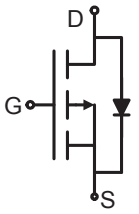
RECTRON SEMICONDUCTOR
TECHNICAL SPECIFICATION

# RM3401

## P-Channel Enhancement Mode Power MOSFET

### Description

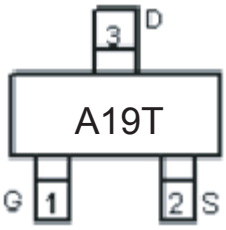
The RM3401 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.




**Schematic diagram**

### General Features

- $V_{DS}$ = -30V,$I_D$ = -4.2A
  $R_{DS(ON)}$ < 130mΩ @ $V_{GS}$=-2.5V
  $R_{DS(ON)}$ < 75mΩ @ $V_{GS}$=-4.5V
  $R_{DS(ON)}$ < 55mΩ @ $V_{GS}$=-10V
- High power and current handing capability
- Lead free product is acquired
- Surface mount package




**Marking and pin Assignment**

### Application

- PWM applications
- Load switch
- Power management


**SOT-23 top view**

### Package Marking And Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| A19T | RM3401 | SOT-23 | Ø180mm | 8 mm | 3000 units |

### Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | V |
| Drain Current-Continuous | $I_D$ | -4.2 | A |
| Drain Current-Pulsed (Note 1) | $I_{DM}$ | -30 | A |
| Maximum Power Dissipation | $P_D$ | 1.2 | W |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 150 | ℃ |

### Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 104 | ℃/W |

### Electrical Characteristics (TA=25℃unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=-250μA | -30 | | - | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-24V,$V_{GS}$=0V | - | - | -1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±10V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=-250μA | -0.7 | -1 | -1.3 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V, $I_D$=-4.2A | - | 47 | 55 | mΩ |
| | | $V_{GS}$=-4.5V, $I_D$=-4A | - | 56 | 75 | mΩ |
| | | $V_{GS}$=-2.5V, $I_D$=-1A | | 72 | 130 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V,$I_D$=-4.2A | - | 10 | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=-15V,$V_{GS}$=0V, F=1.0MHz | - | 880 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 105 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 65 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=-15V,$I_D$=-4.2A $V_{GS}$=-10V,$R_{GEN}$=6Ω | - | 7 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 3 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 12 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-15V,$I_D$=-4.2A,$V_{GS}$=-4.5V | - | 8.5 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 1.8 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 2.7 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=-4.2A | - | - | -1.2 | V |

