# EMD22 / UMD22N

**NPN + PNP  Complex Digital Transistors** (Bias Resistor Built-in Transistors)  Datasheet

<For DTr1(NPN)>

| Parameter | Value |
|---|---|
| $V_{CC}$ | 50V |
| $I_{C(MAX.)}$ | 100mA |
| $R_1$ | 4.7kΩ |
| $R_2$ | 47kΩ |

<For DTr2(PNP)>

| Parameter | Value |
|---|---|
| $V_{CC}$ | −50V |
| $I_{C(MAX.)}$ | −100mA |
| $R_1$ | 4.7kΩ |
| $R_2$ | 47kΩ |

●**Outline**



EMD22 (SC-107C)

UMD22N SOT-363 (SC-88)

●**Features**

1) Both the DTC143Z chip and DTA143Z chip in one package.

2) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see inner circuit).

3) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of completely eliminating parasitic effects.

4) Only the on/off conditions need to be set for operation, making the circuit design easy.

5) Lead Free/RoHS Compliant.

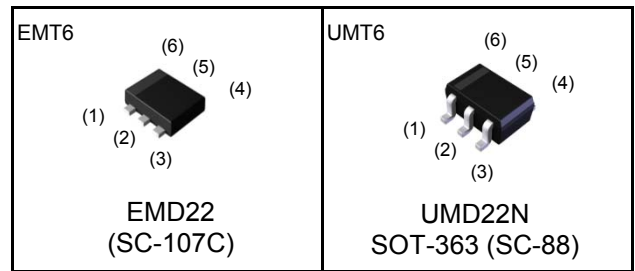●**Application**
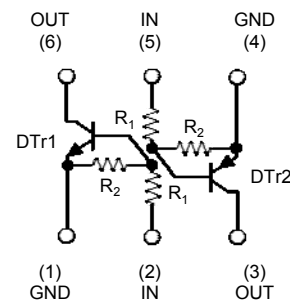
Inverter circuit, Interface circuit, Driver circuit

●**Inner circuit**



●**Packaging specifications**

| Part No. | Package | Package size (mm) | Taping code | Reel size (mm) | Tape width (mm) | Basic ordering unit (pcs) | Marking |
|---|---|---|---|---|---|---|---|
| EMD22 | EMT6 | 1616 | T2R | 180 | 8 | 8,000 | D22 |
| UMD22N | UMT6 | 2021 | TR | 180 | 8 | 3,000 | D22 |

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

| Parameter | Symbol | DTr1(NPN) | DTr2(PNP) | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | 50 | −50 | V |
| Input voltage | $V_{IN}$ | −5 to +30 | −30 to +5 | V |
| Output current | $I_O$ | 100 | −100 | mA |
| Collector current | $I_{C(MAX.)}$ [1] | 100 | −100 | mA |
| Power dissipation | $P_D$ [2] | 150 (Total) [3] | | mW |
| Junction temperature | $T_j$ | 150 | | °C |
| Range of storage temperature | $T_{stg}$ | −55 to +150 | | °C |

● **Electrical characteristics** (Ta = 25°C)   &lt;For DTr1(NPN)&gt;

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input voltage | $V_{I(off)}$ | $V_{CC}$ = 5V, $I_O$ = 100μA | - | - | 0.5 | V |
| | $V_{I(on)}$ | $V_O$ = 0.3V, $I_O$ = 5mA | 1.3 | - | - | |
| Output voltage | $V_{O(on)}$ | $I_O$ / $I_I$ = 5mA / 0.25mA | - | 0.1 | 0.3 | V |
| Input current | $I_I$ | $V_I$ = 5V | - | - | 1.8 | mA |
| Output current | $I_{O(off)}$ | $V_{CC}$ = 50V, $V_I$ = 0V | - | - | 0.5 | μA |
| DC current gain | $G_I$ | $V_O$ = 5V, $I_O$ = 10mA | 80 | - | - | - |
| Input resistance | $R_1$ | - | 3.29 | 4.7 | 6.11 | kΩ |
| Resistance ratio | $R_2/R_1$ | - | 8 | 10 | 12 | - |
| Transition frequency | $f_T$ [1] | $V_{CE}$ = 10V, $I_E$ = −5mA f = 100MHz | - | 250 | - | MHz |

