

FMHP3139E-H

List

List.....1

Package outline.....2

Features.....2

Mechanical data.....2

Maximum ratings .....2

Electrical characteristics.....3

Rating and characteristic curves.....4

Pinning information.....5

Marking.....5

Suggested solder pad layout.....5

Packing information.....6

Reel packing.....7

Suggested thermal profiles for soldering processes.....7

# FMHP3139E-H

## -0.75A -20V P-Channel Enhancement Mode MOSFET ESD Protection

### Features

- $-V_{DS}=20V$ ,  $-I_D=0.75A$ .
- $R_{DS(on)} \leq 510m\Omega$  @  $-V_{GS}=4.5V$ ,  $-I_D=1.0A$ .
- $R_{DS(on)} \leq 750m\Omega$  @  $-V_{GS}=2.5V$ ,  $-I_D=0.8A$ .
- P-channel switch with low on-resistance.
- Operated at low logic level gate drive.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

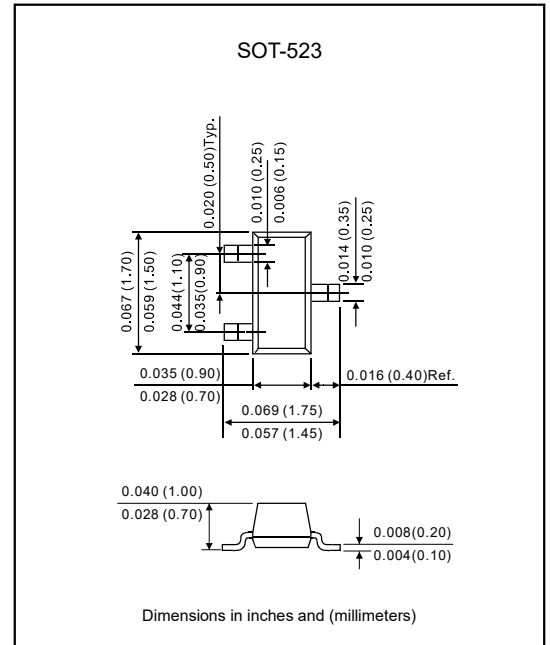
### Applications

- Load/Power switching.
- Interfacing, logic switching.
- Battery management for ultra small portable electronics.

### Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-523.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Weight : Approximated 2mg.

### Package outline



### Maximum ratings (At $T_A=25^\circ C$ unless otherwise noted)

| Parameter                                       | Symbol          | Ratings     | Units        |
|-------------------------------------------------|-----------------|-------------|--------------|
| Drain-source voltage                            | $-V_{DS}$       | 20          | V            |
| Gate-source voltage                             | $V_{GS}$        | $\pm 8$     | V            |
| Continuous drain current                        | $-I_D$          | 0.75        | A            |
| Pulsed drain current (Note1)                    | $-I_{DM}$       | 1.2         | A            |
| Total power dissipation (Note2)                 | $P_D$           | 150         | mW           |
| Thermal resistance, junction to ambient (Note1) | $R_{\theta JA}$ | 833         | $^\circ C/W$ |
| Junction temperature                            | $T_J$           | +150        | $^\circ C$   |
| Storage temperature range                       | $T_{STG}$       | -50 to +150 | $^\circ C$   |

## FMHP3139E-H

Electrical characteristics (At  $T_A=25^\circ\text{C}$  unless otherwise noted)

| Parameter                      | Symbol     | Conditions                                   | Min. | Typ. | Max.     | Unit          |
|--------------------------------|------------|----------------------------------------------|------|------|----------|---------------|
| <b>Off characteristics</b>     |            |                                              |      |      |          |               |
| Drain-source breakdown voltage | $-BV_{DS}$ | $-I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$   | 20   |      |          | V             |
| Drain-source leakage current   | $-I_{DSS}$ | $-V_{DS}=20\text{V}$ , $V_{GS}=0\text{V}$    |      |      | 1        | $\mu\text{A}$ |
| Gate-source leakage current    | $I_{GSS}$  | $V_{DS}=\pm 10\text{V}$ , $V_{DS}=0\text{V}$ |      |      | $\pm 20$ | $\mu\text{A}$ |

