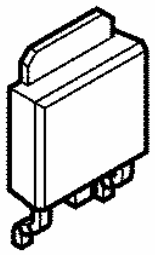
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA58L05F, TA58L06F, TA58L08F, TA58L09F TA58L10F, TA58L12F, TA58L15F

250 mA Low Dropout Voltage Regulator

The TA58L**F Series consists of fixed-positive-output, low-dropout regulators with an output current of 250 mA (max) that utilize PNP transistors for the output stage. Low dropout voltage and standby current make the TA58L**F Series suitable for applications requiring low power consumption.



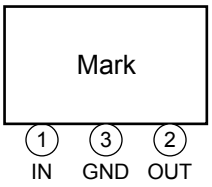
HSOP3-P-2.30D

Weight : 0.36 g (Typ.)

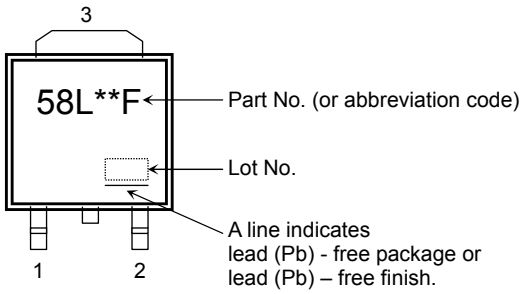
## Features

- Maximum output current : 250 mA
- Output voltage : 5/ 6/ 8/ 9/ 10/ 12/ 15 V
- Output voltage accuracy : $V_{OUT}$ ± 3% (@$T_j$ = 25°C)
- Low-dropout voltage : 0.4 V (Max) (@$I_{OUT}$ = 200mA)
- Protection function : Over current protection/ thermal shutdown/ Reverse connection of power supply / 60 V load dump
- Package type : Surface-mount New PW-Mold

## Pin Assignment




## Marking




Note1: The “**” in each product name is replaced with the output voltage of each product.

## Pin Description

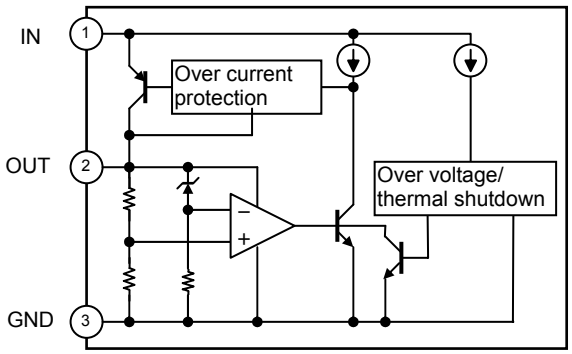
| Pin No. | Symbol | Description |
|---|---|---|
| 1 | IN | Input terminal. Connected by capacitor ($C_{IN}$) to GND. |
| 3 | GND | Ground terminal |
| 2 | OUT | Output terminal. Connected by capacitor ($C_{OUT}$) to GND. |

## How to Order

| Product No. | Package | Package Type and Capacity |
|---|---|---|
| TA58L**F(TE16L1,NQ (Note2) | New PW-Mold: Surface-mount | Tape (2000 pcs/reel) |

Note2: The "**" in each product number is replaced with the output voltage of each product.

## Block Diagram



## Maximum Rating (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input voltage | DC | $V_{IN\ (DC)}$ | 29 | V |
| | Pulse | $V_{IN\ (Pulse)}$ | 60( $\tau$ =200ms) | V |
| Output current | | $I_{OUT}$ | 250 | 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 | |

Note3: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

## 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 |
| 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 | — | 600 | — | mA |
| 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 | — | 330 | — | mA |
| Overvoltage protection | $V_{IN}$ | $T_j$ = 25°C | 29 | 33 | — | V |

Note4: Ensure that the devices operate within the limits of the maximum rating when in actual use.

Note5: When the input voltage exceeds 29 V, the overvoltage protection circuit is activated to turn off the output voltage.

