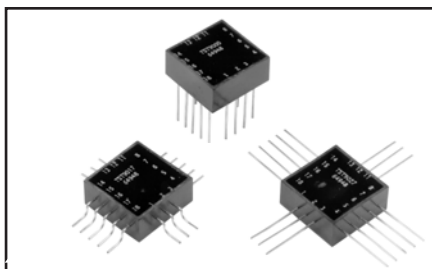


## TWIN-STACKED, 0.280" MAXIMUM HEIGHT, 1553 TRANSFORMERS CONSERVE BOARD SPACE



### DESCRIPTION AND APPLICATIONS

The TST-9000 series of transformers provide the turns ratio configurations, component isolation, and common mode rejection ratio characteristics necessary for MIL-STD-1553A and B compliance.

The step-up and step-down ratios that are available with the TST-9000 series complement DDC's entire MIL-STD-1553 product line. These transformers are low-profile, dual modular units, made to couple into data bus redundant systems. They have excellent isolation within the dual package and are multi-tapped to accommodate existing system configurations.

Encapsulated in accordance with MIL-PRF-21038, their SN63 solder-dipped copper clad steel leads conveniently accommodate printed circuit board mounting. Sinusoidal or trapezoidal waveforms are accurately processed, making the TST-9000 series of transformers an excellent choice for any MIL-STD-1553A or B application.

### FEATURES

- **PC Mount**
- **Flat Pack**
- **Surface Mount**
- **For Use with MIL-STD-1553A and B, MacAir A-5690, A-5232, and A-4905**
- **-55°C to +130°C Operating Temperature Range**
- **Built and Tested to MIL-PRF-21038 and MIL-STD-202**

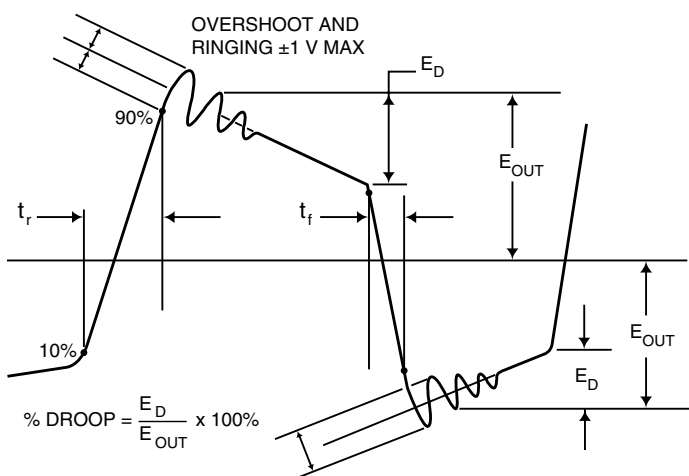


FIGURE 1. WAVEFORM INTEGRITY

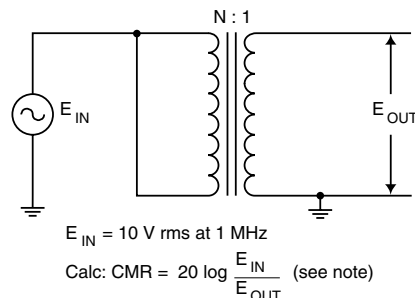
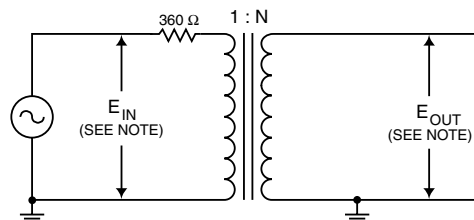


FIGURE 2. CIRCUIT FOR COMMON MODE REJECTION



$E_{IN} = 250 \text{ kHz square wave, } 27.0 \text{ volts peak-to-peak with a rise and fall time of } 90\text{ns} \pm 5\text{ns}$

