

**SILICON CONTROLLED RECTIFIERS (SCR)****(FOR PHASE CONTROL APPLICATIONS)**

T-25-01

| DC or Pk Volts<br>$V_{DRM}$       | $I_{T(RMS)}$ Maximum Forward Current Amps (All Conducting Angles) |                         |                      |              |                 |         |         |                      |              |                 |         |
|-----------------------------------|-------------------------------------------------------------------|-------------------------|----------------------|--------------|-----------------|---------|---------|----------------------|--------------|-----------------|---------|
|                                   | 0.8A<br>Sensitive<br>Gate                                         | 3A<br>Sensitive<br>Gate | 4A<br>Sensitive Gate |              | 5A              |         | 7A      | 8A<br>Sensitive Gate |              | 8A              | 10A     |
| 25                                |                                                                   |                         |                      |              |                 |         |         |                      |              | NTE5480         |         |
| 30                                | NTE5400                                                           |                         | NTE5411              | NTE5452      |                 |         |         |                      |              |                 |         |
| 50                                |                                                                   |                         |                      | NTE5453      | NTE5470         |         |         | NTE5442              |              | NTE5481         | NTE5461 |
| 60                                | NTE5401                                                           |                         | NTE5412              |              |                 |         |         |                      |              |                 |         |
| 100                               | NTE5402                                                           |                         | NTE5413              | NTE5454      | NTE5471         |         |         |                      |              | NTE5482         | NTE5462 |
| 150                               | NTE5403                                                           |                         |                      |              |                 |         |         |                      |              |                 |         |
| 200                               | NTE5404                                                           | NTE5408                 | NTE5414              | NTE5455      | NTE5472         | NTE5511 | NTE5427 | NTE5444              |              | NTE5483         | NTE5463 |
| 250                               |                                                                   |                         |                      |              |                 |         |         |                      |              |                 |         |
| 300                               |                                                                   |                         |                      | NTE5456      | NTE5473         |         |         |                      |              | NTE5484         |         |
| 400                               | NTE5405                                                           | NTE5409                 | NTE5415              | NTE5457      | NTE5474         | NTE5512 | NTE5428 | NTE5446              | NTE5437      | NTE5485         | NTE5465 |
| 500                               |                                                                   |                         |                      |              | NTE5475         |         |         |                      |              | NTE5486         |         |
| 600                               | NTE5406                                                           | NTE5410                 | NTE5416              | NTE5458      | NTE5476         | NTE5513 | NTE5429 | NTE5448              | NTE5438      | NTE5487         | NTE5466 |
| 700                               |                                                                   |                         |                      |              |                 |         |         |                      |              |                 |         |
| 800                               |                                                                   |                         |                      |              |                 |         |         |                      |              |                 | NTE5468 |
| 1200                              |                                                                   |                         |                      |              |                 |         |         |                      |              |                 |         |
| $I_{GT} \text{ Max}^*$            | 200 $\mu$ A#                                                      | 10mA                    | 200 $\mu$ A#         | 200 $\mu$ A# | 10mA            | 15mA    | 25mA    | 30mA                 | 200 $\mu$ A# | 30mA            | 15mA    |
| $V_{GT} \text{ Max (V)}$          | 0.8                                                               | 1.5                     | 1.0                  | 1.5          | 1.5             | 2.0     | 1.5     | 1.5                  | 0.08         | 1.5             | 1.5     |
| $I_{Hold} \text{ Max (mA)}$       | 5                                                                 | 20                      | 5                    | 3            | 25              | 20      | 50      | 40                   | 3            | 30              | 20      |
| $V_{F(on)} \text{ (V)}$           | 1.7                                                               | 1.6                     | 2.0                  | 2.2          | 2.0             | 2.8     | 2.6     | 1.5                  | 1.6          | 2.0             | 2.0     |
| $I_{Surge} \text{ (A)}$           | 20                                                                | 30                      | 25                   | 20           | 100             | 60      | 100     | 80                   | 100          | 100             | 100     |
| $V_{GFM} \text{ (V)}$             | 8                                                                 | 10                      | 6                    | 6            | 6               | 10      | —       | 10                   | 6            | 10              | 6       |
| $V_{GRM} \text{ (V)}$             | 8                                                                 | 10                      | 6                    | 6            | 6               | 5       | —       | 10                   | 6            | 10              | 6       |
| Diag. No.                         | 9m                                                                | 25c                     | 7c                   | 10f          | 110b            | 6b      | 25c     | 33b                  | 11e          | 110b            | 11e     |
| Mounting<br>Torque<br>in•lb (m•N) | —                                                                 | —                       | —                    | —            | 20 (2.22)       | —       | —       | —                    | —            | 20 (2.22)       | —       |
| Thread Size                       | —                                                                 | —                       | —                    | —            | 10-32<br>UNF-2A | —       | —       | —                    | —            | 10-32<br>UNF-2A | —       |
| Case Style                        | TO92                                                              | TO5                     | TO126                | TO202        | TO64            | TO66    | TO5     | TO127                | TO220        | TO64            | TO220   |

# Connect a 1K $\Omega$  resistor between the gate and cathode.\*  $I_{GT} \text{ (max)}$  is the maximum gate current required to switch a thyristor to the on state.  
This value is positive for P-Gate and negative for N-Gate thyristors.

