



THE DATASHEET OF MMBTA05LT1



MMBTA05L, MMBTA06L

Driver Transistors

NPN Silicon

Features

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|-----------|--|------|
| Collector–Emitter Voltage MMBTA05L MMBTA06L | V_{CEO} | 60 80 | Vdc |
| Collector–Base Voltage MMBTA05L MMBTA06L | V_{CBO} | 60 80 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 4.0 | Vdc |
| Collector Current – Continuous | I_C | 500 | mAdc |
| Electrostatic Discharge | ESD | HBM Class 3B MM Class C CDM Class IV | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

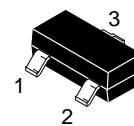
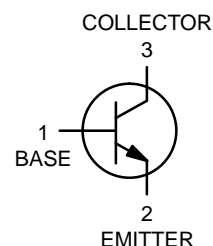
| Characteristic | Symbol | Max | Unit |
|--|-----------------|-------------|-------------|
| Total Device Dissipation FR–5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 1.8 | mW mW/°C |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 556 | °C/W |
| Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 2.4 | mW mW/°C |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 417 | °C/W |
| Junction and Storage Temperature | T_J, T_{stg} | –55 to +150 | °C |

1. FR–5 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.



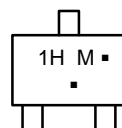
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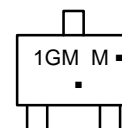


SOT-23
CASE 318
STYLE 6

MARKING DIAGRAMS



MMBTA05LT1



MMBTA06LT1,
SMMBTA06L

1H, 1GM = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)
*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

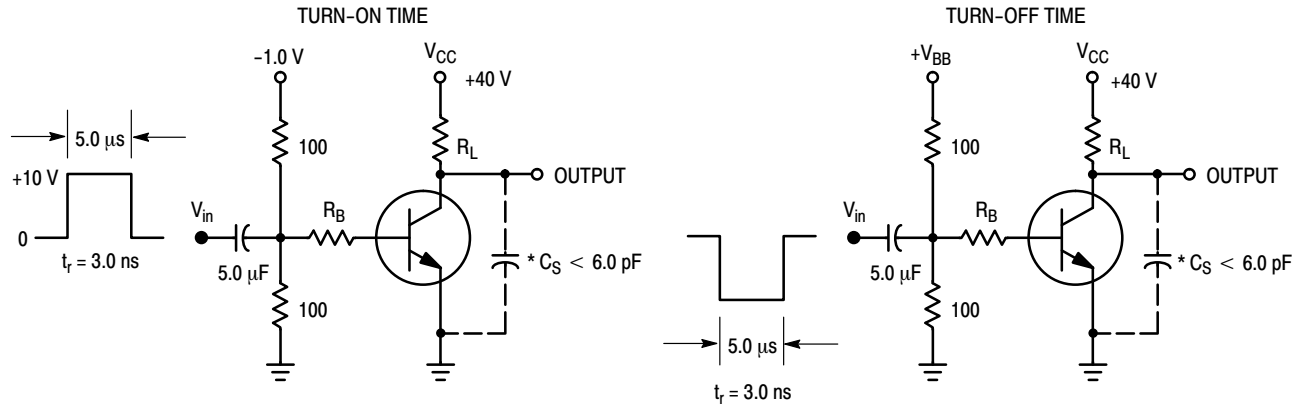
MMBTA05L, MMBTA06L

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|--|---------------|------------|------------|---------------|
| OFF CHARACTERISTICS | | | | |
| Collector–Emitter Breakdown Voltage (Note 3) ($I_C = 1.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 60 80 | – | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 100\ \mu\text{A}$, $I_C = 0$) | $V_{(BR)EBO}$ | 4.0 | – | Vdc |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) | I_{CES} | – | 0.1 | μA |
| Collector Cutoff Current ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$) | I_{CBO} | – | 0.1 0.1 | μA |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 10\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 100\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) | h_{FE} | 100 100 | – | – |
| Collector–Emitter Saturation Voltage ($I_C = 100\text{ mA}$, $I_B = 10\text{ mA}$) | $V_{CE(sat)}$ | – | 0.25 | Vdc |
| Base–Emitter On Voltage ($I_C = 100\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) | $V_{BE(on)}$ | – | 1.2 | Vdc |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current–Gain – Bandwidth Product (Note 4) ($I_C = 10\text{ mA}$, $V_{CE} = 2.0\text{ V}$, $f = 100\text{ MHz}$) | f_T | 100 | – | MHz |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.
- f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.



