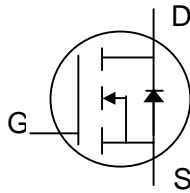




**N-channel Enhancement-mode Power MOSFET**

- Simple Drive Requirement**
- Very Low On-resistance**
- Fast Switching Performance**
- RoHS-compliant, halogen-free**



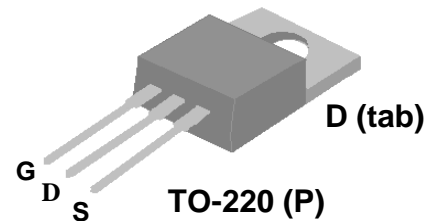
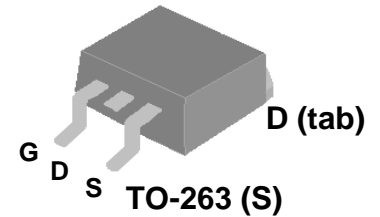
|              |       |
|--------------|-------|
| $BV_{DSS}$   | 30V   |
| $R_{DS(ON)}$ | 2.5mΩ |
| $I_D$        | 200A  |

**Description**

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP99T03GS-HF-3 is in the TO-263 package, which is widely used for commercial and industrial surface-mount applications, and is well suited for low voltage applications such as DC/DC converters.

The AP99T03GP-HF-3 is in the TO-220 through-hole package which is used where a small PCB footprint or an attached heatsink is required.



**Absolute Maximum Ratings**

| Symbol                      | Parameter                             | Rating     | Units |
|-----------------------------|---------------------------------------|------------|-------|
| $V_{DS}$                    | Drain-Source Voltage                  | 30         | V     |
| $V_{GS}$                    | Gate-Source Voltage                   | ±20        | V     |
| $I_D$ at $T_C=25^{\circ}C$  | Continuous Drain Current (Chip)       | 200        | A     |
| $I_D$ at $T_C=25^{\circ}C$  | Continuous Drain Current <sup>3</sup> | 120        | A     |
| $I_D$ at $T_C=100^{\circ}C$ | Continuous Drain Current <sup>3</sup> | 120        | A     |
| $I_{DM}$                    | Pulsed Drain Current <sup>1</sup>     | 800        | A     |
| $P_D$ at $T_C=25^{\circ}C$  | Total Power Dissipation               | 156        | W     |
| $P_D$ at $T_A=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>  | 3.12       | W     |
| $T_{STG}$                   | Storage Temperature Range             | -55 to 150 | °C    |
| $T_J$                       | Operating Junction Temperature Range  | -55 to 150 | °C    |

**Thermal Data**

| Symbol | Parameter   | Value | Units |
|--------|---|-------|-------|
| Rthj-c | Maximum Thermal Resistance, Junction-case                             | 0.8   | °C/W  |
| Rthj-a | Maximum Thermal Resistance, Junction-ambient (PCB mount) <sup>4</sup> | 40    | °C/W  |
| Rthj-a | Maximum Thermal Resistance, Junction-ambient                          | 62    | °C/W  |