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| DC or Pk Volts<br>$V_{DRM}$    | $I_T(\text{RMS})$ Maximum Forward Current Amps (All Conducting Angles) |                   |                  |         |                  |                   |                  |         |                  |                  |                   |
|--------------------------------|------------------------------------------------------------------------|-------------------|------------------|---------|------------------|-------------------|------------------|---------|------------------|------------------|-------------------|
|                                | 10A<br>Sensitive Gate                                                  | 10A               | 12.5A            | 16A     | 20A              | 25A               | 35A              | 35A     |                  |                  |                   |
| 25                             |                                                                        |                   |                  | NTE5500 |                  | NTE5520           |                  |         |                  |                  |                   |
| 30                             |                                                                        |                   |                  |         |                  |                   |                  |         |                  |                  |                   |
| 50                             |                                                                        |                   |                  | NTE5501 |                  | NTE5521           | NTE5550          | NTE5541 |                  |                  |                   |
| 60                             |                                                                        |                   |                  |         |                  |                   |                  |         |                  |                  |                   |
| 100                            |                                                                        | NTE5491           |                  | NTE5502 |                  | NTE5522           |                  | NTE5542 |                  |                  |                   |
| 150                            |                                                                        |                   |                  | NTE5503 |                  | NTE5523           |                  |         |                  |                  |                   |
| 200                            | NTE5417                                                                | NTE5492           |                  | NTE5504 | NTE5514          | NTE5524           | NTE5552          | NTE5543 | NTE5517          | NTE5562          |                   |
| 250                            |                                                                        |                   |                  | NTE5505 |                  | NTE5525           |                  |         |                  |                  |                   |
| 300                            |                                                                        |                   |                  | NTE5506 |                  | NTE5526           |                  | NTE5544 |                  |                  |                   |
| 400                            | NTE5418                                                                | NTE5426           | NTE5494          | NTE314  | NTE5507          | NTE5515           | NTE5527          | NTE5554 | NTE5545          | NTE5518          | NTE5564           |
| 500                            |                                                                        |                   |                  | NTE5508 |                  | NTE5528           |                  | NTE5546 |                  |                  |                   |
| 600                            | NTE5419                                                                | NTE5496           |                  | NTE5509 | NTE5516          | NTE5529           | NTE5556          | NTE5547 | NTE5519          | NTE5566          |                   |
| 700                            |                                                                        |                   |                  |         |                  | NTE5530           |                  |         |                  |                  |                   |
| 800                            |                                                                        |                   |                  |         |                  | NTE5531           | NTE5558          | NTE5548 |                  |                  |                   |
| 1200                           |                                                                        |                   |                  |         |                  |                   |                  |         |                  |                  |                   |
| $I_{GT} \text{ Max}^*$         | 15mA                                                                   | 200 $\mu$ A       | 15mA             | 40mA    | 30mA             | 15mA              | 40mA             | 30mA    | 30mA             | 30mA             | 30mA              |
| $V_{GT} \text{ Max (V)}$       | 1.5                                                                    | 0.8               | 2                | 2       | 1.5              | 2                 | 3                | 1.5     | 2                | 2                | 2                 |
| $I_{Hold} \text{ Max (mA)}$    | 30                                                                     | 3                 | 20               | 50      | 40               | 20                | 50               | 40      | 50               | 50               | 50                |
| $V_{F(on)} \text{ (V)}$        | 1.6                                                                    | 1.6               | 2.5              | 1.8     | 1.6              | 2.4               | 2                | 1.6     | 1.6              | 1.6              | 1.6               |
| $I_{Surge} \text{ (A)}$        | 100                                                                    | 100               | 100              | 200     | 150              | 200               | 150              | 300     | 300              | 300              | 300               |
| $V_{GFM} \text{ (V)}$          | —                                                                      | —                 | 10               | —       | 10               | 10                | 10               | —       | 10               | 10               | 10                |
| $V_{GRM} \text{ (V)}$          | —                                                                      | —                 | 10               | —       | 5                | 5                 | 5                | —       | 10               | 10               | 10                |
| Diag. No.                      | 11d                                                                    | 11d               | 111b             | 118     | 111b             | 112               | 111b             | 11e     | 111b             | 111b             | 113a              |
| Mounting Torque<br>in·lb (m·N) | —                                                                      | —                 | 30 (3.33)        | —       | 30 (3.33)        | —                 | 30 (3.33)        | —       | 30 (3.33)        | 30 (3.33)        | 30 (3.33)         |
| Thread Size                    | —                                                                      | —                 | 1/4-28<br>UNF-2A | —       | 1/4-28<br>UNF-2A | —                 | 1/4-28<br>UNF-2A | —       | 1/4-28<br>UNF-2A | 1/4-28<br>UNF-2A | 1/4-28<br>UNF-2A  |
| Case Style                     | TO220<br>Isolated                                                      | TO220<br>Isolated | TO48             | TO3     | TO48             | 1/2"<br>Press Fit | TO48             | TO220   | TO48             | TO48             | TO48<br>Isol Stud |

\*  $I_{GT} \text{ (max)}$  is the maximum gate current required to switch a thyristor to the on state.  
This value is positive for P-Gate and negative for N-Gate thyristors.

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| DC or Pk<br>Volts<br><br>V <sub>DRM</sub> | I <sub>T(RMS)</sub> Maximum Forward Current Amps (All Conducting Angles) |                   |         |                           |                  |                  |                  |                  |                             |                  |                             |                             |
|-------------------------------------------|--------------------------------------------------------------------------|-------------------|---------|---------------------------|------------------|------------------|------------------|------------------|-----------------------------|------------------|-----------------------------|-----------------------------|
|                                           | 40A                                                                      | 50A               | 55A     | 65A                       | 80A              | 125A             |                  | 275A             | 470A                        | 550A             | 850A                        | 1800A                       |
| 200                                       |                                                                          |                   |         |                           | NTE5567          | NTE5570          | NTE5575          | NTE5580          | NTE5590                     |                  | NTE5594                     |                             |
| 250                                       |                                                                          |                   |         |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 300                                       |                                                                          |                   |         |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 400                                       |                                                                          |                   | NTE5539 |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 500                                       |                                                                          |                   |         |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 600                                       |                                                                          |                   |         | NTE5534                   | NTE5568          | NTE5572          | NTE5577          | NTE5582          | NTE5591                     | NTE5587          | NTE5595                     | NTE5598                     |
| 700                                       |                                                                          |                   |         |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 800                                       | NTE5536                                                                  | NTE5538           | NTE5540 |                           |                  |                  |                  |                  |                             |                  |                             |                             |
| 1200                                      |                                                                          |                   |         |                           | NTE5569          | NTE5574          | NTE5579          | NTE5584          | NTE5592                     | NTE5589          | NTE5596                     | NTE5599                     |
| I <sub>GT</sub> Max*                      | 50mA                                                                     | 80mA              | 40mA    | 25mA                      | 100mA            | 150mA            | 150mA            | 150mA            | 150mA                       | 150mA            | 150mA                       | 200mA                       |
| V <sub>GT</sub> Max<br>(V)                | 1.5                                                                      | 3                 | 1.5     | 2                         | 2.5              | 3                | 3                | 3                | 3                           | 3                | 3                           | 3                           |
| I <sub>Hold</sub> Max<br>(mA)             | 60                                                                       | 150               | 60      | 50                        | 200              | —                | —                | —                | —                           | —                | —                           | —                           |
| V <sub>F(on)</sub><br>(V)                 | 1.6                                                                      | 2                 | 1.8     | 1.8                       | 1.6              | 1.95             | 2.2              | 1.5              | 1.55                        | 1.4              | 1.4                         | 1.35                        |
| I <sub>Surge</sub> (A)                    | 400                                                                      | 525               | 650     | 700                       | 1255             | 1800             | 1600             | 5500             | 5500                        | 10,000           | 10,000                      | 27,000                      |
| V <sub>GFM</sub> (V)                      | —                                                                        | 15                | —       | —                         | 20               | 4                | —                | 4                | 5                           | 5                | 5                           | 5                           |
| V <sub>GRM</sub> (V)                      | —                                                                        | 5                 | —       | —                         | 5                | 5                | 5                | 5                | 5                           | 5                | 5                           | 5                           |
| Diag. No.                                 | 11e                                                                      | 55c               | 55c     | 382a                      | 117              | 114              | 115              | 116              | 347                         | 177              | 346                         | 404                         |
| Mounting<br>Torque<br>in•lb<br>(m•N)      | —                                                                        | —                 | —       | —                         | 30 (3.33)        | 130<br>(14.46)   | 130<br>(14.46)   | 360<br>(40.06)   | 1400 lbs<br>(6.2 kN)        | 360<br>(40.06)   | 2400 lbs<br>(10.7 kN)       | 5500 lbs<br>(24.5 kN)       |
| Thread<br>Size                            | —                                                                        | —                 | —       | —                         | 1/4–28<br>UNF–2A | 1/2–20<br>UNF–2A | 1/2–20<br>UNF–2A | 3/4–16<br>UNF–2A | —                           | 3/4–16<br>UNF–2A | —                           | —                           |
| Case<br>Style                             | TO220                                                                    | TO218<br>Isolated | TO218   | TO3<br>Isolated<br>Square | TO65             | TO94             | TO83             | TO93             | Hockey<br>Puck<br>1.65" Dia | TO118            | Hockey<br>Puck<br>2.25" Dia | Hockey<br>Puck<br>2.25" Dia |

