

FMOSTHAC90N06-H

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## FMOSTHAC90N06-H

90A 60V N-Channel Trench  
Enhancement Mode Power MOSFET

## Features

- $V_{DS} = 60V$ ,  $I_D = 90A$ .
- $R_{DS(ON)} \leq 3.5 m\Omega$ , @  $V_{GS} = 10V$ ,  $I_D = 45A$ .
- $R_{DS(ON)} \leq 4.5 m\Omega$ , @  $V_{GS} = 4.5V$ ,  $I_D = 45A$ .
- Excellent gate charge x on-resistance product (FOM.).
- Very low on-resistance.
- 100% UIS and  $\Delta V_{DS}$  tested.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

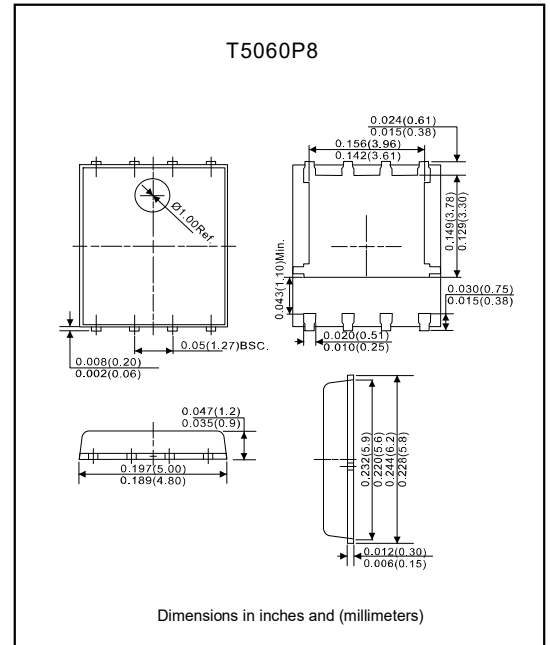
## Application

- DC/DC converter.
- Ideal for high-frequency switching and synchronous rectification.

## Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, T5060P8 (DFN5060-8) .
- Mounting Position : Any.

## Package outline

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

| Parameter                                                                | Symbol          | Ratings     | Unit          |
|--------------------------------------------------------------------------|-----------------|-------------|---------------|
| Drain-source voltage                                                     | $V_{DS}$        | 60          | V             |
| Gate-source voltage                                                      | $V_{GS}$        | $\pm 20$    | V             |
| Continuous drain current<br>(Silicon limited)<br>( $T_c = 100^\circ C$ ) | $I_D$           | 90          | A             |
|                                                                          |                 | 63.6        |               |
| Pulsed drain current tested                                              | $I_{DM}$        | 360         | A             |
| Single pulse avalanche energy (Note 5)                                   | $E_{AS}$        | 500         | mJ            |
| Derating factor                                                          | -               | 0.8         | W/ $^\circ C$ |
| Power dissipation<br>( $T_c = 25^\circ C$ )                              | $P_D$           | 100         | W             |
| Thermal resistance Junction to case (Note 2)                             | $R_{\theta JC}$ | 1.25        | $^\circ C/W$  |
| Operating Junction temperature                                           | $T_J$           | +150        | $^\circ C$    |
| Storage temperature range                                                | $T_{STG}$       | -55 to +150 | $^\circ C$    |