**Ordering Information**

**AP99T03GS-HF-3TR**    **RoHS-compliant TO-263, shipped on tape and reel (800 pcs/reel)**

**AP99T03GP-HF-3TB**    **RoHS-compliant TO-220, shipped in tubes (50pcs/tube, 1000pcs/box)**



**Electrical Specifications at  $T_j=25^\circ\text{C}$  (unless otherwise specified)**

| Symbol       | Parameter                                      | Test Conditions               | Min. | Typ. | Max.      | Units      |
|--------------|--|-------------------------------|------|------|-----------|------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$     | 30   | -    | -         | V          |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=40A$         | -    | -    | 2.5       | m $\Omega$ |
|              |  | $V_{GS}=4.5V, I_D=30A$        | -    | -    | 4         | m $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{DS}=V_{GS}, I_D=250\mu A$ | 0.8  | -    | 2.5       | V          |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=10V, I_D=30A$         | -    | 110  | -         | S          |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=24V, V_{GS}=0V$       | -    | -    | 25        | $\mu A$    |
| $I_{GSS}$    | Gate-Source Leakage                            | $V_{GS}= \pm 20V, V_{DS}=0V$  | -    | -    | $\pm 100$ | nA         |
| $Q_g$        | Total Gate Charge                              | $I_D=30A$                     | -    | 80   | 128       | nC         |
| $Q_{gs}$     | Gate-Source Charge                             | $V_{DS}=24V$                  | -    | 11.5 | -         | nC         |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge                   | $V_{GS}=4.5V$                 | -    | 55   | -         | nC         |
| $t_{d(on)}$  | Turn-on Delay Time                             | $V_{DS}=15V$                  | -    | 16   | -         | ns         |
| $t_r$        | Rise Time                                      | $I_D=30A$                     | -    | 60   | -         | ns         |
| $t_{d(off)}$ | Turn-off Delay Time                            | $R_G=3.3\Omega$               | -    | 55   | -         | ns         |
| $t_f$        | Fall Time                                      | $V_{GS}=10V$                  | -    | 20   | -         | ns         |
| $C_{iss}$    | Input Capacitance                              | $V_{GS}=0V$                   | -    | 5000 | 8000      | pF         |
| $C_{oss}$    | Output Capacitance                             | $V_{DS}=25V$                  | -    | 1060 | -         | pF         |
| $C_{rss}$    | Reverse Transfer Capacitance                   | $f=1.0\text{MHz}$             | -    | 850  | -         | pF         |
| $R_g$        | Gate Resistance                                | $f=1.0\text{MHz}$             | -    | 1.1  | -         | $\Omega$   |

**Source-Drain Diode**

| Symbol   | Parameter                       | Test Conditions      | Min. | Typ. | Max. | Units |
|----------|---------------------------------|----------------------|------|------|------|-------|
| $V_{SD}$ | Forward On Voltage <sup>2</sup> | $I_S=40A, V_{GS}=0V$ | -    | -    | 1.2  | V     |
| $t_{rr}$ | Reverse Recovery Time           | $I_S=10A, V_{GS}=0V$ | -    | 55   | -    | ns    |
| $Q_{rr}$ | Reverse Recovery Charge         | $dI/dt=100A/\mu s$   | -    | 80   | -    | nC    |

**Notes:**

1. Pulse width limited by maximum junction temperature.
2. Pulse test
3. Package limitation current is 120A.
4. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



