# Power management (dual transistors)

## UMF7N

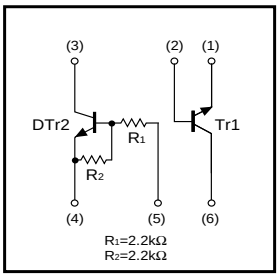
2SC5585 and DTC123EE are housed independently in a UMT package.

**●Application**
Power management circuit

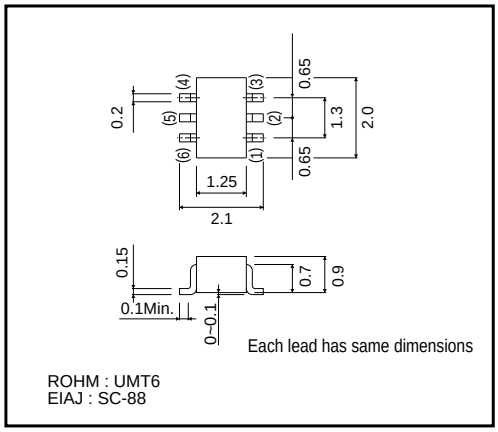
**●Features**
1) Power switching circuit in a single package.
2) Mounting cost and area can be cut in half.

**●Structure**
Silicon epitaxial planar transistor

**●Equivalent circuits**




**●External dimensions** (Units : mm)




**●Packaging specifications**

| Type | UMF7N |
|---|---|
| Package | UMT6 |
| Marking | F7 |
| Code | TR |
| Basic ordering unit(pieces) | 3000 |

## ●Absolute maximum ratings (Ta=25°C)

Tr1

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | 15 | V |
| Collector-emitter voltage | $V_{CEO}$ | 12 | V |
| Emitter-base voltage | $V_{EBO}$ | 6 | V |
| Collector current | $I_C$ | 500 | mA |
| | $I_{CP}$ | 1.0 | A *1 |
| Power dissipation | $P_C$ | 150(TOTAL) | mW *2 |
| Junction temperature | Tj | 150 | °C |
| Range of storage temperature | Tstg | −55~+150 | °C |

*1 Single pulse $P_W$=1ms
*2 120mW per element must not be exceeded.
Each terminal mounted on a recommended land.

DTr2

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 50 | V |
| Input voltage | $V_{IN}$ | −10~+20 | V |
| Collector current | $I_C$ | 100 | mA *1 |
| Output current | $I_O$ | 100 | mA |
| Power dissipation | $P_C$ | 150(TOTAL) | mW *2 |
| Junction temperature | Tj | 150 | °C |
| Range of storage temperature | Tstg | −55~+150 | °C |

*1 Characteristics of built-in transistor.
*2 120mW per element must not be exceeded.
Each terminal mounted on a recommended land.

## ●Electrical characteristics (Ta=25°C)

Tr1

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Collector-emitter breakdown voltage | $BV_{CEO}$ | 12 | – | – | V | $I_C$=1mA |
| Collector-base breakdown voltage | $BV_{CBO}$ | 15 | – | – | V | $I_C$=10μA |
| Emitter-base breakdown voltage | $BV_{EBO}$ | 6 | – | – | V | $I_E$=10μA |
| Collector cut-off current | $I_{CBO}$ | – | – | 100 | nA | $V_{CB}$=15V |
| Emitter cut-off current | $I_{EBO}$ | – | – | 100 | nA | $V_{EB}$=6V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | – | 90 | 250 | mV | $I_C$=200mA, $I_B$=10mA |
| DC current gain | $h_{FE}$ | 270 | – | 680 | – | $V_{CE}$=2V, $I_C$=10mA |
| Transition frequency | $f_T$ | – | 320 | – | MHz | $V_{CE}$=2V, $I_E$=−10mA, f=100MHz |
| Collector output capacitance | Cob | – | 7.5 | – | pF | $V_{CB}$=10V, $I_E$=0mA, f=1MHz |

