

# Power management (dual transistors)

## EMF23/UMF23N

2SA1774 and DTC114E are housed independently in a EMT6 or UMT6 package.

### ●Application

Power management circuit

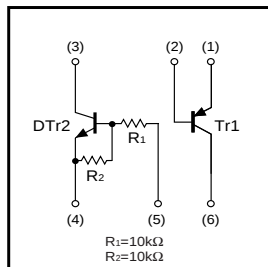
### ●Features

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

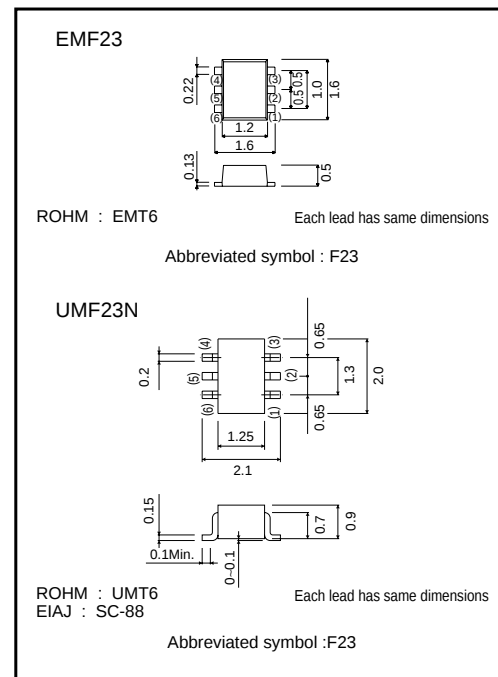
### ●Structure

Silicon epitaxial planar transistor

### ●Equivalent circuits



### ●External dimensions (Units : mm)



### ●Package, marking, and packaging specifications

| Type                        | EMF23 | UMF23N |
|-----------------------------|-------|--------|
| Package                     | EMT6  | UMT6   |
| Marking                     | F23   | F23    |
| Code                        | T2R   | TR     |
| Basic ordering unit(pieces) | 8000  | 3000   |

## Transistors

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

Tr1

| Parameter                   | Symbol           | Limits      | Unit |
|-----------------------------|------------------|-------------|------|
| Collector-base voltage      | V <sub>CBO</sub> | −60         | V    |
| Collector-emitter voltage   | V <sub>CEO</sub> | −50         | V    |
| Emitter-base voltage        | V <sub>EBO</sub> | −6          | V    |
| Collector current           | I <sub>C</sub>   | −150        | mA   |
| Collector power dissipation | P <sub>C</sub>   | 150 (TOTAL) | mW * |
| Junction temperature        | T <sub>J</sub>   | 150         | °C   |
| Storage temperature         | T <sub>stg</sub> | −55 to +150 | °C   |

\* 120mW per element must not be exceeded.

DTr2

| Parameter                    | Symbol           | Limits      | Unit  |
|------------------------------|------------------|-------------|-------|
| Supply voltage               | V <sub>CC</sub>  | 50          | V     |
| Input voltage                | V <sub>IN</sub>  | −10~+40     | V     |
| Collector current            | I <sub>C</sub>   | 100         | mA *1 |
| Output current               | I <sub>O</sub>   | 50          | mA    |
| Power dissipation            | P <sub>C</sub>   | 150(TOTAL)  | mW *2 |
| Junction temperature         | T <sub>J</sub>   | 150         | °C    |
| Range of storage temperature | T <sub>stg</sub> | −55 to +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-base breakdown voltage     | BV <sub>CBO</sub>    | −60  | −    | −    | V    | I <sub>C</sub> =−50μA                                |
| Collector-emitter breakdown voltage  | BV <sub>CEO</sub>    | −50  | −    | −    | V    | I <sub>C</sub> =−1mA                                 |
| Emitter-base breakdown voltage       | BV <sub>EBO</sub>    | −6   | −    | −    | V    | I <sub>E</sub> =−50μA                                |
| Collector cutoff current             | I <sub>CBO</sub>     | −    | −    | −0.1 | μA   | V <sub>CB</sub> =−60V                                |
| Emitter cutoff current               | I <sub>EBO</sub>     | −    | −    | −0.1 | μA   | V <sub>EB</sub> =−6V                                 |
| Collector-emitter saturation voltage | V <sub>CE(sat)</sub> | −    | −    | −0.5 | V    | I <sub>C</sub> /I <sub>B</sub> =−50mA/−5mA           |
| DC current transfer ratio            | h <sub>FE</sub>      | 180  | −    | 390  | −    | V <sub>CE</sub> =−6V, I <sub>C</sub> =−1mA           |
| Transition frequency                 | f <sub>T</sub>       | −    | 140  | −    | MHz  | V <sub>CE</sub> =−12V, I <sub>E</sub> =2mA, f=100MHz |
| Output capacitance                   | C <sub>ob</sub>      | −    | 4    | 5    | pF   | V <sub>CB</sub> =−12V, I <sub>E</sub> =0A, f=1MHz    |