Typical Electrical Characteristics

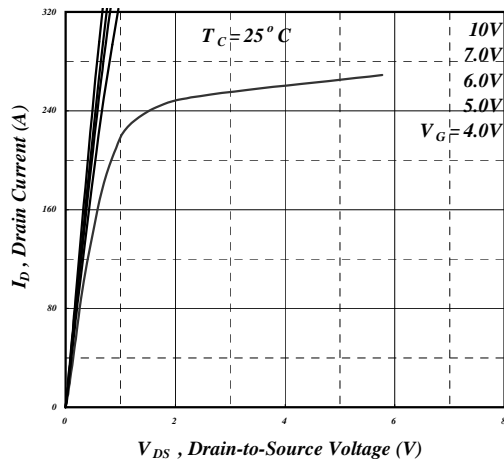


Fig 1. Typical Output Characteristics

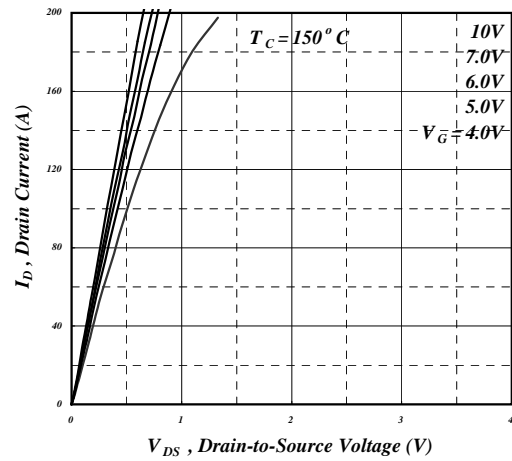


Fig 2. Typical Output Characteristics

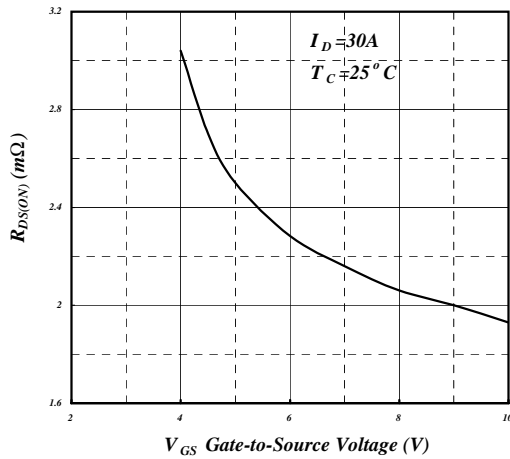


Fig 3. On-Resistance vs. Gate Voltage

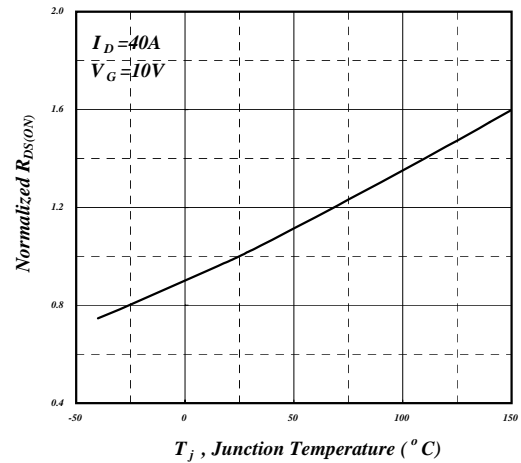


Fig 4. Normalized On-Resistance vs. Junction Temperature

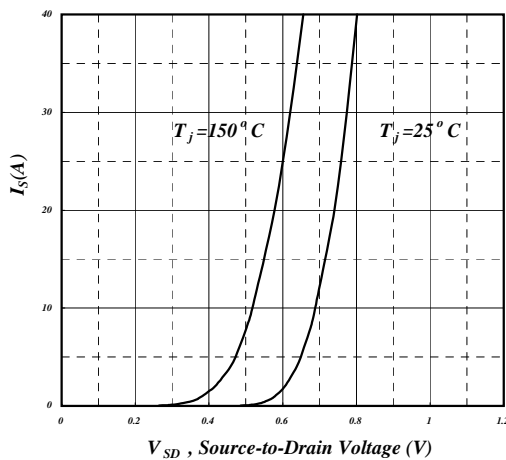


Fig 5. Forward Characteristic of Reverse Diode

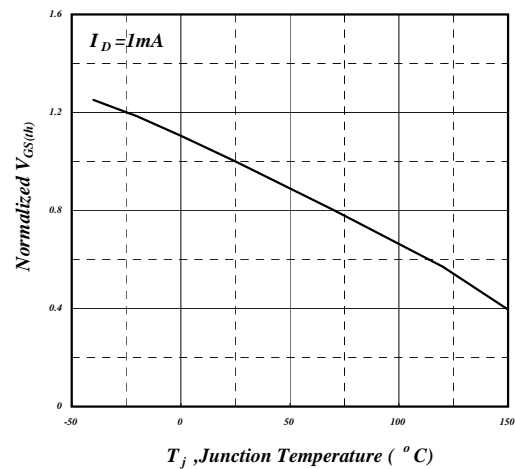


Fig 6. Gate Threshold Voltage vs. Junction Temperature



Typical Electrical Characteristics (cont.)