**SILICON CONTROLLED RECTIFIERS (SCR)****(FOR HIGH SPEED SWITCHING)**

T-25-01

| DC or Pk Volts<br>$V_{DRM}$               | $I_T(RMS)$ Maximum Forward Current Amps (All Conducting Angles) |                  |                  |                  |                  |                             |                  |                            |
|-------------------------------------------|-----------------------------------------------------------------|------------------|------------------|------------------|------------------|-----------------------------|------------------|----------------------------|
|                                           | 5A                                                              | 35A              | 125A             |                  | 275A             | 400A                        | 475A             | 700A                       |
| 800                                       | NTE5351                                                         | NTE5360          | NTE5368          | NTE5371          | NTE5374          | NTE5380                     | NTE5377          | NTE5386                    |
| 1200                                      |                                                                 |                  | NTE5369          | NTE5372          | NTE5375          | NTE5381                     | NTE5378          | NTE5387                    |
| $I_{GT}$ Max                              | 50mA                                                            | 180mA            | 150mA            | 150mA            | 150mA            | 150mA                       | 150mA            | 150mA                      |
| $V_{GT}$ Max (V)                          | 2                                                               | 3                | 3                | 3                | 3                | 3                           | 3                | 3                          |
| $I_{Hold}$ Max (mA)                       | 100                                                             | 150              | —                | —                | —                | —                           | —                | —                          |
| $V_{F(on)}$ Max (V)                       | 2.06                                                            | 2.05             | 3.2              | 3.3              | 1.85             | 1.85                        | 1.45             | 1.45                       |
| $I_{Surge}$ (A)                           | 90                                                              | 180              | 1400             | 1400             | 4500             | 4500                        | 8000             | 8000                       |
| Repetitive di/dt<br>Amps/ $\mu$ s Max     | —                                                               | —                | 150              | 150              | 300              | 300                         | 400              | 400                        |
| Non-Repetitive di/dt<br>Amps/ $\mu$ s Max | 500                                                             | 400              | 800              | 800              | 800              | 800                         | 500              | 800                        |
| dv/dt Volts/ $\mu$ s Max                  | 400 (Typ)                                                       | 200              | 200              | 200              | 300              | 300                         | 300              | 300                        |
| Turn-Off $t_q$ $\mu$ s Max                | 2.9 (Typ)                                                       | 10               | 10               | 10               | 10               | 15                          | 25               | 25                         |
| Diag. No.                                 | 6b                                                              | 111b             | 115              | 114              | 116              | 347                         | 177              | 346                        |
| Mounting Torque<br>in•lb (m•N)            | —                                                               | 30 (3.33)        | 130 (14.46)      | 130 (14.46)      | 360 (40.06)      | 1400 lbs<br>(6.2 kN)        | 360 (40.06)      | 2400 lbs<br>(10.7 kN)      |
| Thread Size                               | —                                                               | 1/4-28<br>UNF-2A | 1/2-20<br>UNF-2A | 1/2-20<br>UNF-2A | 3/4-16<br>UNF-2A | —                           | 3/4-16<br>UNF-2A | —                          |
| Case Style                                | TO66                                                            | TO48             | TO83             | TO94             | TO93             | Hockey<br>Puck<br>1.65" Dia | TO118            | Hockey<br>Puck<br>2.3" Dia |

**SILICON CONTROLLED RECTIFIERS (SCR)****(HIGH SPEED SWITCHING APPLICATIONS)**

| NTE Type<br>Number | Description and Application | Case<br>Style | Diagram<br>Number | Repetitive<br>Peak<br>Forward<br>Off-State<br>Voltage<br>(Volts) | RMS<br>On-State<br>Current<br>(Amps) | Peak<br>Forward<br>Surge<br>Current<br>(Amps) | Maximum Ratings                       |                                    |                                |                            | Typical<br>Reverse<br>Recovery<br>Time<br>( $\mu$ s) |
|--------------------|-----------------------------|---------------|-------------------|------------------------------------------------------------------|--------------------------------------|-----------------------------------------------|---------------------------------------|------------------------------------|--------------------------------|----------------------------|------------------------------------------------------|
|                    |                             |               |                   | $V_{DRM}$                                                        | $I_T(RMS)$                           | $I_{TSM}$                                     | Gate<br>Trigger<br>Voltage<br>(Volts) | Gate<br>Trigger<br>Current<br>(mA) | Turn-Off<br>Time<br>( $\mu$ s) | Holding<br>Current<br>(mA) | $t_{rr}$                                             |
| 230                | Deflection Circuit of TV    | TO66          | 6b                | 700                                                              | 8                                    | 90                                            | 2.0                                   | 50                                 | 1.8                            | 100                        | —                                                    |
| 231                | Deflection Circuit of TV    | TO66          | 6b                | 600                                                              | 8                                    | 90                                            | 2.0                                   | 50                                 | 3.8                            | 100                        | —                                                    |
| 314                | Power Regulating Switch     | TO3           | 118               | 400                                                              | 12.5                                 | 200                                           | 2.0                                   | 40                                 | 20 Typ                         | 50                         | 5                                                    |

# SILICON GATE CONTROLLED SWITCH

## (GATE TURN OFF THYRISTOR)

T-25-01

| NTE Type Number | Description and Application                       | Case Style | Diagram Number | Repetitive Peak Forward Off-State Voltage (Volts) | RMS On-State Current (Amps) | Surge Current (Amps) | Maximum Ratings              |                           |                      | Typical Turn-Off Time ( $\mu$ s) |
|-----------------|---------------------------------------------------|------------|----------------|---------------------------------------------------|-----------------------------|----------------------|------------------------------|---------------------------|----------------------|----------------------------------|
|                 |                                                   |            |                |                                                   |                             |                      | Gate Trigger Voltage (Volts) | Gate Trigger Current (mA) | Holding Current (mA) |                                  |
|                 |                                                   |            |                | $V_{DRM}$                                         | $I_{T(RMS)}$                | $I_{SURGE}$          | $V_{GT}$                     | $I_{GT}$                  | $I_{HOLD}$           | $t_q$                            |
| 5424            | High Speed Switch, Power Supply Control Regulator | TO220      | 11e            | 400                                               | 4.7                         | 55                   | 3                            | 20                        | 135                  | 4                                |

### DESCRIPTION:

The NTE5424 is an all-diffused silicon controlled rectifier (reverse-blocking triode thyristor) intended for high speed switching applications such as power inverters, switching regulators, and high current pulse applications. This device features fast turn-off, high dv/dt, and high di/dt characteristics and may be used at frequencies up to 25kHz.

### Features:

- Fast turn-off time ( $t_q$ ) = 6 $\mu$ s Max.
- High di/dt and dv/dt capabilities
- Shorted-emitter gate-cathode construction (contains an internally diffused resistor between the gate and cathode)
- Low thermal resistance
- Center-gate construction (provides rapid uniform gate-current spreading for faster turn-on with substantially reduced heating effects)

# SILICON CONTROLLED RECTIFIERS (SCR)

## (FOR TV HORIZONTAL DEFLECTION)

| NTE Type Number | Case Style | Diagram Number | Repetitive Peak Forward Off-State Voltage (Volts) | RMS On-State Current (Amps) | Surge Current (Amps) | Maximum Ratings          |                           |                              |                      | Typical Turn-Off Time ( $\mu$ s) | Rate of Rise Voltage (V/ $\mu$ s) |
|-----------------|------------|----------------|---------------------------------------------------|-----------------------------|----------------------|--------------------------|---------------------------|------------------------------|----------------------|----------------------------------|-----------------------------------|
|                 |            |                |                                                   |                             |                      | On-State Voltage (Volts) | Gate Trigger Current (mA) | Gate Trigger Voltage (Volts) | Holding Current (mA) |                                  |                                   |
|                 |            |                | $V_{DRM}$                                         | $I_{T(RMS)}$                | $I_{SURGE}$          | $V_T$                    | $I_{GT}$                  | $V_{GT}$                     | $I_{HOLD}$           | $t_q$                            | dv/dt                             |
| 230             | TO66       | 6b             | 700                                               | 8                           | 90                   | 2.16                     | 50                        | 2                            | 100                  | 1.8                              | 400                               |
| 231             | TO66       | 6b             | 600                                               | 8                           | 90                   | 2.16                     | 50                        | 2                            | 100                  | —                                | 400                               |

