

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78DL05AS, TA78DL06AS, TA78DL08AS, TA78DL09AS, TA78DL10AS, TA78DL12AS, TA78DL15AS

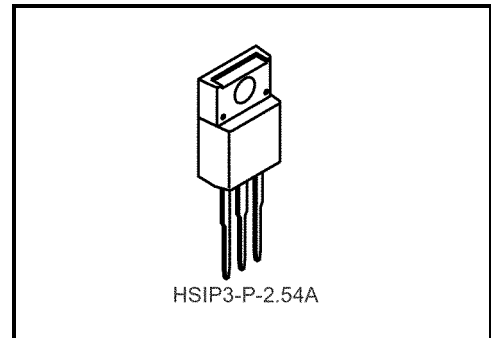
5 V, 6 V, 8 V, 9 V, 10 V, 12 V, 15 V

Three-Terminal Low Dropout Voltage Regulator

The TA78DL××AS series consists of positive fixed output voltage regulator IC capable of sourcing current up to 250 mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery powered equipment. This series includes current limiting, thermal shutdown, overvoltage protection, input fault protection and excessive transient protection circuits internally.

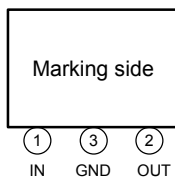
Features

- Low standby current of 500 μ A typical.
- Maximum output current up to 250 mA.
- Low dropout voltage of less than 0.6 V (@ $I_{OUT} = 0.2$ A).
- Multi-protection:
Reverse connection of power supply, 60 V load dump, thermal shut down and current limiting.
- Metal fin (tab) is fully covered with mold resin. (TO-220 NIS package)

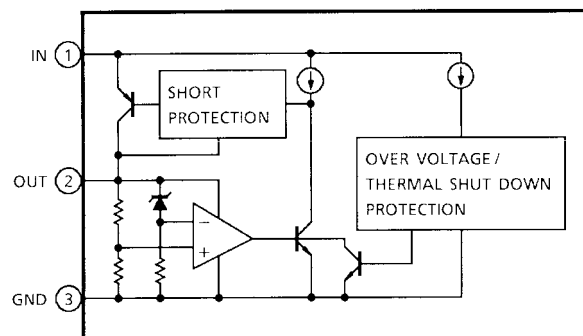


Weight: 1.7 g (typ.)

Pin Assignment



Block Diagram



Maximum Ratings (Ta = 25°C)

| Characteristics | | Symbol | Rating | Unit |
|--------------------------|----------------------|------------------|-----------|------|
| Operating input voltage | | V _{IN} | 29 | V |
| Input voltage of surge | | V _{IN} | 60 | V |
| Power dissipation | (Ta = 25°C) | P _D | 2 | W |
| | (Tc = 25°C) | | 20 | |
| Operating temperature | | T _{opr} | -40~85 | °C |
| Storage temperature | | T _{stg} | -55~150 | °C |
| Junction temperature | | T _j | 150 | °C |
| Thermal resistance | R _{th(j-c)} | 6.25 | °C/W | |
| | R _{th(j-a)} | 62.5 | | |
| Storage temperature-time | | T _{sol} | 260 (10s) | °C |

TA78DL05AS

Electrical Characteristics (Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 10 mA, T_j = 25°C)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|------------------|--------------|---|------|------|------|------|
| Output voltage | V _{OUT} | — | 5.35 V ≤ V _{IN} ≤ 26 V, -40°C ≤ Ta ≤ 85°C | 4.75 | 5.0 | 5.25 | V |
| Line regulation | Reg-line | — | 9 V ≤ V _{IN} ≤ 16 V | — | 2 | 10 | mV |
| | | | 6 V ≤ V _{IN} ≤ 26 V | — | 4 | 30 | |
| Load regulation | Reg-load | — | 10 mA ≤ I _{OUT} ≤ 200 mA | — | 14 | 50 | mV |
| Quiescent current | I _B | — | I _{OUT} ≤ 10 mA, 6 V ≤ V _{IN} ≤ 26 V | — | 0.5 | 1 | mA |
| Dropout voltage | V _D | — | I _{OUT} = 50 mA | — | 0.15 | 0.3 | V |
| | | | I _{OUT} = 200 mA | — | 0.4 | 0.6 | |
| Max operating voltage | V _{IN} | — | — | 29 | 33 | — | V |