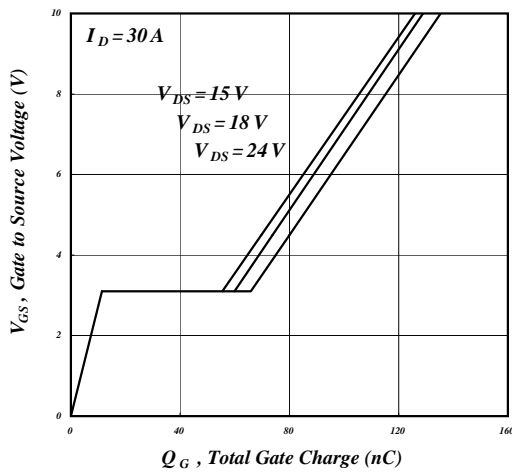


Fig 7. Gate Charge Characteristics

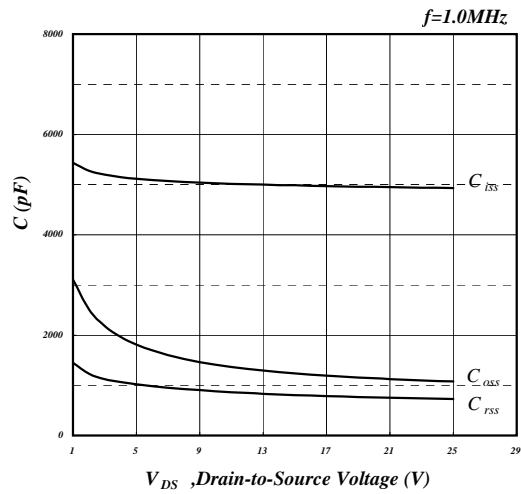


Fig 8. Typical Capacitance Characteristics

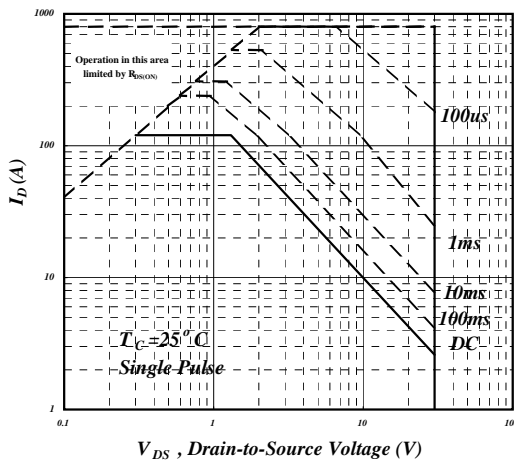


Fig 9. Maximum Safe Operating Area

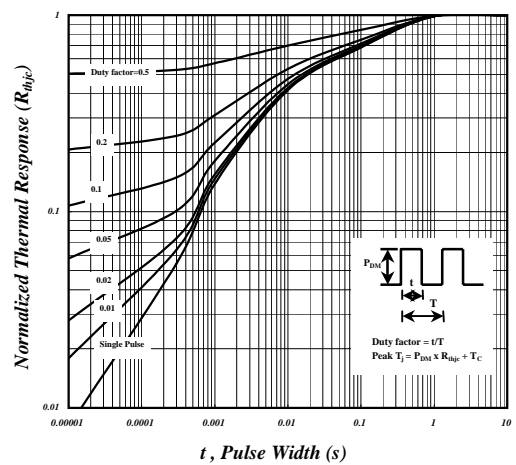


Fig 10. Effective Transient Thermal Impedance

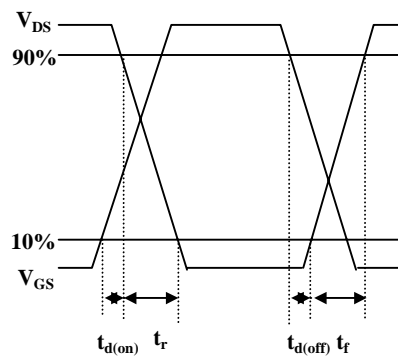


Fig 11. Switching Time Waveform

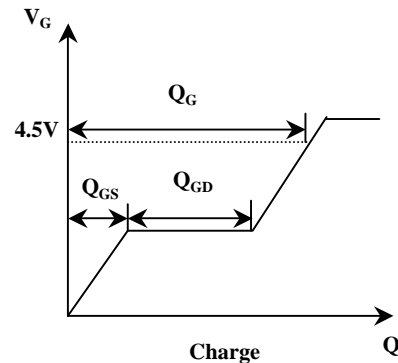
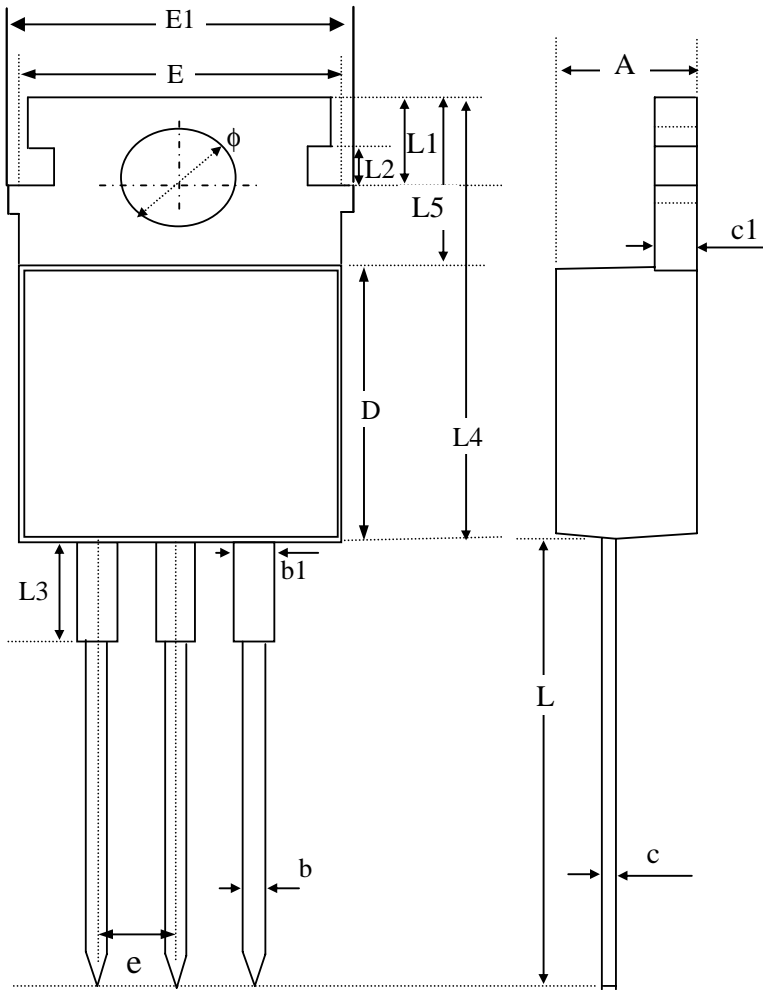


Fig 12. Gate Charge Waveform



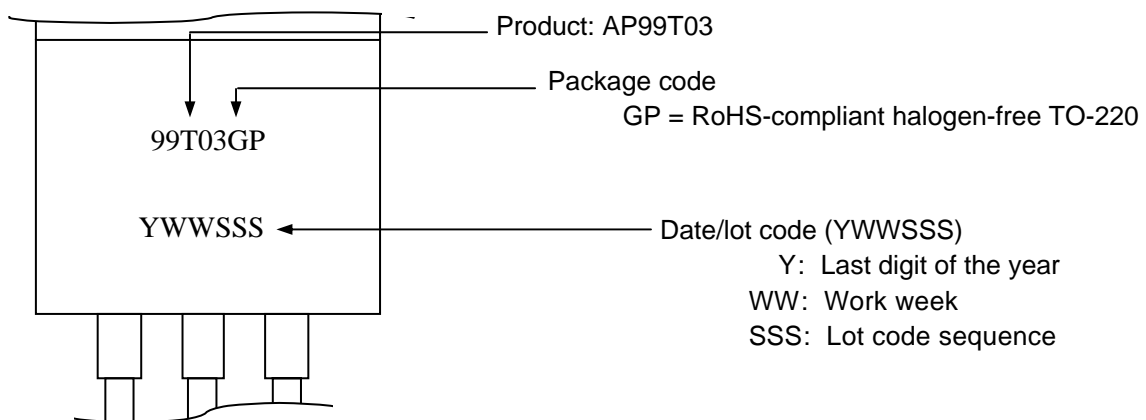
**Package Dimensions: TO-220**



| SYMBOLS | Millimeters |       |       |
|---------|-------------|-------|-------|
|         | MIN         | NOM   | MAX   |
| A       | 4.25        | 4.48  | 4.70  |
| b       | 0.65        | 0.80  | 0.90  |
| b1      | 1.15        | 1.38  | 1.60  |
| c       | 0.40        | 0.50  | 0.60  |
| c1      | 1.00        | 1.20  | 1.40  |
| E       | 9.70        | 10.00 | 10.40 |
| E1      | ---         | ---   | 11.50 |
| e       | ----        | 2.54  | ----  |
| L       | 12.70       | 13.60 | 14.50 |
| L1      | 2.60        | 2.80  | 3.00  |
| L2      | 1.00        | 1.40  | 1.80  |
| L3      | 2.6         | 3.10  | 3.6   |
| L4      | 14.70       | 15.50 | 16    |
| L5      | 6.30        | 6.50  | 6.70  |
| φ       | 3.50        | 3.60  | 3.70  |
| D       | 8.40        | 8.90  | 9.40  |