● **Electrical characteristics** (Ta = 25°C)   &lt;For DTr2(PNP)&gt;

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input voltage | $V_{I(off)}$ | $V_{CC}$ = −5V, $I_O$ = −100μA | - | - | −0.5 | V |
| | $V_{I(on)}$ | $V_O$ = −0.3V, $I_O$ = −5mA | −1.3 | - | - | |
| Output voltage | $V_{O(on)}$ | $I_O$ / $I_I$ = −5mA / −0.25mA | - | −0.1 | −0.3 | V |
| Input current | $I_I$ | $V_I$ = −5V | - | - | −1.8 | mA |
| Output current | $I_{O(off)}$ | $V_{CC}$ = −50V, $V_I$ = 0V | - | - | −0.5 | μA |
| DC current gain | $G_I$ | $V_O$ = −5V, $I_O$ = −10mA | 80 | - | - | - |
| Input resistance | $R_1$ | - | 3.29 | 4.7 | 6.11 | kΩ |
| Resistance ratio | $R_2/R_1$ | - | 8 | 10 | 12 | - |
| Transition frequency | $f_T$ [1] | $V_{CE}$ = −10V, $I_E$ = 5mA f = 100MHz | - | 250 | - | MHz |

*1 Characteristics of built-in transistor

*2 Each terminal mounted on a reference footprint

*3 120mW per element must not be exceeded.

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● **Electrical characteristic curves** (Ta = 25°C) <For DTr1(NPN)>

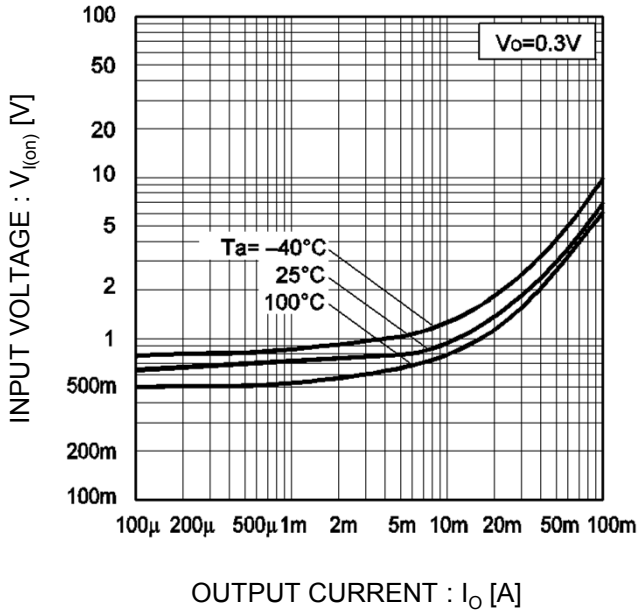Fig.1 Input voltage vs. output current
(ON characteristics)



