

## 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<sub>RMS</sub>
- 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

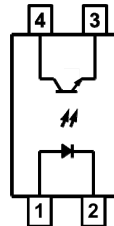
### APPLICATIONS

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

### ORDER INFORMATION

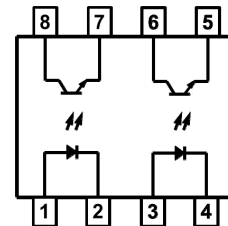
- Add X after PN for VDE Approval
- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel  
(Available for TLP521SM and TLP521-2SM)
- Optional Order Part No. TLP521-1 for TLP521
- Consult Factory for Tape and Reel version of TLP521-4SM

**TLP521**



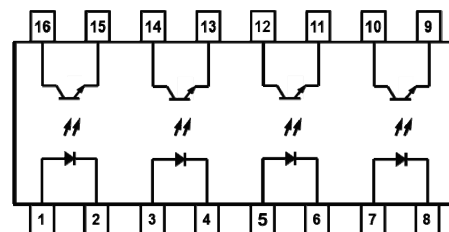
- |   |           |
|---|-----------|
| 1 | Anode     |
| 2 | Cathode   |
| 3 | Emitter   |
| 4 | Collector |

**TLP521-2**



- |      |           |
|------|-----------|
| 1, 3 | Anode     |
| 2, 4 | Cathode   |
| 5, 7 | Emitter   |
| 6, 8 | Collector |

**TLP521-4**



- |                |           |
|----------------|-----------|
| 1, 3, 5, 7     | Anode     |
| 2, 4, 6, 8     | Cathode   |
| 9, 11, 13, 15  | Emitter   |
| 10, 12, 14, 16 | Collector |

#### ISOCOM COMPONENTS 2004 LTD

Unit 25B, Park View Road West, Park View Industrial Estate  
Hartlepool, Cleveland, TS25 1PE, United Kingdom  
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## TLP521, TLP521-2, TLP521-4

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

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 <sub>RMS</sub>
Total Power Dissipation	200mW
Operating Temperature	-30 to 100 °C
Storage Temperature	-55 to 125 °C
Junction Temperature	125 °C
Lead Soldering Temperature (10s)	260°C

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## TLP521, TLP521-2, TLP521-4

### 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	$\mu\text{A}$
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

## TLP521, TLP521-2, TLP521-4

### 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		$\mu\text{s}$
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		$\mu\text{s}$
Turn-off Time	$t_{OFF}$			25		

#### ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Input to Output Isolation Voltage	$V_{ISO}$	R.H. = 40% to 60 %, $t = 1\text{ min}$	5300			$V_{RMS}$
Input to Output Resistance	$R_{ISO}$	$V_{IO} = 500\text{VDC}$ , R.H. = 40% to 60 %	$5 \times 10^{10}$			$\Omega$

Device is considered a two terminal device : Input pins are shorted together and Output pins are shorted together.

