

# FMOSAC140N08

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# FMOSAC140N08

## 140A 80V N-Channel Enhancement Mode Power MOSFET

### Features

- $V_{DS} = 80V$ ,  $I_D = 140A$ .
- $R_{DS(ON)} \leq 3.7 m\Omega$ , @  $V_{GS} = 10V$ ,  $I_D = 20A$
- Fast switching speed.
- Reliable and rugged.
- 100% UIS and  $R_g$  tested.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen free part, ex: FMOSAC140N08-H.

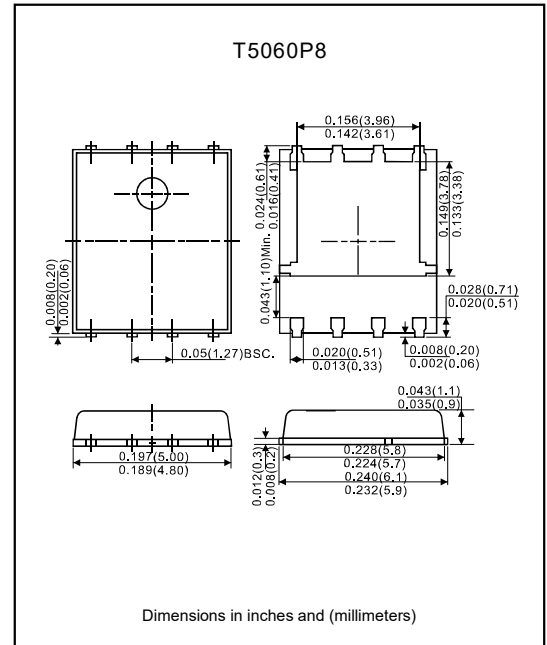
### Application

- DC/DC converters.

### Mechanical data

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

### Package outline



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

| Parameter                                                      | Symbol          | Ratings     | Unit         |
|----------------------------------------------------------------|-----------------|-------------|--------------|
| Drain-source voltage                                           | $V_{DS}$        | 80          | V            |
| Gate-source voltage                                            | $V_{GS}$        | $\pm 20$    | V            |
| Continuous drain current (Note 2)                              | $I_D$           | 20          | A            |
|                                                                |                 | 16          |              |
| Continuous drain current                                       |                 | 140         |              |
|                                                                |                 | 89          |              |
| Pulsed drain current tested (Note 1)                           | $I_{DM}$        | 350         | A            |
| Avalanche current, single pulse (Note 3)                       | $I_{AS}$        | 55          | A            |
|                                                                |                 | 30          |              |
| Diode continuous forward current                               | $I_S$           | 38          | A            |
| Avalanche energy, single pulse (Note 3)                        | $E_{AS}$        | 140         | mJ           |
|                                                                |                 | 210         |              |
| Power dissipation (Note 2)                                     | $P_D$           | 2.6         | W            |
|                                                                |                 | 1.7         |              |
| Power dissipation                                              |                 | 125         |              |
|                                                                |                 | 50          |              |
| Thermal resistance junction to ambient (Note 2) (Steady state) | $R_{\theta JA}$ | 48          | $^\circ C/W$ |
| Thermal resistance Junction to case (Steady state)             | $R_{\theta JC}$ | 1           | $^\circ C/W$ |
| Operating Junction temperature                                 | $T_J$           | +150        | $^\circ C$   |
| Storage temperature range                                      | $T_{STG}$       | -55 to +150 | $^\circ C$   |

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

| Parameter                      | Conditions                                   | Symbol     | Min | Typ | Max       | Unit          |
|--------------------------------|----------------------------------------------|------------|-----|-----|-----------|---------------|
| <b>Off characteristics</b>     |                                              |            |     |     |           |               |
| Drain-source breakdown voltage | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$    | $BV_{DSS}$ | 80  |     |           | V             |
| Drain-source leakage current   | $V_{DS}=64\text{V}$ , $V_{GS}=0\text{V}$     | $I_{DSS}$  |     |     | 1         | $\mu\text{A}$ |
| Gate-source leakage current    | $V_{GS}=\pm 20\text{V}$ , $V_{DS}=0\text{V}$ | $I_{GSS}$  |     |     | $\pm 100$ | nA            |