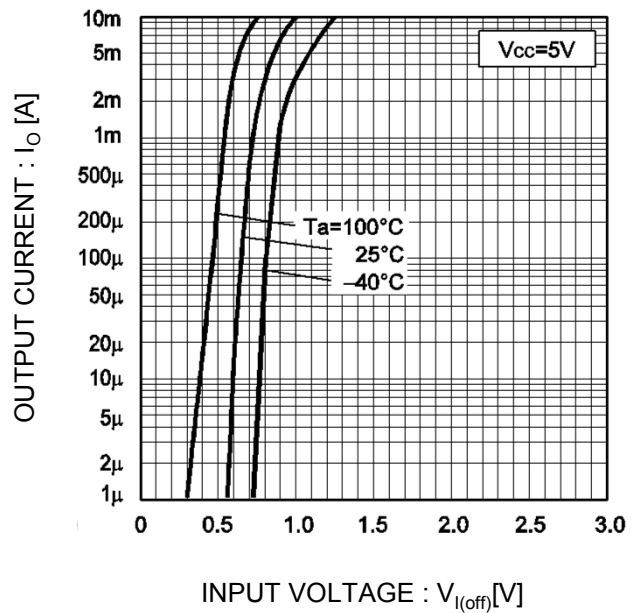Fig.2 Output current vs. input voltage
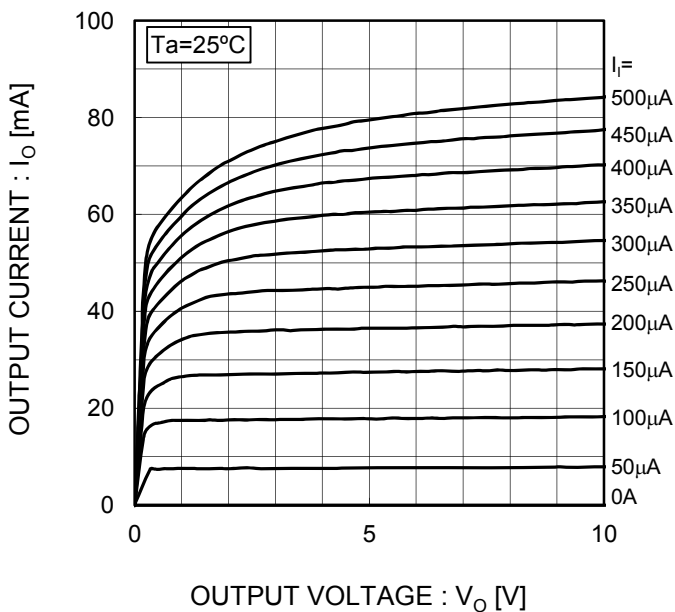(OFF characteristics)



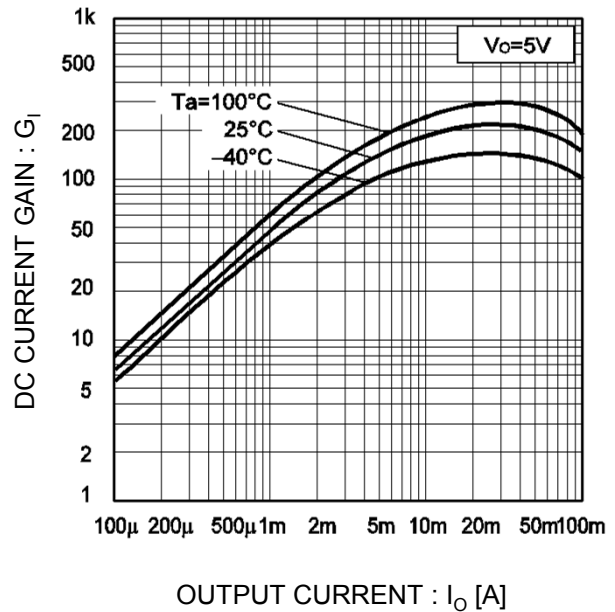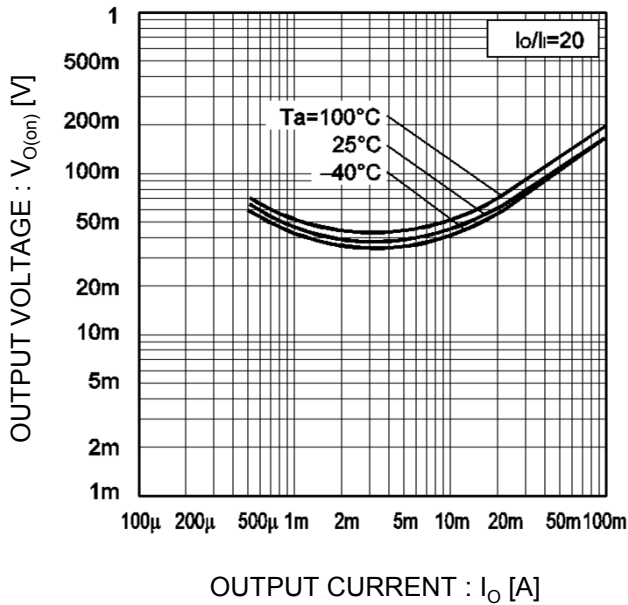Fig.3 Output current  vs. output voltage