TA78DL06AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 14\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|--|-----|------|-----|------|
| Output voltage | V_{OUT} | — | $6.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 5.7 | 6.0 | 6.3 | V |
| Line regulation | Reg.line | — | $10\text{ V} \leq V_{IN} \leq 17\text{ V}$ | — | 2 | 12 | mV |
| | | | $7\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 5 | 36 | |
| Load regulation | Reg.load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 17 | 60 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $7\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.55 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

TA78DL08AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|--|-----|------|-----|------|
| Output voltage | V_{OUT} | — | $8.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 7.6 | 8 | 8.4 | V |
| Line regulation | Reg.line | — | $12\text{ V} \leq V_{IN} \leq 19\text{ V}$ | — | 3 | 16 | mV |
| | | | $9\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 6 | 45 | |
| Load regulation | Reg.load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 22 | 80 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $9\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.6 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

TA78DL09AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|--|------|------|------|------|
| Output voltage | V_{OUT} | — | $9.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 8.55 | 9 | 9.45 | V |
| Line regulation | Reg.line | — | $13\text{ V} \leq V_{IN} \leq 20\text{ V}$ | — | 3 | 18 | mV |
| | | | $10\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 7 | 50 | |
| Load regulation | Reg.load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 25 | 90 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $10\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.65 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

TA78DL10AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|---|-----|------|------|------|
| Output voltage | V_{OUT} | — | $10.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 9.5 | 10 | 10.5 | V |
| Line regulation | Reg·line | — | $14\text{ V} \leq V_{IN} \leq 21\text{ V}$ | — | 4 | 20 | mV |
| | | | $11\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 8 | 60 | |
| Load regulation | Reg·load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 28 | 100 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $11\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.7 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

TA78DL12AS

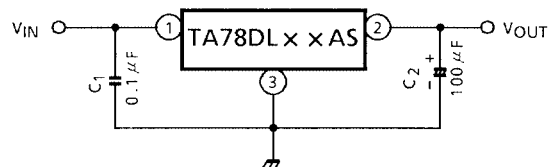
Electrical Characteristics (Unless otherwise specified, $V_{IN} = 18\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|---|------|------|------|------|
| Output voltage | V_{OUT} | — | $12.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 11.4 | 12 | 12.6 | V |
| Line regulation | Reg·line | — | $16\text{ V} \leq V_{IN} \leq 23\text{ V}$ | — | 5 | 24 | mV |
| | | | $13\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 10 | 70 | |
| Load regulation | Reg·load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 33 | 120 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $13\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.8 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

