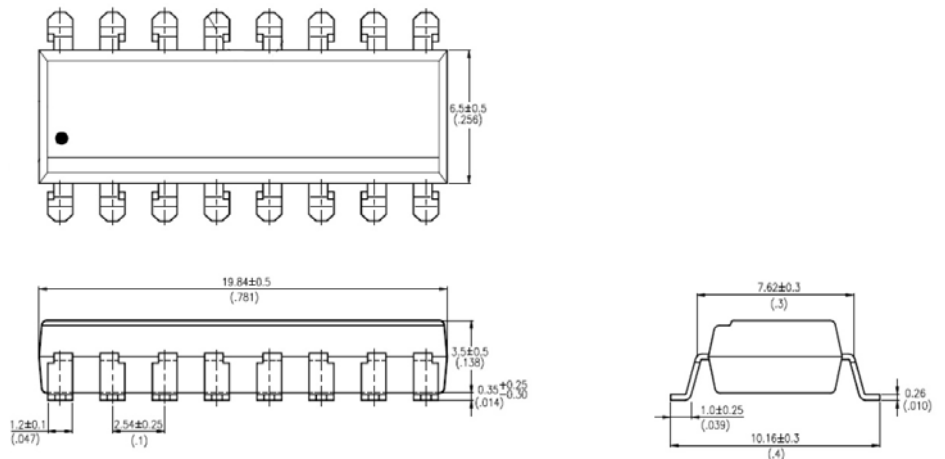
TLP521SM



TLP521-2SM



TLP521-4SM





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RECOMMENDED PAD LAYOUT FOR SMD (mm)

TLP521SM



TLP521-2SM



TLP521-4SM





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TAPE AND REEL PACKAGING



TLP521SMT&R



TLP521-2SMT&R

| Description | Symbol | Dimensions in mm (inches) |
|--|--------|-----------------------------|
| Tape wide | W | 16 ± 0.3 (.63) |
| Pitch of sprocket holes | P_0 | 4 ± 0.1 (.15) |
| Distance of compartment | F | 7.5 ± 0.1 (.295) |
| Distance of compartment to compartment | P_1 | 2 ± 0.1 (.079) |
| Distance of compartment to compartment | P_1 | 12 ± 0.1 (.472) |



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**IR REFLOW SOLDERING TEMPERATURE PROFILE FOR SMD
(One Time Reflow Soldering is Recommended)**



| Profile Details | Conditions |
|--|--|
| Preheat <ul style="list-style-type: none"> - Min Temperature (T_{SMIN}) - Max Temperature (T_{SMAX}) - Time T_{SMIN} to T_{SMAX} (t_s) | 150°C 200°C 60s - 120s |
| Soldering Zone <ul style="list-style-type: none"> - Peak Temperature (T_P) - Time at Peak Temperature - Liquidous Temperature (T_L) - Time within 5°C of Actual Peak Temperature (T_P - 5°C) - Time maintained above T_L (t_L) - Ramp Up Rate (T_L to T_P) - Ramp Down Rate (T_P to T_L) | 260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max |
| Average Ramp Up Rate (T _{smax} to T _P) | 3°C/s max |
| Time 25°C to Peak Temperature | 8 minutes max |

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