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# 2SD1685

## Bipolar Transistor 20V, 5A, Low VCE(sat), NPN Single TO-126ML

ON Semiconductor®

<http://onsemi.com>

### Applications

- Strobe, voltage regulators, relay drivers, lamp drivers

### Features

- Low saturation voltage
- Large current capacity
- Fast switching time
- No insulator required when mounting because the leadframe of the chip is covered with plastic

### Specifications

#### Absolute Maximum Ratings at Ta=25°C

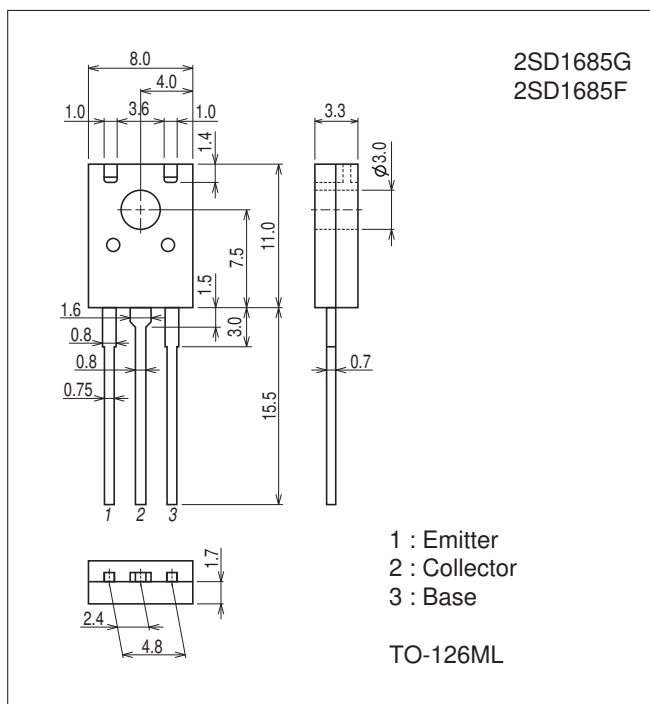
| Parameter                    | Symbol | Conditions | Ratings     | Unit |
|------------------------------|--------|------------|-------------|------|
| Collector-to-Base Voltage    | VCBO   |            | 60          | V    |
| Collector-to-Emitter Voltage | VCEO   |            | 20          | V    |
| Emitter-to-Base Voltage      | VEBO   |            | 6           | V    |
| Collector Current            | IC     |            | 5           | A    |
| Collector Current (Pulse)    | ICP    |            | 8           | A    |
| Collector Dissipation        | PC     |            | 1.5         | W    |
|                              |        | Tc=25°C    | 10          | W    |
| Junction Temperature         | Tj     |            | 150         | °C   |
| Storage Temperature          | Tstg   |            | -55 to +150 | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### Package Dimensions

unit : mm (typ)

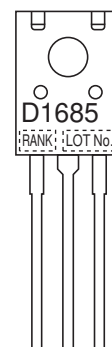
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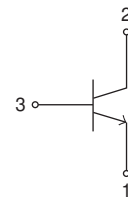
### Product & Package Information

- Package : TO-126ML
- JEITA, JEDEC : TO-126
- Minimum Packing Quantity : 200 pcs./bag

### Marking



### Electrical Connection



# 2SD1685

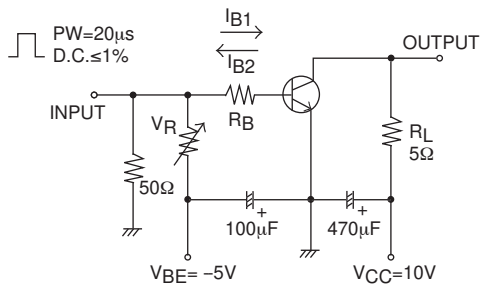
## Electrical Characteristics at Ta=25°C