*Total Shunt Capacitance of Test Jig and Connectors
For PNP Test Circuits, Reverse All Voltage Polarities

Figure 1. Switching Time Test Circuits

MMBTA05L, MMBTA06L

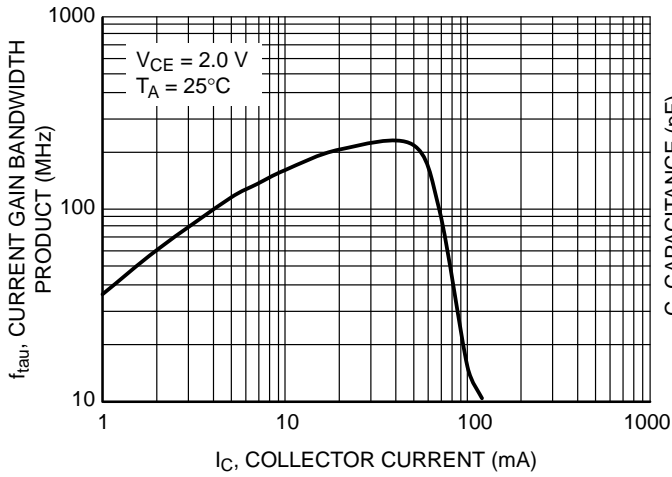


Figure 2. Current Gain Bandwidth Product vs. Collector Current

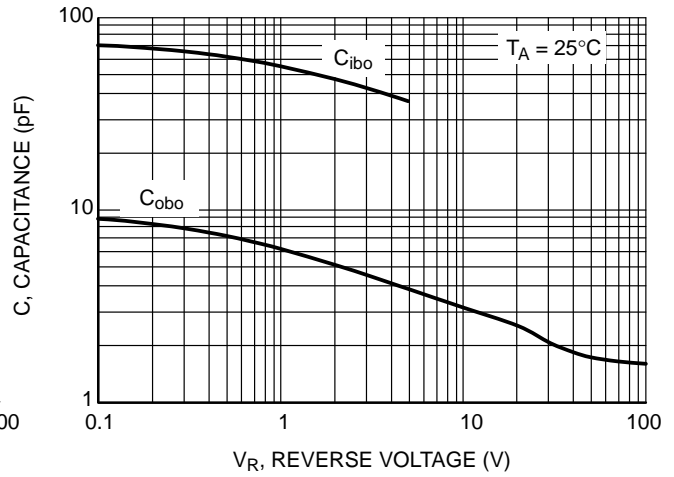


Figure 3. Capacitance

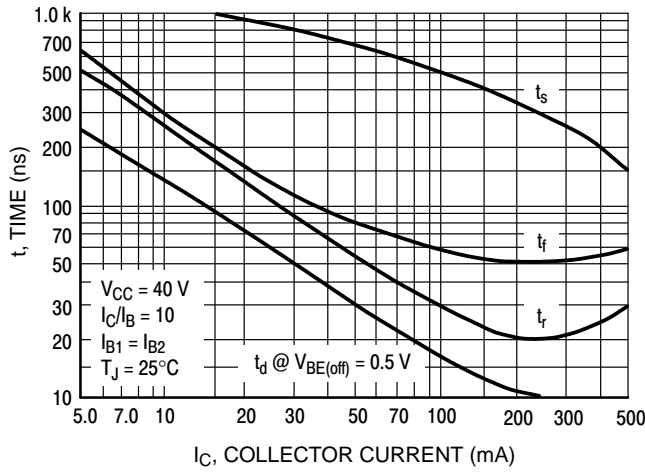


Figure 4. Switching Time

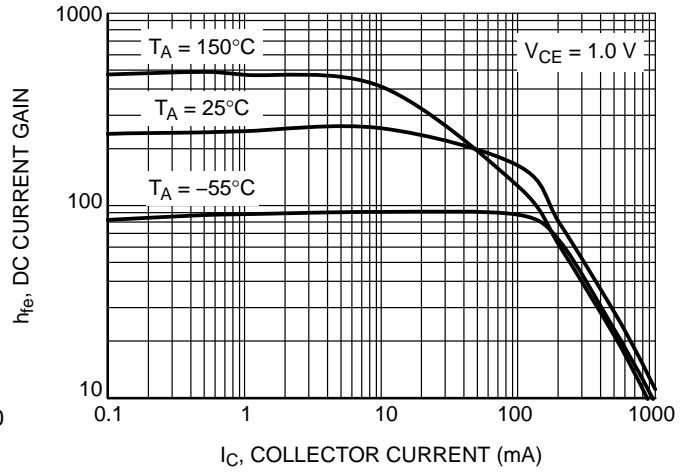


Figure 5. DC Current Gain vs. Collector Current

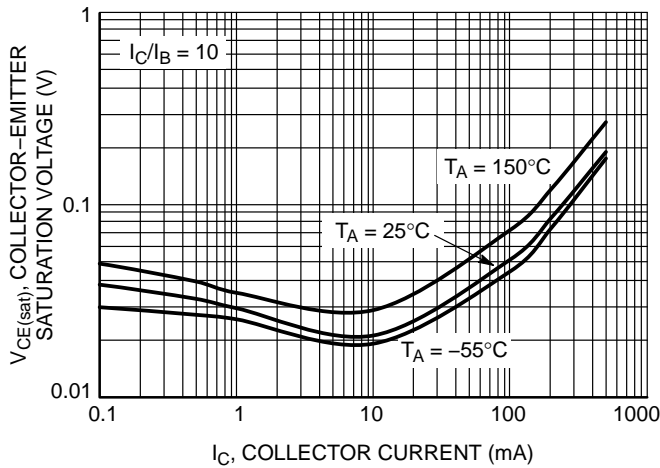


Figure 6. Collector Emitter Saturation Voltage vs. Collector Current

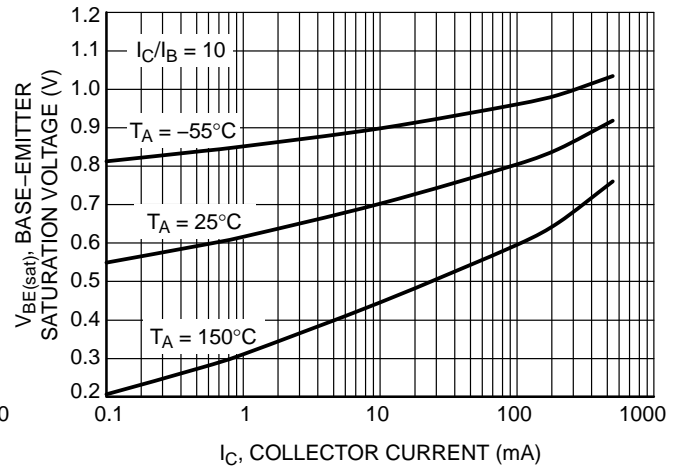


Figure 7. Base Emitter Saturation Voltage vs. Collector Current