### TA58L05F
### Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 14 V, $I_{OUT}$ = 10 mA | 4.85 | 5.00 | 5.15 | V |
| | | 5.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 4.8 | 5.0 | 5.2 | |
| Line regulation | Reg·line | 9 V ≦ $V_{IN}$ ≦ 16 V, $I_{OUT}$ = 10 mA | — | 1 | 10 | mV |
| | | 5.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 15 | |
| Load regulation | Reg·load | $V_{IN}$ = 14 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 10 | 30 | mV |
| Quiescent current | $I_B$ | 6 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.45 | 1.00 | mA |
| | | 6 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

### TA58L06F
### Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 14 V, $I_{OUT}$ = 10 mA | 5.82 | 6.00 | 6.18 | V |
| | | 6.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 5.76 | 6.00 | 6.24 | |
| Line regulation | Reg·line | 10 V ≦ $V_{IN}$ ≦ 17 V, $I_{OUT}$ = 10 mA | — | 1 | 10 | mV |
| | | 6.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 15 | |
| Load regulation | Reg·load | $V_{IN}$ = 14 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 10 | 30 | mV |
| Quiescent current | $I_B$ | 7 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.5 | 1.0 | mA |
| | | 7 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

**TA58L08F**

**Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)**

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 16 V, $I_{OUT}$ = 10mA | 7.76 | 8.00 | 8.24 | V |
| | | 8.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 7.68 | 8.00 | 8.32 | |
| Line regulation | Reg・line | 12 V ≦ $V_{IN}$ ≦ 19 V, $I_{OUT}$ = 10 mA | — | 1 | 10 | mV |
| | | 8.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 15 | |
| Load regulation | Reg・load | $V_{IN}$ = 16 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 10 | 40 | mV |
| Quiescent current | $I_B$ | 9 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.55 | 1.00 | mA |
| | | 9 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

**TA58L09F**

**Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)**

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 16 V, $I_{OUT}$ = 10 mA | 8.73 | 9.00 | 9.27 | V |
| | | 9.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 8.64 | 9.00 | 9.36 | |
| Line regulation | Reg・line | 13 V ≦ $V_{IN}$ ≦ 20 V, $I_{OUT}$ = 10 mA | — | 1 | 12 | mV |
| | | 9.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 20 | |
| Load regulation | Reg・load | $V_{IN}$ = 16 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 12 | 40 | mV |
| Quiescent current | $I_B$ | 10 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.6 | 1.0 | mA |
| | | 10 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

### TA58L10F
### Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 16 V, $I_{OUT}$ = 10 mA | 9.7 | 10.0 | 10.3 | V |
| | | 10.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 9.6 | 10.0 | 10.4 | |
| Line regulation | Reg·line | 14 V ≦ $V_{IN}$ ≦ 21 V, $I_{OUT}$ = 10 mA | — | 1 | 12 | mV |
| | | 10.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 20 | |
| Load regulation | Reg·load | $V_{IN}$ = 16 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 12 | 40 | mV |
| Quiescent current | $I_B$ | 11 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.6 | 1.2 | mA |
| | | 11 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

### TA58L12F
### Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 18 V, $I_{OUT}$ = 10 mA | 11.64 | 12.00 | 12.36 | V |
| | | 12.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 11.52 | 12.00 | 12.48 | |
| Line regulation | Reg·line | 16 V ≦ $V_{IN}$ ≦ 23 V, $I_{OUT}$ = 10 mA | — | 1 | 12 | mV |
| | | 12.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 20 | |
| Load regulation | Reg·load | $V_{IN}$ = 18 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 20 | 50 | mV |
| Quiescent current | $I_B$ | 13 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.65 | 1.20 | mA |
| | | 13 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

**TA58L15F**

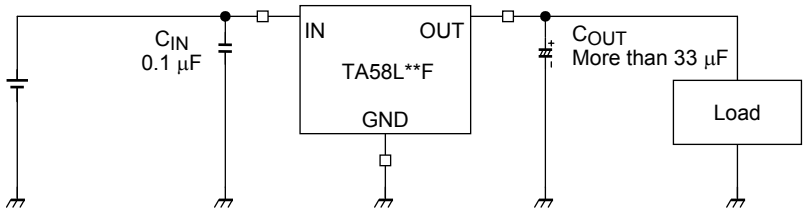
**Electrical Characteristics (unless otherwise specified, $T_j$ = 25°C)**

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 20 V, $I_{OUT}$ = 10 mA | 14.55 | 15.00 | 15.45 | V |
| | | 15.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA, -40°C ≦ Ta ≦ 105°C | 14.4 | 15.0 | 15.6 | |
| Line regulation | Reg・line | 19 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 1 | 12 | mV |
| | | 15.35 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 10 mA | — | 2 | 20 | |
| Load regulation | Reg・load | $V_{IN}$ = 20 V, 10 mA ≦ $I_{OUT}$ ≦ 250 mA | — | 20 | 60 | mV |
| Quiescent current | $I_B$ | 16 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 0 A | — | 0.75 | 1.40 | mA |
| | | 16 V ≦ $V_{IN}$ ≦ 26 V, $I_{OUT}$ = 250 mA | — | 25 | 50 | |
| Dropout voltage | $V_D$ | $I_{OUT}$ = 50 mA | — | 0.08 | 0.20 | V |
| | | $I_{OUT}$ = 200 mA | — | 0.22 | 0.40 | |

