# MJ N-Channel Enhancement Mode Power MOSFET

## Description

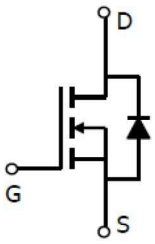
The MJ6012AS uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

## General Features

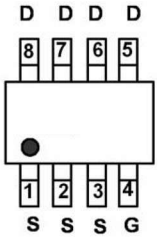
- $V_{DS}$ =60V,$I_D$ =12A
  $R_{DS(ON)}$ <11mΩ @ $V_{GS}$=10V (Typ:8.5mΩ)
  $R_{DS(ON)}$ <12mΩ @ $V_{GS}$=4.5V (Typ:9.1mΩ)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Low gate to drain charge to reduce switching losses

## Application

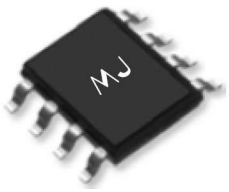
- Power switching application
- Load switch




Schematic diagram




Marking and pin assignment




SOP-8 top view

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| MJ6012AS | MJ6012AS | SOP-8 | Ø330mm | 12mm | 4000 units |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 12 | A |
| Drain Current-Continuous($T_C$ =100℃) | $I_{D(100℃)}$ | 8.5 | A |
| Pulsed Drain Current | $I_{DM}$ | 30 | A |
| Maximum Power Dissipation | $P_D$ | 3 | W |
| Operating Junction and Storage Temperature Range | $T_J$ ,$T_{STG}$ | -55 To 150 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 42 | ℃/W |

## Electrical Characteristics ($T_C$=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 | 60 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=60V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ ,$I_D$=250μA | 0.9 | 1.3 | 1.8 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=12A | - | 8.5 | 11 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=6A | - | 9.1 | 12 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=12A | 40 | - | - | S |
| **Dynamic Characteristics** (Note 4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=30V,$V_{GS}$=0V F=1.0MHz | - | 4100 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 298 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 229 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=30V,$R_L$=1Ω $V_{GS}$=10V,$R_{GEN}$=3Ω | - | 8.5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 7 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 40 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 15 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=30V,$I_D$=12A $V_{GS}$=10V | - | 93 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 9.7 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 20 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=12A | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 12 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C,$I_F$=12A di/dt= 100A/μs (Note 3) | - | 32 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 45 | - | nC |

**Notes:**

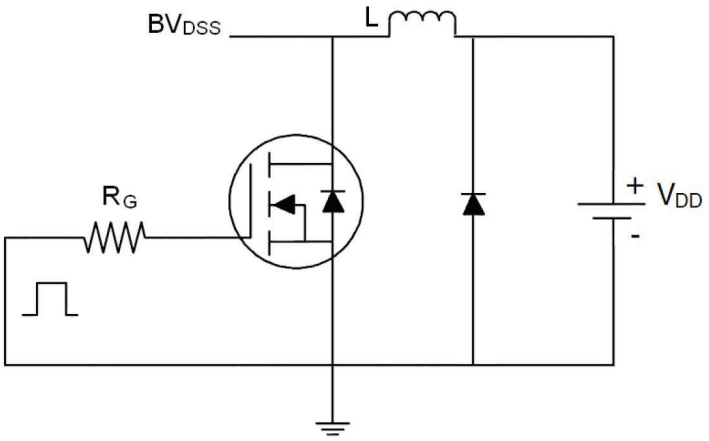
① Repetitive Rating: Pulse width limited by maximum junction temperature.

② The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C. The value in any given application depends on the user's specific board design.

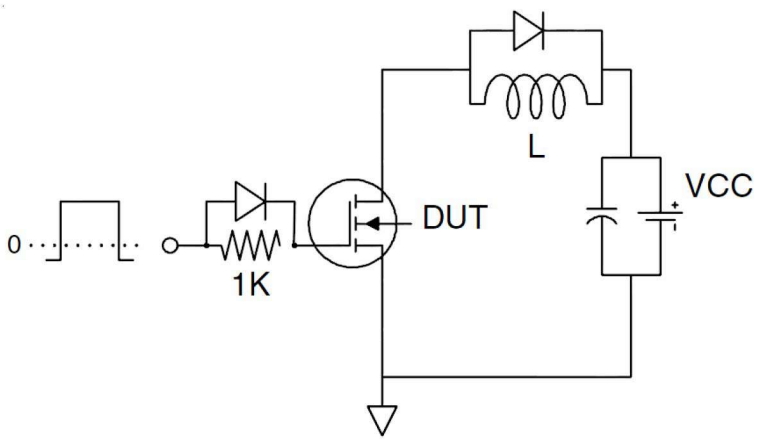
③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