DTr2

| Parameter            | Symbol                         | Min. | Typ. | Max. | Unit | Conditions                                             |
|----------------------|--------------------------------|------|------|------|------|--------------------------------------------------------|
| Input voltage        | V <sub>I(off)</sub>            | −    | −    | 0.5  | V    | V <sub>CC</sub> =5V, I <sub>O</sub> =100μA             |
|                      | V <sub>I(on)</sub>             | 3    | −    | −    |      | V <sub>O</sub> =0.3V, I <sub>O</sub> =10mA             |
| Output voltage       | V <sub>O(on)</sub>             | −    | 0.1  | 0.3  | V    | I <sub>O</sub> /I <sub>I</sub> =10mA/0.5mA             |
| Input current        | I <sub>I</sub>                 | −    | −    | 0.88 | mA   | V <sub>I</sub> =5V                                     |
| Output current       | I <sub>O(off)</sub>            | −    | −    | 0.5  | μA   | V <sub>CC</sub> =50V, V <sub>I</sub> =0V               |
| DC current gain      | G <sub>I</sub>                 | 30   | −    | −    | −    | V <sub>O</sub> =5V, I <sub>O</sub> =5mA                |
| Input resistance     | R <sub>1</sub>                 | 7    | 10   | 13   | kΩ   | −                                                      |
| Resistance ratio     | R <sub>2</sub> /R <sub>1</sub> | 0.8  | 1    | 1.2  | −    | −                                                      |
| Transition frequency | f <sub>T</sub>                 | −    | 250  | −    | MHz  | V <sub>CE</sub> =10V, I <sub>E</sub> =−5mA, f=100MHz * |

\* Transition frequency of the device

## Transistors

## ●Electrical characteristic curves

Tr1

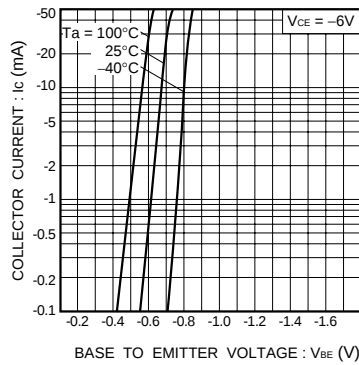


Fig.1 Grounded emitter propagation characteristics

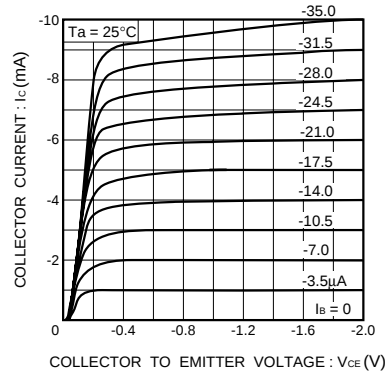


Fig.2 Grounded emitter output characteristics (I)

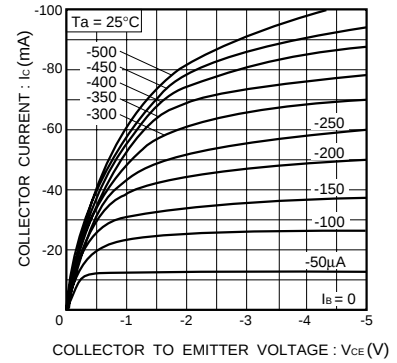


Fig.3 Grounded emitter output characteristics (II)

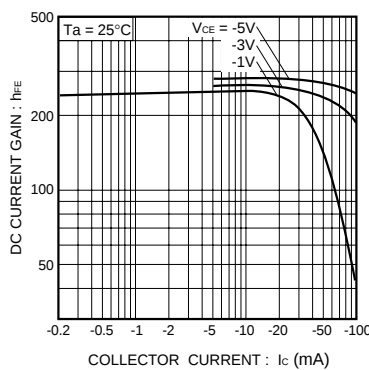


Fig.4 DC current gain vs. collector current (I)

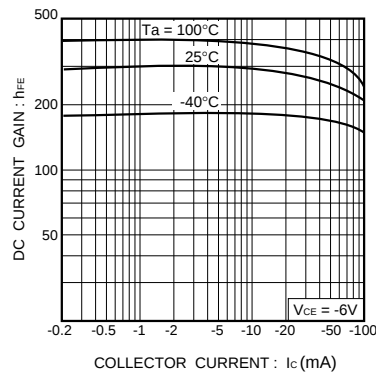


Fig.5 DC current gain vs. collector current (II)