## FMOSTHAC90N06-H

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

| Parameter                                      | Symbol              | Conditions                                                                            | Min | Typ  | Max  | Unit |
|------------------------------------------------|---------------------|---------------------------------------------------------------------------------------|-----|------|------|------|
| Off characteristics                            |                     |                                                                                       |     |      |      |      |
| Drain-source breakdown voltage                 | BV <sub>DSS</sub>   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V                                            | 60  |      |      | V    |
| Drain-source leakage current                   | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                             |     |      | 1    | μA   |
| Gate-source leakage current                    | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                            |     |      | ±100 | nA   |
| On characteristics (Note3)                     |                     |                                                                                       |     |      |      |      |
| Gate threshold voltage                         | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA                              | 1.0 | 1.7  | 2.2  | V    |
| Static drain-source on-resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =45A                                             |     | 2.8  | 3.5  | mΩ   |
|                                                |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =45A                                            |     | 3.5  | 4.5  |      |
| Forward trans conductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =10V, I <sub>D</sub> =45A                                             | 40  |      |      | S    |
| Dynamic parameters (Note4)                     |                     |                                                                                       |     |      |      |      |
| Input capacitance                              | C <sub>iss</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1.0MHz                                   |     | 4000 |      | pF   |
| Out capacitance                                | C <sub>oss</sub>    |                                                                                       |     | 680  |      |      |
| Reverse transfer capacitance                   | C <sub>rss</sub>    |                                                                                       |     | 23   |      |      |
| Switching parameters (Note4)                   |                     |                                                                                       |     |      |      |      |
| Total gate charge                              | Q <sub>g</sub>      | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =45A                       |     | 67   |      | nC   |
| Gate to source charge                          | Q <sub>gs</sub>     |                                                                                       |     | 12   |      |      |
| Gate to drain charge                           | Q <sub>gd</sub>     |                                                                                       |     | 8.5  |      |      |
| Turn-on delay time                             | t <sub>d(on)</sub>  | V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =4.7Ω, I <sub>D</sub> =45A |     | 11   |      | ns   |
| Rise time                                      | t <sub>r</sub>      |                                                                                       |     | 5    |      |      |
| Turn-off delay time                            | t <sub>d(off)</sub> |                                                                                       |     | 56   |      |      |
| Fall time                                      | t <sub>f</sub>      |                                                                                       |     | 12   |      |      |
| Source-drain diode ratings and characteristics |                     |                                                                                       |     |      |      |      |
| Diode forward voltage (Note3)                  | V <sub>SD</sub>     | I <sub>S</sub> =45A, V <sub>GS</sub> =0V                                              |     |      | 1.2  | V    |
| Diode forward current (Note2)                  | I <sub>S</sub>      |                                                                                       |     |      | 90   | A    |
| Body diode reverse recovery time               | t <sub>rr</sub>     | I <sub>F</sub> =I <sub>S</sub> , T <sub>J</sub> =25°C, di/dt=100A/μs (Note3)          |     | 48   |      | nS   |
| Body diode reverse recovery charge             | Q <sub>rr</sub>     |                                                                                       |     | 60   |      | nC   |