④ Guaranteed by design, not subject to production

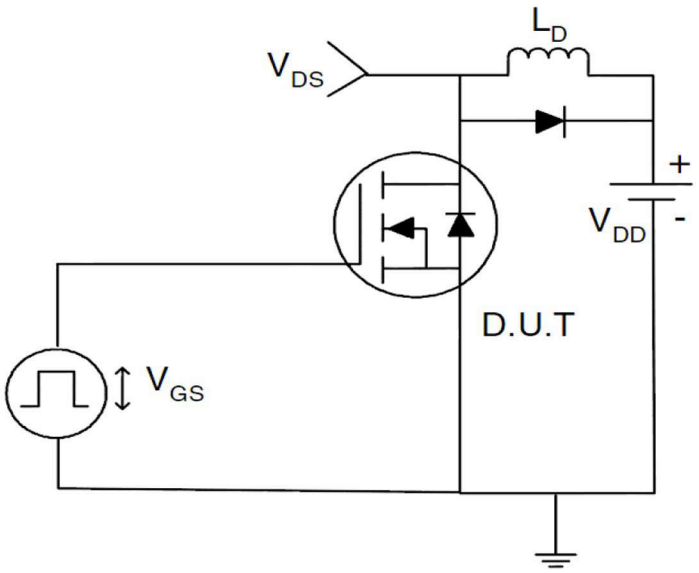
Test circuit




EAS test Circuit

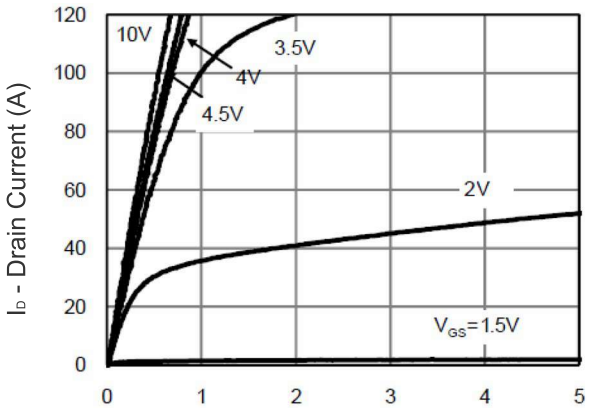



Gate charge test Circuit



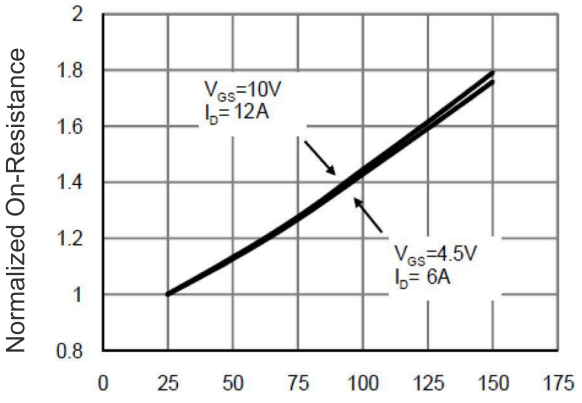

Switch Time Test Circuit

## Typical Electrical and Thermal Characteristics (Curves)



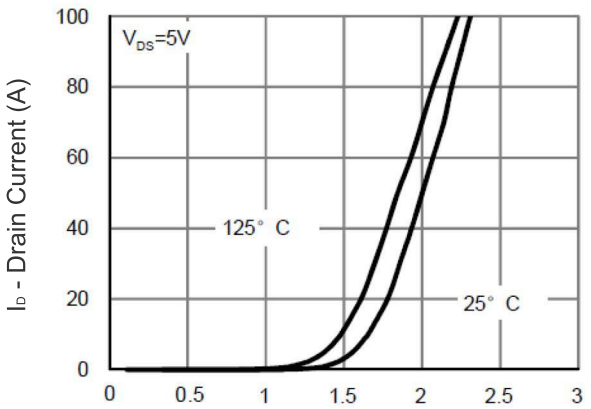

Vds Drain-Source Voltage (V)

