

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

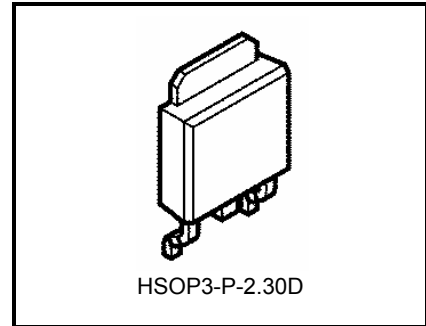
TA58M05F, TA58M06F, TA58M08F, TA58M09F TA58M10F, TA58M12F, TA58M15F

500 mA Low Dropout Voltage Regulator

The TA58M**F Series consists of fixed-positive-output, low-dropout regulators with an output current of 500 mA (max) that utilize PNP transistors for the output stage. Low dropout voltage and standby current make the TA58M**F Series suitable for applications requiring low power consumption.

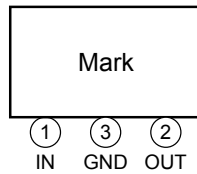
Features

- Maximum output current : 500 mA
- Output voltage : 5 / 6 / 8 / 9 / 10 / 12 / 15 V
- Output voltage accuracy : $V_{OUT} \pm 3\%$ (@ $T_j = 25^\circ\text{C}$)
- Low-dropout voltage : 0.65 V (Max) (@ $I_{OUT} = 500\text{mA}$)
- Protection function : Over current protection / thermal shutdown / Reverse connection of power supply / 60 V load dump
- Package type : Surface-mount New PW-Mold

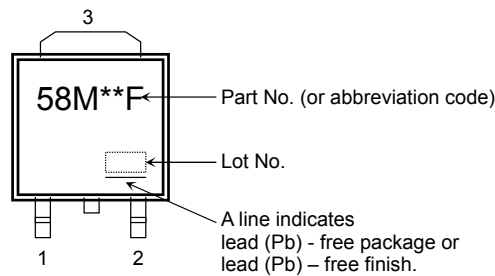


Weight : 0.36 g (Typ.)

Pin Assignment



Marking



Note 1: The “**” in each product name is replaced with the output voltage of each product.

Pin Description

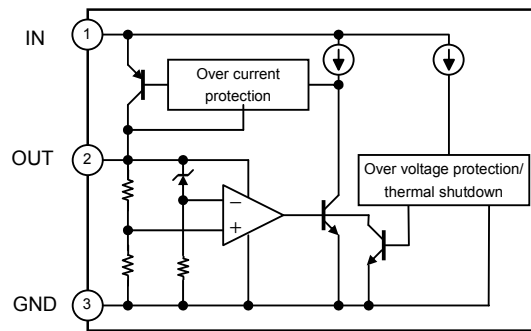
| Pin No. | Symbol | Description |
|---------|--------|---|
| 1 | IN | Input terminal. Connected by capacitor (C_{IN}) to GND. |
| 3 | GND | Ground terminal |
| 2 | OUT | Output terminal. Connected by capacitor (C_{OUT}) to GND. |

How to Order

| Product No. | Package | Package Type and Capacity |
|----------------------------|----------------------------|---------------------------|
| TA58M**F(TE16L1,NQ (Note2) | New PW-Mold: Surface-mount | Tape (2000 pcs/reel) |

Note 2: The “**” in each product number is replaced with the output voltage of each product.

Block Diagram



Absolute Maximum Rating (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|-----------------------|-----------|-------------------------|----------------|------|
| Input voltage | DC | V _{IN} (DC) | 29 | V |
| | Pulse | V _{IN} (Pulse) | 60 (τ = 200ms) | V |
| Output current | | I _{OUT} | 500 | mA |
| Operating temperature | | T _{opr} | -40~105 | °C |
| Junction temperature | | T _j | 150 | °C |
| Storage temperature | | T _{stg} | -55~150 | °C |
| Power dissipation | Ta = 25°C | P _D | 1 | W |
| | Tc = 25°C | | 10 | |

Note 3: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 4: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Thermal Characteristics

| Characteristic | Symbol | Max | Unit |
|---|----------------------|------|------|
| Thermal resistance, junction to ambient | R _{th(j-a)} | 125 | °C/W |
| Thermal resistance, junction to case | R _{th(j-c)} | 12.5 | °C/W |

Protection Function (Reference)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------------------------|----------------------|--|-----|------|-----|------|
| Thermal shutdown | T _{SD} | V _{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F) | — | 170 | — | °C |
| Thermal shutdown hysteresis width | T _{SD(hys)} | | — | 20 | — | °C |
| Peak circuit current | I _{PEAK} | V _{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F), T _j = 25°C | — | 1 | — | A |
| Short circuit current | I _{SC} | V _{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F), T _j = 25°C | — | 600 | — | mA |
| Overvoltage protection | V _{IN} | T _j = 25°C | 29 | 33 | — | V |

Note 5: Ensure that the devices operate within the limits of the maximum rating when in actual use.