**SILICON CONTROLLED RECTIFIERS (SCR)****(TV POWER SUPPLY SWITCHING)**

T-25-01

| NTE<br>Type<br>No. | Description<br>and<br>Application    | Case Style       | Diag.<br>No. | Repetitive<br>Peak Forward<br>Off-State<br>Voltage<br>(Volts) | Maximum Ratings                        |                                        |                                |                                       |                                    | Typical<br>Turn-On<br>Delay Time<br>(mS) | Typical<br>Turn-On<br>Rise Time<br>(mS) | Typical<br>Holding<br>Current<br>(mA) |
|--------------------|--------------------------------------|------------------|--------------|---------------------------------------------------------------|----------------------------------------|----------------------------------------|--------------------------------|---------------------------------------|------------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|
|                    |                                      |                  |              |                                                               | On-State<br>Anode<br>Current<br>(Amps) | Surge<br>On-State<br>Current<br>(Amps) | On-State<br>Voltage<br>(Volts) | Gate<br>Trigger<br>Voltage<br>(Volts) | Gate<br>Trigger<br>Current<br>(mA) |                                          |                                         |                                       |
|                    |                                      |                  |              | $V_{DRM}$                                                     | $I_T$                                  | $I_{TSM}$                              | $V_T$                          | $V_{GT}$                              | $I_{GT}$                           | $t_d$                                    | $t_{rr}$                                | $I_{HOLD}$                            |
| 276                | SCR, Gate Turn Off<br>TV Application | Japanese<br>TO66 | 119          | 1250                                                          | 5                                      | 80                                     | 5.3                            | 1.5                                   | 120                                | 0.2                                      | 1.3                                     | 300                                   |

**INTEGRATED THYRISTOR/RECTIFIER (ITR)**

| NTE<br>Type<br>No. | Description and Application                        | Case<br>Style | Diag.<br>No. | Maximum Ratings                      |                            |                                                               |                                     |                                        | Typical<br>Turn-Off<br>Time<br>( $\mu$ S) | Typical<br>Holding<br>Current<br>(mA) |
|--------------------|----------------------------------------------------|---------------|--------------|--------------------------------------|----------------------------|---------------------------------------------------------------|-------------------------------------|----------------------------------------|-------------------------------------------|---------------------------------------|
|                    |                                                    |               |              | RMS<br>On-State<br>Current<br>(Amps) | Surge<br>Current<br>(Amps) | Repetitive<br>Peak Forward<br>Off-State<br>Voltage<br>(Volts) | Gate<br>Turn-Off<br>Current<br>(mA) | Gate<br>Turn-Off<br>Voltage<br>(Volts) |                                           |                                       |
|                    |                                                    |               |              | $I_{T(RMS)}$                         | $I_{TSM}$                  | $V_{DRM}$                                                     | $I_{GT}$                            | $V_{GT}$                               |                                           |                                       |
| 308                | TV Horizontal Deflection<br>and Commutating Switch | TO66          | 6b           | 8                                    | 80                         | 800                                                           | 50                                  | 2                                      | 5.1                                       | 50                                    |
| 308P               | TV Horizontal Deflection<br>and Commutating Switch | TO220         | 11c          | 8                                    | 80                         | 700                                                           | 45                                  | 4                                      | 4.2                                       | —                                     |
| 310                | TV Horizontal Deflection and Trace Switch          | TO66          | 6b           | 8                                    | 80                         | 800                                                           | 50                                  | 2                                      | 2.9                                       | —                                     |
| 310P               | TV Horizontal Deflection and Trace Switch          | TO220         | 11c          | 8                                    | 80                         | 750                                                           | 40                                  | 4                                      | 2.4                                       | —                                     |

**DESCRIPTION:**

The NTE308 and NTE310 series integrated thyristor/rectifiers are all-diffused power monolithic circuits that incorporate a silicon controlled rectifier and a silicon rectifier on a common pellet. The NTE308 series types are used as bipolar switches to control horizontal yoke current during the beam trace interval; the NTE310 series types are used as commutating switches to initiate trace-retrace switching.

## TRIACS

(LISTED IN ORDER OF  $I_{T-RMS}$ )

T-25-01

| $V_{RRM}$<br>DC or Pk<br>Volts | $I_{T-RMS}$ Maximum Forward Current |           |         |         |         |         |                   |                    |           |
|--------------------------------|-------------------------------------|-----------|---------|---------|---------|---------|-------------------|--------------------|-----------|
|                                | 0.8A                                | 2.5A      |         | 4A      |         | 8A      |                   | 10A                |           |
| 25                             |                                     |           |         | NTE5600 |         |         |                   |                    |           |
| 50                             |                                     |           |         | NTE5601 |         |         |                   |                    | NTE5661   |
| 100                            |                                     | NTE5640   | NTE5650 | NTE5602 |         |         |                   |                    |           |
| 200                            | NTE5655                             | NTE5641   | NTE5651 | NTE5603 |         |         |                   |                    |           |
| 300                            |                                     |           |         | NTE5604 |         |         |                   |                    |           |
| 400                            | NTE5656                             | NTE5642   | NTE5652 | NTE5605 | NTE5629 | NTE5608 | NTE5638           |                    |           |
| 500                            |                                     |           |         | NTE5606 |         |         |                   |                    |           |
| 600                            | NTE5657                             | NTE5643   | NTE5653 | NTE5607 |         | NTE5609 |                   |                    |           |
| 800                            |                                     |           |         |         |         | NTE5610 |                   | NTE5620            |           |
| 1000                           |                                     |           |         |         |         |         |                   |                    |           |
| $I_{GT}$ (mA)*                 | 5 Max                               | 25/40 Max | 3 Max   | 30 Max  | 3 Max   | 10 Max  | 10 Max            | 50/75 Max          | 30/40 Max |
| $V_{GT}$ (V)                   | 2 Max                               | 2.2 Max   | 2.2 Max | 2.5 Max | 2 Max   | 2.5 Max | 2 Max             | 2 Max              | 2 Max     |
| $V_{FON}$ (V)                  | 1.5 Max                             | 1.8 Max   | 2.2 Max | 2 Max   | 1.6 Max | 1.5 Max | 1.6 Max           | 2 Max              | 1.8 Max   |
| $I_{Surge}$ (A)                | 8 Max                               | 25 Max    | 25 Max  | 30 Max  | 40 Max  | 80 Max  | 80 Max            | 100 Max            | 100 Max   |
| $I_{Hold}$ (mA)                | 20 Max                              | 35 Max    | 5 Max   | 30 Max  | 5 Max   | 15 Max  | 15 Max            | 50 Max             | 30 Max    |
| Firing<br>Quads                | All                                 | All       | All     | I, II   | All     | All     | All               | All                | All       |
| Diag. No.                      | 9n                                  | 25b       | 25b     | 7b      | 10g     | 11j     | 11k               | 491                | 110a      |
| Package                        | TO92                                | TO5       | TO5     | TO126   | TO202   | TO220   | TO220<br>Isolated | TO220<br>Full Pack | TO64**    |

\*  $I_{GT}$  (max) is the worst case current required to guarantee turn-on of the device.

