# 1.General Description

The EMS3157 is a single SPDT low on-resistance analog switch. It can operate from 1.5V to 5.5V power supply. The device offers low ON-state resistance and excellent ON-state resistance matching with break-before-make feature, to prevent signal distortion during the transferring of a signal from one channel to another. The device is capable of truly isolation. Even when A overrides $V_{CC}$, very little current will flow back to the supply.

# 2.Features and Benefits

- Wide Supply Range from 1.5 V to 5.5 V
- Low ON-state resistance, typically 1.9 Ω ($V_{CC}$=5.5 V)
- 1.8 V Compatible Control Logic Inputs
- High Off-Isolation: -80 dB @ 10 kHz
- Low Channel-to-Channel Crosstalk: -82 dB @ 10 kHz
- High Bandwidth: -3dB @ 800MHz
- Low Quiescent Current (< 1uA) when $V_{CC}$ = 3.3 V

# 3.Applications

- Audio, Video, UART, USB2.0 Signal and Supply Routing
- Cell phones and TWS headset

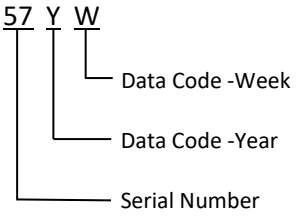
# 4.Ordering Information

**Table 1. Ordering information**

| Type number | Topside marking | Package | | |
|---|---|---|---|---|
| | | Name | Description | Quantity |
| EMS3157GW | 57 YW | SOT363 | SOT363 package, 6 pins<br>2.1 mm × 1.25 mm; 1.1 mm (Max) height | 3000 |
| EMS3157GV | 57 YW | SOT23-6L | SOT23 package, 6pins<br>2.92 mm × 1.6 mm; 1.25 mm (Max) height | 3000 |
| EMS3157GM | 57 YW | DFN1.45x1-6L | DFN1.45×1 package, 6 pins<br>1.45 mm × 1 mm; 0.6 mm (Max) height | 3000 |

**MARKING INFORMATION**

NOTE: YW = Data Code.



# 5.Pinning Information

## 5.1. Pin map

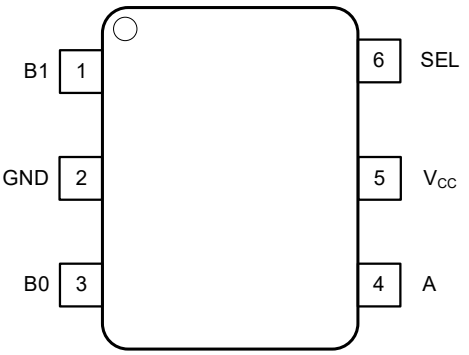



Fig 1. Top view pin configuration SOT363 and SOT23-6L

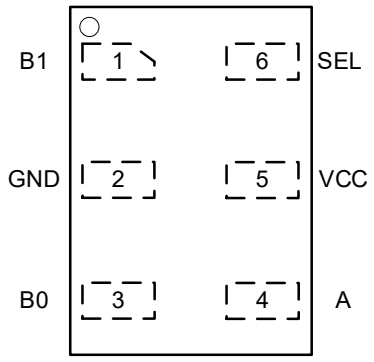



Fig 2. Top view pin configuration DFN6L

## 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| B1 | 1 | Analog/Digital Signal Port (Normally open) |
| GND | 2 | Ground (0V) |
| B0 | 3 | Analog/Digital Signal Port (Normally closed) |
| A | 4 | Common Signal Port |
| $V_{CC}$ | 5 | Supply voltage |
| SEL | 6 | Logic Input Control |

# 6.Functional Description

**Table 3. Function table**

H = HIGH voltage level; L = LOW voltage level.

| Input SEL | Channel on |
|---|---|
| L | B0 |
| H | B1 |

# 7.Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

**Table 4. Absolute Maximum Ratings**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | -0.3 | 6.5 | V |
| $V_{SEL}$ | control Input Voltage | | -0.3 | 6.5 | V |
| $V_A$ | signal input voltage | | -0.3 | 6.5 | V |
| $I_{max}$ | continuous Current Through A, B0, B1 | | | ±100 | mA |
| | peak Current Through A, B0, B1 (pulsed at 1ms 50% duty cycle) | | | ±200 | mA |
| $T_J$ | junction Temperature under Bias | | | 150 | °C |
| $T_L$ | lead Temperature (Soldering, 10 seconds) | | | 260 | °C |
| $R_{\theta JA}$ | thermal resistance | | | 350 | °C/W |