Fig.4 DC current gain vs. output current

●**Electrical characteristic curves** (Ta = 25°C) <For DTr1(NPN)>

Fig.5 Output voltage vs. output current



●**Electrical characteristic curves** (Ta = 25°C) <For DTr2(PNP)>

Fig.6 Input voltage vs. output current
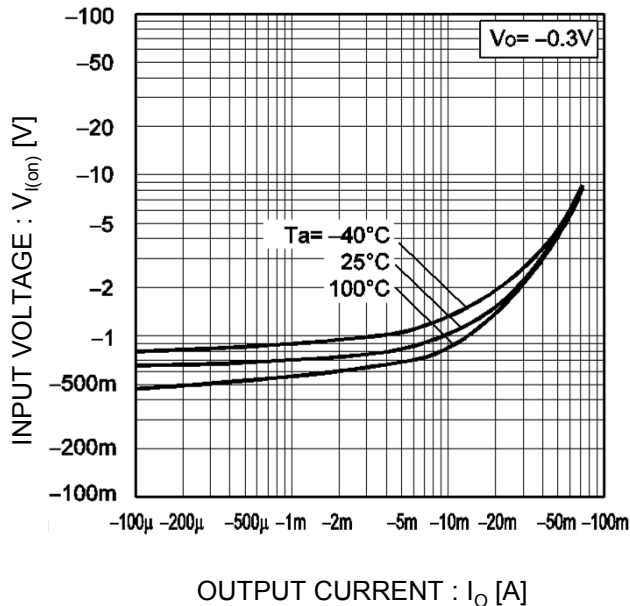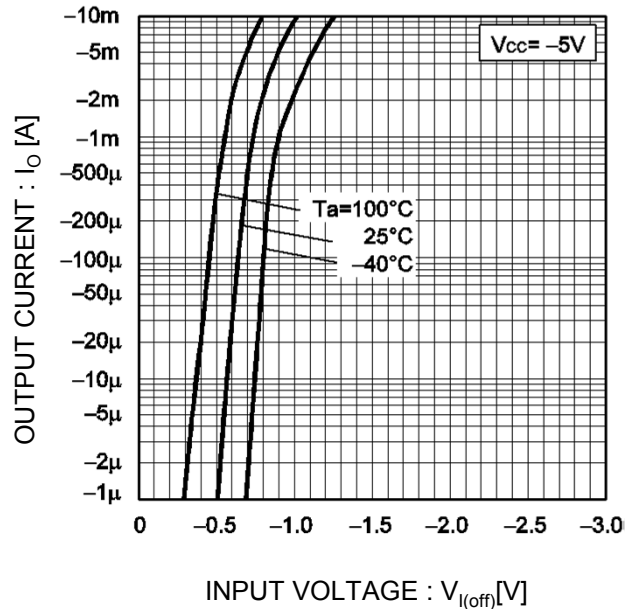(ON characteristics)

Fig.7 Output current vs. input voltage
(OFF characteristics)