\*\* Mounting Torque, in•lb (m•N): TO48 – 30 (3.33); TO64 – 20 (2.22)

| $V_{RRM}$<br>DC or Pk<br>Volts | $I_{T-RMS}$ Maximum Forward Current |         |            |                   |                            |           |                    |                            |                   |            |
|--------------------------------|-------------------------------------|---------|------------|-------------------|----------------------------|-----------|--------------------|----------------------------|-------------------|------------|
|                                | 10A                                 |         |            |                   | 15A                        |           | 20A                | 25A                        |                   |            |
| 25                             | NTE5611                             | NTE5621 |            |                   |                            |           |                    | NTE5680                    |                   |            |
| 50                             | NTE5612                             | NTE5622 | NTE5631    |                   |                            |           |                    | NTE5681                    |                   |            |
| 100                            | NTE5613                             | NTE5623 | NTE5632    |                   |                            |           |                    | NTE5682                    |                   |            |
| 200                            | NTE5614                             |         | NTE5633    |                   | NTE5673                    | NTE56004  |                    | NTE5683                    | NTE56019          | NTE56015   |
| 300                            | NTE5615                             |         | NTE5634    |                   |                            |           |                    | NTE5684                    |                   |            |
| 400                            |                                     |         | NTE5635    |                   | NTE5675                    | NTE56006  |                    | NTE5685                    | NTE56020          | NTE56016   |
| 500                            | NTE5617                             | NTE5627 | NTE5636    |                   | NTE5676                    |           |                    | NTE5686                    |                   |            |
| 600                            | NTE5618                             |         | NTE5637    | NTE5645           | NTE5677                    | NTE56008  |                    | NTE5687                    |                   | NTE56017   |
| 800                            |                                     |         |            |                   |                            | NTE56010  | NTE5671            |                            |                   | NTE56018   |
| 1000                           |                                     |         |            |                   |                            |           |                    |                            |                   |            |
| $I_{GT}$ (mA)*                 | 50/75 Max                           | 50 Max  | 50 Max     | 25/50 Max         | 50/80 Max                  | 40/75 Max | 50/75 Max          | 75/100 Max                 | 50/75 Max         | 50/100 Max |
| $V_{GT}$ (V)                   | 2.5 Max                             | 2 Max   | 2.5 Max    | 2.5 Max           | 2.5 Max                    | 2.5 Max   | 2.5 Max            | 2.5 Max                    | 2.5 Max           | 2.5 Max    |
| $V_{FON}$ (V)                  | 1.8 Max                             | 1.8 Max | 1.65 Max   | 1.6 Max           | 2.2 Max                    | 1.6 Max   | 1.7 Max            | 1.8 Max                    | 1.8 Max           | 1.8 Max    |
| $I_{Surge}$ (A)                | 100 Max                             | 100 Max | 100 Max    | 110 Max           | 150 Max                    | 150 Max   | 150 Max            | 250 Max                    | 200 Max           | 180 Max    |
| $I_{Hold}$ (mA)                | 50 Max                              | 50 Max  | 50 Max     | 50 Max            | 60 Max                     | 40 Max    | 40 Max             | 80 Max                     | 70 Max            | 50 Max     |
| Firing<br>Quads                | All                                 | I, II   | I, II, III | All               | All                        | All       | All                | All                        | All               | All        |
| Diag. No.                      | 33c                                 | 33c     | 11j        | 11k               | 111a                       | 11j       | 491                | 111a                       | 11k               | 11j        |
| Package                        | TO127                               | TO127   | TO220      | TO220<br>Isolated | TO48**<br>1/4-28<br>UNF-2A | TO220     | TO220<br>Full Pack | TO48**<br>1/4-28<br>UNF-2A | TO220<br>Isolated | TO220      |

\*  $I_{GT}$  (max) is the worst case current required to guarantee turn-on of the device.

\*\* Mounting Torque, in•lb (m•N): TO48 – 30 (3.33); TO64 – 20 (2.22)

**TRIACS****(LISTED IN ORDER OF  $I_T$  RMS)**

T-25-01

| $V_{RRM}$<br>DC or Pk<br>Volts | $I_T$ RMS Maximum Forward Current |                           |               |           |                            |                            |                       |                   |            |
|--------------------------------|-----------------------------------|---------------------------|---------------|-----------|----------------------------|----------------------------|-----------------------|-------------------|------------|
|                                | 25A                               |                           |               | 40A       |                            |                            |                       | 45A               |            |
| 25                             |                                   |                           |               |           |                            |                            |                       |                   |            |
| 50                             |                                   |                           |               |           |                            |                            |                       |                   |            |
| 100                            |                                   |                           |               |           |                            |                            |                       |                   |            |
| 200                            |                                   |                           |               |           | NTE5693                    | NTE56022                   |                       | NTE5688           |            |
| 300                            |                                   |                           |               |           |                            |                            |                       |                   |            |
| 400                            |                                   | NTE56014                  |               |           | NTE5695                    | NTE56024                   |                       | NTE5689           |            |
| 500                            |                                   |                           |               |           |                            |                            |                       |                   |            |
| 600                            |                                   |                           | NTE5672       |           | NTE5697                    | NTE56026                   | NTE5679               | NTE5690           | NTE56033   |
| 800                            | NTE5699                           |                           |               | NTE56028  |                            |                            |                       |                   |            |
| 1000                           |                                   |                           |               |           |                            |                            |                       |                   |            |
| $I_{GT}$ (mA)*                 | 50/75 Max                         | 80/100 Max                | 80/100 Max    | 50/75 Max | 50/80 Max                  | 50/80 Max                  | 100 Max               | 50/80 Max         | 50/100 Max |
| $V_{GT}$ (V)                   | 2.5 Max                           | 2.5 Max                   | 2.5 Max       | 2 Max     | 2.5 Max                    | 2.5 Max                    | 2.5 Max               | 2.5 Max           | 1.5 Max    |
| $V_{FON}$ (V)                  | 1.85 Max                          | 1.8 Max                   | 1.8 Max       | 1.85 Max  | 2 Max                      | 2 max                      | 1.8 Max               | 2 Max             | 1.8 Max    |
| $I_{Surge}$ (A)                | 250 Max                           | 250 Max                   | 250 Max       | 350 Max   | 400 Max                    | 300 Max                    | 300 Max               | 400 Max           | 300 Max    |
| $I_{Hold}$ (mA)                | 50 Max                            | 80 Max                    | 80 Max        | 75 Max    | 60 Max                     | 60 Max                     | 100 Max               | 60 Max            | 80 Max     |
| Firing<br>Quads                | All                               | All                       | All           | All       | All                        | All                        | I, II, III            | All               | All        |
| Diag. No.                      | 491                               | 406                       | 172           | 11j       | 111a                       | 113b                       | 178/382b***           | 397               | 55b        |
| Package                        | TO220<br>Full Pack                | TO3<br>Isolated<br>Flange | TO3<br>Swedge | TO220     | TO48**<br>1/4-28<br>UNF-2A | TO40<br>Isolated<br>Flange | TO3<br>Square<br>Pack | 1/2" Press<br>Fit | TO218      |

\*  $I_{GT}$  (max) is the worst case current required to guarantee turn-on of the device.

\*\* Mounting Torque, in•lb (m•N): TO48 – 30 (3.33); TO64 – 20 (2.22)

\*\*\* NTE5679 may be received in either package style depending on availability. Consult factory for current stock.