**On characteristics**

|                                            |                                        |              |   |     |     |            |
|--------------------------------------------|----------------------------------------|--------------|---|-----|-----|------------|
| Gate threshold voltage                     | $V_{GS}=V_{DS}$ , $I_D=250\mu\text{A}$ | $V_{GS(TH)}$ | 2 | 3   | 4   | V          |
| Static drain-source on-resistance (Note 4) | $V_{GS}=10\text{V}$ , $I_D=20\text{A}$ | $R_{DS(ON)}$ |   | 3.1 | 3.7 | m $\Omega$ |
| Forward trans conductance                  | $V_{DS}=5\text{V}$ , $I_D=10\text{A}$  | $g_{FS}$     |   | 32  |     | S          |

**Dynamic parameters (Note 5)**

|                              |                                                              |           |  |      |  |          |
|------------------------------|--------------------------------------------------------------|-----------|--|------|--|----------|
| Input capacitance            | $V_{GS}=0\text{V}$ , $V_{DS}=40\text{V}$ , $f=1.0\text{MHz}$ | $C_{iss}$ |  | 3935 |  | pF       |
| Out capacitance              |                                                              | $C_{oss}$ |  | 1160 |  |          |
| Reverse transfer capacitance |                                                              | $C_{rss}$ |  | 101  |  |          |
| Gate resistance              | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1.0\text{MHz}$  | $R_G$     |  | 0.8  |  | $\Omega$ |

**Switching parameters**

|                       |                                                                             |              |  |      |  |    |
|-----------------------|-----------------------------------------------------------------------------|--------------|--|------|--|----|
| Total gate charge     | $V_{GS}=6\text{V}$ , $V_{DS}=40\text{V}$ , $I_D=20\text{A}$                 | $Q_g$        |  | 53.5 |  | nC |
|                       |                                                                             |              |  | 84.2 |  |    |
| Gate to source charge | $V_{GS}=10\text{V}$ , $V_{DS}=40\text{V}$ , $I_D=20\text{A}$                | $Q_{gs}$     |  | 26.5 |  |    |
| Gate to drain charge  |                                                                             | $Q_{gd}$     |  | 16   |  |    |
| Turn-on delay time    | $V_{DS}=40\text{V}$ , $V_{GS}=10\text{V}$ , $R_G=1\Omega$ , $I_D=1\text{A}$ | $t_{d(on)}$  |  | 19.3 |  | ns |
| Rise time             |                                                                             | $t_r$        |  | 12.3 |  |    |
| Turn-off delay time   |                                                                             | $t_{d(off)}$ |  | 47.5 |  |    |
| Fall time             |                                                                             | $t_f$        |  | 92.8 |  |    |

**Source-drain diode ratings and characteristics**

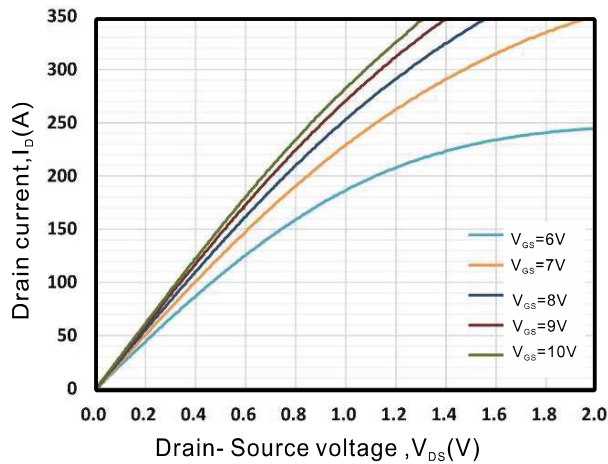
|                                             |                                                                         |          |  |      |     |    |
|---------------------------------------------|-------------------------------------------------------------------------|----------|--|------|-----|----|
| Drain-source diode forward voltage (Note 4) | $I_S=10\text{A}$ , $V_{GS}=0\text{V}$                                   | $V_{SD}$ |  | 0.75 | 1.1 | V  |
| Body diode reverse recovery time            | $V_R=64\text{V}$ , $I_F=10\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{s}$ | $t_{rr}$ |  | 60.5 |     | nS |
| Body diode reverse recovery charge          |                                                                         | $Q_{rr}$ |  | 86   |     | nC |

Note : 1. Maximum current is limited by junction temperature.  
2. Surface mounted on 1in<sup>2</sup> FR-4 board with 1oz.  
3. UIS tested and pulse width are limited by maximum junction temperature 150°C.  
4. Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
5. Guaranteed by design, not subject to production testing.