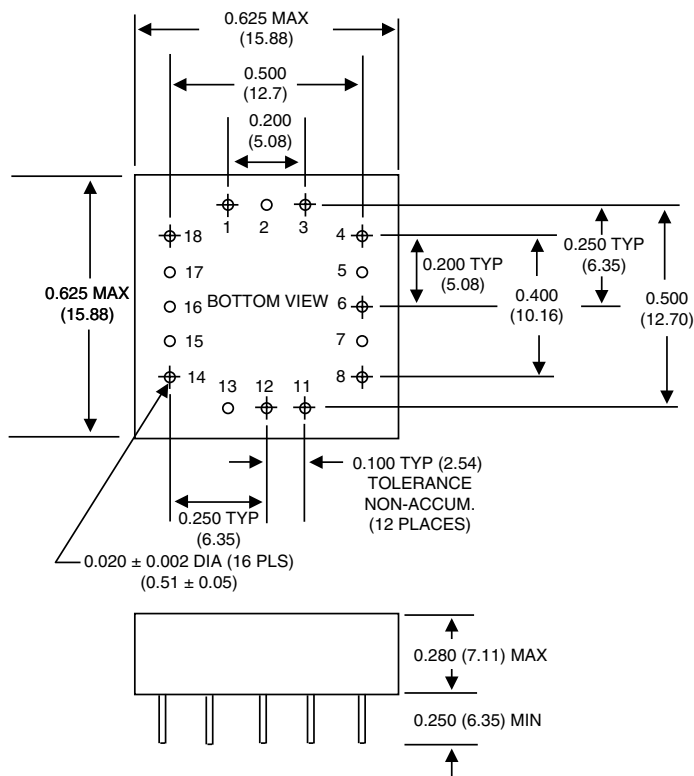
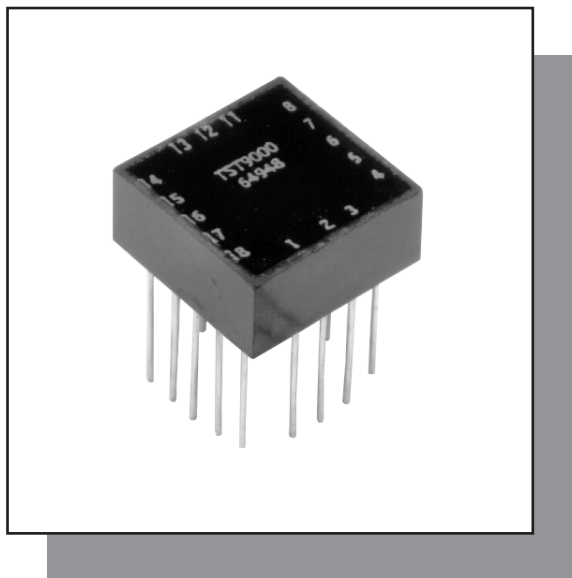
Calc :  $\text{Droop} = \frac{E_D}{E_{OUT}} \times 100\%$ . (see figure 1 for  $E_D$ )

FIGURE 3. CIRCUIT FOR WAVEFORM INTEGRITY

Note: Input to be applied and output to be measured for all dash numbers are as shown. N represents highest turns winding in each test.

**TABLE 1. GENERAL SPECIFICATIONS**

| PARAMETER                       | UNIT | VALUE        | REMARKS                                                                                                     |
|---------------------------------|------|--------------|-------------------------------------------------------------------------------------------------------------|
| Case                            | —    | —            | Flame Resistant, Diallyl Phthalate                                                                          |
| Terminals                       | —    | —            | SN63 Solder-Dipped, Copper Clad Steel                                                                       |
| Weight                          | gm   | 5            |                                                                                                             |
| Terminal Strength               | lbs  | 2            | 2 pounds applied force, Method 211, MIL-STD-202, Test Condition A                                           |
| Dielectric Withstanding Voltage | Vrms | 100          | Method 301, MIL-STD-202                                                                                     |
| Life (expectancy "X")           | Hrs  | 10,000 min.  | In accordance with MIL-PRF-21038                                                                            |
| Insulation Resistance           | MΩ   | 1,000 min.   | At 250 Vdc using Method 302, Test Condition B, MIL-STD-202                                                  |
| Pulse Width (Output Pulse)      | μs   | 2            | Tested using FIGURE 3 with resulting FIGURE 1 waveform.                                                     |
| Overshoot                       | V    | ± 1 max.     | Tested using FIGURE 3 with resulting FIGURE 1 waveform.                                                     |
| Rise Time (of Output Pulse)     | ns   |              | Tested using FIGURE 3 with resulting FIGURE 1 waveform.<br>See respective ELECTRICAL CHARACTERISTICS TABLE. |
| Common Mode Rejection           | dB   | 45           | Tested using FIGURE 2.                                                                                      |
| Operating Temperature Range     | °C   | -55° - +130° | See respective ELECTRICAL CHARACTERISTICS TABLE                                                             |
| Droop                           | %    | ≤ 20         | Tested using FIGURE 3 with resulting FIGURE 1 waveform.                                                     |
| DC Resistance                   | Ω    | —            | See respective ELECTRICAL CHARACTERISTICS TABLE                                                             |
| Input Impedance                 | Ω    | —            | See respective ELECTRICAL CHARACTERISTICS TABLE.                                                            |