**On characteristics**

|                                           |               |                                            |      |      |      |            |
|-------------------------------------------|---------------|--------------------------------------------|------|------|------|------------|
| Gate threshold voltage (Note3)            | $-V_{GS(TH)}$ | $V_{GS}=V_{DS}$ , $-I_D=250\mu\text{A}$    | 0.35 | 0.61 | 1.10 | V          |
| Static drain-source on-resistance (Note3) | $R_{DS(ON)}$  | $-V_{GS}=4.5\text{V}$ , $-I_D=1.0\text{A}$ |      | 420  | 510  | m $\Omega$ |
|                                           |               | $-V_{GS}=2.5\text{V}$ , $-I_D=0.8\text{A}$ |      | 630  | 750  |            |
|                                           |               | $-V_{GS}=1.8\text{V}$ , $-I_D=0.5\text{A}$ |      | 960  |      |            |
| Forward transconductance                  | $g_{FS}$      | $-V_{DS}=10\text{V}$ , $-I_D=0.54\text{A}$ | 0.8  |      |      | S          |

**Dynamic parameters** (Note4)

|                              |           |                                                               |  |     |  |    |
|------------------------------|-----------|---------------------------------------------------------------|--|-----|--|----|
| Input capacitance            | $C_{iss}$ | $V_{GS}=0\text{V}$ , $-V_{DS}=16\text{V}$ , $f=1.0\text{MHz}$ |  | 113 |  | pF |
| Out capacitance              | $C_{oss}$ |                                                               |  | 15  |  |    |
| Reverse transfer capacitance | $C_{rss}$ |                                                               |  | 9   |  |    |

**Switching parameters** (Note4)

|                     |              |                                                                                        |  |      |  |    |
|---------------------|--------------|----------------------------------------------------------------------------------------|--|------|--|----|
| Turn-on delay time  | $t_{d(on)}$  | $-V_{DS}=10\text{V}$ , $-V_{GS}=4.5\text{V}$ , $R_G=10\Omega$ ,<br>$-I_D=200\text{mA}$ |  | 9.0  |  | ns |
| Rise time           | $t_r$        |                                                                                        |  | 5.7  |  |    |
| Turn-off delay time | $t_{d(off)}$ |                                                                                        |  | 32.6 |  |    |
| Fall time           | $t_f$        |                                                                                        |  | 20.3 |  |    |

**Source-drain diode ratings and characteristics**

|                                             |           |                                         |  |  |     |   |
|---------------------------------------------|-----------|-----------------------------------------|--|--|-----|---|
| Drain-source diode forward voltage (Note 3) | $-V_{SD}$ | $-I_S=0.5\text{A}$ , $V_{GS}=0\text{V}$ |  |  | 1.2 | V |
|---------------------------------------------|-----------|-----------------------------------------|--|--|-----|---|

\*Note: 1.Repetitive rating: pulse width limited by maximum junction temperature.