## Notes:

**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production

## RATING AND CHARACTERISTICS CURVES (RM3401)

Typical Electrical and Thermal Characteristics

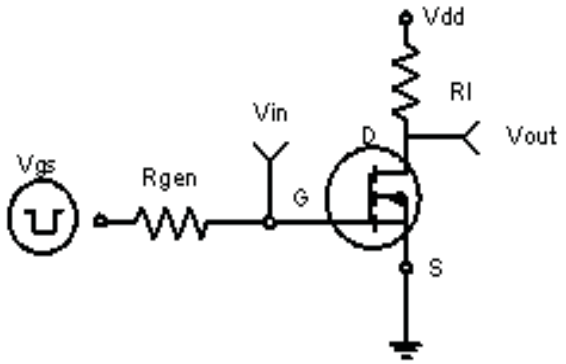



Figure 1:Switching Test Circuit

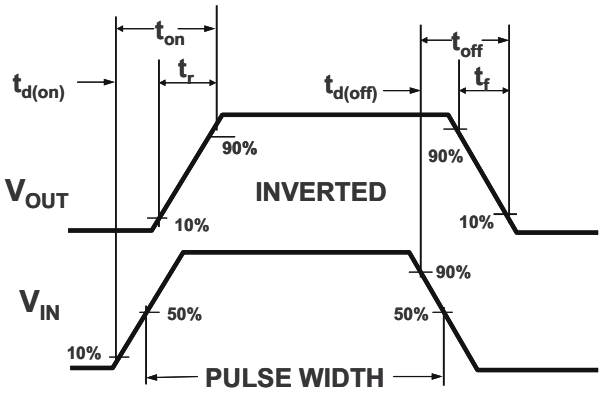
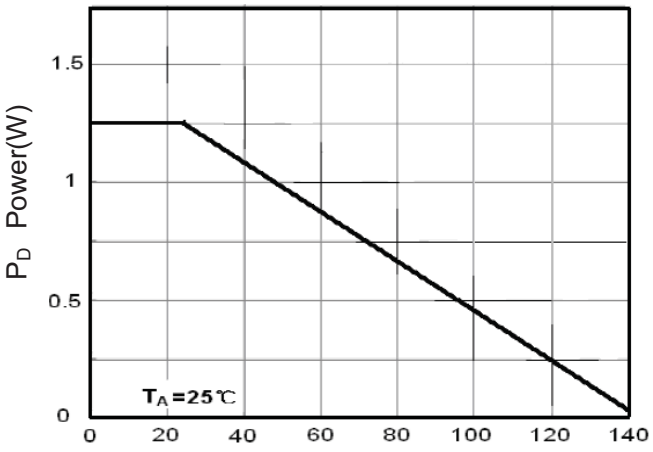
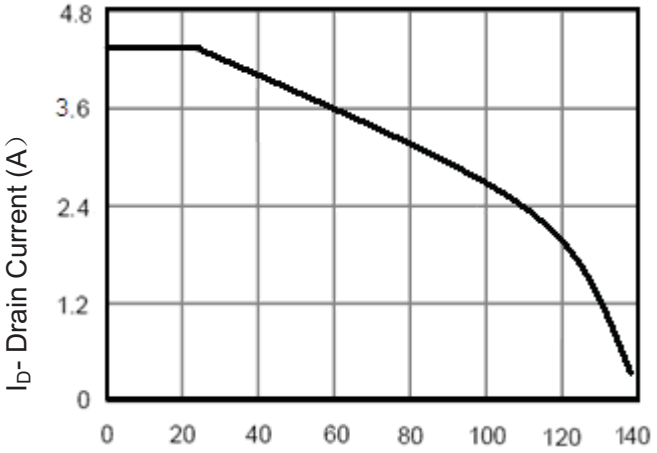



Figure 2:Switching Waveforms



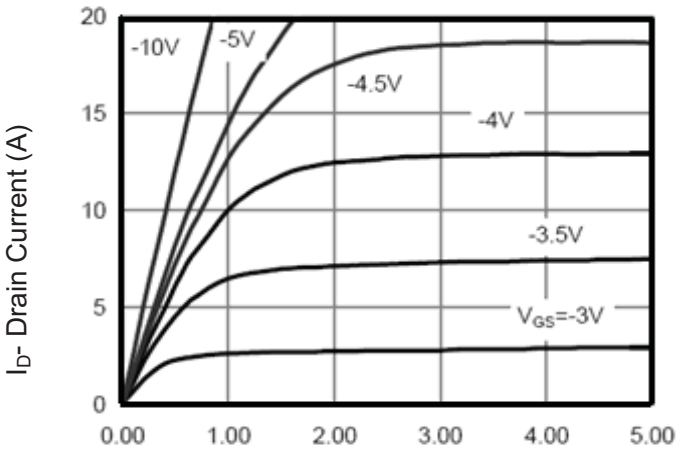

$T_J$-Junction Temperature(℃)