| Parameter                               | Symbol        | Conditions                  | Ratings |     |      | Unit |
|---|---------------|-----------------------------|---------|-----|------|------|
|   |               |                             | min     | typ | max  |      |
| Collector Cutoff Current                | $I_{CBO}$     | $V_{CB}=50V, I_E=0A$        |         |     | 100  | nA   |
| Emitter Cutoff Current                  | $I_{EBO}$     | $V_{EB}=5V, I_C=0A$         |         |     | 100  | nA   |
| DC Current Gain                         | $h_{FE1}$     | $V_{CE}=2V, I_C=500mA$      | 120*    |     | 560* |      |
|   | $h_{FE2}$     | $V_{CE}=2V, I_C=3A$         | 95      |     |      |      |
| Gain-Bandwidth Product                  | $f_T$         | $V_{CE}=10V, I_C=50mA$      |         | 120 |      | MHz  |
| Output Capacitance                      | $C_{ob}$      | $V_{CB}=10V, f=1MHz$        |         | 45  |      | pF   |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=3A, I_B=60mA$          |         | 220 | 500  | mV   |
| Base-to-Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C=3A, I_B=60mA$          |         |     | 1.5  | V    |
| Collector-to-Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C=10\mu A, I_E=0A$       | 60      |     |      | V    |
| Collector-to-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C=1mA, R_{BE}=\infty$    | 20      |     |      | V    |
| Emitter-to-Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E=10\mu A, I_C=0A$       | 6       |     |      | V    |
| Turn-ON Time                            | $t_{on}$      | See specified Test Circuit. |         | 30  |      | ns   |
| Storage Time                            | $t_{stg}$     |                             |         | 300 |      | ns   |
| Fall Time                               | $t_f$         |                             |         | 40  |      | ns   |

\* : The 2SD1685 is classified by 500mA  $h_{FE}$  as follows :

| Rank     | E          | F          | G          |
|----------|------------|------------|------------|
| $h_{FE}$ | 120 to 200 | 160 to 320 | 280 to 560 |

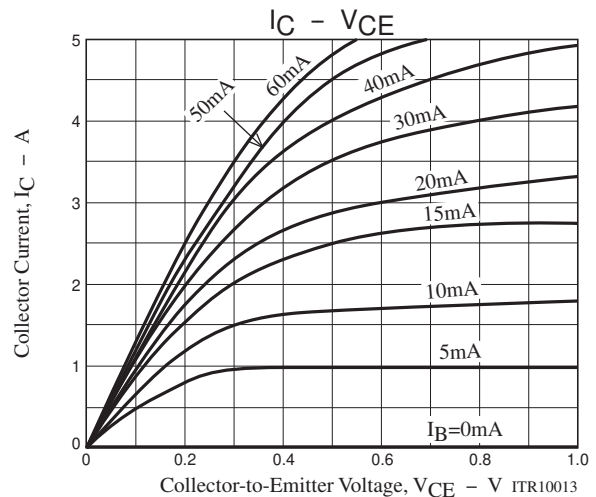
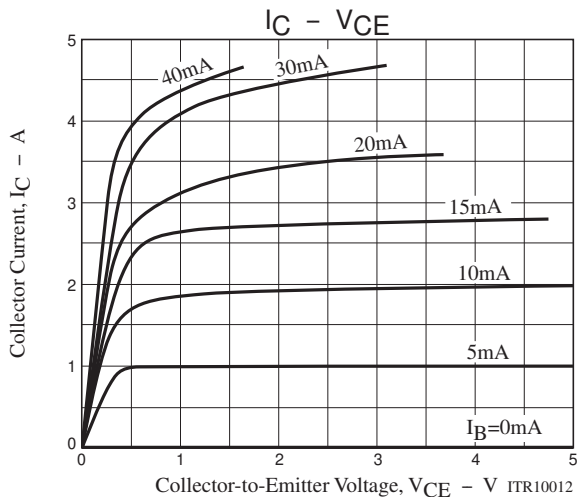
## Switching Time Test Circuit