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

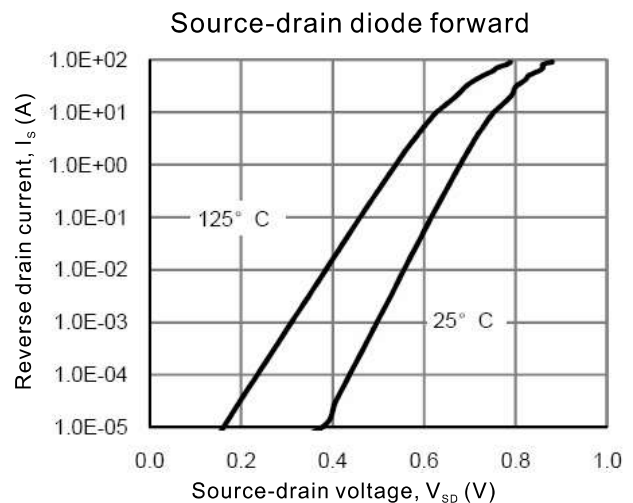
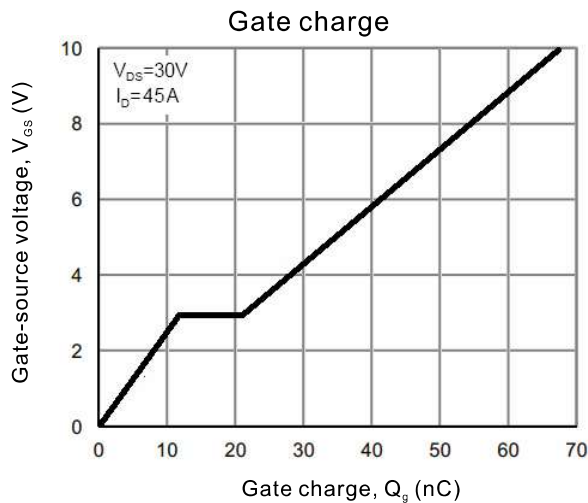
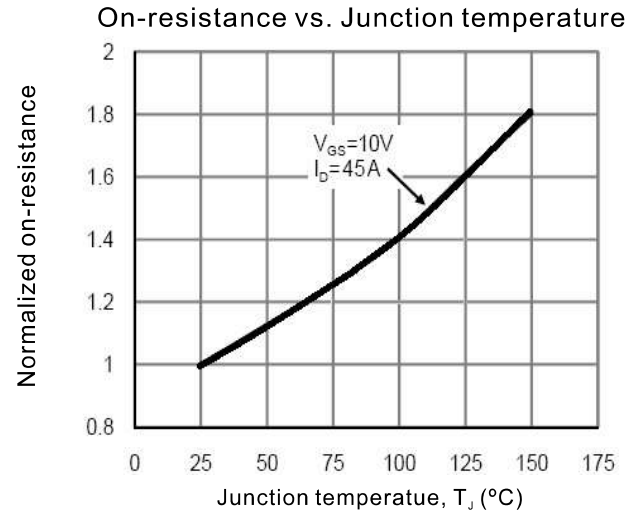
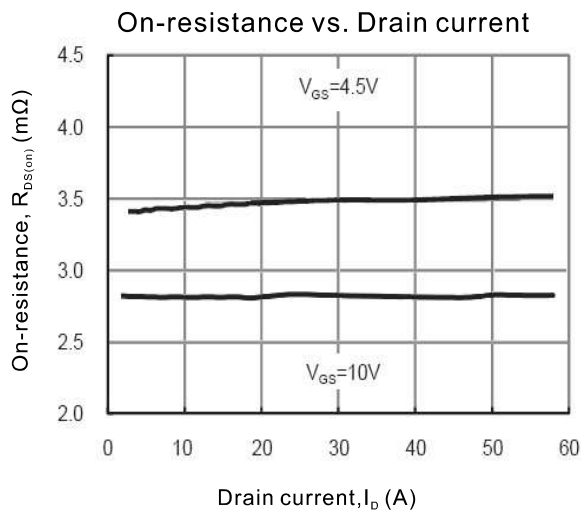
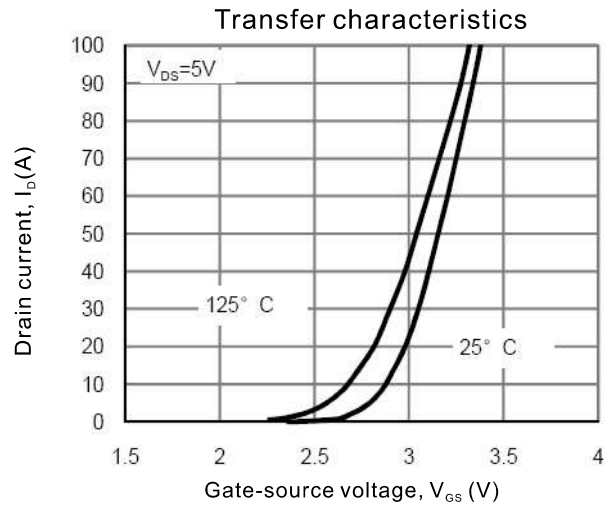
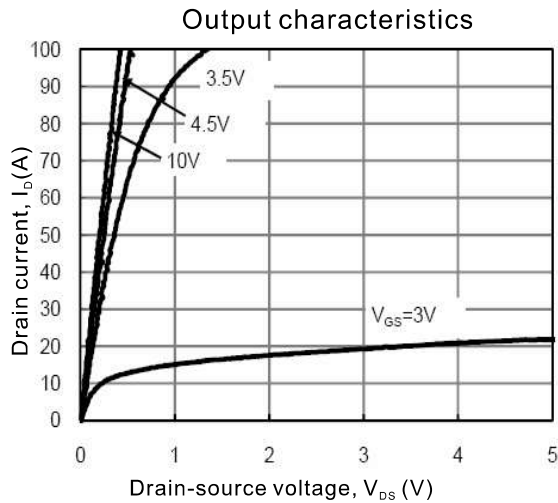
2. Surface mounted on FR4 board,  $t_s \leq 10$  seconds.3. Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycles  $\leq 2\%$ .