**CONFIGURATION A**

## Notes:

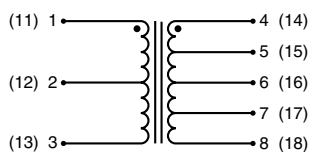
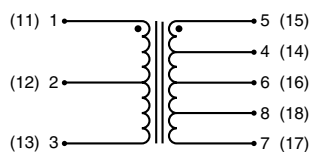
(1) Dimensions are in inches (mm).

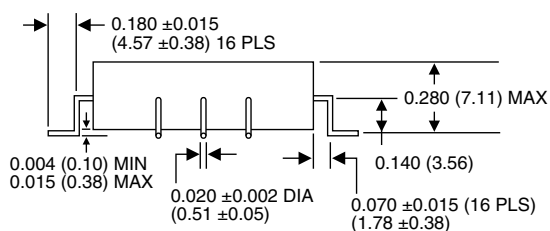
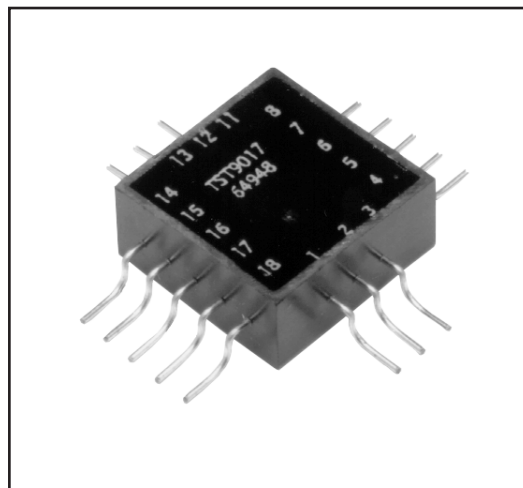
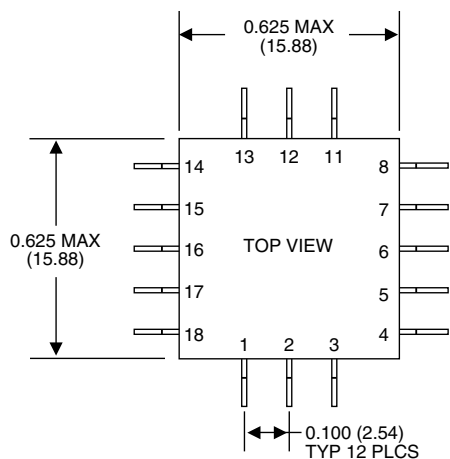
(2) Unless otherwise specified, tolerance is  $\pm 0.010$  inches (0.25mm)**TABLE 2. ELECTRICAL CHARACTERISTICS - CONFIGURATION A**

| BETA P/N | TURNS RATIO                          | PRIMARY                    | SECONDARY                  | DC RESISTANCE $\Omega$ (MAX)           | OUTPUT RISETIME (MAX) | IMPEDANCE $\Omega$ (MIN) |
|----------|--------------------------------------|----------------------------|----------------------------|----------------------------------------|-----------------------|--------------------------|
| TST-9000 | 2:5 $\pm 3\%$<br>4:7 $\pm 3\%$       | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (4-8) (14-18)<br>3,000   |
| TST-9001 | 1:0.83 $\pm 3\%$<br>1:0.60 $\pm 3\%$ | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>3,000   |
| TST-9002 | 1.4:1 $\pm 3\%$<br>2:1 $\pm 3\%$     | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>7,200   |
| TST-9003 | 1:1 $\pm 3\%$<br>1:0.707 $\pm 3\%$   | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9004 | 1.25:1 $\pm 3\%$<br>1.66:1 $\pm 3\%$ | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.2<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9005 | 2.3:1 $\pm 3\%$<br>3.2:1 $\pm 3\%$   | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.2<br>(4-8) (14-18) 3.0 | 150 ns                | (5-7) (15-17)<br>3,000   |
| TST-9006 | 2.12:1 $\pm 3\%$<br>1.5:1 $\pm 3\%$  | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.1<br>(4-8) (14-18) 3.0 | 200 ns                | (4-8) (14-18)<br>4,000   |
| TST-9007 | 1:2.5 $\pm 3\%$<br>1:1.79 $\pm 3\%$  | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 4.0 | 250 ns                | (4-8) (14-18)<br>3,000   |

## Note:

Wave soldering method shall preheat leads to a temperature of 100° C minimum and 140° C maximum at a rate of 2° C per second. Solder wave temperature to be 245°C nominal, 265°C maximum, with a nominal dwell time of 3 seconds and a maximum dwell time of 5 seconds.