## Electrical Characteristics Common to All Products

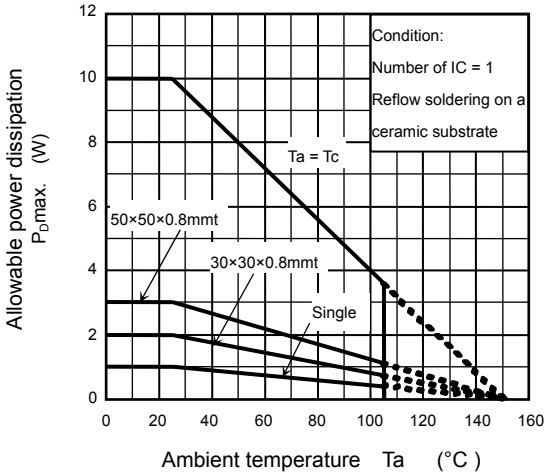
- Tj = 25°C in the measurement conditions of each item is a regulation for where the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

## Standard Application Circuit

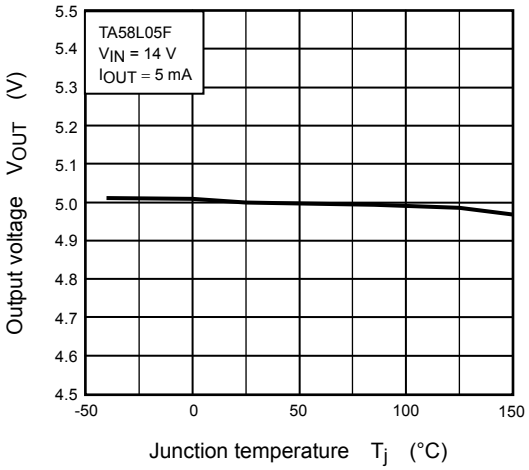



- Place $C_{IN}$ as close as possible to the input terminal and GND. Place $C_{OUT}$ as close as possible to the output terminal and GND. Although capacitor $C_{OUT}$ acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold 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.