# 8.Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

**Table 5. Recommended Operating Conditions**

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | 1.5 | 5.5 | V |
| $V_{SEL}$ | control input voltage | | 0 | 5.5 | V |
| $V_A$ | signal input voltage | | 0 | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | -40 | 125 | °C |

# 9. Electrical Characteristics

**Table 6. Static characteristics**

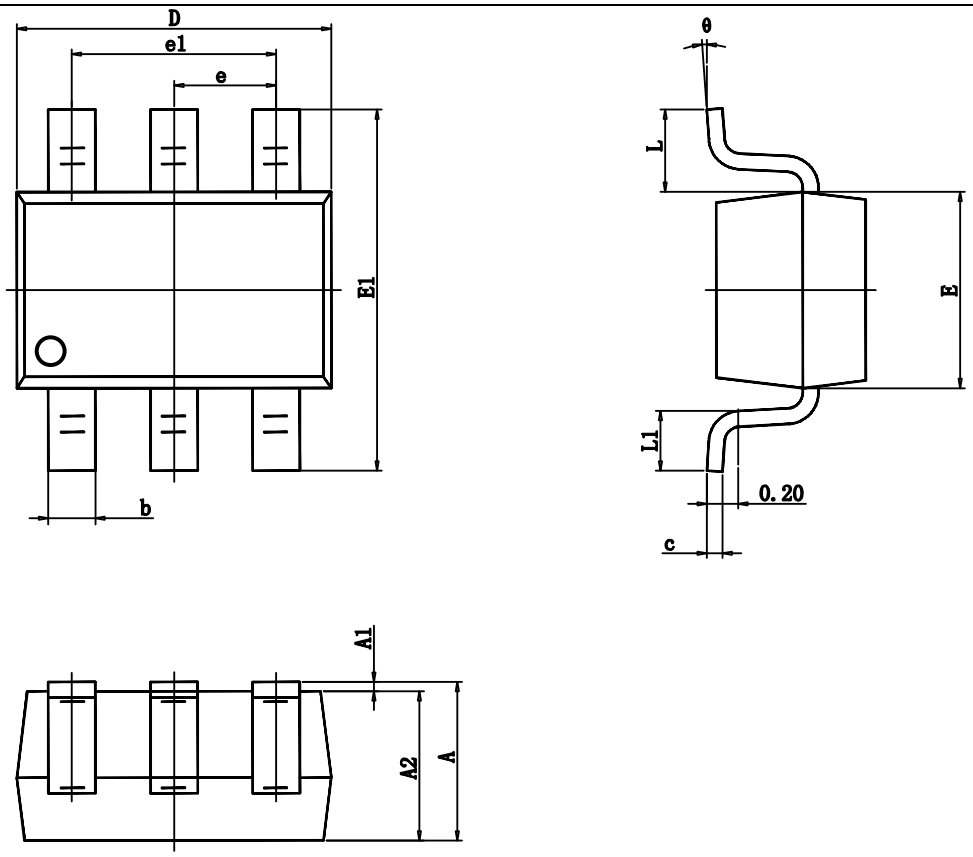
$T_{amb}$=25 ℃, $V_{CC}$=3.3 V, unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **DC Electrical Characteristics** | | | | | | |
| $V_{IH}$ | input logic high level | $V_{CC}$ = 3.4 V to 5.5 V | 1.6 | | | V |
| | | $V_{CC}$ = 1.5 V to 3.3 V | 1.4 | | | V |
| $V_{IL}$ | input logic low level | $V_{CC}$ = 3.4 V to 5.5 V | | | 0.6 | V |
| | | $V_{CC}$ = 1.5 V to 3.3 V | | | 0.4 | V |
| $I_{CC}$ | supply current | $I_A$ = 0, $V_{SEL}$ = 0 or $V_{SEL}$ = $V_{CC}$ | | | 1.0 | µA |
| $\Delta I_{CC}$ | additional supply current | $I_A$ = 0, $V_{CC}$ = 2.5 V or 4.2 V<br>$V_{SEL}$ = 1.6 V | | | 3.0 | µA |
| $I_{off}$ | OFF-state switch leakage current from A to B0 (or B1) | $V_A$ = 5 V , $V_{B0}$ or $V_{B1}$ = 0 V | | | ±2.0 | µA |
| $R_{ON}$ | on-resistance | $V_{CC}$ = 3.5 V , $V_A$ = 0.8 V to 2.0 V,<br>$I_A$ = 10 mA | | 3.4 | 4.0 | Ω |
| | | $V_{CC}$ = 4.5 V , $V_A$ = 0.8 V to 2.3 V,<br>$I_A$ = 10 mA | | 2.4 | 3.0 | Ω |
| | | $V_{CC}$ = 5.5 V , $V_A$ = 0.8 V to 2.6 V,<br>$I_A$ = 10 mA | | 1.9 | 2.5 | Ω |