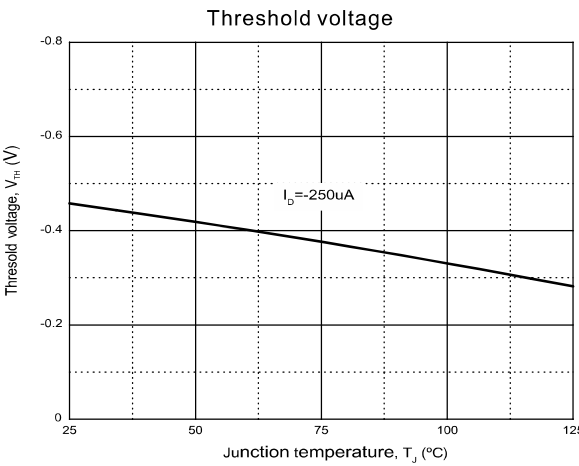
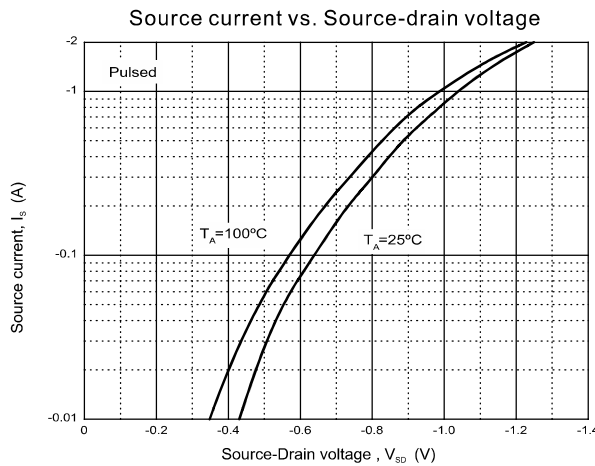
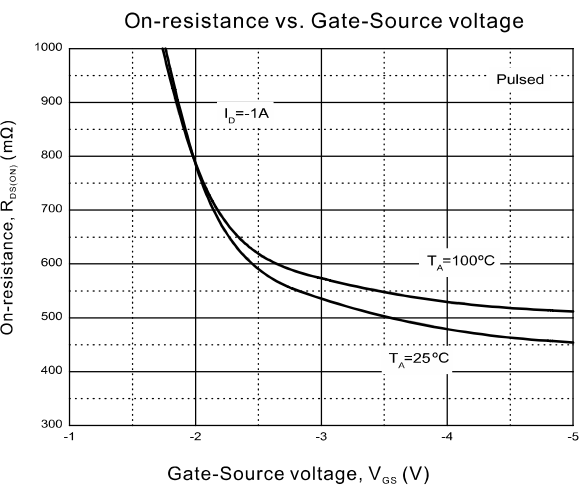
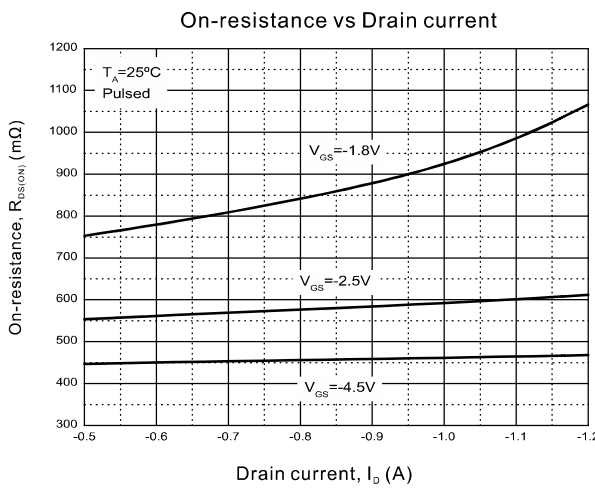
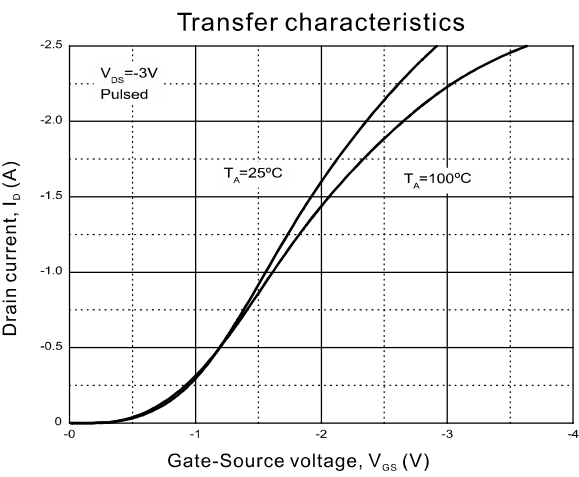
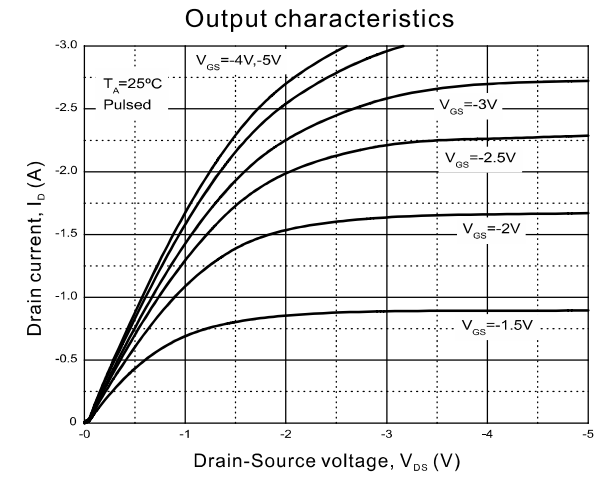
2.This test is performed with no heat sink at  $T_A=25^\circ\text{C}$ .

3.Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 0.5\%$ .

4.These parameters have no way to verify.