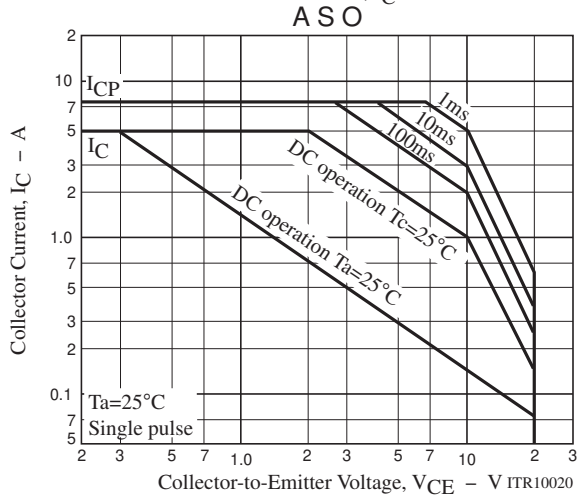
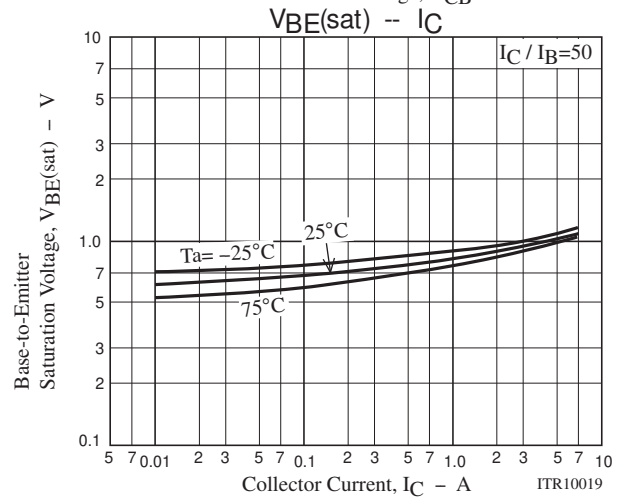
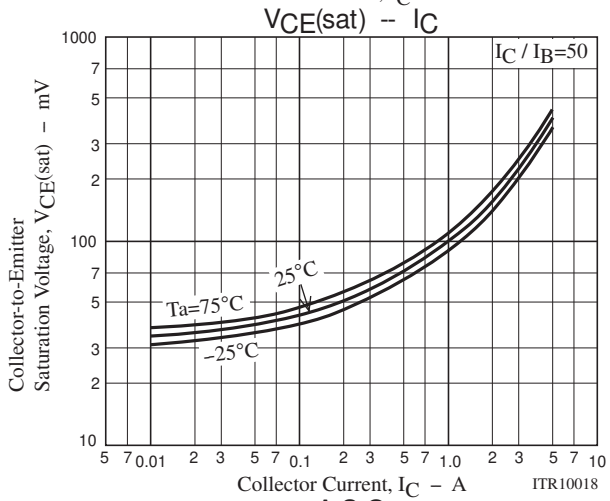
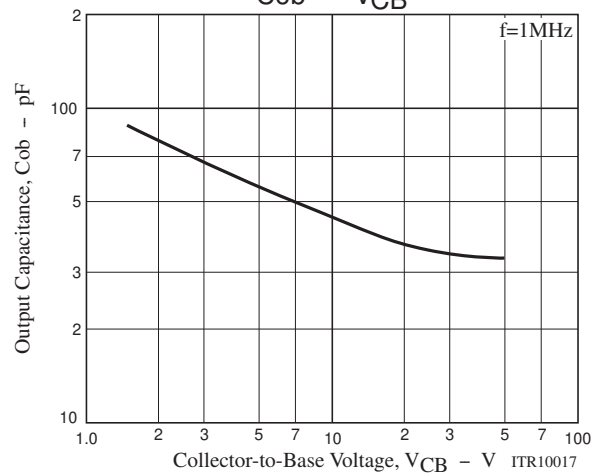
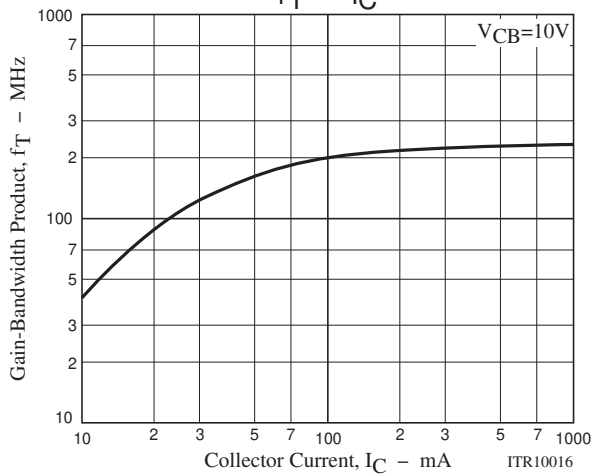
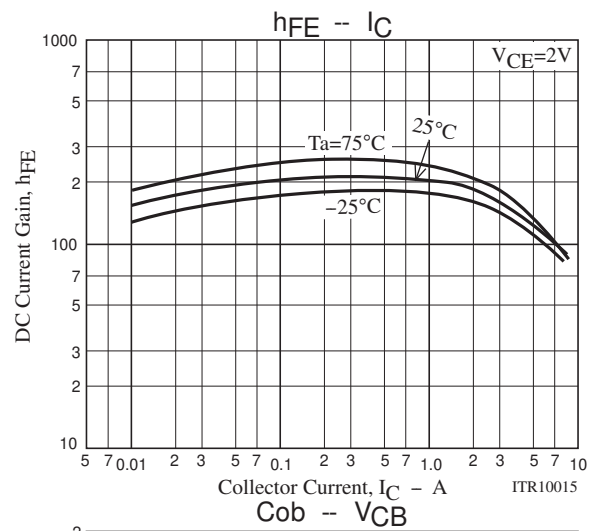
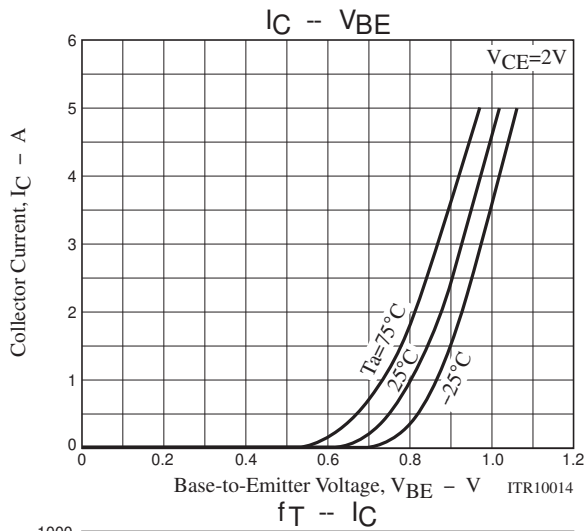