Note 6: When the input voltage exceeds 29 V, the overvoltage protection circuit is activated to turn off the output voltage.

TA58M05F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|---|------|------|------|------|
| Output voltage | V_{OUT} | $V_{IN} = 14\text{ V}, I_{OUT} = 250\text{ mA}$ | 4.85 | 5.00 | 5.15 | V |
| | | $6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 4.8 | 5.0 | 5.2 | |
| Line regulation | Reg·line | $9\text{ V} \leq V_{IN} \leq 16\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 20 | mV |
| | | $6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 30 | |
| Load regulation | Reg·load | $V_{IN} = 14\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 60 | mV |
| Quiescent current | I_B | $6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.5 | 1.0 | mA |
| | | $6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M06F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|---|------|------|------|------|
| Output voltage | V_{OUT} | $V_{IN} = 14\text{ V}, I_{OUT} = 250\text{ mA}$ | 5.82 | 6.00 | 6.18 | V |
| | | $7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 5.76 | 6.00 | 6.24 | |
| Line regulation | Reg·line | $10\text{ V} \leq V_{IN} \leq 17\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 20 | mV |
| | | $7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 30 | |
| Load regulation | Reg·load | $V_{IN} = 14\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 60 | mV |
| Quiescent current | I_B | $7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.5 | 1.0 | mA |
| | | $7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M08F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|---|------|------|------|------|
| Output voltage | V_{OUT} | $V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$ | 7.76 | 8.00 | 8.24 | V |
| | | $9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 7.68 | 8.00 | 8.32 | |
| Line regulation | Reg·line | $12\text{ V} \leq V_{IN} \leq 19\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 20 | mV |
| | | $9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 30 | |
| Load regulation | Reg·load | $V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 70 | mV |
| Quiescent current | I_B | $9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.5 | 1.0 | mA |
| | | $9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M09F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|--|------|------|------|------|
| Output voltage | V_{OUT} | $V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$ | 8.73 | 9.00 | 9.27 | V |
| | | $10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 8.64 | 9.00 | 9.36 | |
| Line regulation | Reg·line | $13\text{ V} \leq V_{IN} \leq 20\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 20 | mV |
| | | $10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 30 | |
| Load regulation | Reg·load | $V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 70 | mV |
| Quiescent current | I_B | $10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.6 | 1.0 | mA |
| | | $10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M10F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|--|-----|------|------|------|
| Output voltage | V_{OUT} | $V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$ | 9.7 | 10.0 | 10.3 | V |
| | | $11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 9.6 | 10.0 | 10.4 | |
| Line regulation | Reg·line | $14\text{ V} \leq V_{IN} \leq 21\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 30 | mV |
| | | $11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 40 | |
| Load regulation | Reg·load | $V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 80 | mV |
| Quiescent current | I_B | $11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.6 | 1.2 | mA |
| | | $11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M12F

Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|--|-------|-------|-------|------|
| Output voltage | V_{OUT} | $V_{IN} = 18\text{ V}, I_{OUT} = 250\text{ mA}$ | 11.64 | 12.00 | 12.36 | V |
| | | $13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 11.52 | 12.00 | 12.48 | |
| Line regulation | Reg·line | $16\text{ V} \leq V_{IN} \leq 23\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 30 | mV |
| | | $13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 40 | |
| Load regulation | Reg·load | $V_{IN} = 18\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 20 | 80 | mV |
| Quiescent current | I_B | $13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.7 | 1.2 | mA |
| | | $13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