CIRCUIT DIAGRAM FOR TST-9000,  
9001, 9002, 9003, 9004, 9006, 9007CIRCUIT DIAGRAM FOR  
DASH NUMBER TST-9005

**CONFIGURATION B**

## Notes:

(1) Dimensions are in inches (mm).

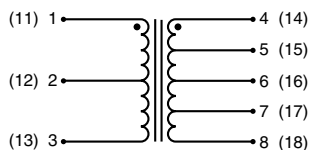
(2) Unless otherwise specified, tolerance is ±0.010 inches (0.25mm)

**TABLE 3. ELECTRICAL CHARACTERISTICS - CONFIGURATION B**

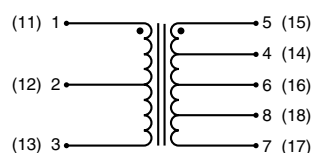
| BETA P/N | TURNS RATIO              | PRIMARY                    | SECONDARY                  | DC RESISTANCE $\Omega$ (MAX)           | OUTPUT RISETIME (MAX) | IMPEDANCE $\Omega$ (MIN) |
|----------|--------------------------|----------------------------|----------------------------|----------------------------------------|-----------------------|--------------------------|
| TST-9010 | 2:5 ±3%<br>4:7 ±3%       | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (4-8) (14-18)<br>3,000   |
| TST-9011 | 1:0.83 ±3%<br>1:0.60 ±3% | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>3,000   |
| TST-9012 | 1.4:1 ±3%<br>2:1 ±3%     | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>7,200   |
| TST-9013 | 1:1 ±3%<br>1:0.707 ±3%   | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9014 | 1.25:1 ±3%<br>1.66:1 ±3% | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.2<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9015 | 2.3:1 ±3%<br>3.2:1 ±3%   | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.2<br>(4-8) (14-18) 3.0 | 150 ns                | (5-7) (15-17)<br>3,000   |
| TST-9016 | 2.12:1 ±3%<br>1.5:1 ±3%  | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.1<br>(4-8) (14-18) 3.0 | 200 ns                | (4-8) (14-18)<br>4,000   |
| TST-9017 | 1:2.5 ±3%<br>1:1.79 ±3%  | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 4.0 | 250 ns                | (4-8) (14-18)<br>3,000   |

## Note:

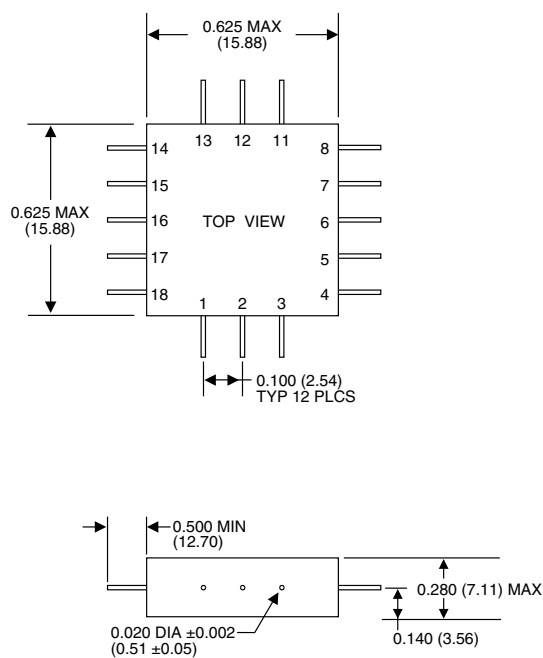
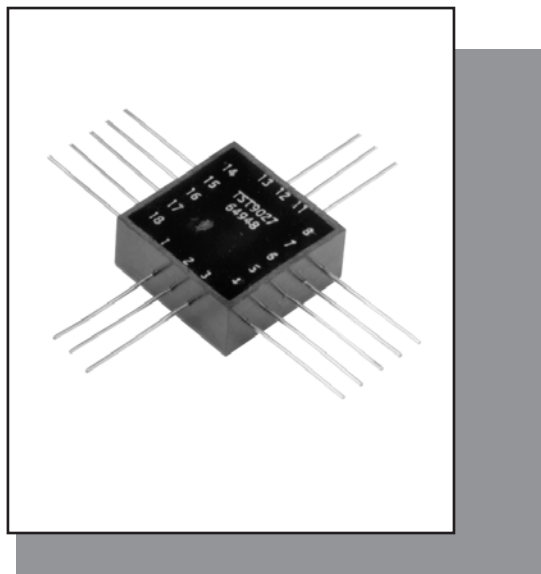
These transformers have been classified as Level 5A IPC-9503 and must be processed accordingly. To ensure product integrity and maintain the product warranty, these transformers require a 24 hour bake at +125°C prior to any solder reflow processing. Dried transformers must be reflowed within 24 hours. J-STD-033 preconditioning (dry-pack) can be provided by Beta upon request. Reflow process must not cause the peak body temperature of the device to exceed 225°C and must not expose the device to temperatures above 183°C for more than 90 seconds.