DTr2

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Input voltage | $V_{I(off)}$ | – | – | 0.5 | V | $V_{CC}$=5V, $I_O$=100μA |
| | $V_{I(on)}$ | 3.0 | – | – | V | $V_O$=0.3V, $I_O$=20mA |
| Output voltage | $V_{O(on)}$ | – | 100 | 300 | mV | $V_O$=10mA, $I_I$=0.5mA |
| Input current | $I_I$ | – | – | 3.8 | mA | $V_I$=5V |
| Output current | $I_{O(off)}$ | – | – | 0.5 | μA | $V_{CC}$=50V, $V_I$=0V |
| DC current gain | $G_I$ | 20 | – | – | – | $V_O$=5V, $I_O$=20mA |
| Transition frequency | $f_T$ | – | 250 | – | MHz | $V_{CE}$=10V, $I_E$=−5mA, f=100MHz * |
| Input resistance | $R_1$ | − | 2.2 | − | kΩ | – |
| Resistance ratio | $R_2/R_1$ | 0.8 | 1.0 | 1.2 | – | – |

* Characteristics of built-in transistor.

**●Electrical characteristic curves**

Tr1

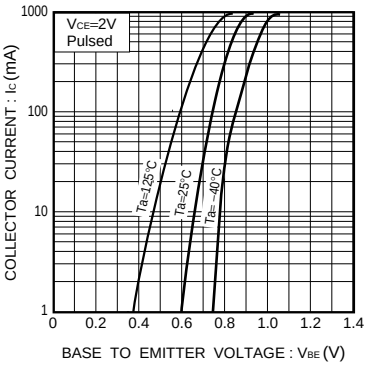



Fig.1 Grounded emitter propagation characteristics

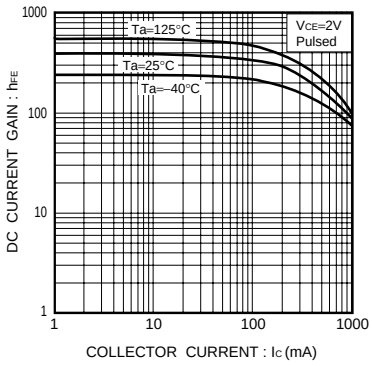



Fig.2 DC current gain vs. collector current

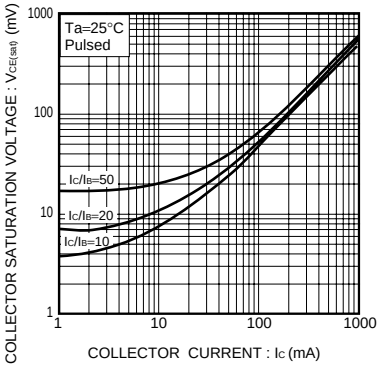



Fig.3 Collector-emitter saturation voltage vs. collector current ( I )

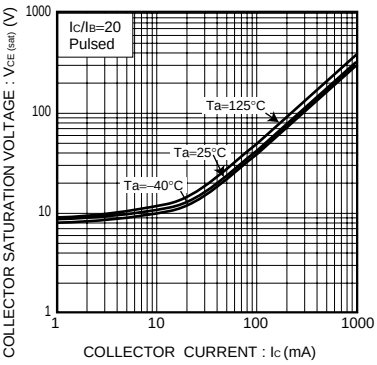



Fig.4 Collector-emitter saturation voltage vs. collector current ( II )