●**Electrical characteristic curves** (Ta = 25°C) <For DTr2(PNP)>

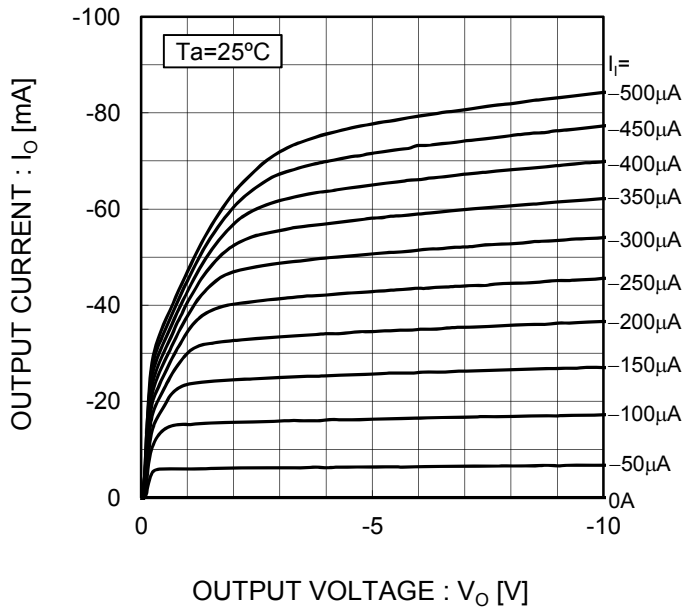Fig.8 Output current  vs. output voltage
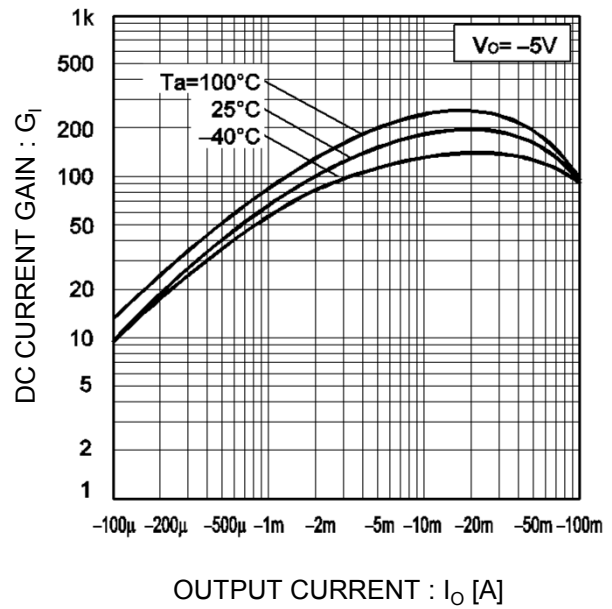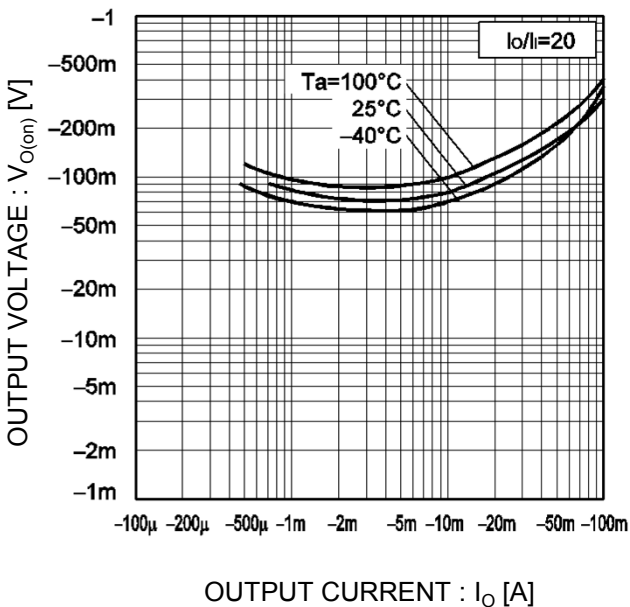


Fig.9 DC current gain vs. output current



Fig.10 Output voltage vs. output current

●**Dimensions** (Unit : mm)