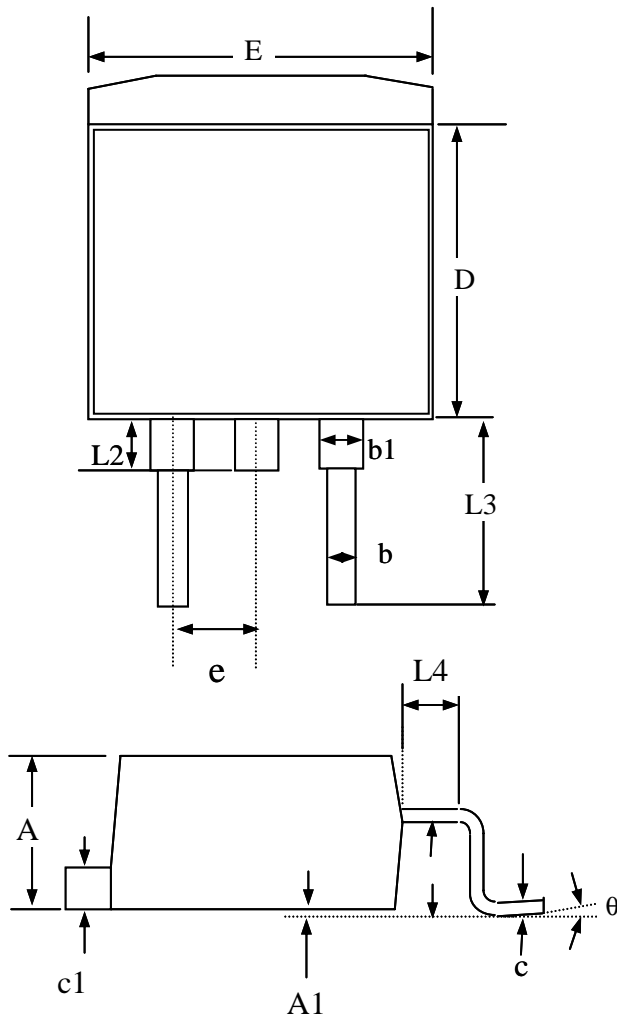
1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

**Marking Information: TO-220**





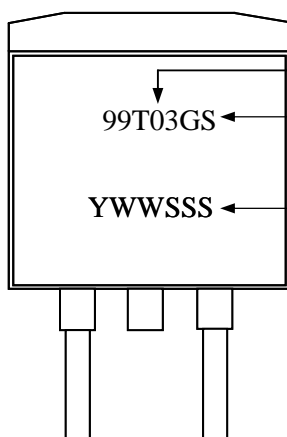
**Package Dimensions: TO-263**



| SYMBOLS | Millimeters |       |       |
|---------|-------------|-------|-------|
|         | MIN         | NOM   | MAX   |
| A       | 4.25        | 4.75  | 5.20  |
| A1      | 0.00        | 0.15  | 0.30  |
| A2      | 2.20        | 2.45  | 2.70  |
| b       | 0.70        | 0.90  | 1.10  |
| b1      | 1.07        | 1.27  | 1.47  |
| c       | 0.30        | 0.45  | 0.60  |
| c1      | 1.15        | 1.30  | 1.45  |
| D       | 8.30        | 8.90  | 9.40  |
| E       | 9.70        | 10.10 | 10.50 |
| e       | 2.04        | 2.54  | 3.04  |
| L2      | -----       | 1.50  | ----- |
| L3      | 4.50        | 4.90  | 5.30  |
| L4      | -----       | 1.50  | ----  |

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

**Marking Information: TO-263**



Product: AP99T03  
 Package code:  
 GS = RoHS-compliant halogen-free TO-263  
 Date Code (YWWSSS)  
 Y : Last digit of the year  
 WW : Work week  
 SSS : Lot code sequence