Figure 1 Output Characteristics



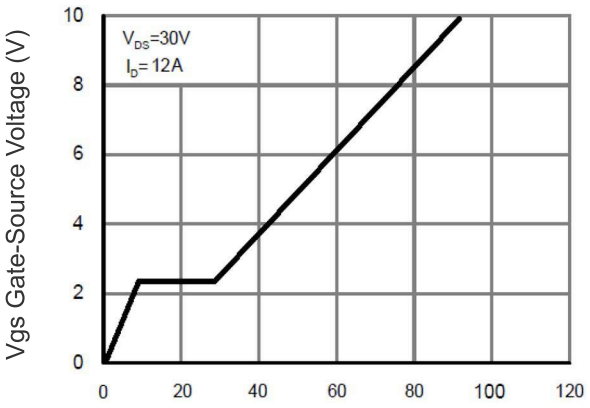

$T_J$ -Junction Temperature(℃)

Figure 4 Rdson-Junction Temperature



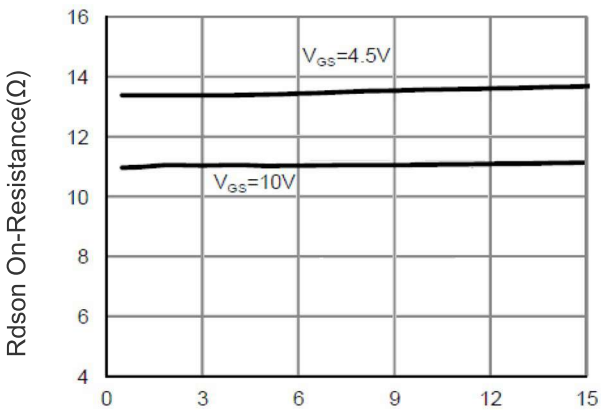

Vgs Gate-Source Voltage (V)

Figure 2 Transfer Characteristics



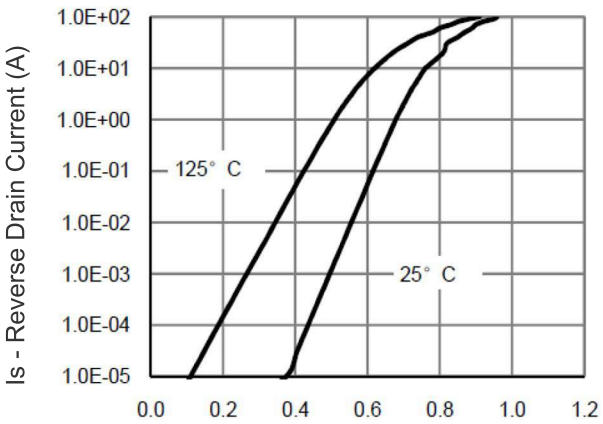

Qg Gate Charge (nC)

Figure 5 Gate Charge



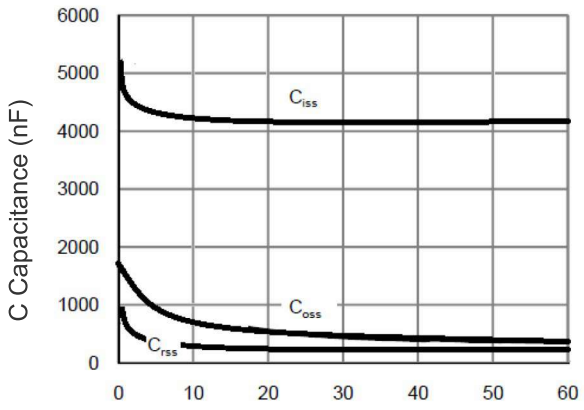

$I_D$ - Drain Current (A)