| $R_{FLAT}$ | on-resistance flatness | $V_{CC}$ = 3.5 V , $V_A$ = 0.8 V to 2.0 V,<br>$I_A$ = 10 mA | | 0.2 | 0.5 | Ω |
| | | $V_{CC}$ = 4.5 V , $V_A$ = 0.8 V to 2.3 V,<br>$I_A$ = 10 mA | | 0.25 | 0.5 | Ω |
| | | $V_{CC}$ = 5.5 V , $V_A$ = 0.8 V to 2.6 V,<br>$I_A$ = 10 mA | | 0.3 | 0.5 | Ω |
| $\Delta R_{ON}$ | on-resistance matching between channels | $V_{CC}$ = 3.5 V , $V_A$ = 0.8 V to 2.0 V,<br>$I_A$ = 10 mA | | 0.1 | 0.2 | Ω |
| | | $V_{CC}$ = 4.5 V , $V_A$ = 0.8 V to 2.3 V,<br>$I_A$ = 10 mA | | 0.1 | 0.2 | Ω |
| | | $V_{CC}$ = 5.5 V , $V_A$ = 0.8 V to 2.6 V,<br>$I_A$ = 10 mA | | 0.1 | 0.2 | Ω |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **AC Electronics Characteristics** | | | | | | |
| $t_{ON}$ | turn-On Time | $V_A$=1.5V, $C_L$=50pF, $R_L$=50Ω | | 470 | | ns |
| $t_{OFF}$ | turn-Off Time | $V_A$=1.5V, $C_L$=50pF, $R_L$=50Ω | | 120 | | ns |
| $t_{BBM}$ | break-before-make time | $V_A$=1.5V, $C_L$=50pF, $R_L$=50Ω | | 600 | | ns |
| BW | -3dB Bandwidth | $C_L$=0pF | | 800 | | MHz |
| OIRR | off isolation | f=10 KHz | | -80 | | dB |
| | | f=240 MHz | | -31 | | dB |
| $X_{TALK}$ | crosstalk | f=10 KHz | | -82 | | dB |
| | | f=240 MHz | | -26 | | dB |
| THD | total harmonic distortion | f=20Hz to 20KHz<br>$V_A$=600mVpp, $R_L$=32Ω | | -80 | | dB |
| **Capacitance** | | | | | | |
| $C_{ON}$ | On Capacitance | f=100KHz | | 12 | | pF |
| $C_{OFF}$ | Off Capacitance | f=100KHz | | 4 | | pF |