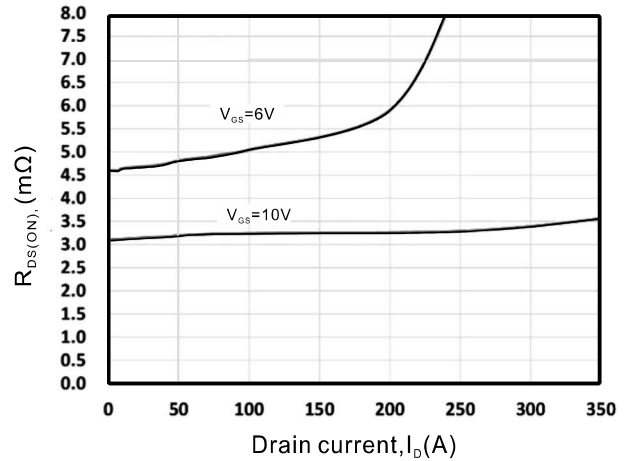
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## Rating and characteristic curves

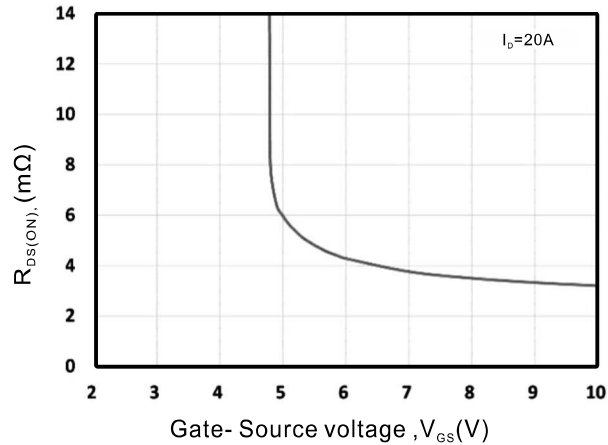
Output characteristics



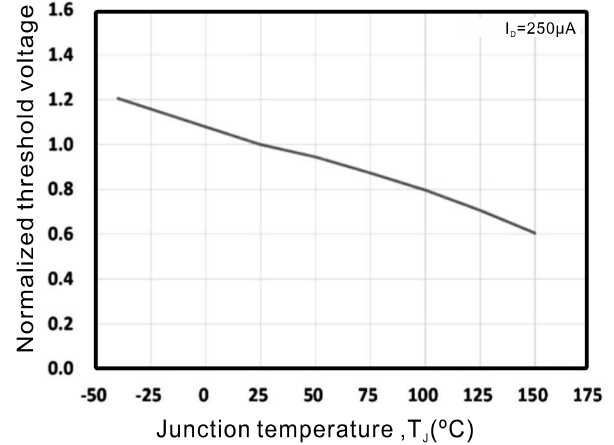
On-resistance vs. Drain current