$$I_C = 10I_{B1} = -10I_{B2} = 2A$$

## Ordering Information

| Device   | Package  | Shipping    | memo    |
|----------|----------|-------------|---------|
| 2SD1685G | TO-126ML | 200pcs./bag | Pb Free |
| 2SD1685F | TO-126ML | 200pcs./bag |         |





**Bag Packing Specification**

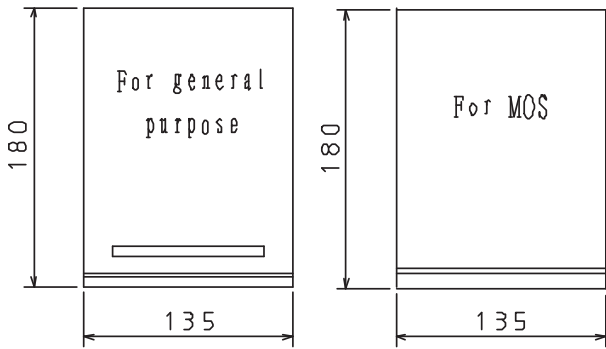
2SD1685G, 2SD1685F

1. Packing Format

| Package Name | Maximum Number of devices contained (pcs) |           |           | Packing format   |   |
|--------------|---|-----------|-----------|--|---|
|              | Bag                                       | Inner box | Outer box | Inner BOX  | Outer BOX   |
| TO-126ML     | 200                                       | 4,000     | 12,000    | B-1<br>20 bags contained<br>Dimensions:mm (external)<br>445×225×55 | A-2<br>3 inner boxes contained<br>Dimensions:mm (external)<br>470×250×190 |