CIRCUIT DIAGRAM FOR TST-9010, 9111, 9012, 9013, 9014, 9016, 9017



CIRCUIT DIAGRAM FOR DASH NUMBER TST-9015

**CONFIGURATION C**

## Notes:

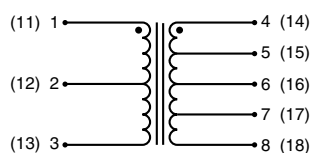
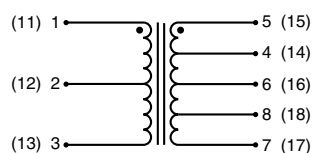
- (1) Dimensions are in inches (mm).  
 (2) Unless otherwise specified, tolerance is  $\pm 0.010$  inches (0.25mm)

**TABLE 4. ELECTRICAL CHARACTERISTICS - CONFIGURATION C**

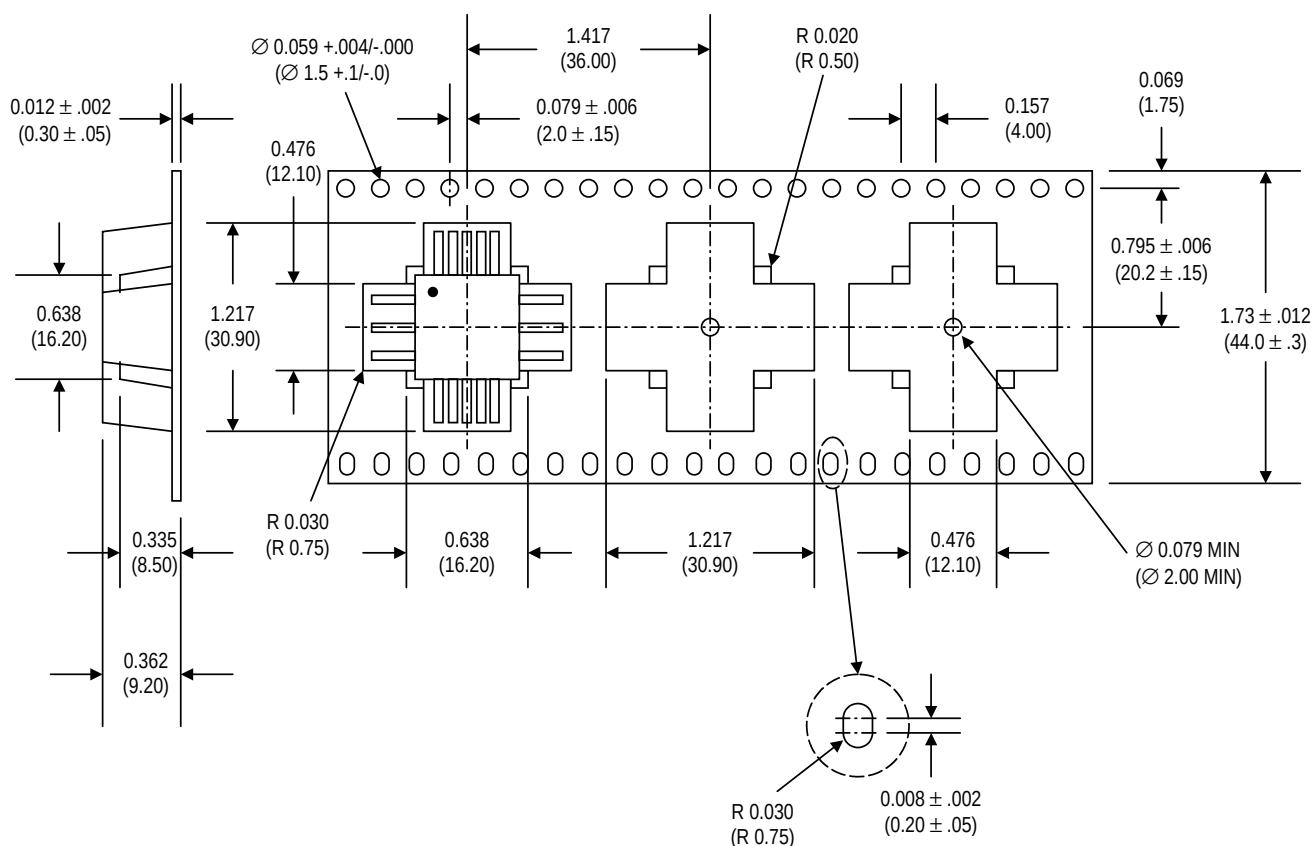
| BETA P/N | TURNS RATIO                          | PRIMARY                    | SECONDARY                  | DC RESISTANCE $\Omega$ (MAX)           | OUTPUT RISETIME (MAX) | IMPEDANCE $\Omega$ (MIN) |
|----------|--------------------------------------|----------------------------|----------------------------|----------------------------------------|-----------------------|--------------------------|
| TST-9020 | 2:5 $\pm 3\%$<br>4:7 $\pm 3\%$       | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (4-8) (14-18)<br>3,000   |
| TST-9021 | 1:0.83 $\pm 3\%$<br>1:0.60 $\pm 3\%$ | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>3,000   |
| TST-9022 | 1.4:1 $\pm 3\%$<br>2:1 $\pm 3\%$     | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>7,200   |
| TST-9023 | 1:1 $\pm 3\%$<br>1:0.707 $\pm 3\%$   | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.0<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9024 | 1.25:1 $\pm 3\%$<br>1.66:1 $\pm 3\%$ | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.2<br>(4-8) (14-18) 3.0 | 150 ns                | (1-3) (11-13)<br>4,000   |
| TST-9025 | 2.3:1 $\pm 3\%$<br>3.2:1 $\pm 3\%$   | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.2<br>(4-8) (14-18) 3.0 | 150 ns                | (5-7) (15-17)<br>3,000   |