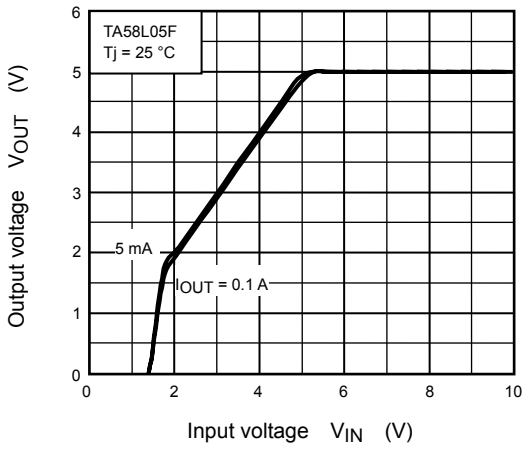
$P_D$max. – Ta



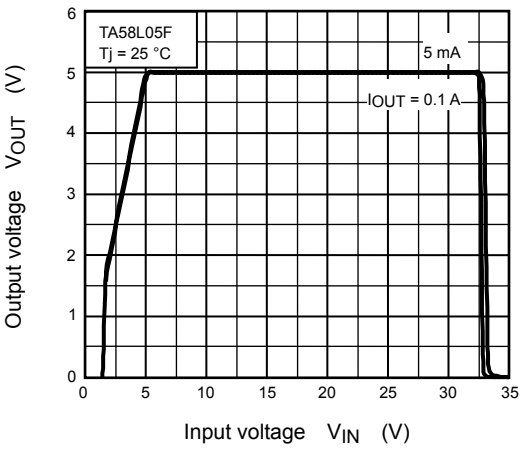

$V_{OUT}$ – $T_j$



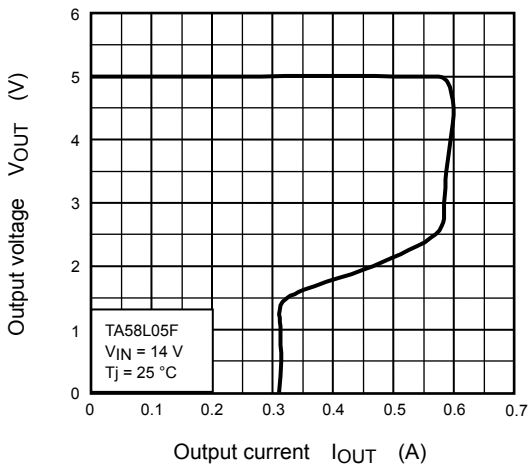

$V_{OUT}$ – $V_{IN}$



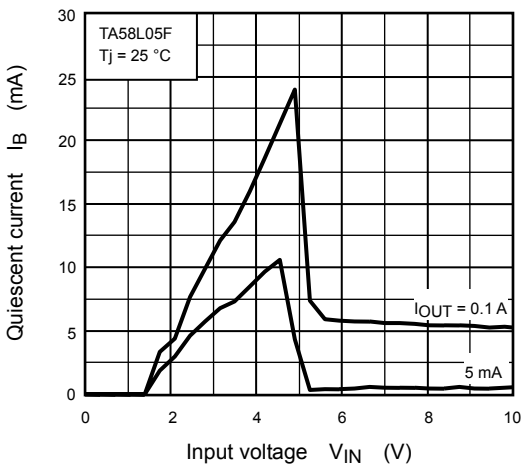

$V_{OUT}$ – $V_{IN}$



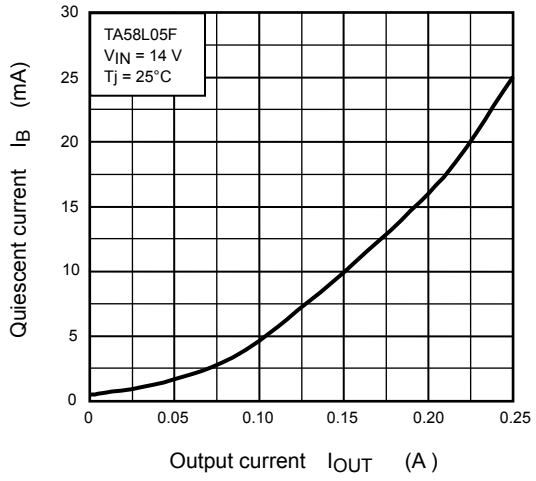

$V_{OUT}$ – $I_{OUT}$



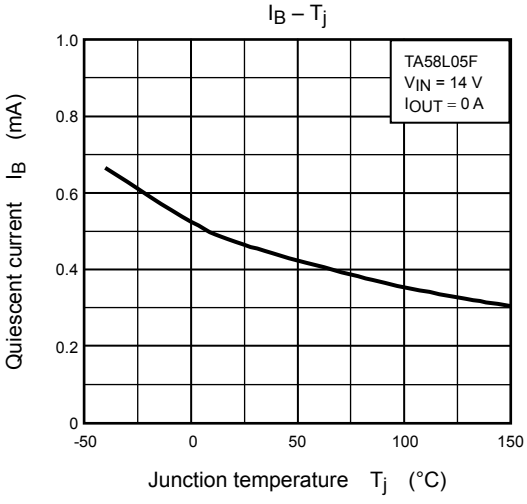

$I_B$ – $V_{IN}$



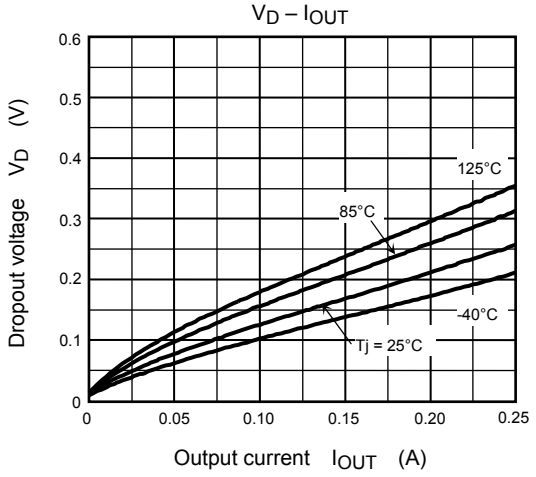