Figure 3 Power Dissipation



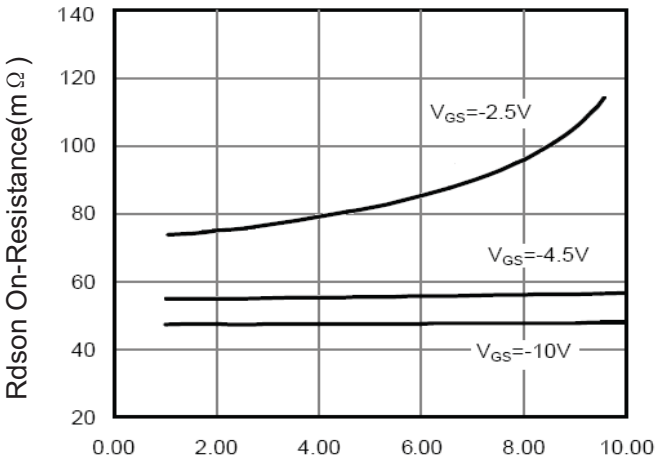

$T_J$-Junction Temperature(℃)

Figure 4 Drain Current




Vds Drain-Source Voltage (V)

Figure 5 Output Characteristics




$I_D$- Drain Current (A)

Figure 6 Drain-Source On-Resistance

## RATING AND CHARACTERISTICS CURVES (RM3401)

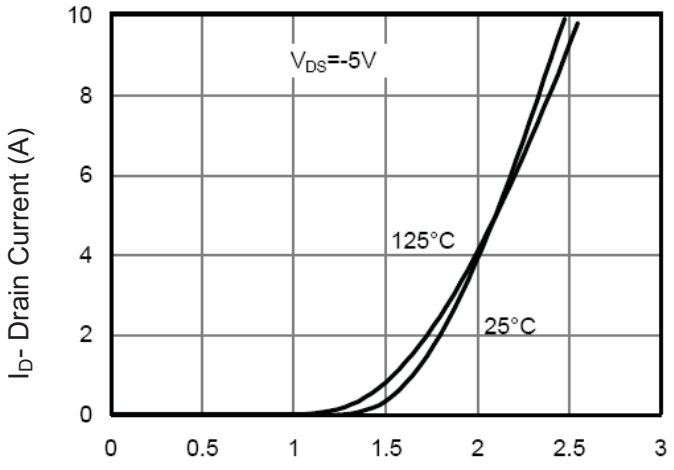