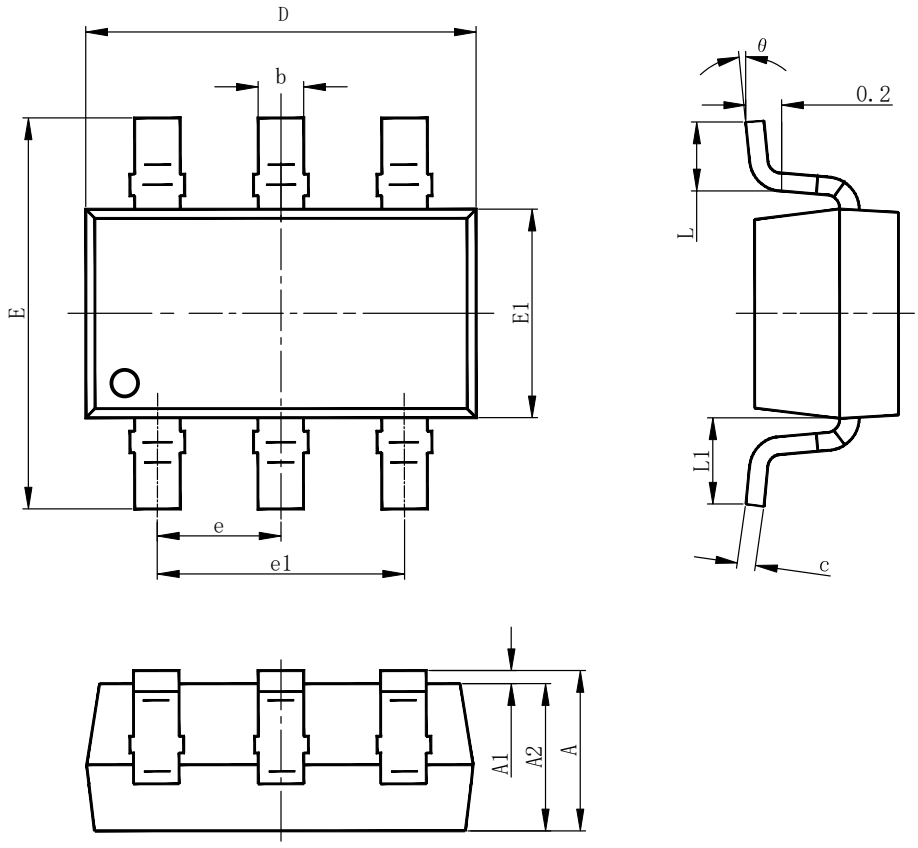
# 10. Package Outline

**SOT363**



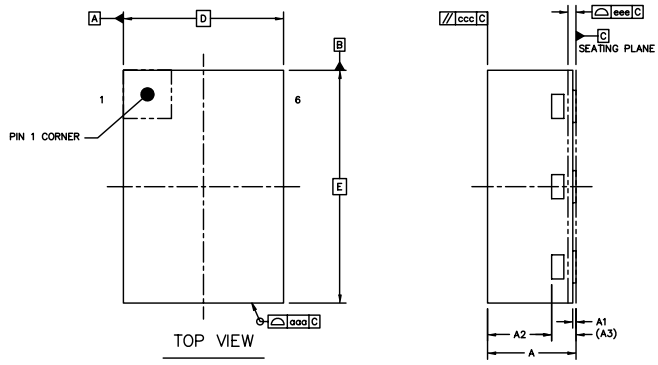

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.000 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.110 | 0.175 | 0.004 | 0.007 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.650 TYP. | | 0.026 TYP. | |
| e1 | 1.200 | 1.400 | 0.047 | 0.055 |
| L | 0.525 REF. | | 0.021 REF. | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |

**SOT23-6L**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E1 | 1.500 | 1.700 | 0.059 | 0.067 |
| E | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| L1 | 0.600REF. | | 0.024REF. | |
| θ | 0° | 8° | 0° | 8° |

## DFN1x1.45-6L




| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| TOTAL THICKNESS | | A | 0.5 | 0.55 | 0.6 |
| STAND OFF | | A1 | 0 | 0.02 | 0.05 |
| MOLD THICKNESS | | A2 | --- | 0.4 | --- |
| L/F THICKNESS | | A3 | | 0.152 REF | |
| LEAD WIDTH | | b | 0.15 | 0.2 | 0.25 |
| BODY SIZE | X | D | | 1 BSC | |
| | Y | E | | 1.45 BSC | |
| LEAD PITCH | | e | | 0.5 BSC | |
| LEAD LENGTH | | L | 0.25 | 0.3 | 0.35 |
| | | L1 | | 0.05 REF | |
| PACKAGE EDGE TOLERANCE | | aaa | | 0.1 | |
| MOLD FLATNESS | | ccc | | 0.1 | |
| COPLANARITY | | eee | | 0.05 | |
| LEAD OFFSET | | bbb | | 0.1 | |