| TST-9026 | 2.12:1 $\pm 3\%$<br>1.5:1 $\pm 3\%$  | 4-8 (14-18)<br>5-7 (15-17) | 1-3 (11-13)<br>1-3 (11-13) | (1-3) (11-13) 1.1<br>(4-8) (14-18) 3.0 | 200 ns                | (4-8) (14-18)<br>4,000   |
| TST-9027 | 1:2.5 $\pm 3\%$<br>1:1.79 $\pm 3\%$  | 1-3 (11-13)<br>1-3 (11-13) | 4-8 (14-18)<br>5-7 (15-17) | (1-3) (11-13) 3.5<br>(4-8) (14-18) 4.0 | 250 ns                | (4-8) (14-18)<br>3,000   |

## Note:

These transformers have been classified as Level 5A IPC-9503 and must be processed accordingly. To ensure product integrity and maintain the product warranty, these transformers require a 24 hour bake at  $+125^{\circ}\text{C}$  prior to any solder reflow processing. Dried transformers must be reflowed within 24 hours. J-STD-033 preconditioning (dry-pack) can be provided by Beta upon request. Reflow process must not cause the peak body temperature of the device to exceed  $225^{\circ}\text{C}$  and must not expose the device to temperatures above  $183^{\circ}\text{C}$  for more than 90 seconds.

CIRCUIT DIAGRAM FOR TST-9020,  
9021, 9022, 9023, 9024, 9026, 9027CIRCUIT DIAGRAM FOR  
DASH NUMBER TST-9025

(AVAILABLE) TAPE AND REEL PACKAGING



PARTS PACKAGED ON 13" DIAMETER REEL,  
160 PARTS PER FULL REEL.

DIMENSIONS ARE IN  
INCHES (MM)

TOLERANCES  
.XXX (.XX) =  $\pm .004$  (0.10)

The information in this data sheet is believed to be accurate; however, no responsibility is assumed by Beta Transformer Technology Corporation for its use, and no license or rights are granted by implication or otherwise in connection therewith. Specifications are subject to change without notice.

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TECHNOLOGY CORPORATION**

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