TA58M15F

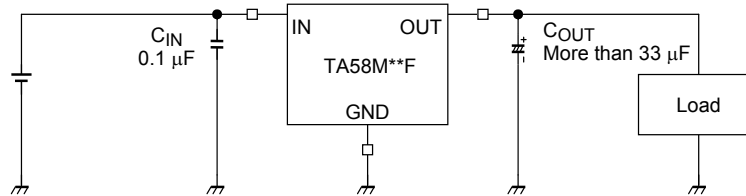
Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|-----------|--|-------|-------|-------|------|
| Output voltage | V_{OUT} | $V_{IN} = 20\text{ V}, I_{OUT} = 250\text{ mA}$ | 14.55 | 15.00 | 15.45 | V |
| | | $16\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$ | 14.4 | 15.0 | 15.6 | |
| Line regulation | Reg·line | $19\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 2 | 30 | mV |
| | | $16\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$ | — | 5 | 40 | |
| Load regulation | Reg·load | $V_{IN} = 20\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$ | — | 30 | 100 | mV |
| Quiescent current | I_B | $16\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$ | — | 0.7 | 1.4 | mA |
| | | $16\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$ | — | 35 | 80 | |
| Dropout voltage | V_D | $I_{OUT} = 250\text{ mA}$ | — | 0.22 | 0.35 | V |
| | | $I_{OUT} = 500\text{ mA}$ | — | 0.42 | 0.65 | |

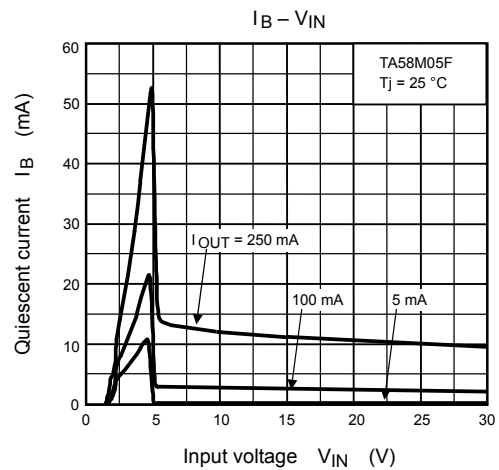
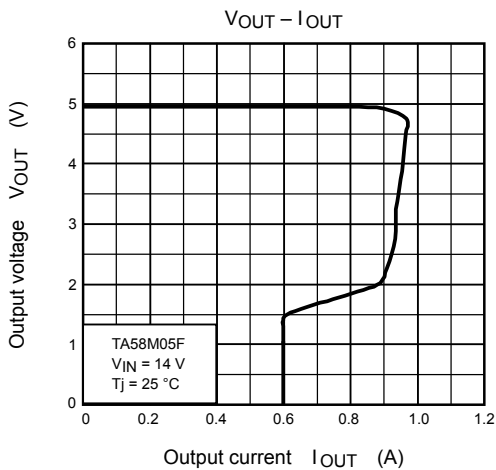
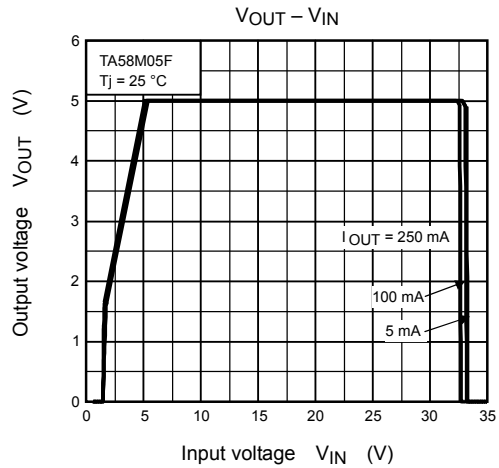
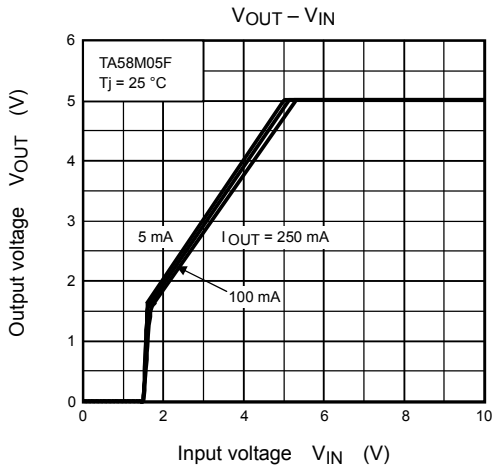
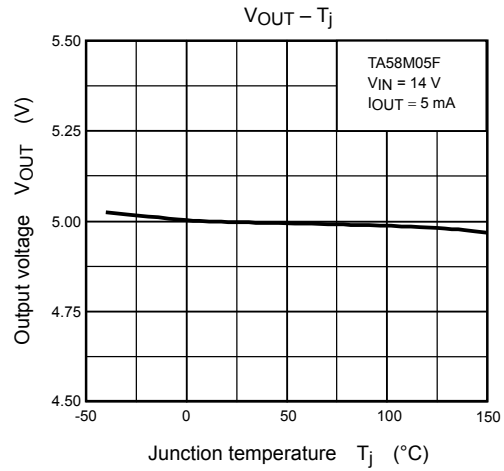
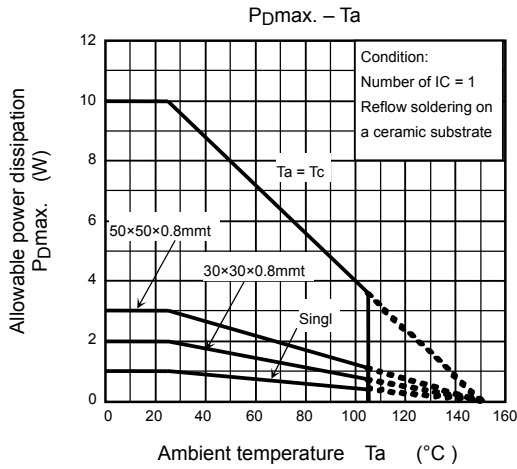
Electrical Characteristics Common to All Products