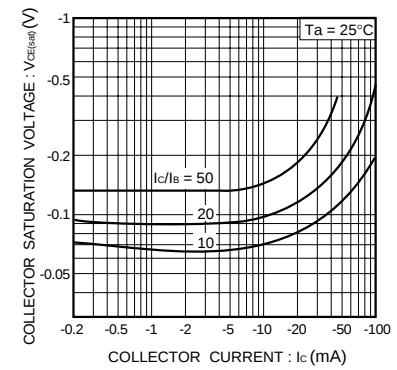


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

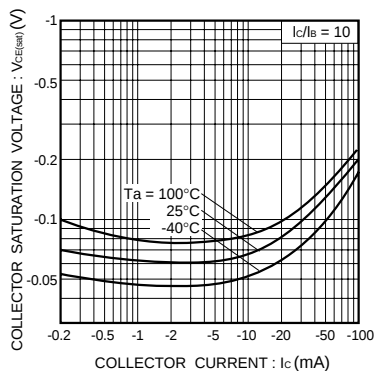


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

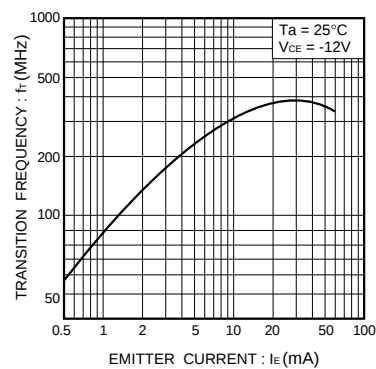
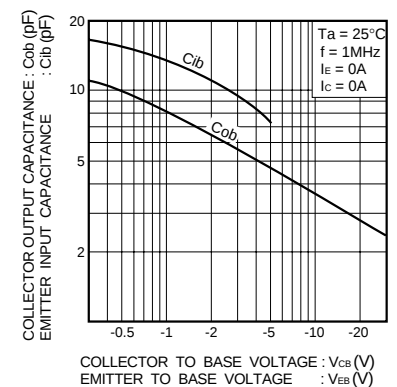


Fig.8 Gain bandwidth product vs. emitter current

Fig.9 Collector output capacitance vs. collector-base voltage  
Emitter input capacitance vs. emitter-base voltage

## Transistors

DTr2

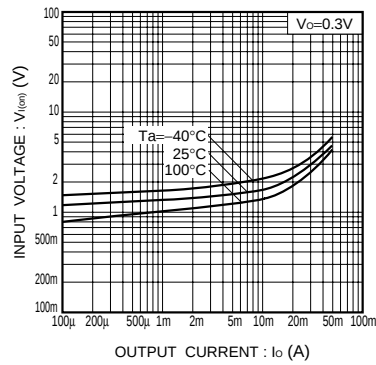


Fig.1 Input voltage vs. output current (ON characteristics)

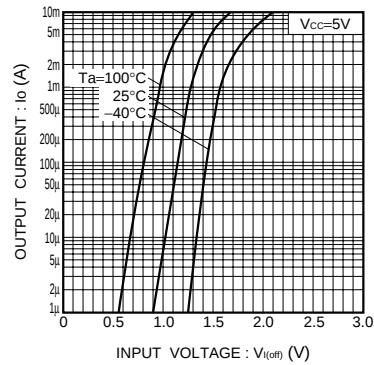


Fig.2 Output current vs. input voltage (OFF characteristics)

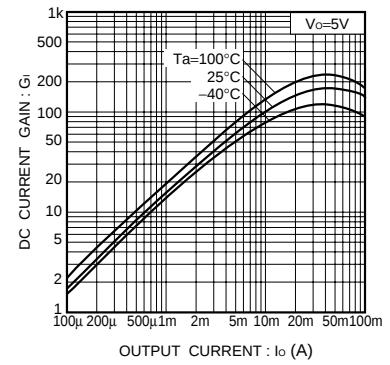


Fig.3 DC current gain vs. output current

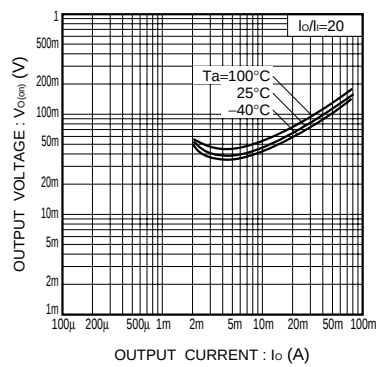


Fig.4 Output voltage vs. output current

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