**INTERNALLY TRIGGERED TRIACS**

| NTE Type<br>Number | Case Style        | Diagram<br>Number | TRIAC Characteristics                                |                                      |                            |                                              |                                                                  | Trigger TRIAC Characteristics                        |                                             |                                      |     |
|--------------------|-------------------|-------------------|------------------------------------------------------|--------------------------------------|----------------------------|----------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------|--------------------------------------|-----|
|                    |                   |                   | Repetitive<br>Peak<br>Blocking<br>Voltage<br>(Volts) | RMS<br>On-State<br>Current<br>(Amps) | Holding<br>Current<br>(mA) | Peak<br>One-Cycle<br>Surge Current<br>(Amps) | Peak<br>On-State<br>Voltage<br>@ I <sub>T</sub> (RMS)<br>(Volts) | Breakover<br>Voltage<br>Forward & Reverse<br>(Volts) | Breakover<br>Voltage<br>Symmetry<br>(Volts) | Peak<br>Breakover<br>Current<br>(μA) |     |
|                    |                   |                   | V <sub>DRM</sub>                                     | I <sub>T</sub> (RMS)                 | I <sub>Hold</sub>          |                                              |                                                                  | V <sub>(BO)</sub>                                    | ΔV <sub>(BO)</sub>                          | I <sub>(BO)</sub>                    |     |
| 5646               | TO220<br>Isolated | 11k               | 600                                                  | 10                                   | 60 Max                     | 120                                          | 1.6                                                              | MIN                                                  | MAX                                         | 3 Max                                | 200 |
|                    |                   |                   |                                                      |                                      |                            |                                              |                                                                  | 30                                                   | 40                                          |                                      |     |

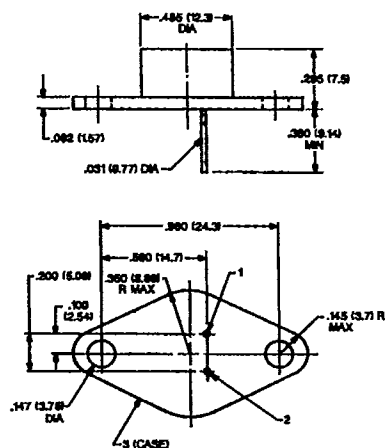
**DESCRIPTION:**

The NTE5646 is a TRIAC that includes a DIAC trigger mounted inside the same package. This device saves the user the expense and assembly time of buying a discrete DIAC and assembling in conjunction with a gated TRIAC. The NTE5646 is a bidirectional AC switch and is gate controlled for either polarity of main terminal voltage.

## DIMENSIONAL OUTLINE DRAWINGS

T-25-01

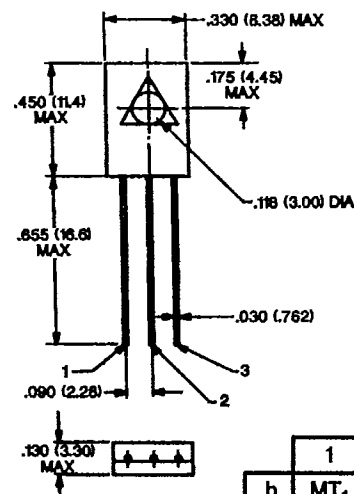
### Diagram 6



TO66

|   |   |   |      |
|---|---|---|------|
|   | 1 | 2 | CASE |
| b | G | K | A    |

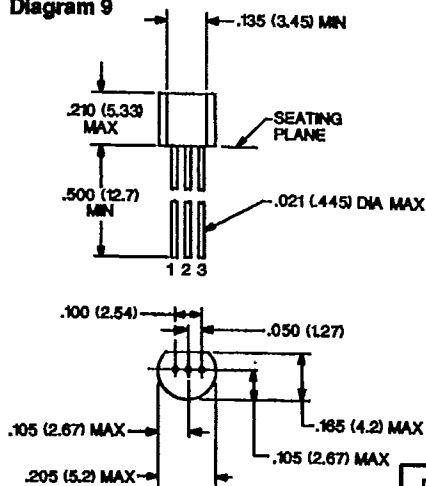
### Diagram 7



TO126

|   |                 |                 |      |
|---|-----------------|-----------------|------|
|   | 1               | 2               | 3    |
| b | MT <sub>1</sub> | MT <sub>2</sub> | Gate |
| c | K               | A               | G    |

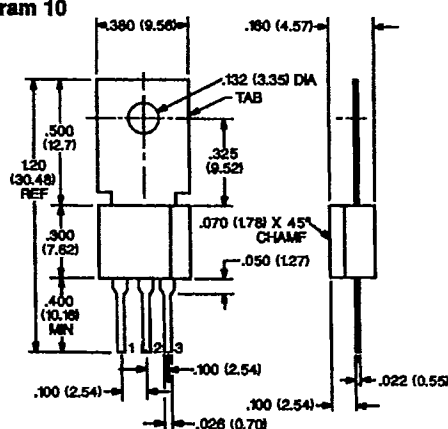
**Diagram 9**



TO92

|   |                 |      |                 |
|---|-----------------|------|-----------------|
|   | 1               | 2    | 3               |
| m | K               | G    | A               |
| n | MT <sub>1</sub> | Gate | MT <sub>2</sub> |

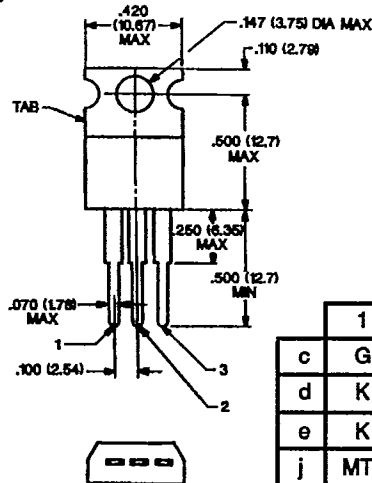
**Diagram 10**



TO202

|   |                 |                 |      |                 |
|---|-----------------|-----------------|------|-----------------|
|   | 1               | 2               | 3    | TAB             |
| f | K               | A               | G    | A               |
| g | MT <sub>1</sub> | MT <sub>2</sub> | Gate | MT <sub>2</sub> |

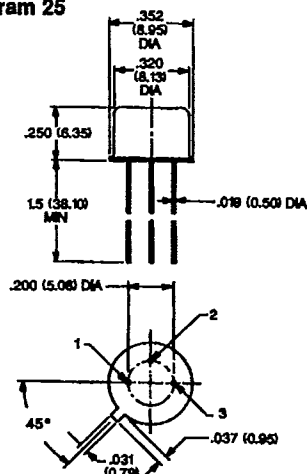
**Diagram 11**



TO220

|   | 1               | 2               | 3    | TAB             |
|---|-----------------|-----------------|------|-----------------|
| c | G               | A               | K    | A               |
| d | K               | A               | G    | Isol            |
| e | K               | A               | G    | A               |
| j | MT <sub>1</sub> | MT <sub>2</sub> | Gate | MT <sub>2</sub> |
| k | MT <sub>1</sub> | MT <sub>2</sub> | Gate | Isol            |

**Diagram 25**



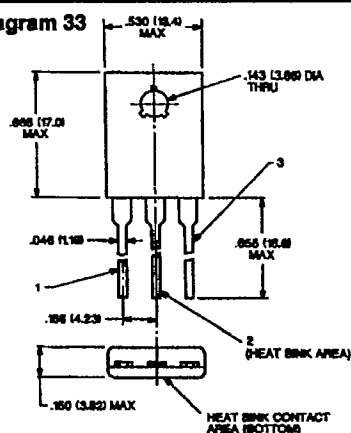
TO5

|   |                 |      |                 |
|---|-----------------|------|-----------------|
|   | 1               | 2    | 3               |
| b | MT <sub>1</sub> | Gate | MT <sub>2</sub> |
| c | K               | G    | A               |

## DIMENSIONAL OUTLINE DRAWINGS

T-25-01

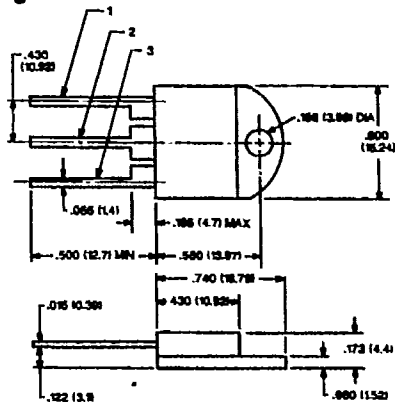
**Diagram 33**



|   |                 |                 |      |
|---|-----------------|-----------------|------|
|   | 1               | 2               | 3    |
| b | K               | A               | G    |
| c | MT <sub>1</sub> | MT <sub>2</sub> | Gate |