TA78DL15AS

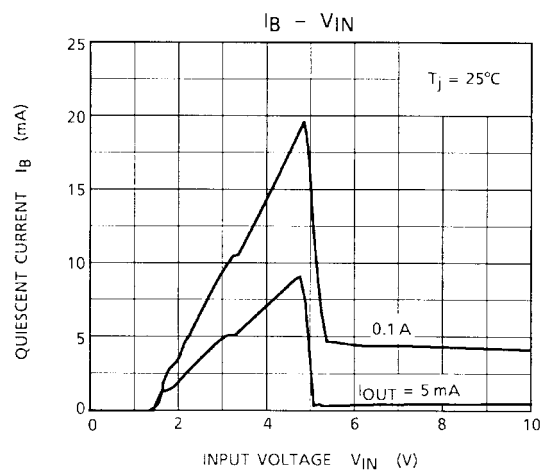
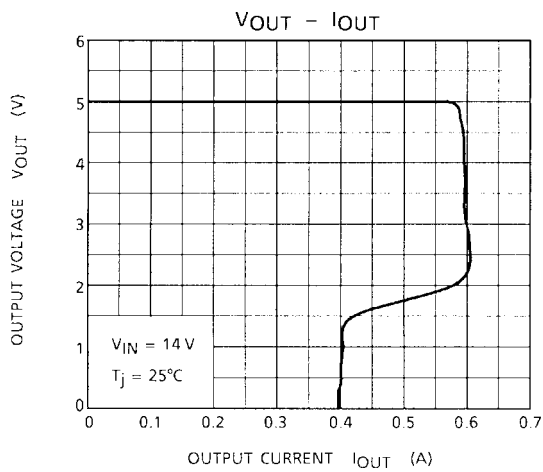
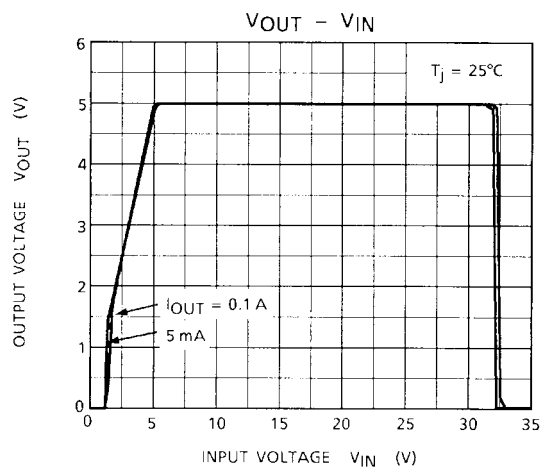
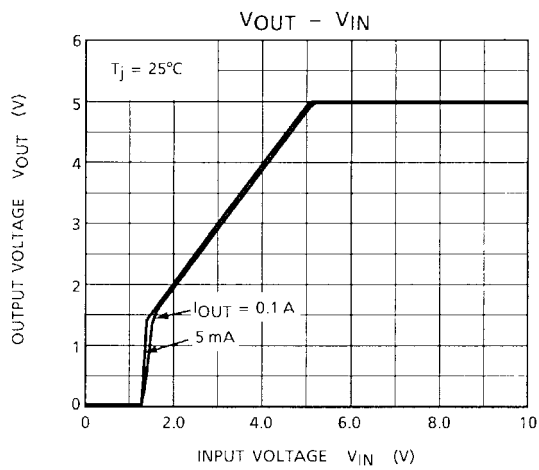
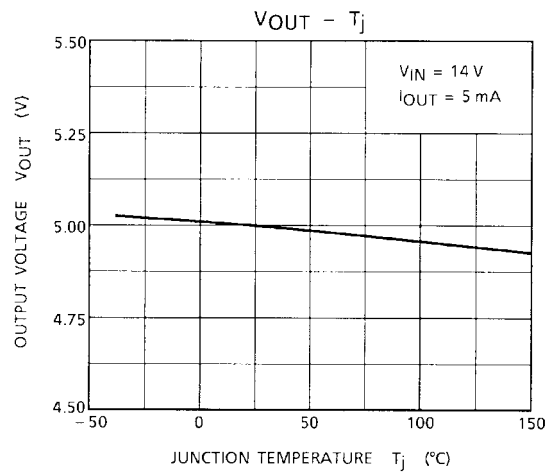
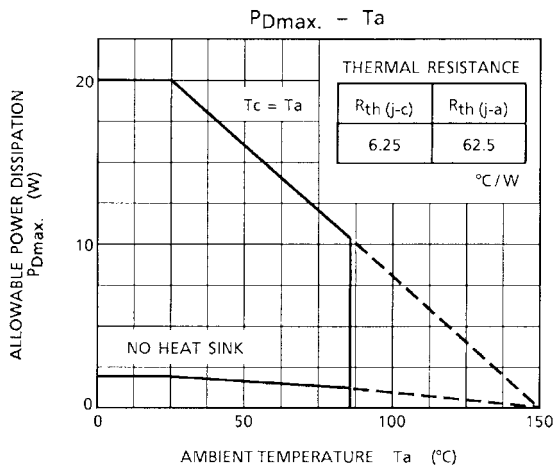
Electrical Characteristics (Unless otherwise specified, $V_{IN} = 20\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