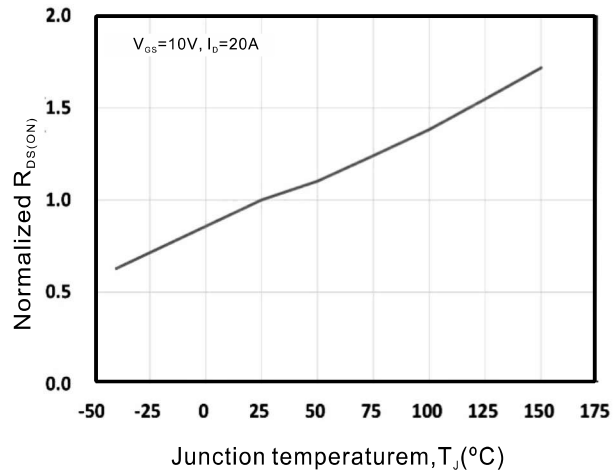
On-resistance vs. Gate-Source voltage



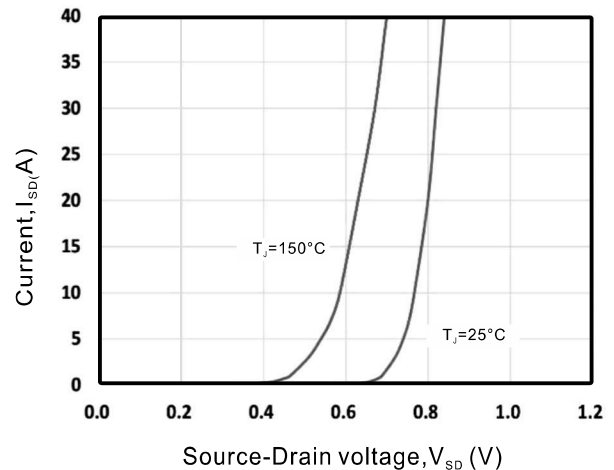
Gate threshold voltage



Drain-Source on-resistance

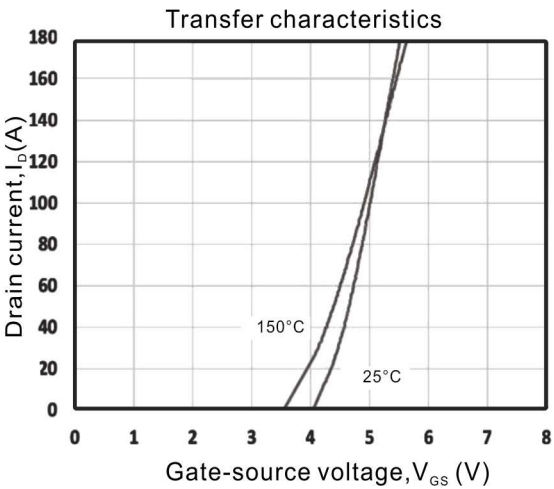
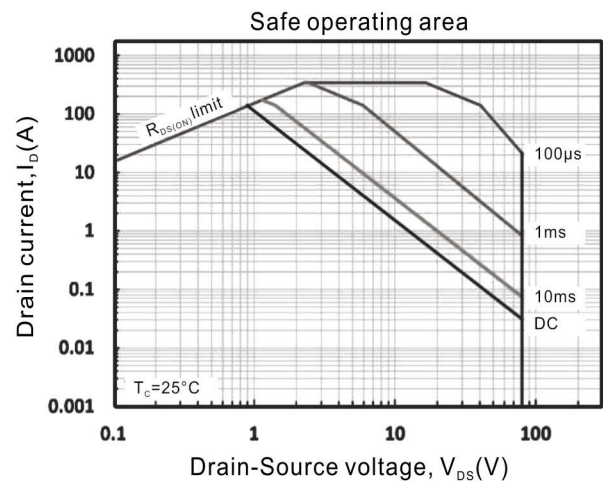
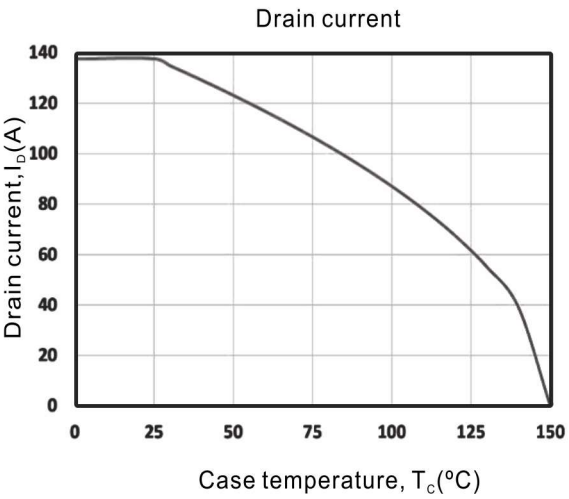