## TLP521, TLP521-2, TLP521-4

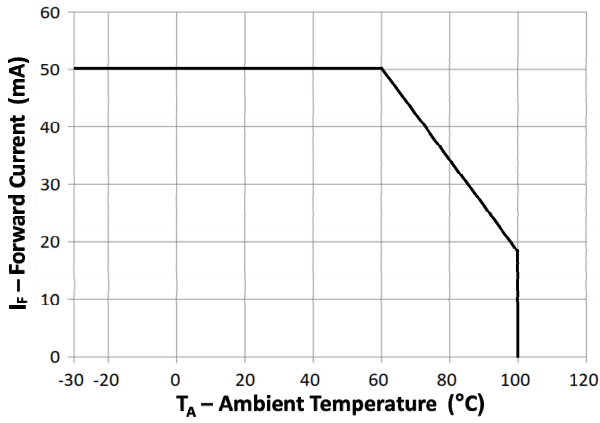


Fig 1 Forward Current vs  $T_A$

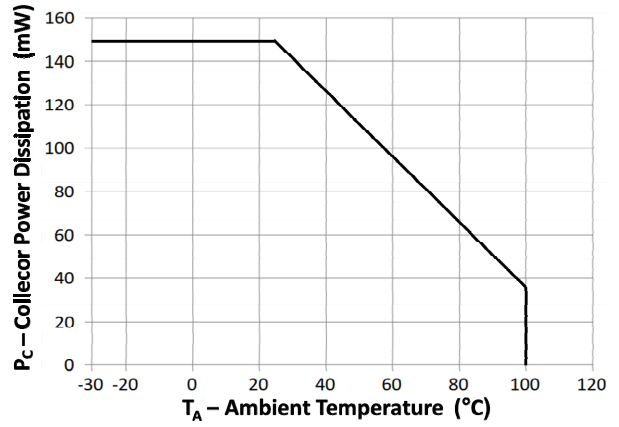


Fig 2 Collector Power Dissipation vs  $T_A$

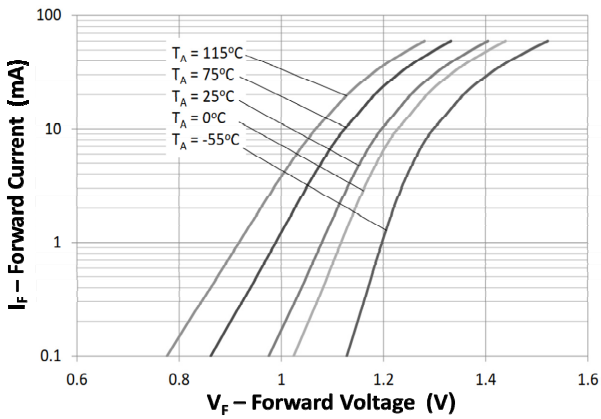


Fig 3 Forward Current vs Forward Voltage

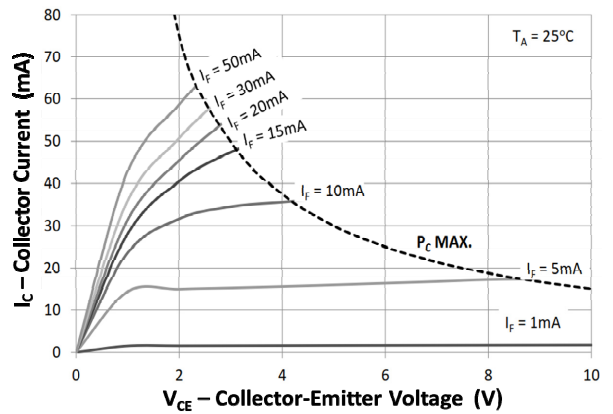


Fig 4 Collector Current vs Collector-Emitter Voltage

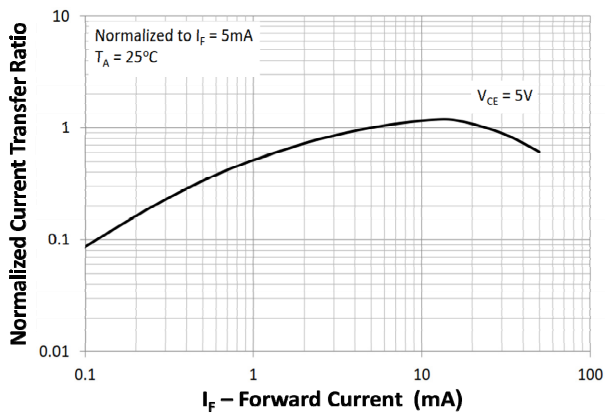


Fig 5 Normalized Current Transfer Ratio vs Forward Current

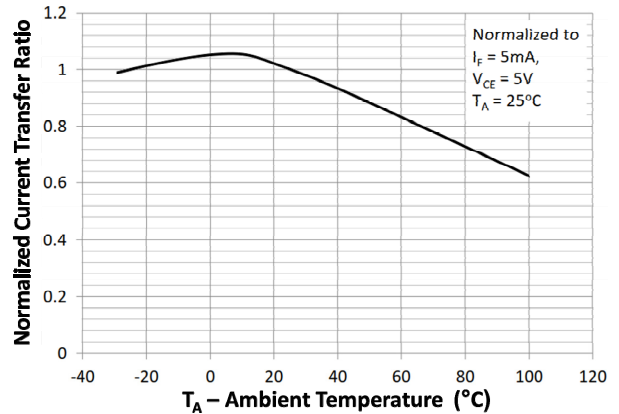


Fig 6 Normalized Current Transfer Ratio vs Ambient Temperature