NOTES
1.REFER TO JEDEC MO-220;
2.COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD;
3.BAN TO USE THE LEVEL 1 ENVIRONMENT-RELATED SUBSTANCES OF JCET PRESCRIBING;
4.FINISH: Cu/EP •Sn8~20s

# 11. Tape and Reel Information

## 11.1. Carrier tape dimensions

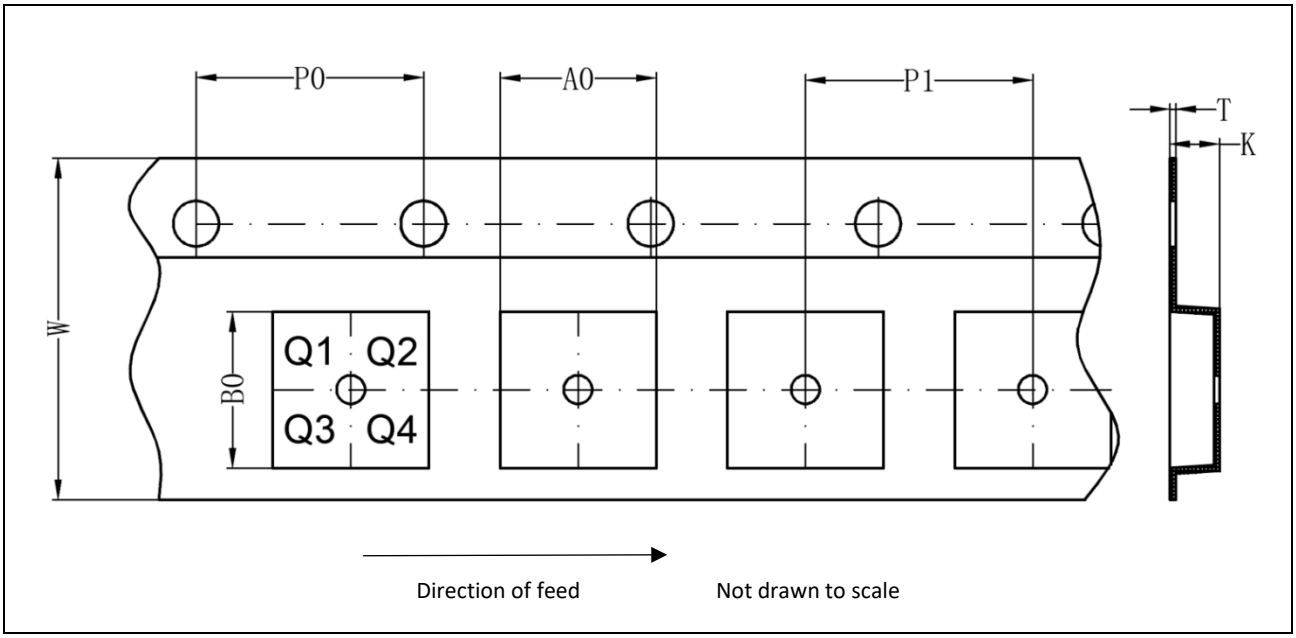



**Table 7. Carrier tape dimensions**

| Package version | A0(mm) | B0(mm) | K(mm) | T(mm) | P1(mm) | W(mm) | P0(mm) | PIN 1 |
|---|---|---|---|---|---|---|---|---|
| SOT363 | 2.55 | 2.55 | 1.2 | 0.2 | 4 | 8 | 4 | Q3 |
| SOT23-6L | 3.23 | 3.17 | 1.37 | 0.25 | 4 | 8 | 4 | Q3 |
| DFN1x1.45-6L | 1.15 | 1.6 | 0.75 | 0.2 | 4 | 8 | 4 | Q1 |