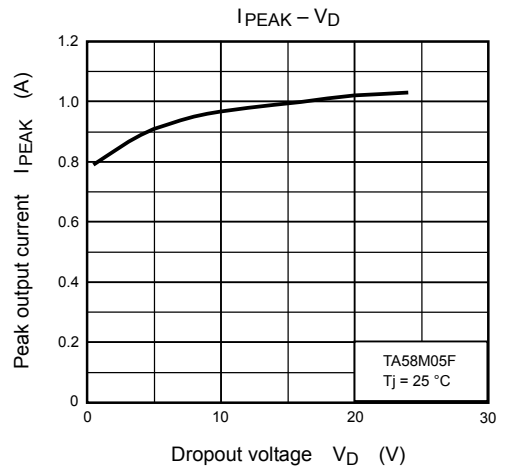
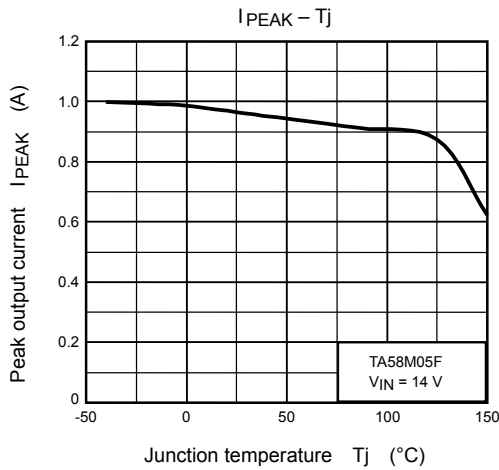
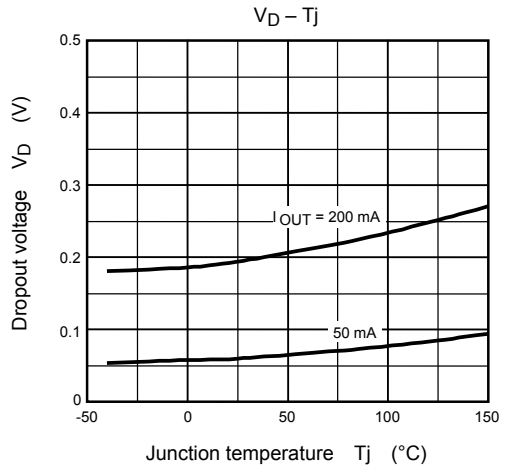
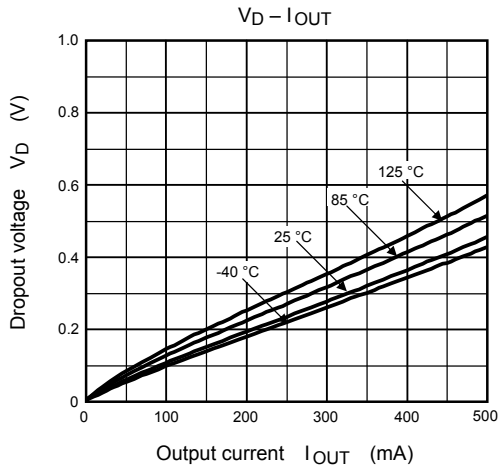
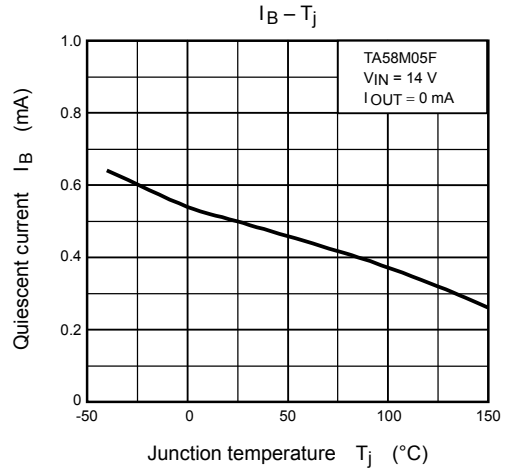
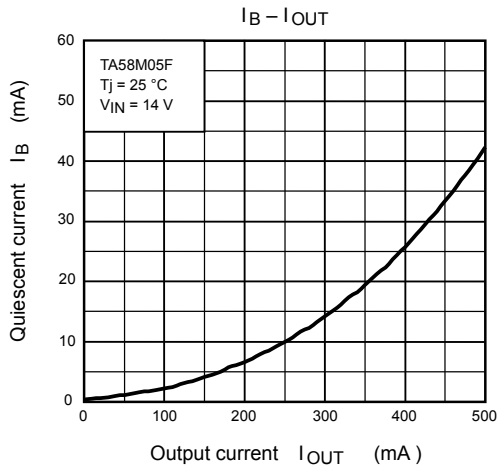
- $T_j = 25^\circ\text{C}$ in the measurement conditions of each item is a regulation for where the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