**EMT6**



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]
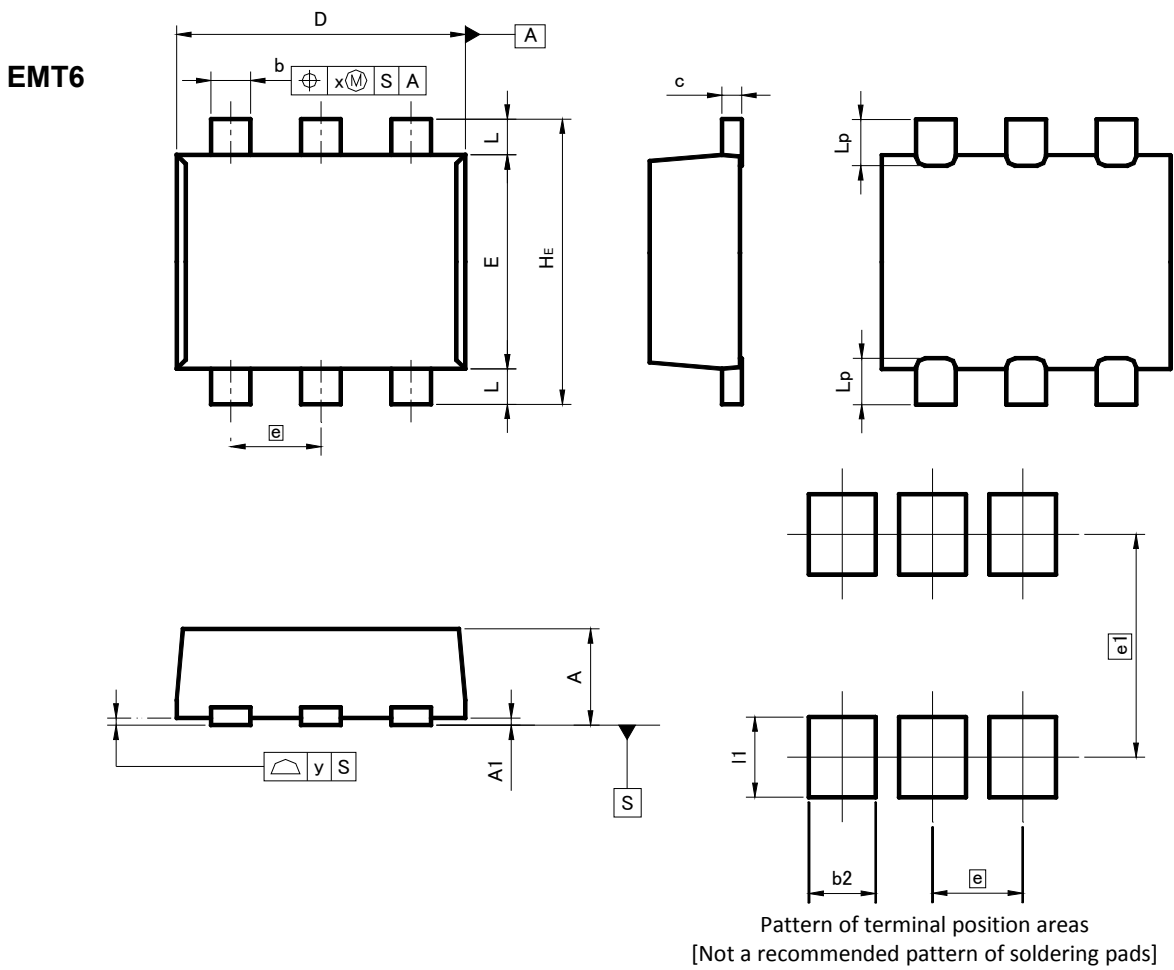
| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.45 | 0.55 | 0.018 | 0.022 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| b | 0.17 | 0.27 | 0.007 | 0.011 |
| c | 0.08 | 0.18 | 0.003 | 0.007 |
| D | 1.50 | 1.70 | 0.059 | 0.067 |
| E | 1.10 | 1.30 | 0.043 | 0.051 |
| e | 0.50 | | 0.020 | |
| $H_E$ | 1.50 | 1.70 | 0.059 | 0.067 |
| L | 0.10 | 0.30 | 0.004 | 0.012 |
| Lp | – | 0.35 | – | 0.014 |
| x | – | 0.10 | – | 0.004 |
| y | – | 0.10 | – | 0.004 |

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| b2 | – | 0.37 | – | 0.015 |
| e1 | 1.25 | | 0.049 | |
| l1 | – | 0.45 | – | 0.018 |

Dimension in mm / inches

● **Dimensions** (Unit : mm)