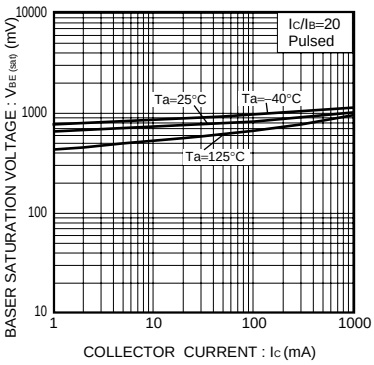



Fig.5 Base-emitter saturation voltage vs. collector current

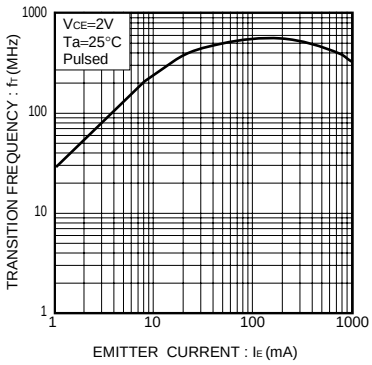



Fig.6 Gain bandwidth product vs. emitter current

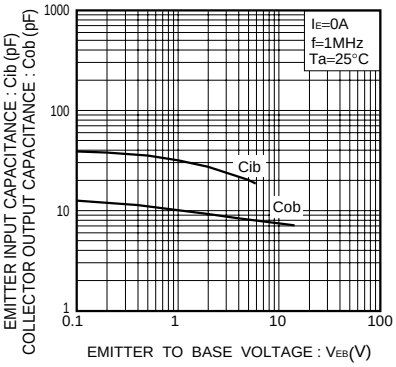



Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

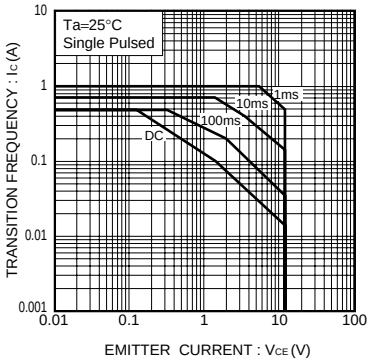



Fig.8 Safe operation area

DTr2

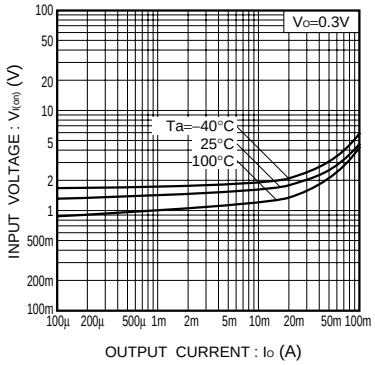



Fig.9 Input voltage vs. output current (ON characteristics)

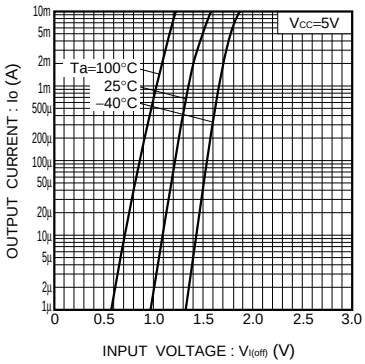



Fig.10 Output current vs. input voltage (OFF characteristics)

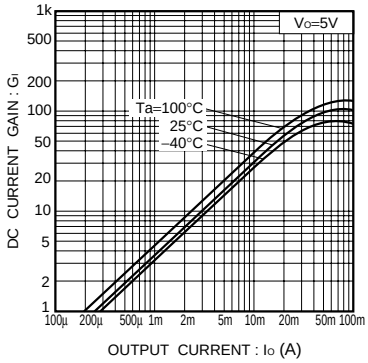



Fig.11 DC current gain vs. output current

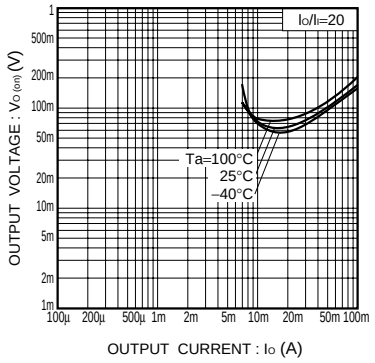



Fig.12 Output voltage vs. output current