TLP521, TLP521-2, TLP521-4

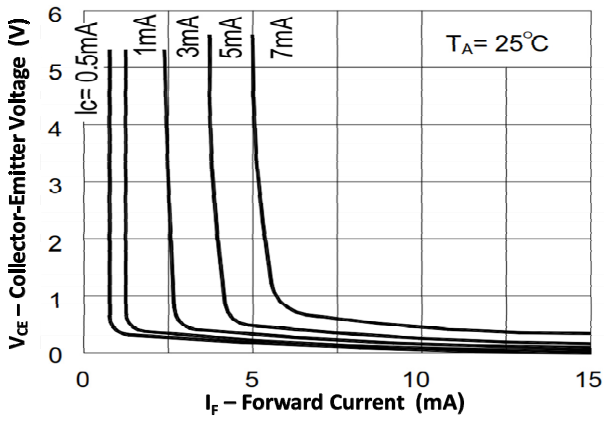


Fig 7 Collector-Emitter Voltage vs Forward Current

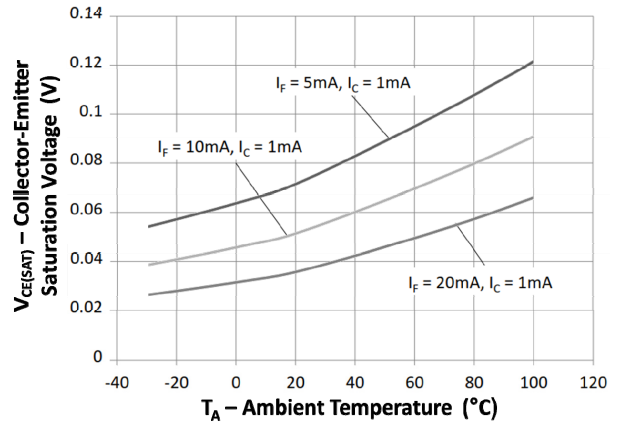


Fig 8 Collector-Emitter Voltage vs Ambient Temperature

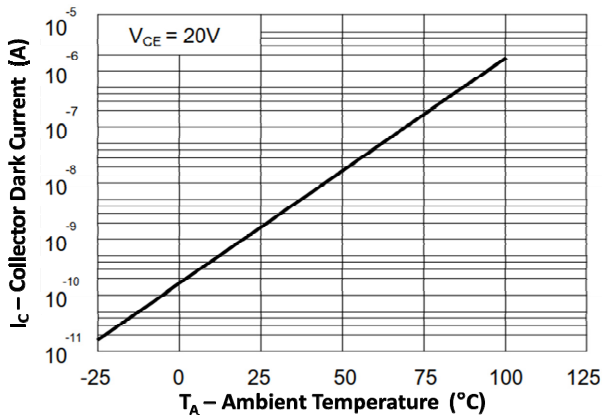
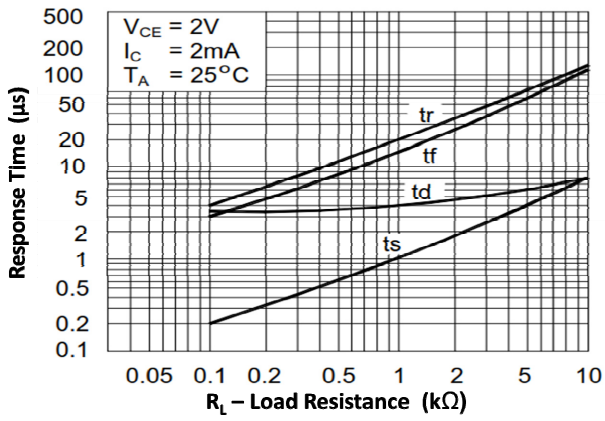
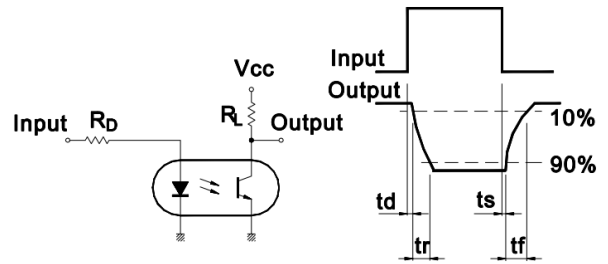


Fig 9 Collector Dark Current vs Ambient Temperature

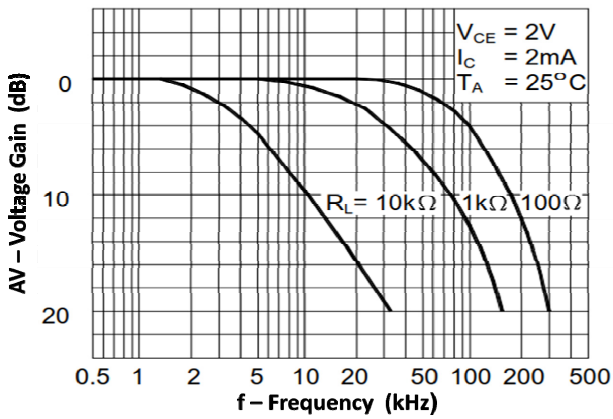
## TLP521, TLP521-2, TLP521-4



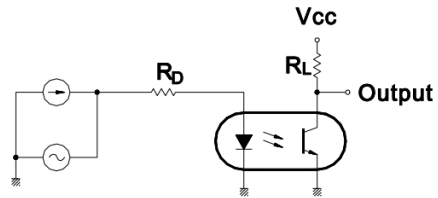
**Fig 10 Response Time vs Load Resistance**