4. Guaranteed by design, not subject to production.

5.  $E_{AS}$  condition:  $T_J=25^\circ\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_g=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$ .

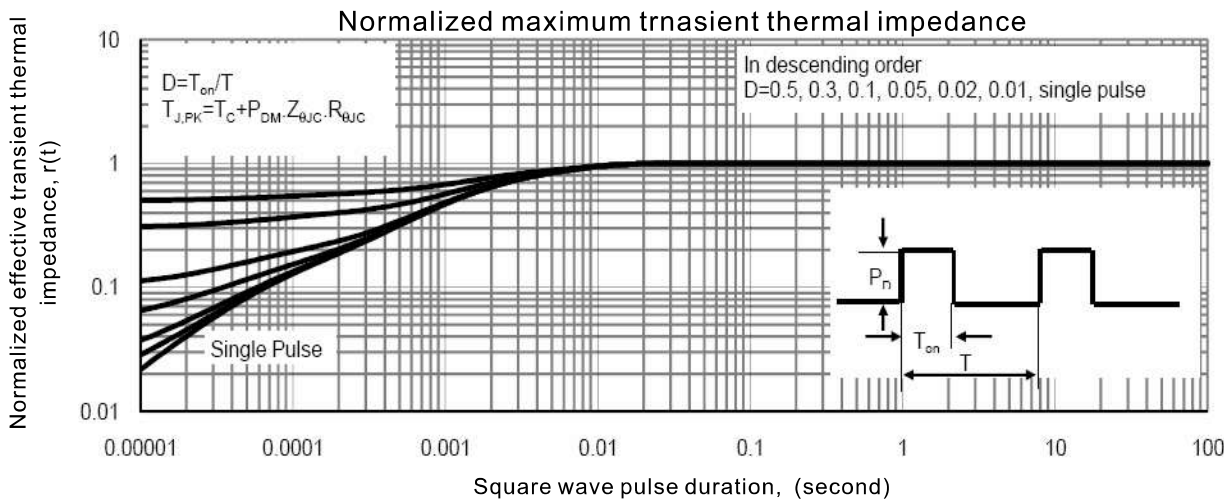
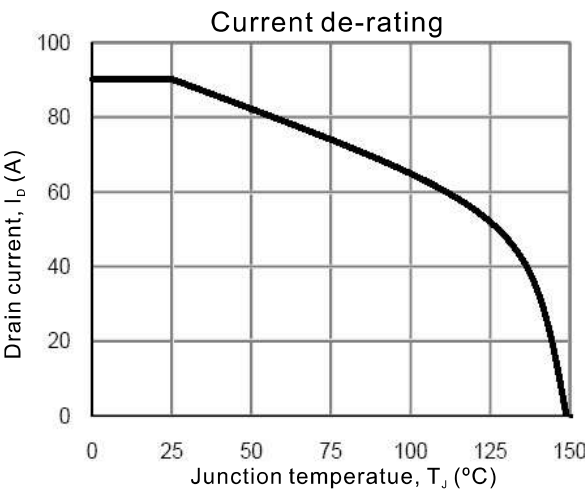
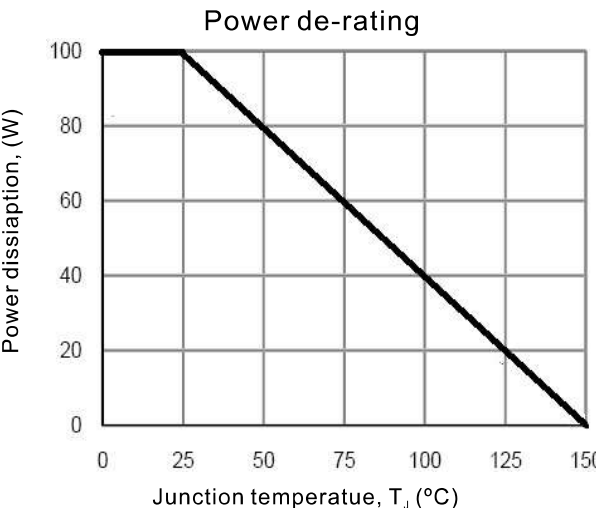