MMBTA05L, MMBTA06L

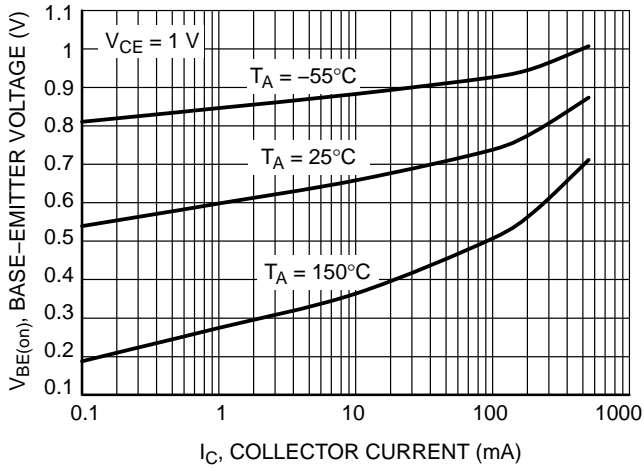


Figure 8. Base-Emitter Turn-ON Voltage vs. Collector Current

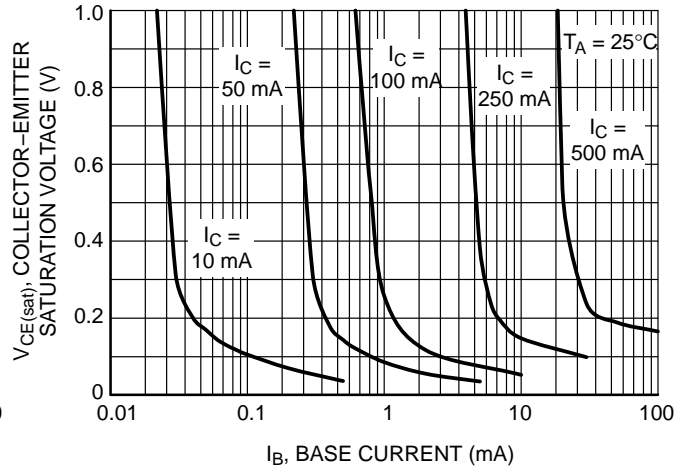


Figure 9. Saturation Region

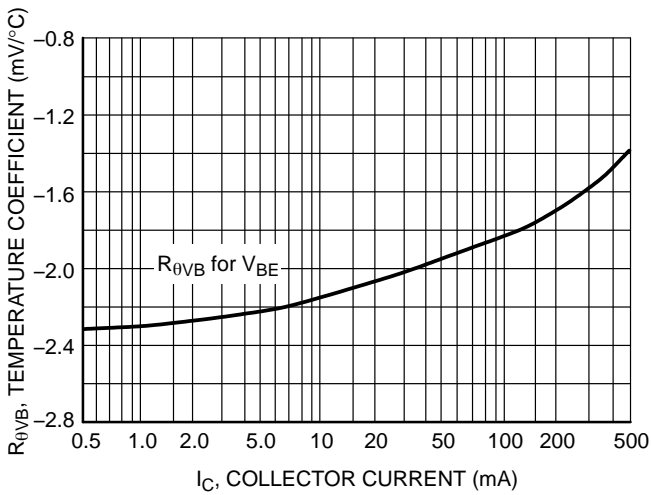


Figure 10. Base-Emitter Temperature Coefficient

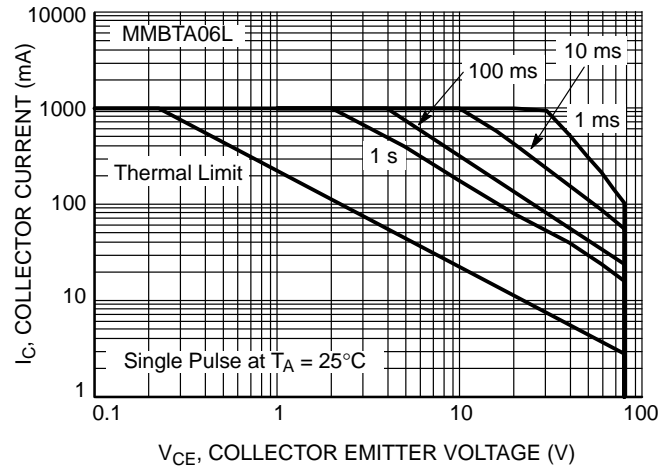


Figure 11. Safe Operating Area

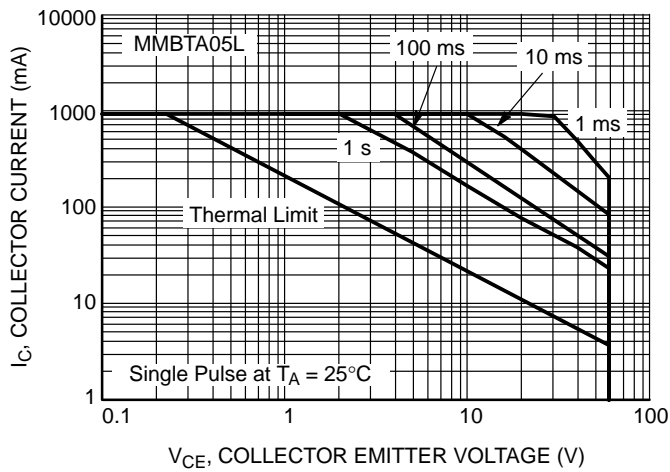


Figure 12. Safe Operating Area

MMBTA05L, MMBTA06L

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|---------------------|----------------------|
| MMBTA05LT1G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| NSVMMBTA05LT1G* | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| MMBTA05LT3G | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| MMBTA06LT1G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SMMBTA06LT1G* | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| MMBTA06LT3G | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| SMMBTA06LT3G* | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|----------------|-------------|------|------|--------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| H _E | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

GENERIC MARKING DIAGRAM*



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

| | | |
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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

| | | |
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