**Response Time Test Circuit**



**Fig 11 Frequency Response**



**Frequency Response Test Circuit**

## TLP521, TLP521-2, TLP521-4

### ORDER INFORMATION

TLP521, TLP521-1 (UL Approval)			
After PN	PN	Description	Packing quantity
None	TLP521, TLP521-1 TLP521GR, TLP521-1GR TLP521BL, TLP521-1BL TLP521GB, TLP521-1GB	Standard DIP4	100 pcs per tube
G	TLP521G, TLP521-1G, TLP521GRG, TLP521-1GRG, TLP521BLG, TLP521-1BLG TLP521GBG, TLP521-1GBG	10mm Lead Spacing	100 pcs per tube
SM	TLP521SM, TLP521-1SM, TLP521GRSM, TLP521-1GRSM, TLP521BLSM, TLP521-1BLSM, TLP521GBSM, TLP521-1GBSM	Surface Mount	100 pcs per tube
SMT&R	TLP521SMT&R, TLP521-1SMT&R TLP521GRSMT&R, TLP521-1GRSMT&R, TLP521BLSMT&R, TLP521-1BLSMT&R, TLP521GBSMT&R, TLP521-1GBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

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

Devices with suffix "X" (UL and VDE approvals) may be supplied when ordering the above Part Numbers (UL approval only).





**TLP521, TLP521-2, TLP521-4**

**ORDER INFORMATION**

<b>TLP521-2 (UL Approval)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	TLP521-2, TLP521-2GR, TLP521-2BL, TLP521-2GB	Standard DIP8	50 pcs per tube
G	TLP521-2G, TLP521-2GRG, TLP521-2BLG, TLP521-2GBG	10mm Lead Spacing	50 pcs per tube
SM	TLP521-2SM, TLP521-2GRSM, TLP521-2BLSM, TLP521-2GBSM	Surface Mount	50 pcs per tube
SMT&R	TLP521-2SMT&R, TLP521-2GRSMT&R, TLP521-2BLSMT&R, TLP521-2GBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

<b>TLP521-4 (UL Approval)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	TLP521-4, TLP521-4GR, TLP521-4BL, TLP521-4GB	Standard DIP16	25 pcs per tube
G	TLP521-4G, TLP521-4GRG, TLP521-4BLG, TLP521-4GBG	10mm Lead Spacing	25 pcs per tube
SM	TLP521-4SM, TLP521-4GRSM, TLP521-4BLSM, TLP521-4GBSM	Surface Mount	25 pcs per tube

Note : Devices with suffix "X" (UL and VDE approvals) may be supplied when ordering the above Part Numbers (UL approval only).

## TLP521, TLP521-2, TLP521-4

### 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. TLP521-1X for TLP521X.

## TLP521, TLP521-2, TLP521-4

### ORDER INFORMATION

TLP521-2X (UL and VDE Approvals)			
After PN	PN	Description	Packing quantity
None	TLP521-2X, TLP521-2XGR, TLP521-2XBL, TLP521-2XGB	Standard DIP8	50 pcs per tube
G	TLP521-2XG, TLP521-2XGRG TLP521-2XBLG, TLP521-2XGBG	10mm Lead Spacing	50 pcs per tube
SM	TLP521-2XSM, TLP521-2XGRSM, TLP521-2XBLSM, TLP521-2XGBSM	Surface Mount	50 pcs per tube
SMT&R	TLP521-2XSMT&R, TLP521-2XGRSMT&R, TLP521-2XBLSMT&R, TLP521-2XGBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

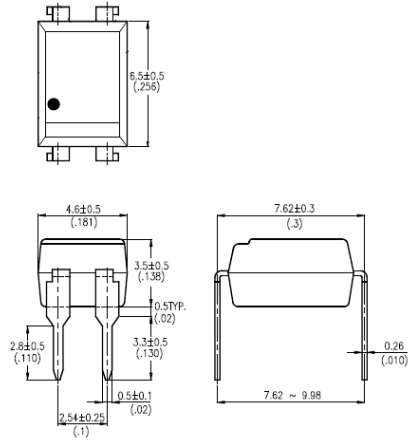
TLP521-4X (UL and VDE Approvals)			
After PN	PN	Description	Packing quantity
None	TLP521-4X, TLP521-4XGR, TLP521-4XBL, TLP521-4XGB	Standard DIP16	25 pcs per tube
G	TLP521-4XG, TLP521-4XGRG, TLP521-4XBLG, TLP521-4XGBG	10mm Lead Spacing	25 pcs per tube
SM	TLP521-4XSM, TLP521-4XGRSM, TLP521-4XBLSM, TLP521-4XGBSM	Surface Mount	25 pcs per tube