Figure 7 Transfer Characteristics

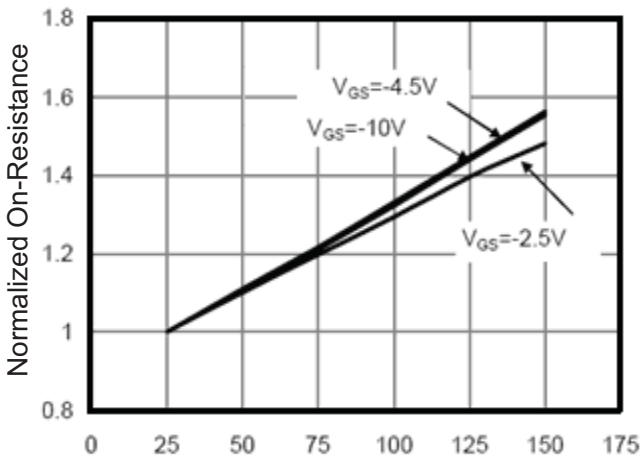



Figure 8 Drain-Source On-Resistance

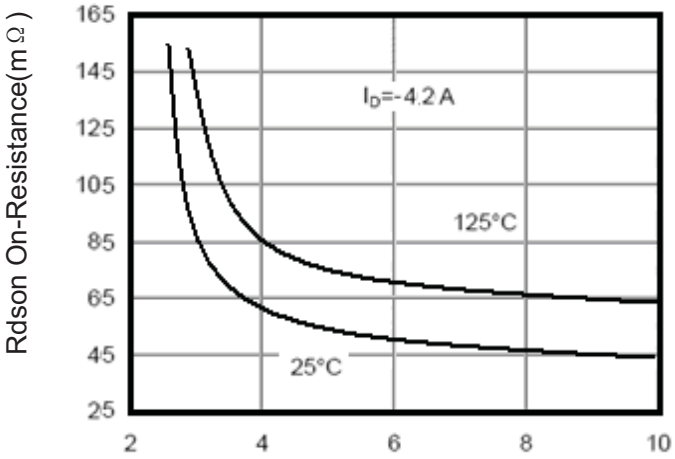



Figure 9 Rdson vs Vgs

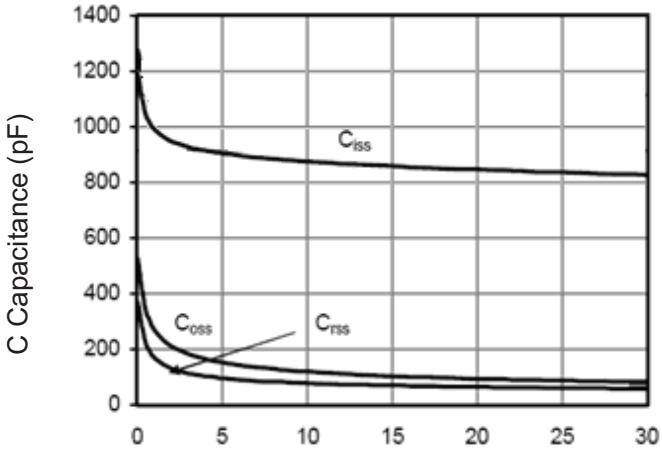



Figure 10 Capacitance vs Vds

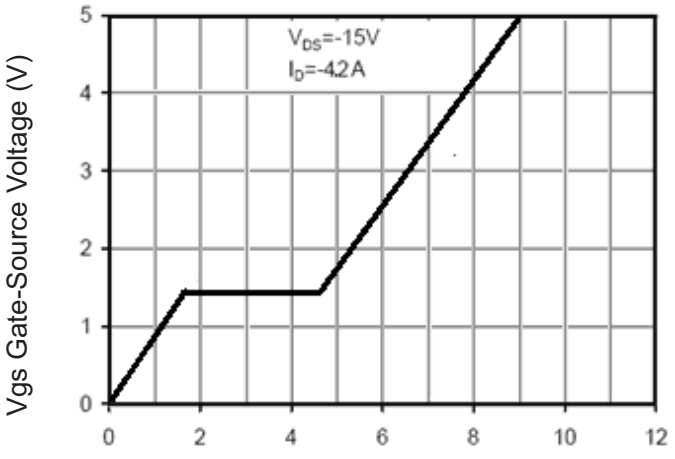