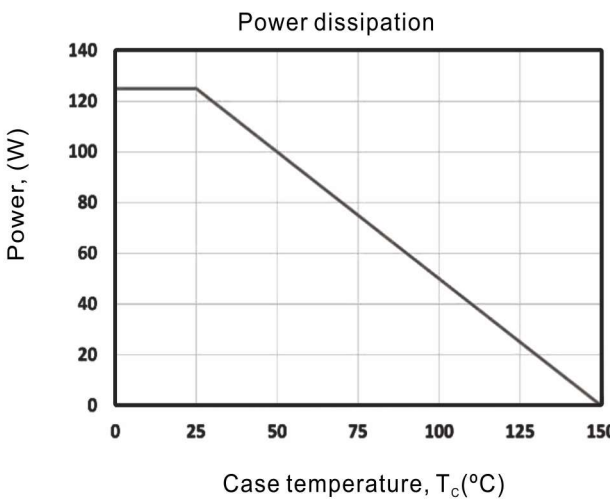
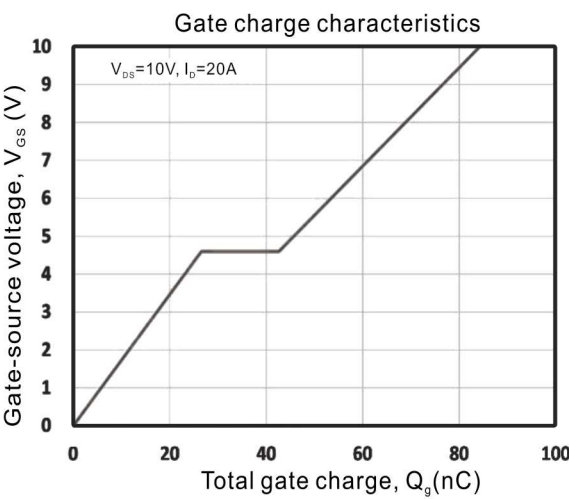
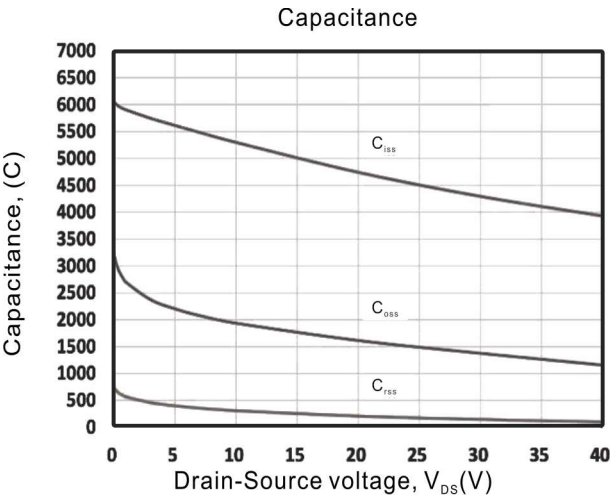


Source-Drain diode forward



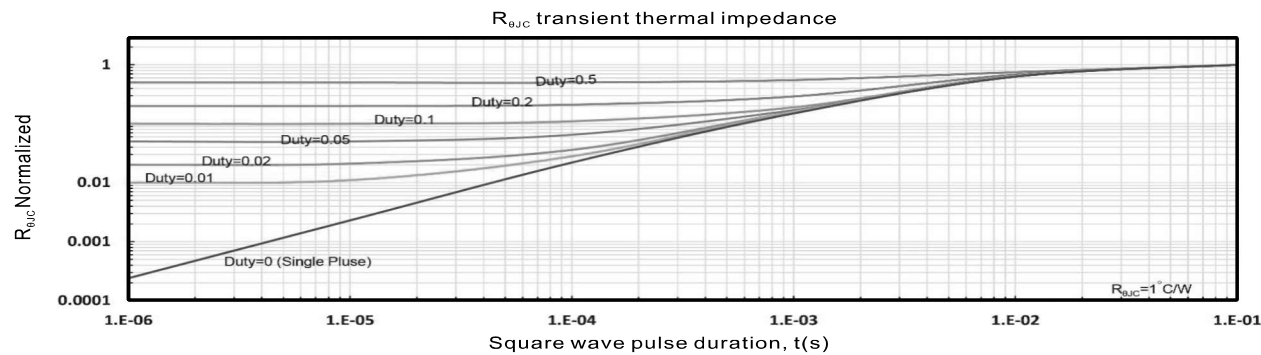
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Rating and characteristic curves