## TLP521, TLP521-2, TLP521-4

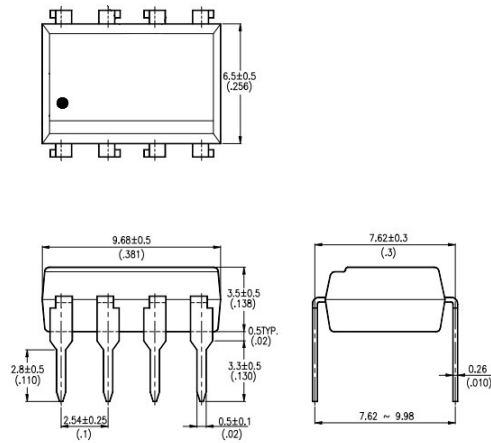
### PACKAGE DIMENSIONS in mm (inch)

#### DIP

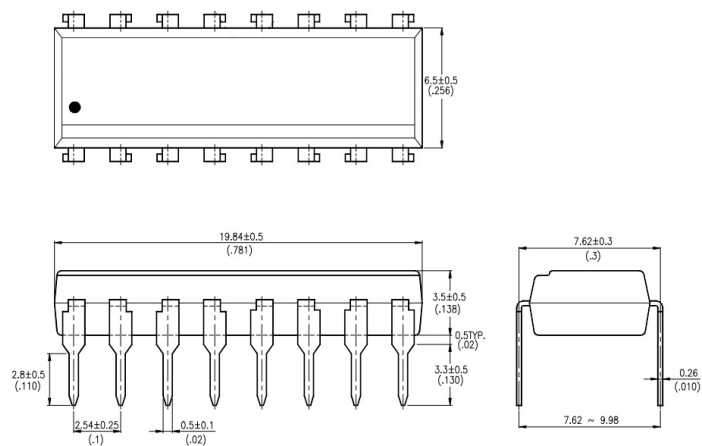
**TLP521**



**TLP521-2**



**TLP521-4**

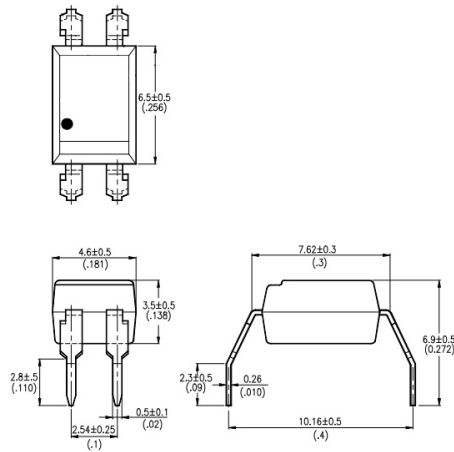


## TLP521, TLP521-2, TLP521-4

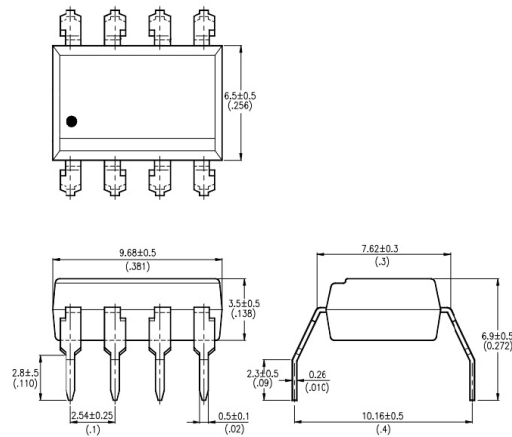
### PACKAGE DIMENSIONS in mm (inch)