TO127

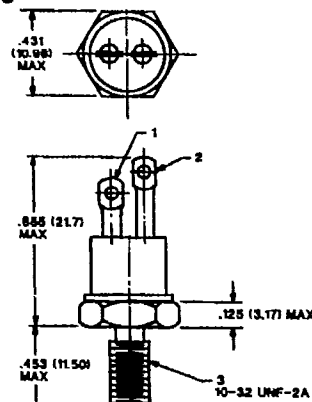
**Diagram 55**



|   |                 |                 |      |
|---|-----------------|-----------------|------|
|   | 1               | 2               | 3    |
| b | MT <sub>1</sub> | MT <sub>2</sub> | Gate |
| c | K               | A               | G    |

TO218

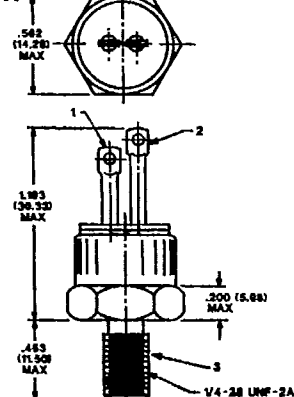
### Diagram 110



|   | 1    | 2               | 3               |
|---|------|-----------------|-----------------|
| a | Gate | MT <sub>1</sub> | MT <sub>2</sub> |
| b | G    | K               | A               |

TO64

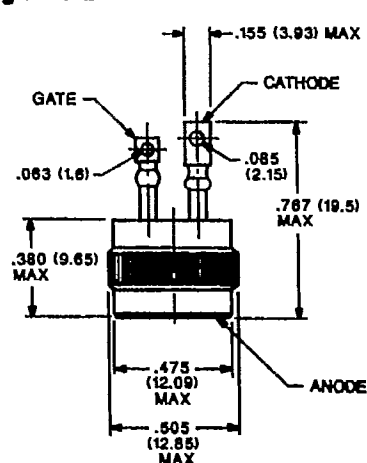
**Diagram 111**



|   |      |                 |                 |
|---|------|-----------------|-----------------|
|   | 1    | 2               | 3               |
| a | Gate | MT <sub>1</sub> | MT <sub>2</sub> |
| b | G    | K               | A               |

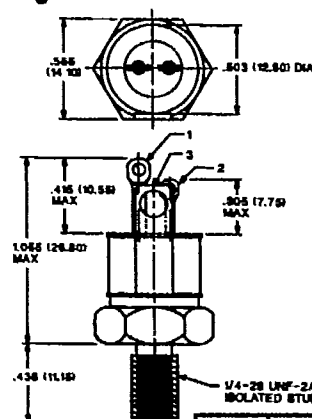
TO48

**Diagram 112**



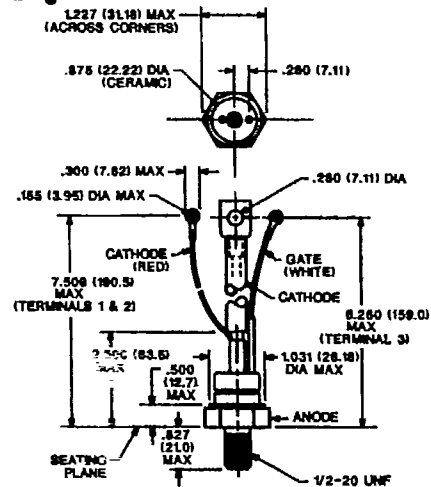
**1/2" PRESS FIT**

**Diagram 113**



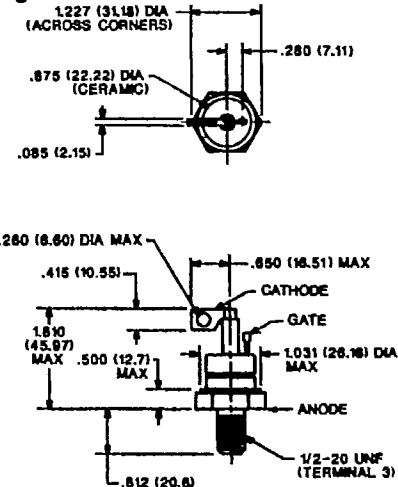
|   |                 |      |                 |
|---|-----------------|------|-----------------|
|   | 1               | 2    | 3               |
| a | K               | G    | A               |
| b | MT <sub>1</sub> | Gate | MT <sub>2</sub> |

**Diagram 114**



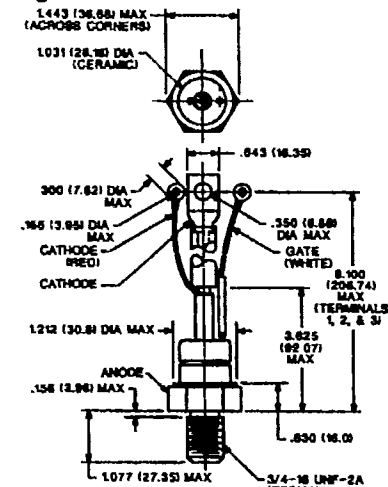
T094

**Diagram 115**



TO83

### Diagram 116

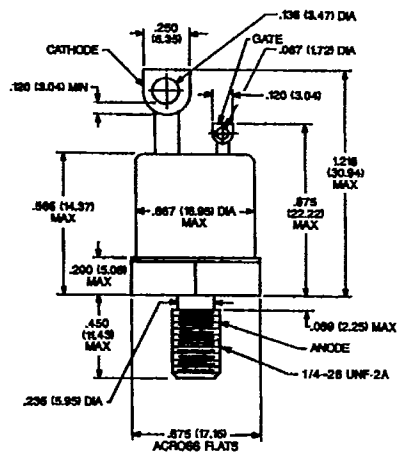


TO93

# DIMENSIONAL OUTLINE DRAWINGS

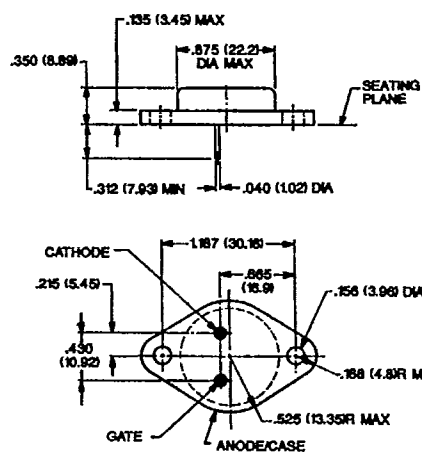
T-25-01

Diagram 117



TO65

Diagram 118



TO3

Diagram 119

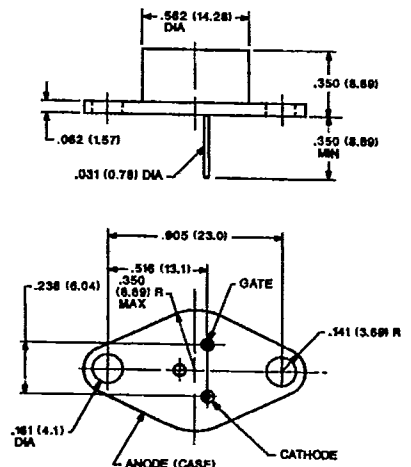


Diagram 172

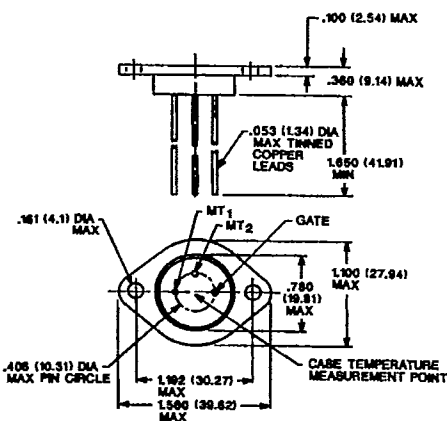
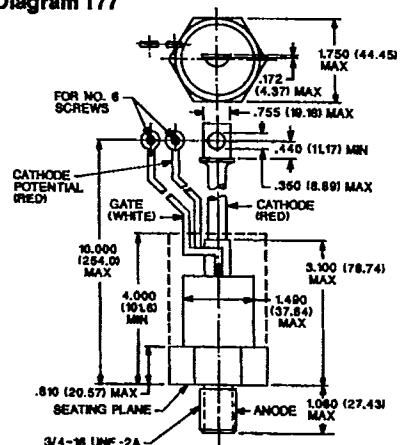