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Rating and characteristic curves



Pinning information

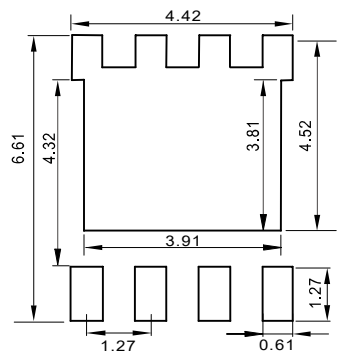
| Pin                                                                                                            | Simplified outline              | Symbol |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|--------|
| Pin1 Source<br>Pin2 Source<br>Pin3 Source<br>Pin4 Gate<br>Pin5 Drain<br>Pin6 Drain<br>Pin7 Drain<br>Pin8 Drain | <p>Top view<br/>Bottom view</p> |        |

Marking

| Type number  | Marking code |
|--------------|--------------|
| FMOSAC140N08 |              |

\* YWW: Wafer lot code  
Y: Year  
W: Week  
SS: Sequence  
A: Assy. code

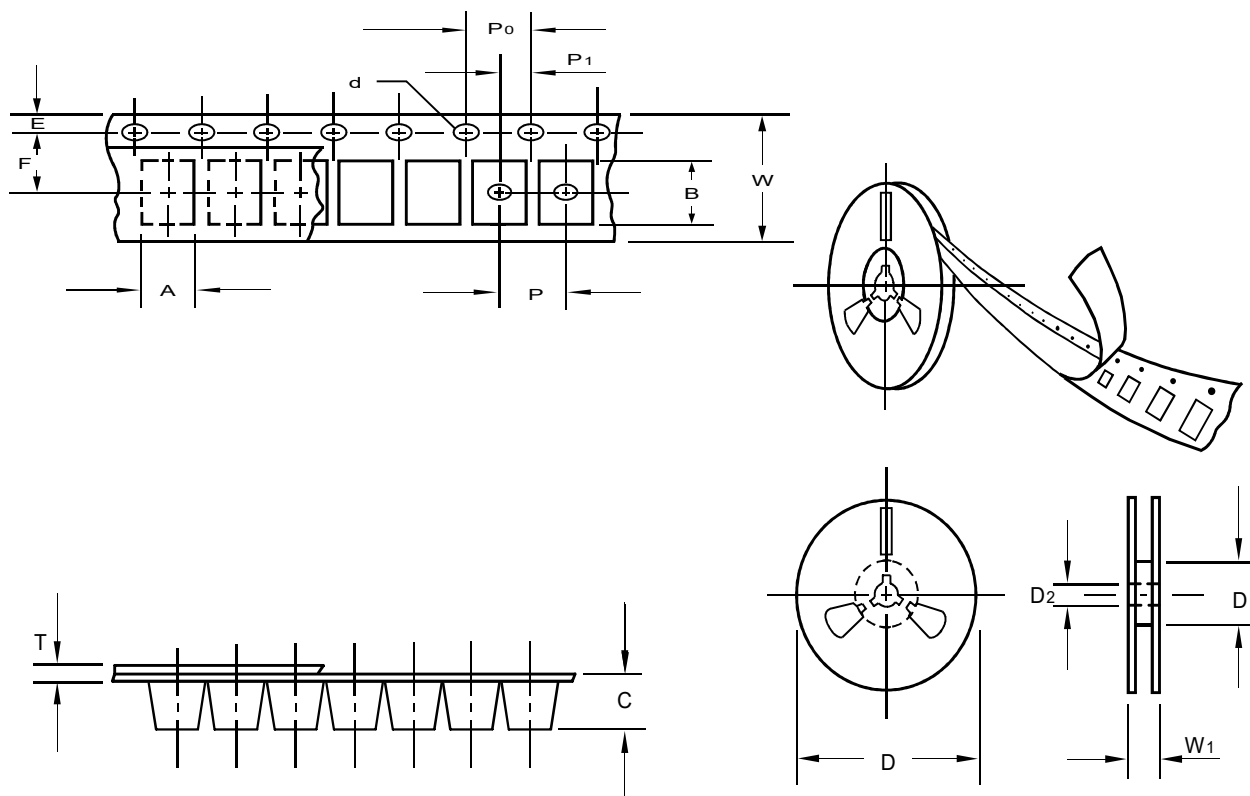
Suggested solder pad layout



Note:  
1. Controlling dimension: in millimeters.  
2. General tolerance:  $\pm 0.05mm$   
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       | 1.25    |
| 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       | 0.30    |
| Tape width                | W      | 0.3       | 12.00   |
| Reel width                | W1     | 1.0       | 17.60   |