Standard Application Circuit



- Place C_{IN} as close as possible to the input terminal and GND. Place C_{OUT} as close as possible to the output terminal and GND. Although capacitor C_{OUT} acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment due to increased capacitor ESR. It is therefore recommended to use a capacitor with small variations temperature sensitivity. The IC may oscillate due to external conditions (output current, temperature, or the type of the capacitor used). The type of capacitor required must be determined by the actual application circuit in which the IC is used.

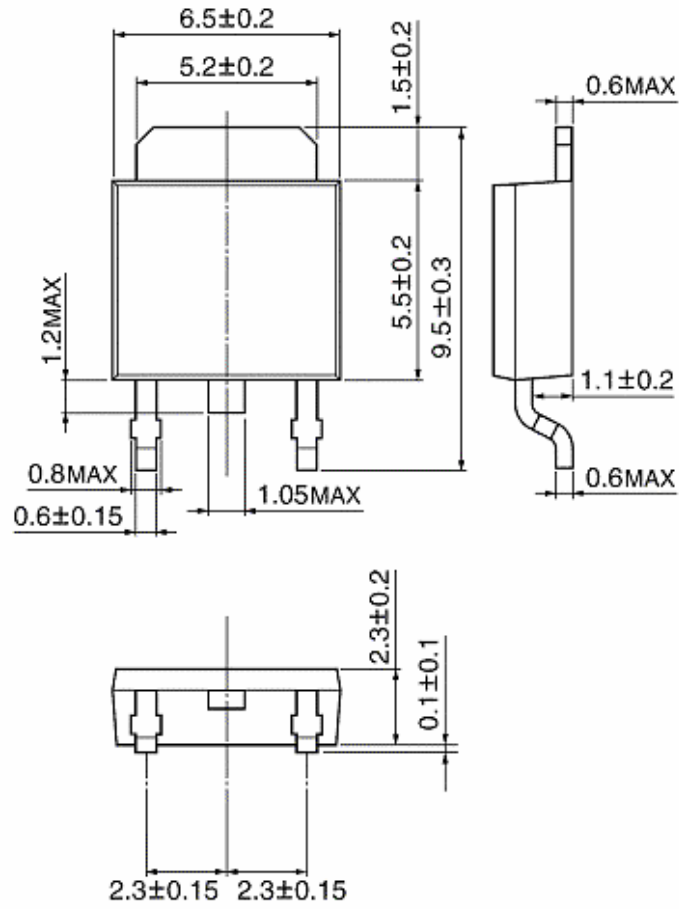




Package Dimensions

HSOP-3-P-2.30D

Unit : mm



Weight: 0.36 g (Typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN

- The information contained herein is subject to change without notice.
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