#### G Form

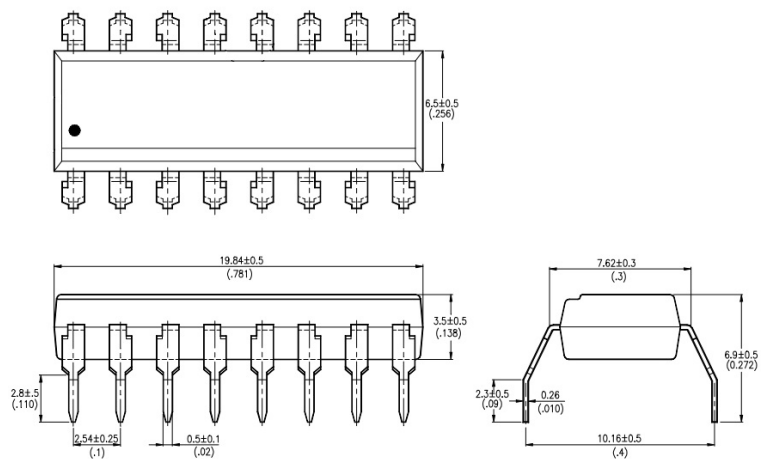
**TLP521G**



**TLP521-2G**



**TLP521-4G**

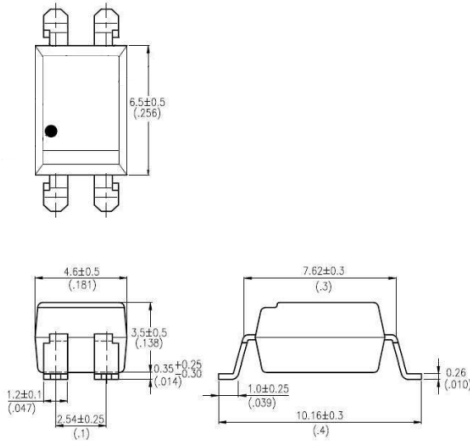


## TLP521, TLP521-2, TLP521-4

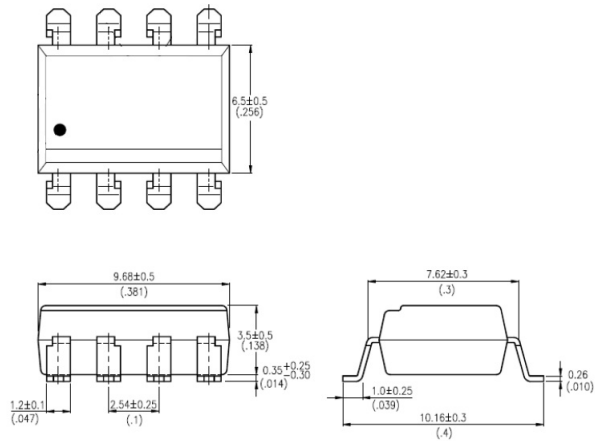
### PACKAGE DIMENSIONS in mm (inch)