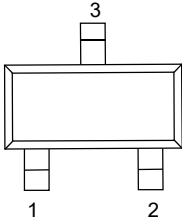
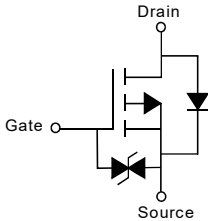
FMHP3139E-H

Rating and characteristic curves



FMHP3139E-H

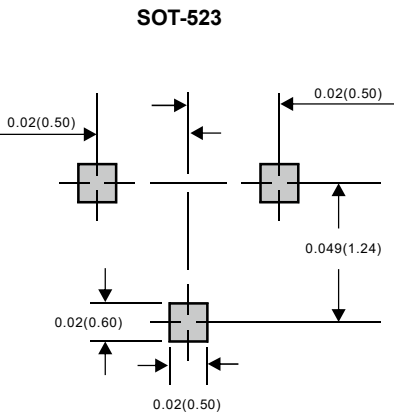
Pinning information

| Pin                                       | Simplified outline                                                                | Symbol                                                                              |
|-------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin 1 Gate<br>Pin 2 Source<br>Pin 3 Drain |  |  |

Marking

| Type number | Marking code |
|-------------|--------------|
| FMHP3139E-H | 39K          |

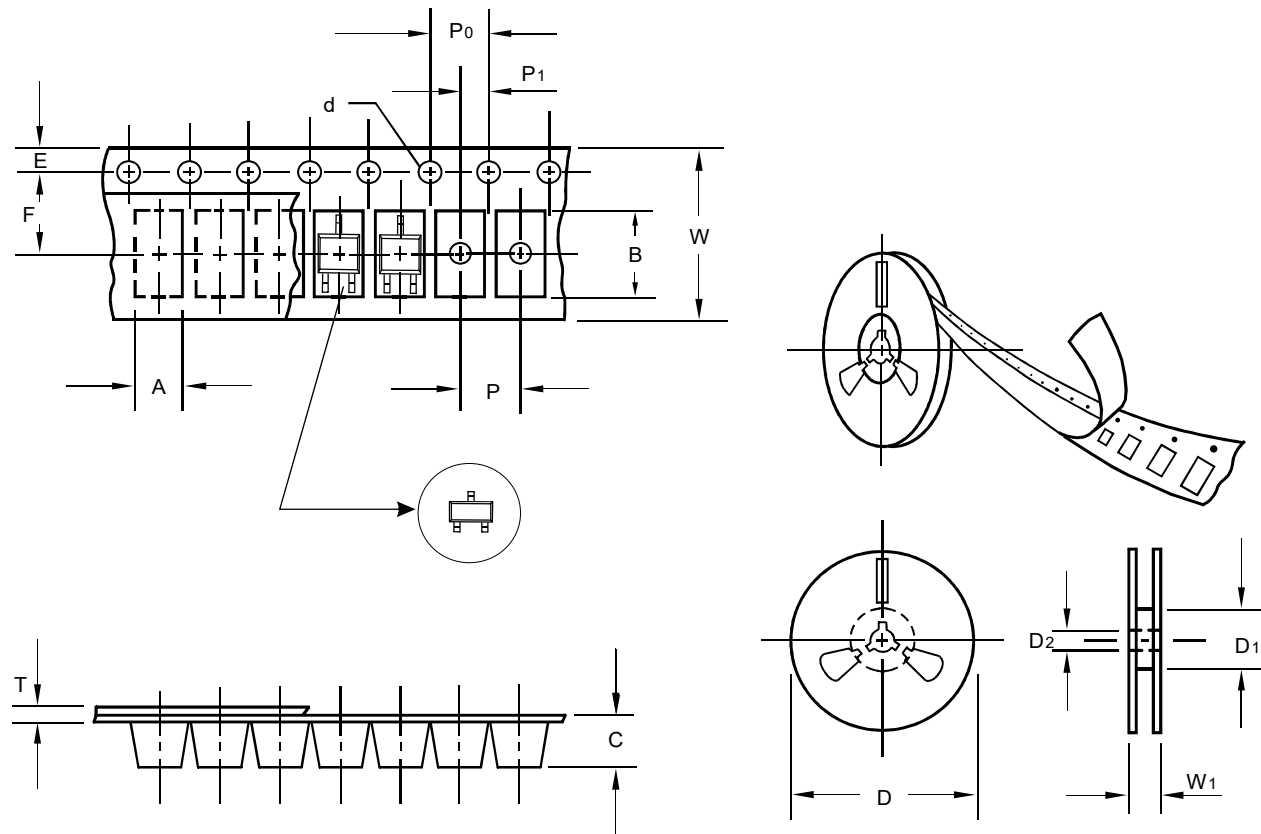
Suggested solder pad layout



Dimensions in inches and (millimeters)