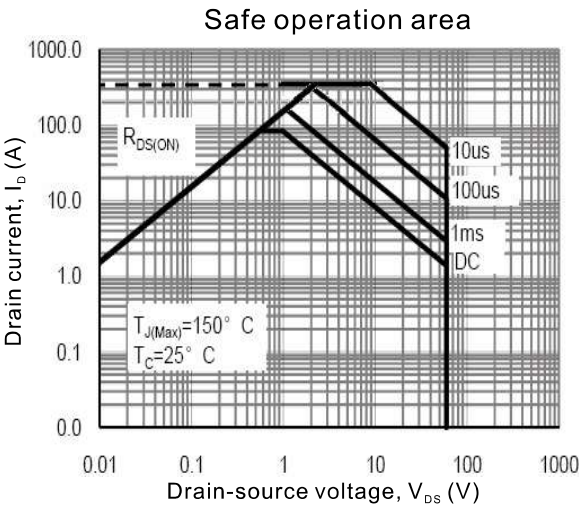
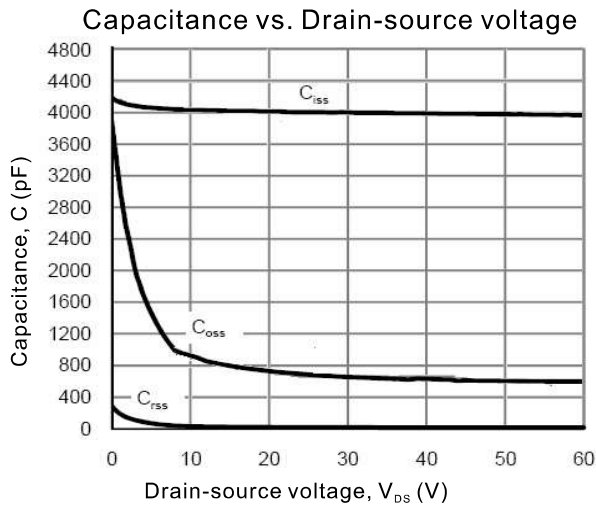
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## Rating and characteristic curves



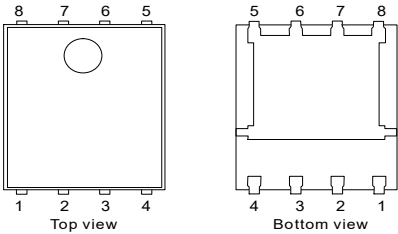
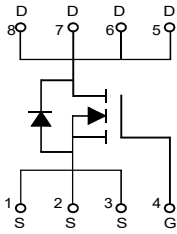
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Rating and characteristic curves