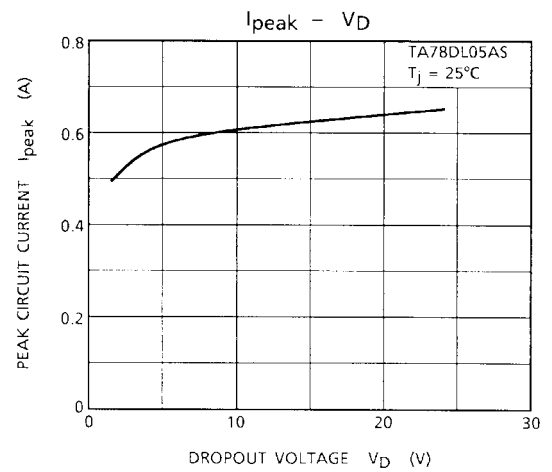
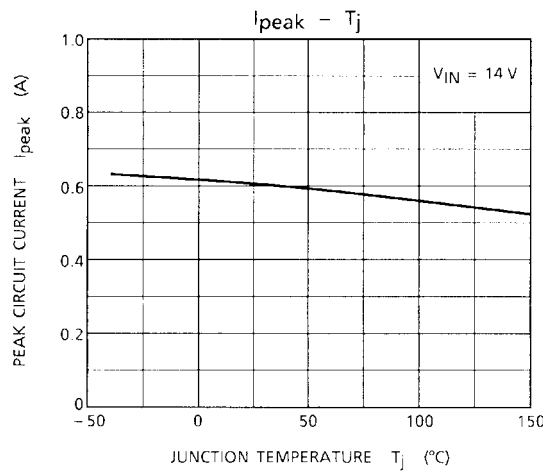
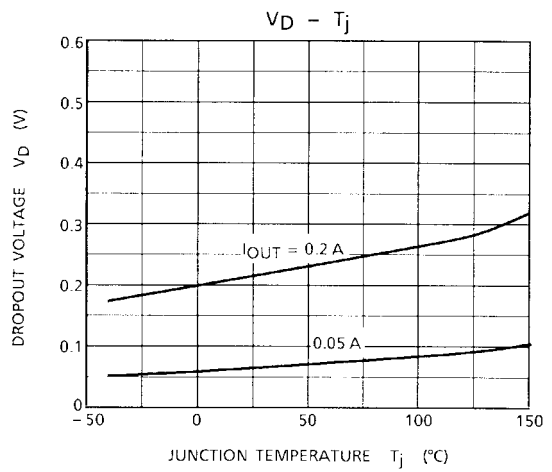
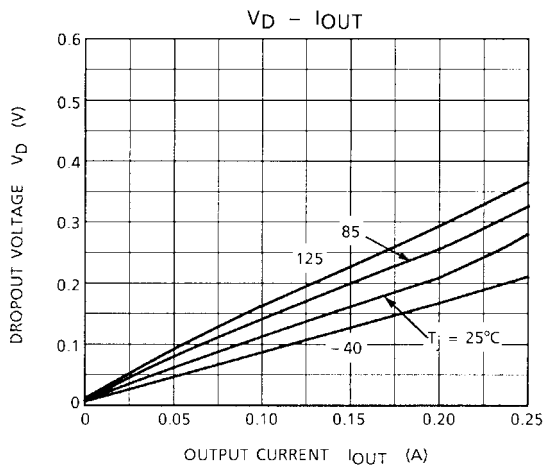
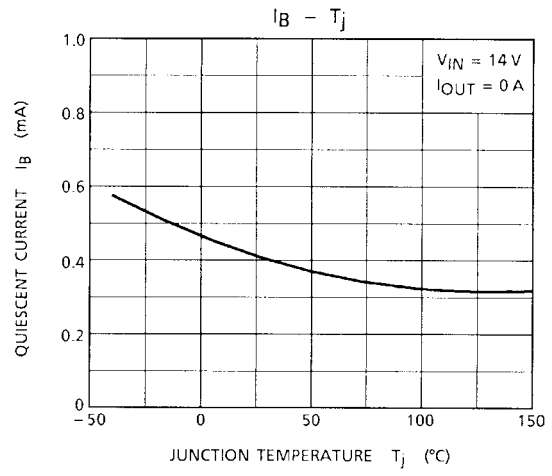
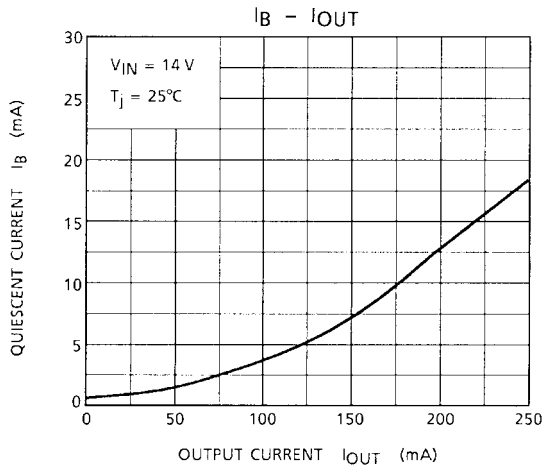
| Characteristics | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-----------|--------------|---|-------|------|-------|------|
| Output voltage | V_{OUT} | — | $15.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$ | 14.25 | 15 | 15.75 | V |
| Line regulation | Reg·line | — | $19\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 6 | 30 | mV |
| | | | $16\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 12 | 80 | |
| Load regulation | Reg·load | — | $10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$ | — | 40 | 150 | mV |
| Quiescent current | I_B | — | $I_{OUT} \leq 10\text{ mA}$, $16\text{ V} \leq V_{IN} \leq 26\text{ V}$ | — | 0.9 | — | mA |
| Dropout voltage | V_D | — | $I_{OUT} = 50\text{ mA}$ | — | 0.15 | 0.3 | V |
| | | | $I_{OUT} = 200\text{ mA}$ | — | 0.4 | 0.6 | |
| Max operating voltage | V_{IN} | — | — | 29 | 33 | — | V |