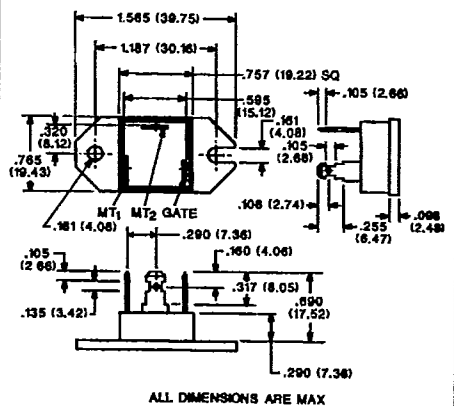
Diagram 177



## NOTES:

1. Complete threads to extend to within 2 1/2 threads of the seating plane.
2. Pitch diameter of 3/4-16 UNF-2A coated threads (ASA B1.1-1960)

Diagram 178



ALL DIMENSIONS ARE MAX

Diagram 346

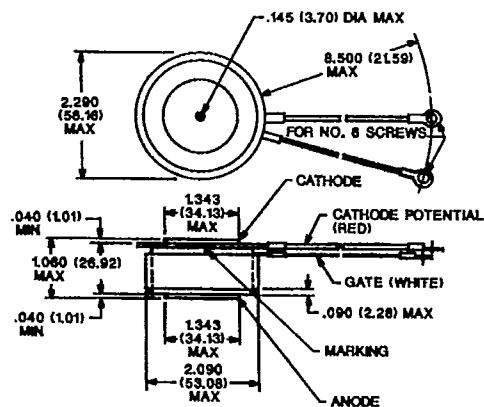
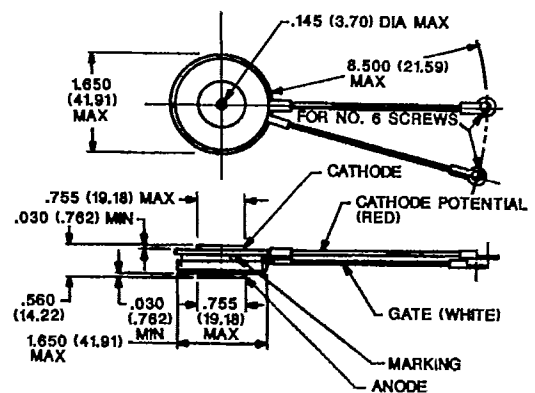


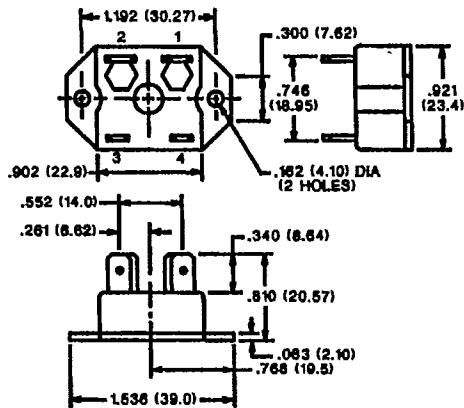
Diagram 347



# DIMENSIONAL OUTLINE DRAWINGS

T-25-01

Diagram 382



|   | 1               | 2               | 3    | 4 |
|---|-----------------|-----------------|------|---|
| a | K               | A               | Gate | * |
| b | MT <sub>1</sub> | MT <sub>2</sub> | Gate | * |

\* Common w/Tab 1

Diagram 397

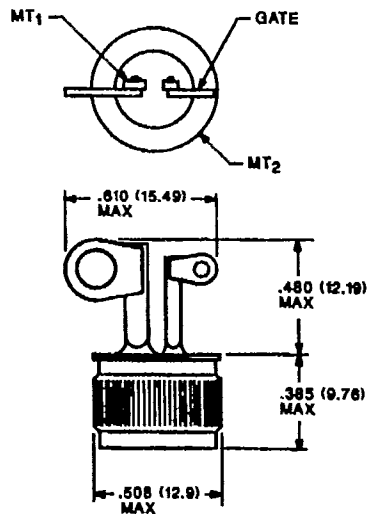


Diagram 404

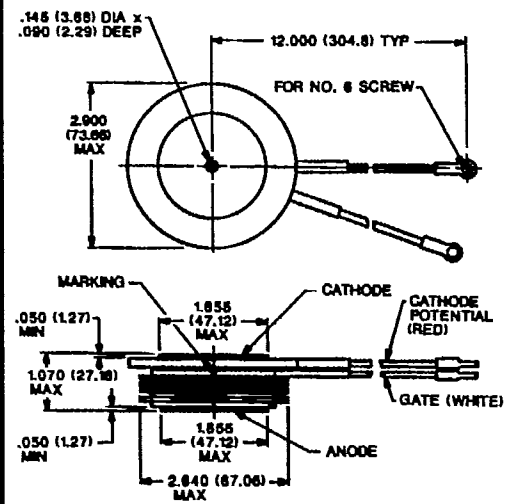
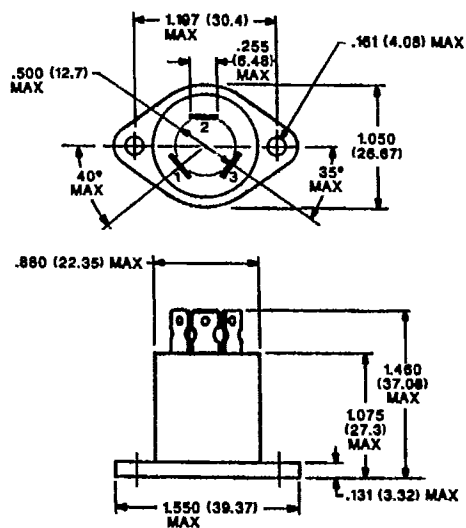
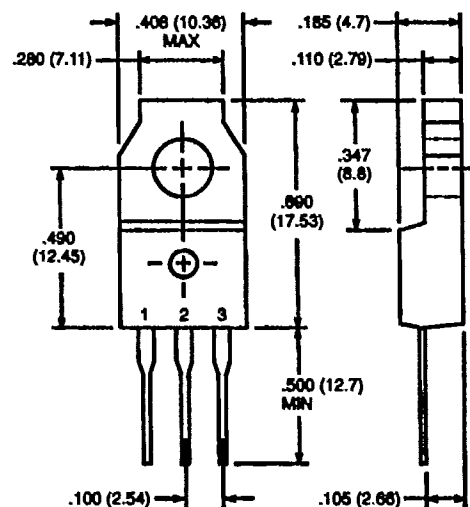


Diagram 406



Tab 1. MT<sub>1</sub>  
2. MT<sub>2</sub>  
3. Gate

Diagram 491



Pin 1. MT<sub>1</sub>  
2. MT<sub>2</sub>  
3. Gate