$I_B - I_{OUT}$



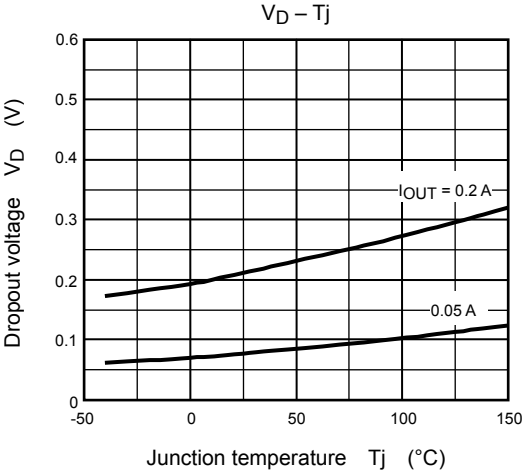

$I_B - T_j$



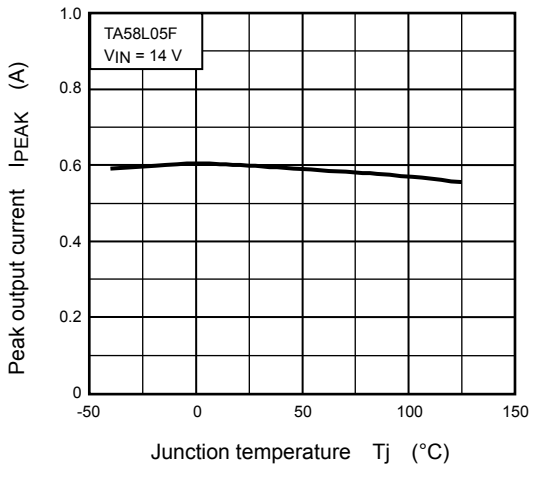

$V_D - I_{OUT}$



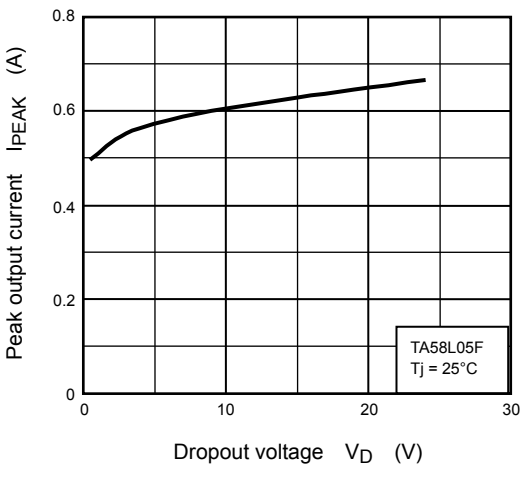

$V_D - Tj$




$I_{PEAK} - Tj$

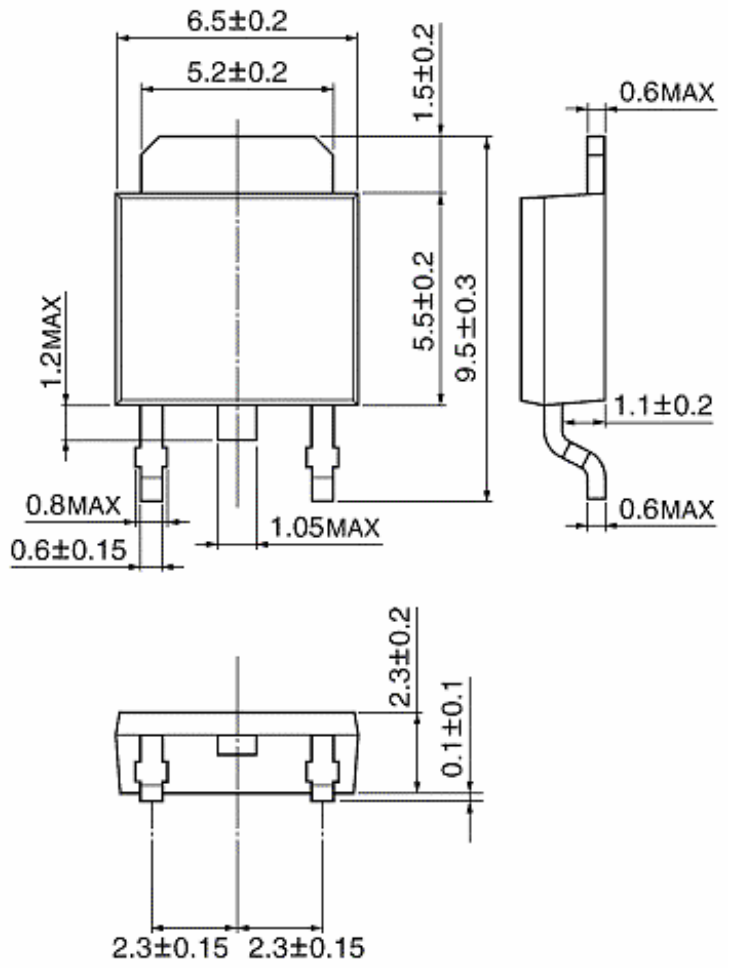



$I_{PEAK} - V_D$



## Package Dimensions

HSOP-3-P-2.30D Unit : mm




Weight: 0.36 g (Typ.)

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