Application Circuit

Capacitor C_{IN}/C_{OUT} must be guaranteed to operate of the temperature range that the regulator should be operated correctly.

The equivalent series resistance (ESR) of C_{OUT} must be less than 1 Ω in operating temperature range.

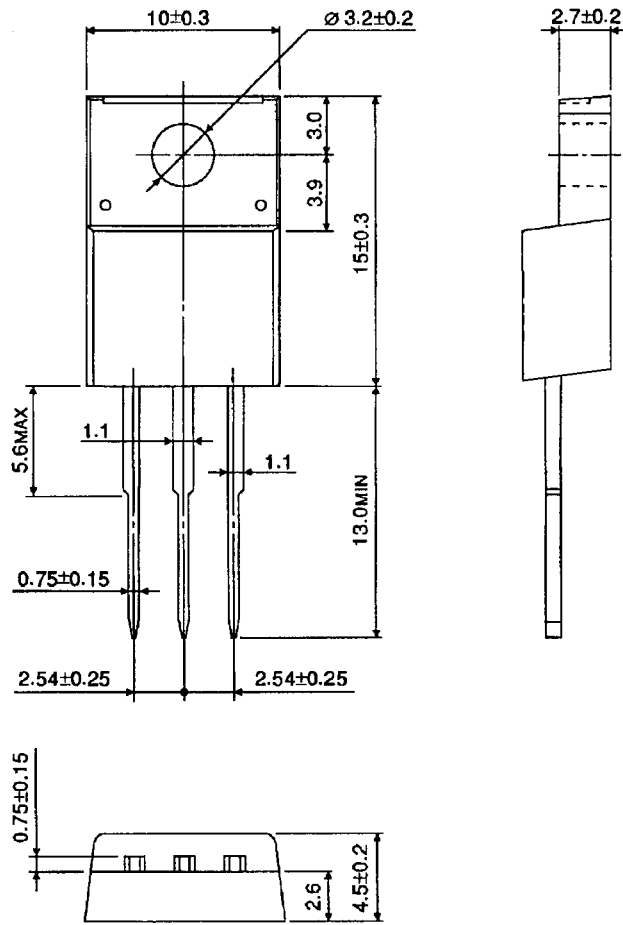




Package Dimensions

HSIP3-P-2.54A

Unit: mm



Weight: 1.7 g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

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