FMHP3139E-H

Packing information



unit:mm

| Item                      | Symbol | Tolerance | SOT-523 |
|---------------------------|--------|-----------|---------|
| Carrier width             | A      | 0.5       | 1.85    |
| Carrier length            | B      | 0.5       | 1.85    |
| Carrier depth             | C      | 0.5       | 0.875   |
| Sprocket hole             | d      | 0.5       | 1.5     |
| 13" Reel outside diameter | D      | 2.0       | -       |
| 13" Reel inner diameter   | D1     | min       | -       |
| 7" Reel outside diameter  | D      | 2.0       | 178.00  |
| 7" Reel inner diameter    | D1     | min       | 60.00   |
| Feed hole diameter        | D2     | 0.5       | 13.00   |
| Sprocket hole position    | E      | 0.1       | 1.75    |
| Punch hole position       | F      | 0.1       | 3.50    |
| Punch hole pitch          | P      | 0.1       | 4.00    |
| Sprocket hole pitch       | P0     | 0.1       | 4.00    |
| Embossment center         | P1     | 0.1       | 2.00    |
| Overall tape thickness    | T      | 0.5       | 0.23    |
| Tape width                | W      | 0.5       | 8.00    |
| Reel width                | W1     | 5.0       | 11.40   |

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

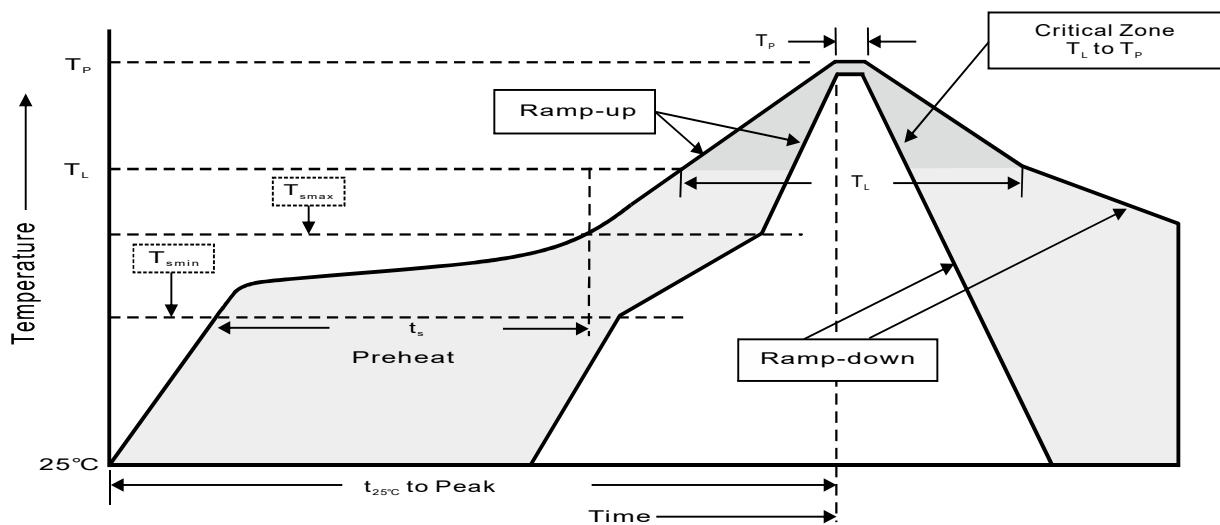
# FMHP3139E-H

## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|
| SOT-523 | 7"        | 3,000      | 4.0                     | 30,000    | 183*123*183     | 178             | 382*257*387       | 240,000      |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature = 5°C ~ 40°C Humidity = 55%, ±25%
- 2.Reflow soldering of surface-mount devices



### 3.Reflow soldering

| Profile feature                                                                                                  | Soldering condition            |
|------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Average ramp-up rate ( $T_L$ to $T_p$ )                                                                          | < 3 °C/sec                     |
| Preheat<br>- Temperature Min ( $T_{smin}$ )<br>- Temperature Max ( $T_{smax}$ )<br>- Time (Min to Max) ( $t_s$ ) | 150°C<br>200°C<br>60 ~ 120 sec |
| $T_{smax}$ to $T_L$<br>- Ramp-up rate                                                                            | < 3 °C/sec                     |
| Time maintained above :<br>- Temperature ( $T_L$ )<br>- Time ( $T_L$ )                                           | 217°C<br>60 ~ 260 sec          |
| Peak temperature ( $T_p$ )                                                                                       | 255 °C -0/+5°C                 |
| Time with 5°C of actual peak temperature ( $T_p$ )                                                               | 10 ~30 sec                     |
| Ramp-down rate                                                                                                   | < 6 °C/sec                     |
| Time 25°C to peak temperature                                                                                    | < 6 minutes                    |