Figure 11 Gate Charge

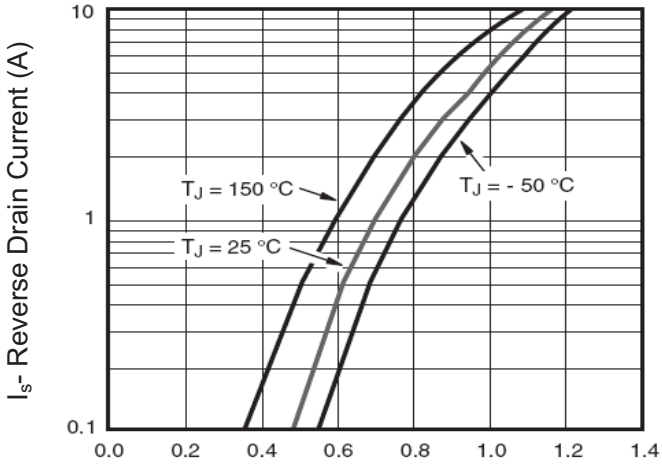



Figure 12 Source- Drain Diode Forward

## RATING AND CHARACTERISTICS CURVES (RM3401)

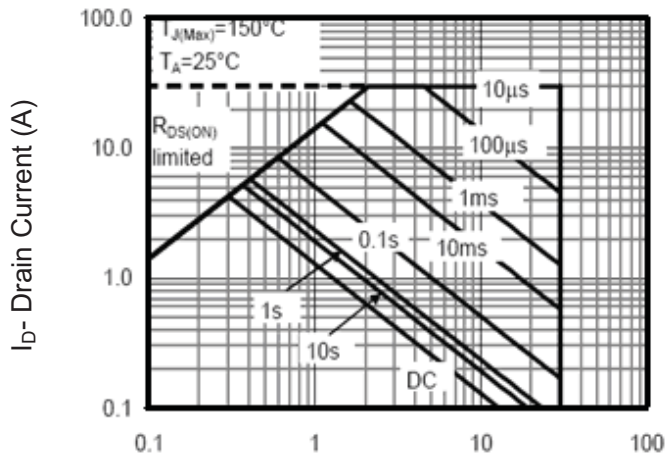



Figure 13 Safe Operation Area

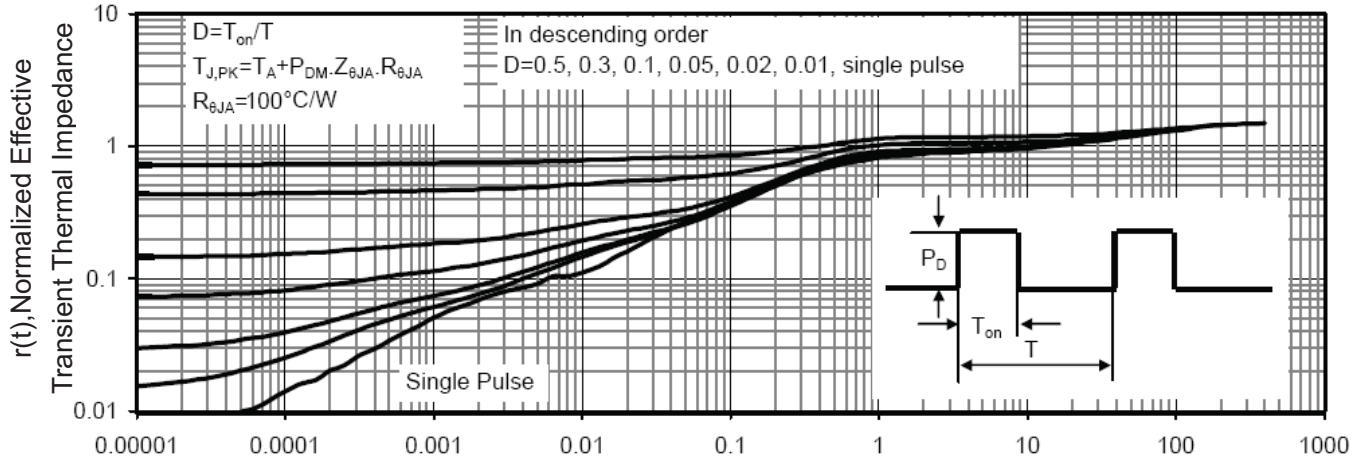
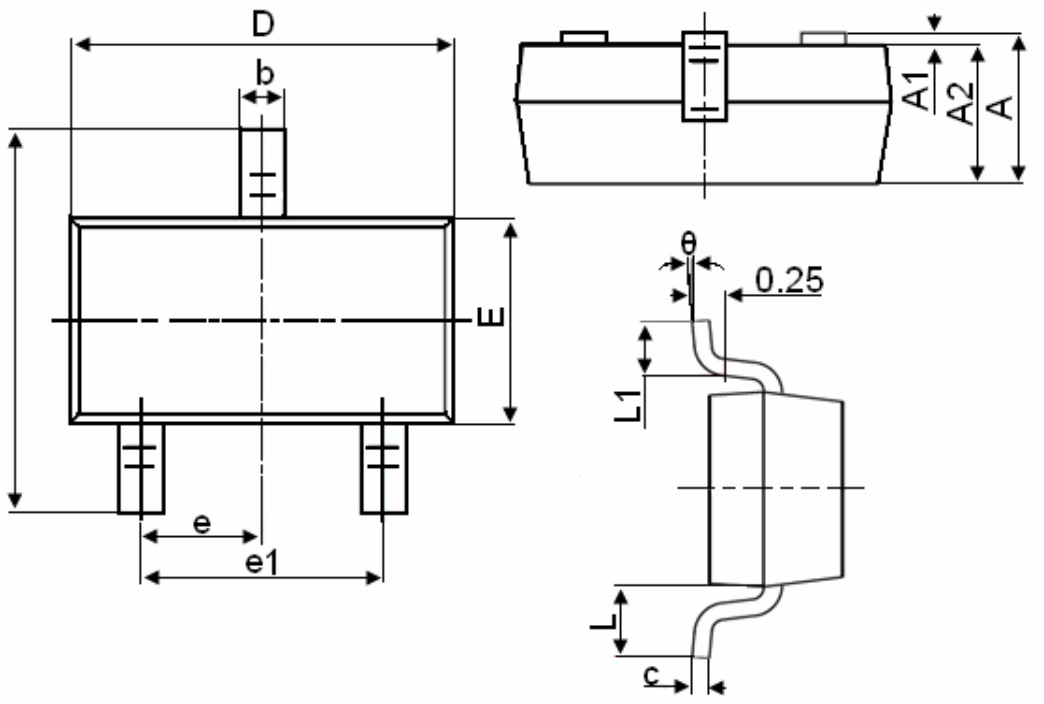