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

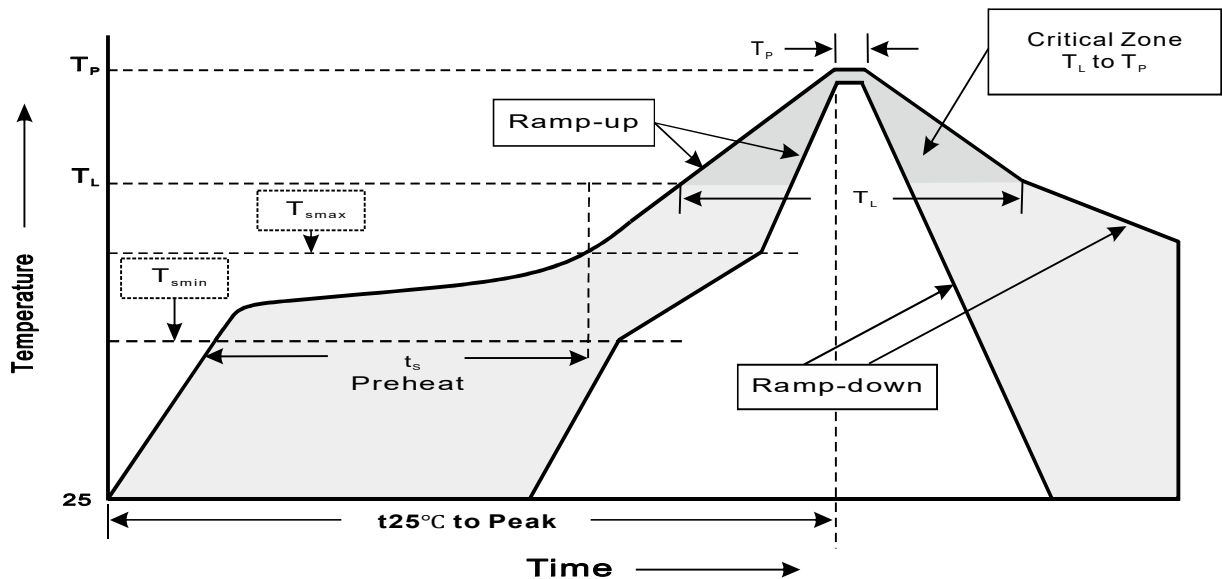
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Reel packing

| Device       | Outline | Device Package | Reel Size | Reel (pcs) |
|--------------|---------|----------------|-----------|------------|
| FMOSAC140N08 | Taping  | T5060P8        | 13 inch   | 5,000      |

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                     |
| Prehaeat<br>-Temperature Min ( $T_{smin}$ )<br>-Temperature Max ( $T_{smax}$ )<br>-Time (min to max) ( $t_s$ ) | 150°C<br>200°C<br>60 ~ 120sec |
| $T_{smax}$ 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 within 5°C of actual peak Temperature( $T_P$ )                                                            | 10 ~ 30sec                    |
| Ramp-down rate                                                                                                 | < 6°C/sec                     |
| Time 25°C to peak temperature                                                                                  | < 6 minutes                   |