FMOSTHAC90N06-H

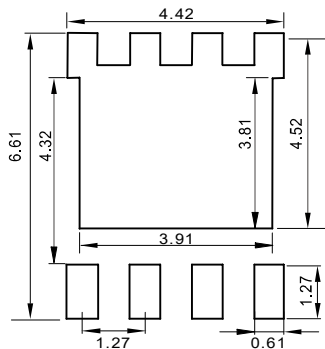
Pinning information

| Pin                                                      | Simplified outline                                                                                                    | Symbol                                                                              |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin 1, 2, 3 Source<br>Pin 4 Gate<br>Pin 5, 6, 7, 8 Drain |  <p>Top view</p> <p>Bottom view</p> |  |

Marking

| Type number     | Marking code |
|-----------------|--------------|
| FMOSTHAC90N06-H | P6090AGU     |

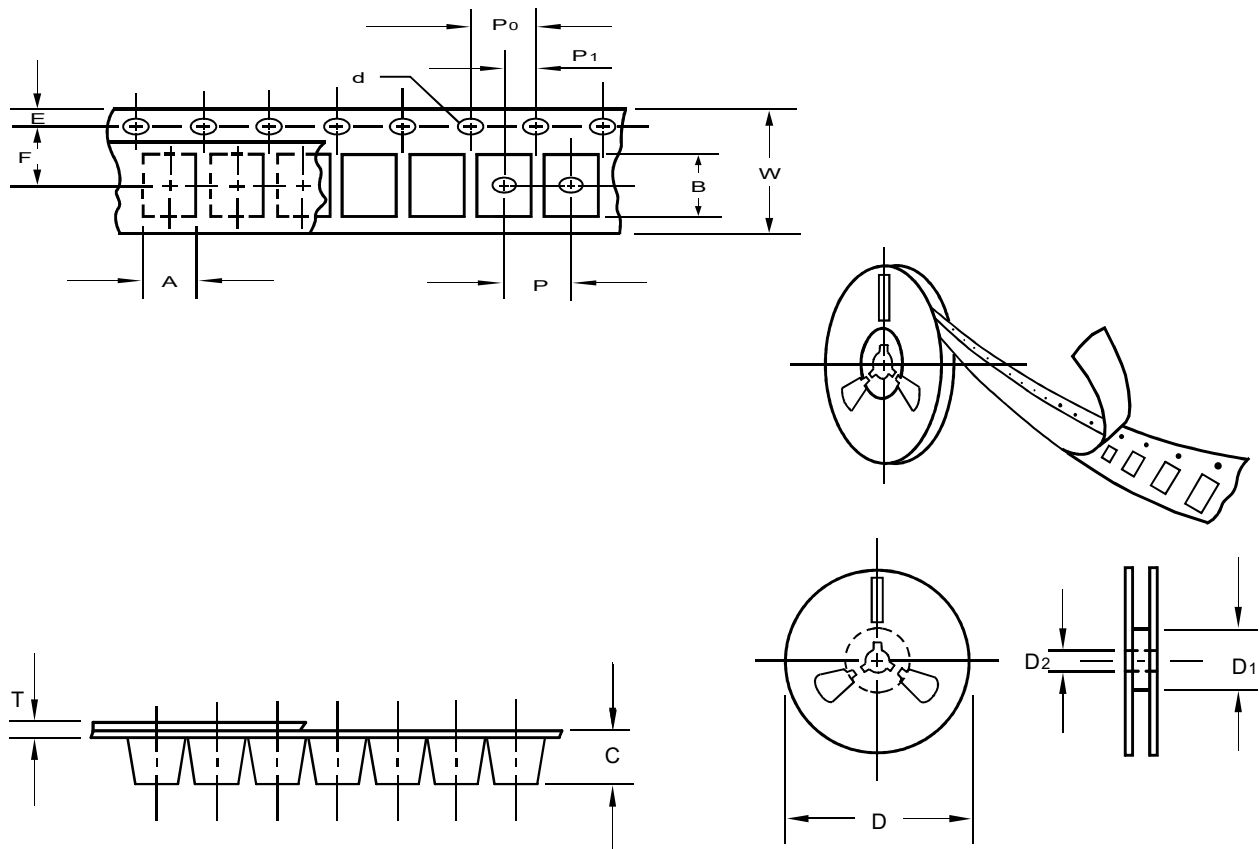
Suggested solder pad layout



Note:  
1. Controlling dimension: in millimeters.  
2. General tolerance:  $\pm 0.05\text{mm}$   
3. The pad layout is for reference purposes only.