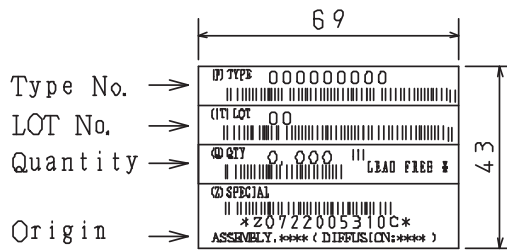
2. Bag dimensions

(unit:mm)



3. Bag label, Inner box label

(unit:mm)



NOTE (1)

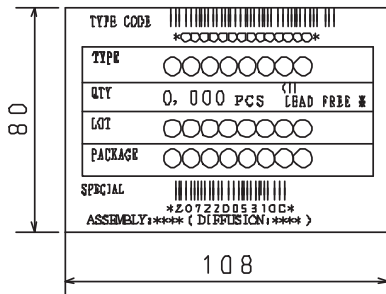
The LEAD FREE # description shows that the surface treatment of the terminal is lead free.

| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

4. Outer box label

(unit:mm)

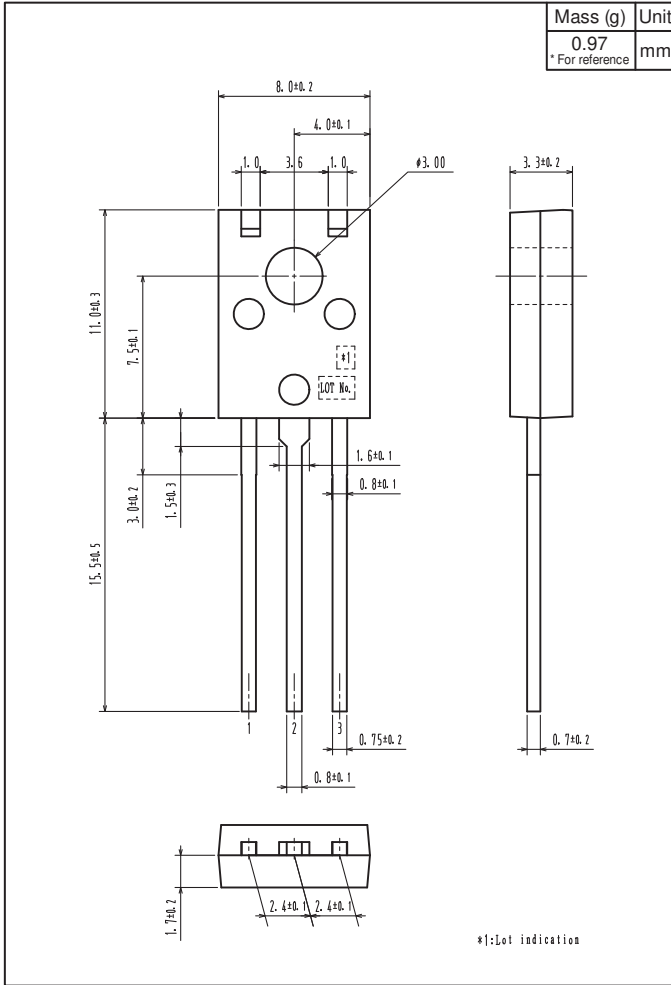
It is a label at the time of factory shipments.  
The form of a label may change in physical distribution process.



# 2SD1685

## Outline Drawing

2SD1685G, 2SD1685F



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