**UMT6**



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]
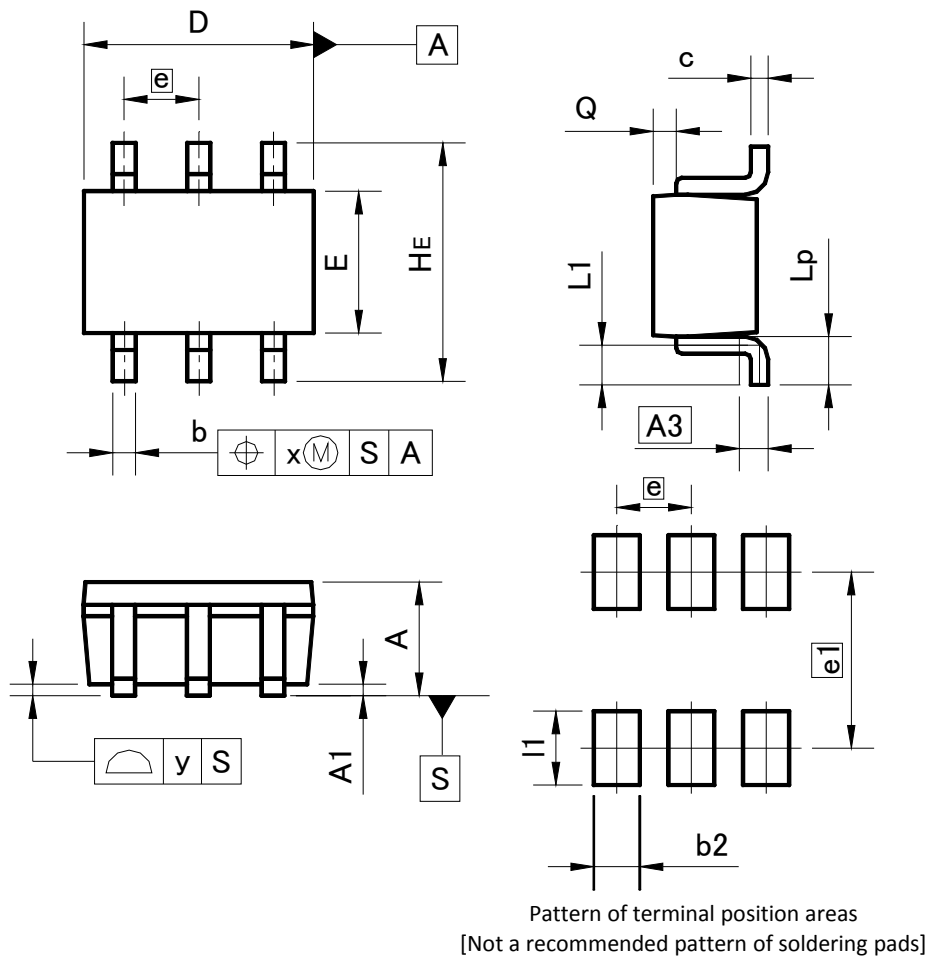
| DIM | MILIMETERS | | INCHES | |
|-----|------|------|------|------|
|     | MIN  | MAX  | MIN  | MAX  |
| A   | 0.80 | 1.00 | 0.031 | 0.039 |
| A1  | 0.00 | 0.10 | 0.000 | 0.004 |
| A3  | 0.25 | | 0.010 | |
| b   | 0.15 | 0.30 | 0.006 | 0.012 |
| c   | 0.10 | 0.20 | 0.004 | 0.008 |
| D   | 1.90 | 2.10 | 0.075 | 0.083 |
| E   | 1.15 | 1.35 | 0.045 | 0.053 |
| e   | 0.65 | | 0.026 | |
| HE  | 2.00 | 2.20 | 0.079 | 0.087 |
| L1  | 0.20 | 0.50 | 0.008 | 0.020 |
| Lp  | 0.25 | 0.55 | 0.010 | 0.022 |
| Q   | 0.10 | 0.30 | 0.004 | 0.012 |
| x   | –    | 0.10 | –    | 0.004 |
| y   | –    | 0.10 | –    | 0.004 |

| DIM | MILIMETERS | | INCHES | |
|-----|------|------|------|------|
|     | MIN  | MAX  | MIN  | MAX  |
| b2  | –    | 0.40 | –    | 0.016 |
| e1  | 1.55 | | 0.061 | |
| l1  | –    | 0.65 | –    | 0.026 |

Dimension in mm / inches

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