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Packing information



unit:mm

| Item                      | Symbol | Tolerance | T5060P8 |
|---------------------------|--------|-----------|---------|
| Carrier width             | A      | 0.1       | 6.40    |
| Carrier length            | B      | 0.1       | 5.40    |
| Carrier depth             | C      | 0.1       | 1.20    |
| Sprocket hole             | d      | 0.1       | 1.55    |
| 13" Reel outside diameter | D      | 2.0       | 330.00  |
| 13" Reel inner diameter   | D1     | min       | 100.00  |
| 7" Reel outside diameter  | D      | 2.0       | -       |
| 7" Reel inner diameter    | D1     | min       | -       |
| Feed hole diameter        | D2     | 0.5       | 13.00   |
| Sprocket hole position    | E      | 0.1       | 1.75    |
| Punch hole position       | F      | 0.1       | 5.50    |
| Punch hole pitch          | P      | 0.1       | 8.00    |
| Sprocket hole pitch       | P0     | 0.1       | 4.00    |
| Embossment center         | P1     | 0.1       | 2.00    |
| Overall tape thickness    | T      | 0.1       | 0.25    |
| Tape width                | W      | 0.3       | 12.0    |

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

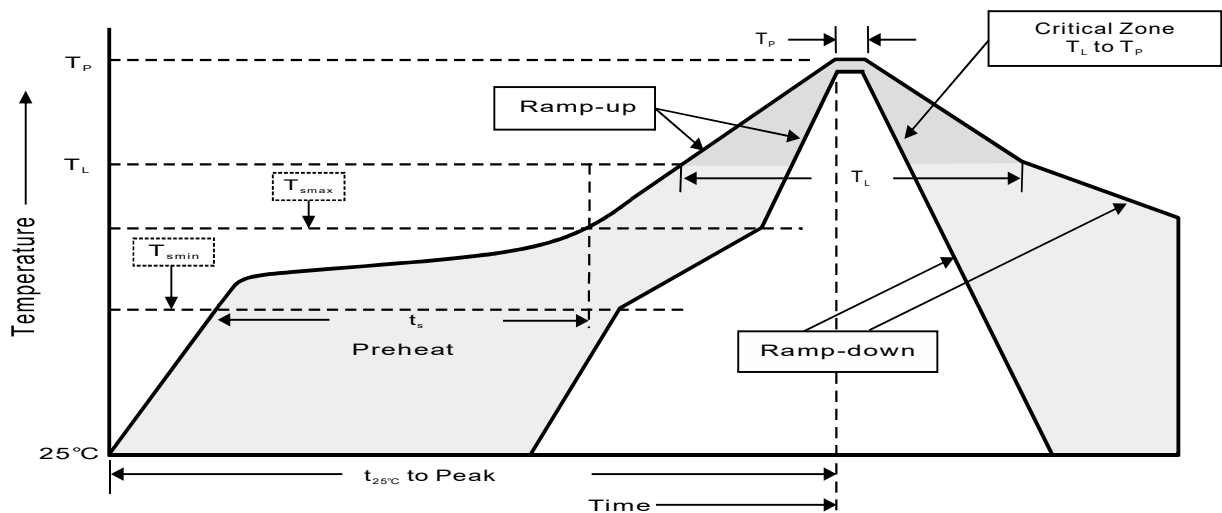
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## Reel packing

| Device          | Outline | Device Package | Reel Size |
|-----------------|---------|----------------|-----------|
| FMOSTHAC90N06-H | Taping  | T5060P8        | 13 inch   |

## 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                    |