#### SMD

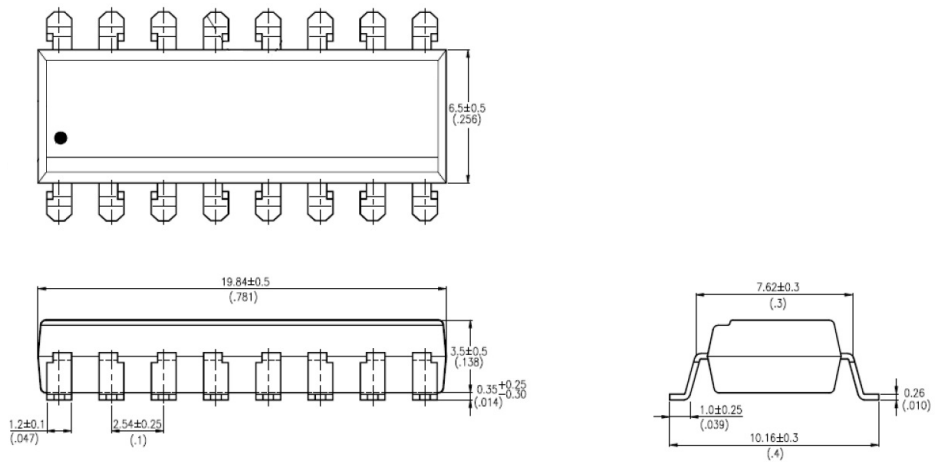
**TLP521SM**



**TLP521-2SM**



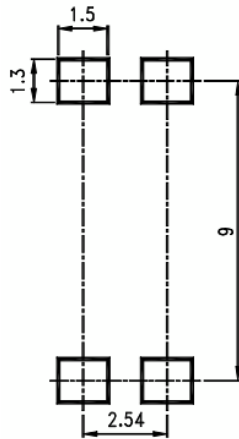
**TLP521-4SM**



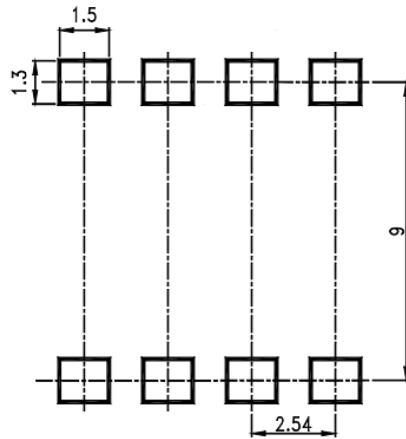
## TLP521, TLP521-2, TLP521-4

### RECOMMENDED PAD LAYOUT FOR SMD (mm)

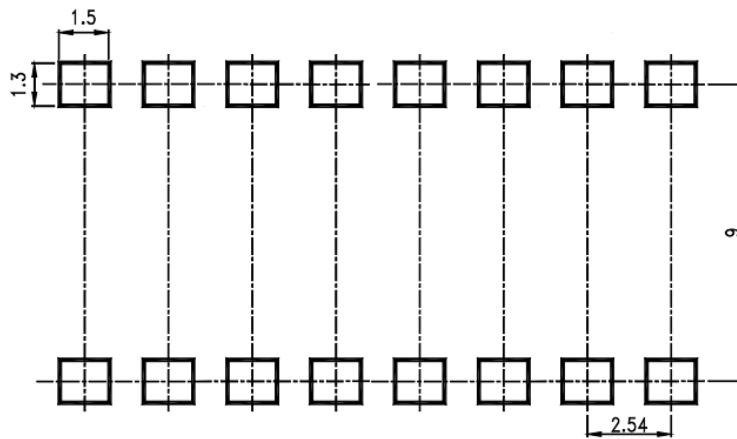
**TLP521SM**



**TLP521-2SM**

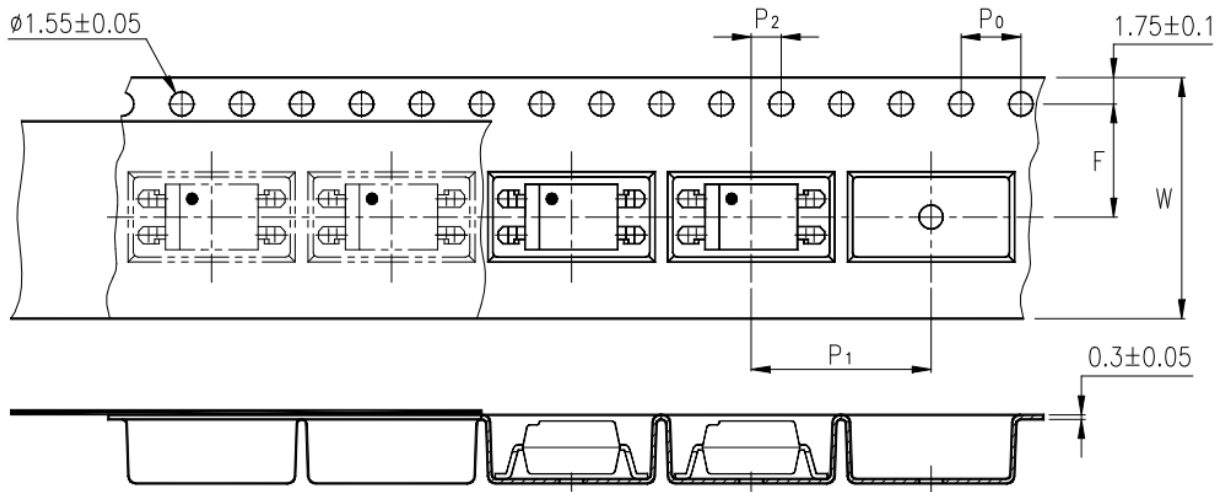


**TLP521-4SM**

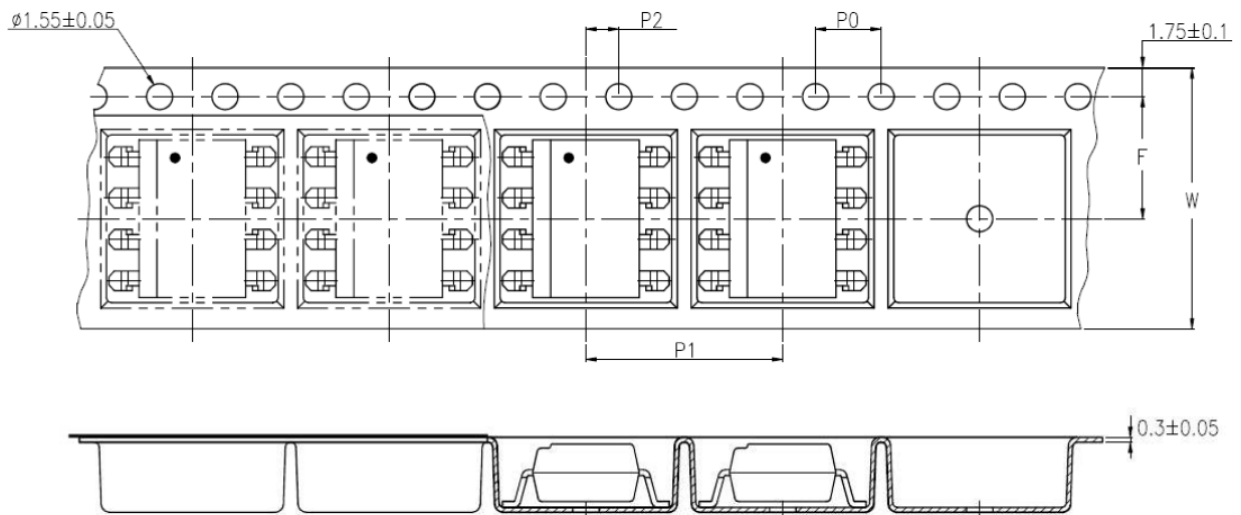


## TLP521, TLP521-2, TLP521-4

### TAPE AND REEL PACKAGING



### TLP521SMT&R



### TLP521-2SMT&R

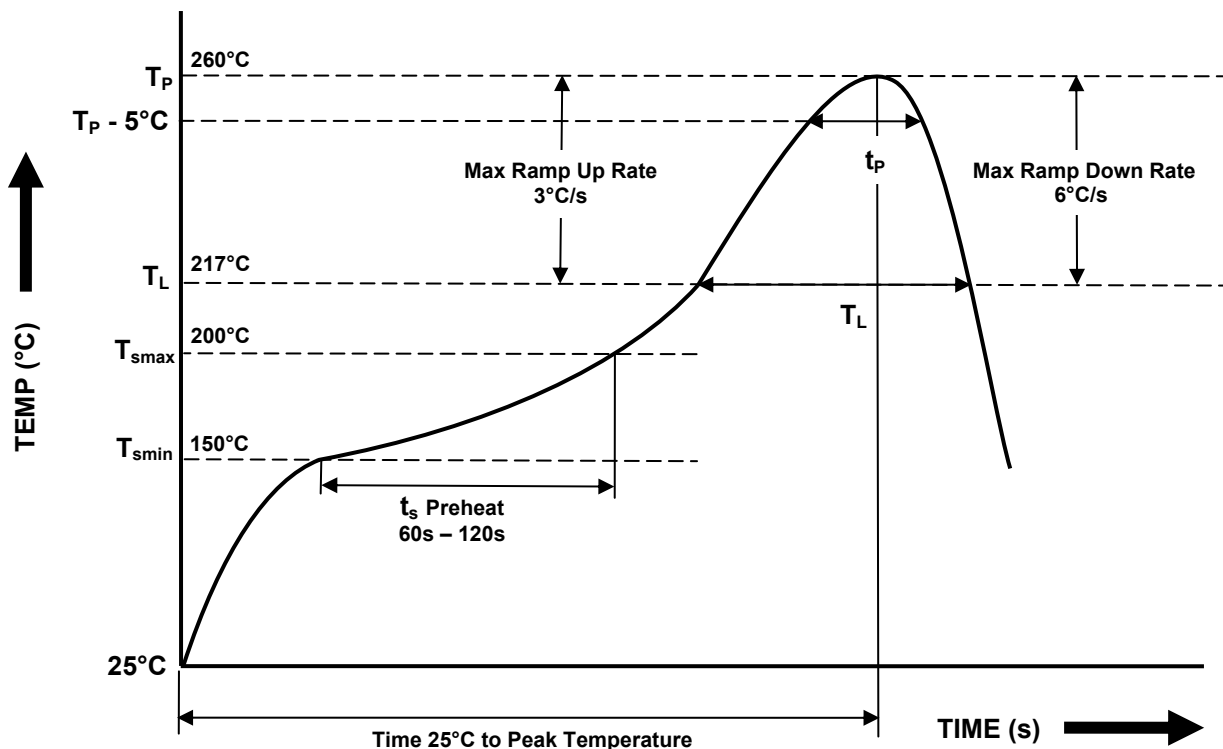
Description	Symbol	Dimensions in mm ( inches )
Tape wide	W	16 ± 0.3 ( .63 )
Pitch of sprocket holes	P <sub>0</sub>	4 ± 0.1 ( .15 )
Distance of compartment	F	7.5 ± 0.1 ( .295 )
Distance of compartment to compartment	P <sub>1</sub>	2 ± 0.1 ( .079 )
Distance of compartment to compartment	P <sub>1</sub>	12 ± 0.1 ( .472 )





**TLP521, TLP521-2, TLP521-4**

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



Profile Details	Conditions
<b>Preheat</b> - Min Temperature ( $T_{SMIN}$ ) - Max Temperature ( $T_{SMAX}$ ) - Time $T_{SMIN}$ to $T_{SMAX}$ ( $t_s$ )	150°C 200°C 60s - 120s
<b>Soldering Zone</b> - Peak Temperature ( $T_P$ ) - Time at Peak Temperature - Liquidous Temperature ( $T_L$ ) - Time within 5°C of Actual Peak Temperature ( $T_P - 5^\circ C$ ) - 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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