## 11.2. Reel and box dimensions

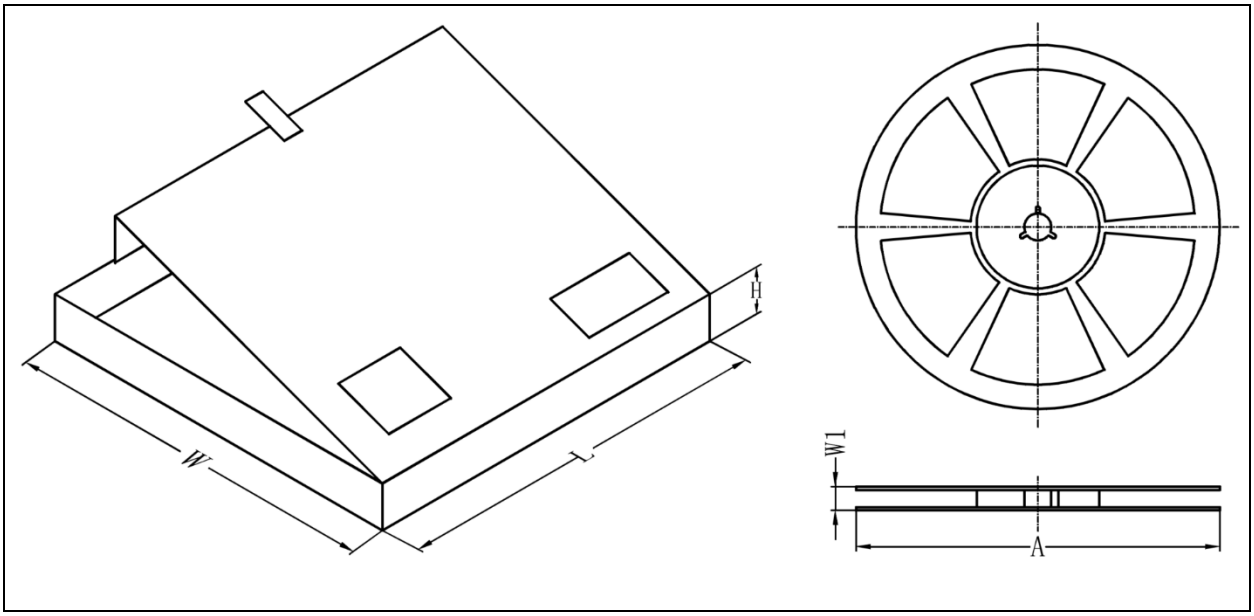



**Table 8. Dimensions and quantities**

| Package version | Type NO. ending | Reel Dimension A (mm) | Reel Width W1 (mm) | SPQ (pcs)[1] | Reels per box | Outer box dimensions L×W×H(mm)[2] |
|---|---|---|---|---|---|---|
| SOT363 | GW | 180 | 13.2 | 3000 | 1 | 210x200x40 |
| SOT23-6L | GV | 180 | 13.2 | 3000 | 1 | 210x200x40 |
| DFN1x1.45-6L | GM | 180 | 13.2 | 3000 | 1 | 210x200x40 |

[1] Packing quantity dependent on specific product type. Please contact your local Energymath representative for ordering.

[2] Dimensions for reference only.

# 12. Revision History

**Table 9. Revision history**

| Document ID | Release Date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| EMS3157 Rev. 1.6 | Aug 12, 2025 | Product datasheet | | EMS3157 Rev. 1.5 |
| Modifications: | • Section 4: Add marking information.<br>• Seciton 5.1: Fig 1 updated.<br>• Table 6：$R_{FLAT}$ updated.<br>• Add DFN1.45x1 package.<br>• Section 11: Add tape and reel information. | | | |
| EMS3157 Rev. 1.5 | Mar 20, 2025 | Product datasheet | | EMS3157 Rev. 1.4 |
| Modifications: | • Table 6：OIRR and $X_{TALK}$ updated. | | | |
| EMS3157 Rev. 1.4 | Feb 13, 2025 | Product datasheet | | EMS3157 Rev. 1.3 |
| Modifications: | • Features and Benefits updated.<br>• Table 6: On resistance updated. | | | |
| EMS3157 Rev. 1.3 | Dec 13, 2024 | Product datasheet | | EMS3157 Rev. 1.2 |
| Modifications: | • Table 1: Topside marking updated. | | | |
| EMS3157 Rev. 1.2 | Dec 10, 2024 | Product datasheet | | EMS3157 Rev. 1.1 |
| Modifications: | • Table 6: $\Delta I_{CC}$ and AC Characteristics updated. | | | |
| EMS3157 Rev. 1.1 | Nov 30, 2024 | Product datasheet | | EMS3157 Rev. 1.0 |
| Modifications: | • Add SOT23-6L package | | | |
| EMS3157 Rev. 1.0 | Oct 30, 2023 | Product datasheet | | |