Figure 14 Normalized Maximum Transient Thermal Impedance

## SOT-23 Package Information




| Symbol | Dimensions in Millimeters | |
|---|---|---|
| | MIN. | MAX. |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| e | 0.950TYP | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF | |
| L1 | 0.300 | 0.500 |
| θ | 0° | 8° |

## Notes

1. All dimensions are in millimeters.
2. Tolerance ±0.10mm (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

| | Package | Tube (pcs/tube) | Tube (pcs/inner box) | Tube (pcs/cartoon) | Tape&Reel (pcs/reel) | Tape&Reel (pcs/inner box) | Tape&Reel (pcs/cartoon) |
|---|---|---|---|---|---|---|---|
| | DFN | 100 | 10,000 | 100,000 | 2,500 | 5,000 | 40,000 |
| | SOP-8 | 100 | 10,000 | 100,000 | 4,000 | 4,000 | 20,000 |
| | TSSOP-8 | 100 | 32,000 | 128,000 | 3,000 | 6,000 | 48,000 |
| | SOT-23-3L | —— | —— | —— | 3,000 | 30,000 | 120,000 |
| | SOT-23-6L | —— | —— | —— | 3,000 | 30,000 | 120,000 |
| | SOT-23(6R) | —— | —— | —— | 3,000 | 30,000 | 120,000 |
| | SOT-363 | —— | —— | —— | 3,000 | 30,000 | 120,000 |
| | SOT-523 | —— | —— | —— | 3,000 | 30,000 | 120,000 |
| | TO-220 | 50 | 1,000 | 5,000 | —— | —— | —— |
| | TO-220F | 50 | 1,000 | 10,000 | —— | —— | —— |
| | TO-247 | 30 | 300 | 1,200 | —— | —— | —— |
| | TO-251 | 80 | 4,000 | 40,000 | —— | —— | —— |
| | TO-251S(4R) | 80 | 4,000 | 40,000 | —— | —— | —— |
| | TO-252-2L(4R) | 80 | 4,000 | 40,000 | 2,500 | 2,500 | 25,000 |
| | TO-263-2L | 50 | 1,000 | 10,000 | 800 | 800 | 8,000 |
| | TO-3P | 30 | 300 | 3,000 | —— | —— | —— |
| | TO-92 | —— | —— | —— | 1,000(袋装) | 10,000 | 100,000 |

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