Figure 3 Rdson- Drain Current



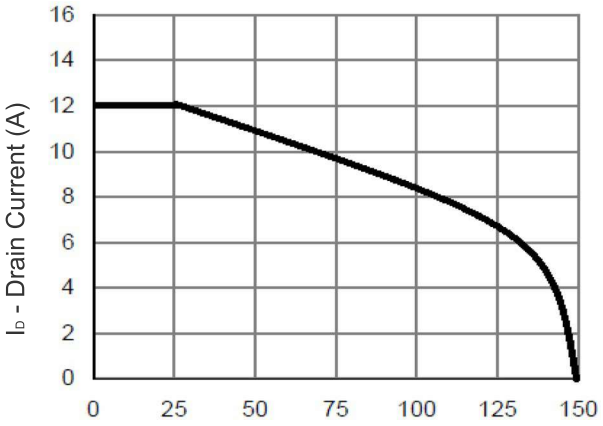

Vsd Source-Drain Voltage (V)

Figure 6 Source- Drain Diode Forward



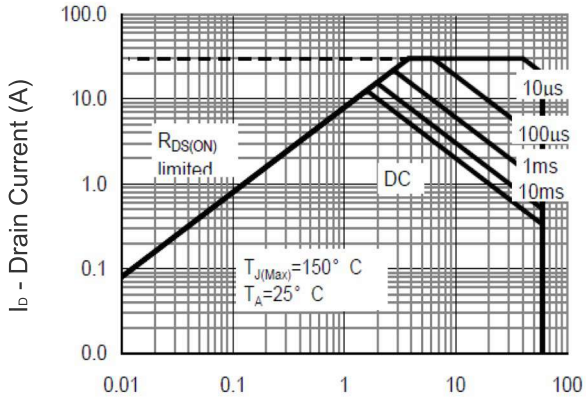

Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



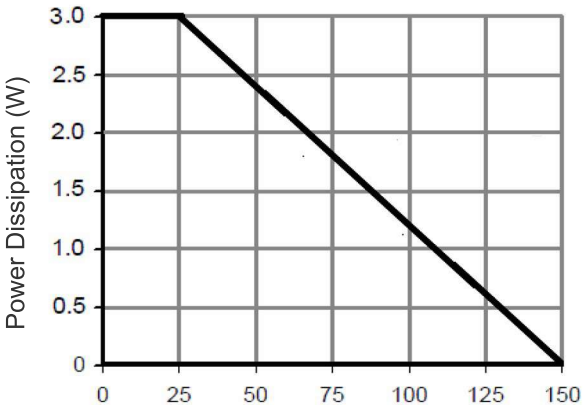

TJ -Junction Temperature(℃)

Figure 9 Current De-rating



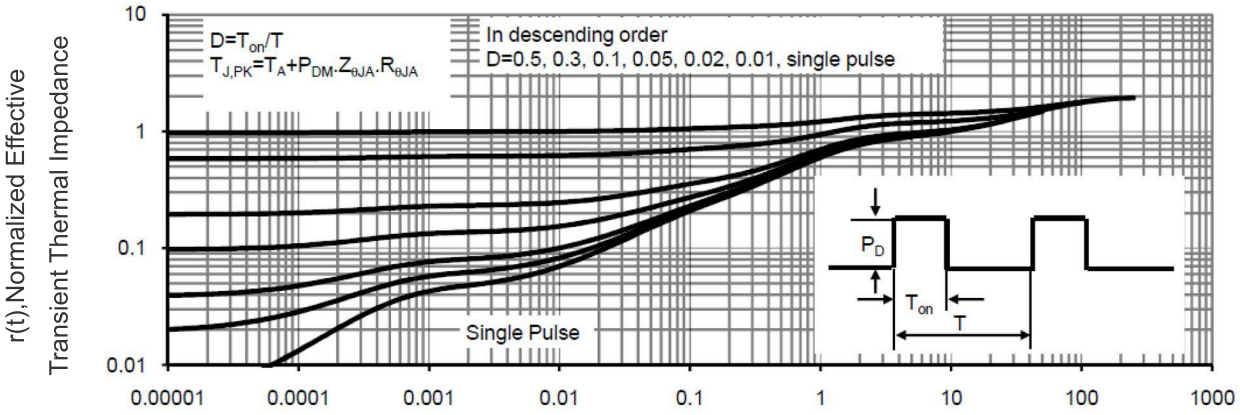

Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area




TJ -Junction Temperature(℃)

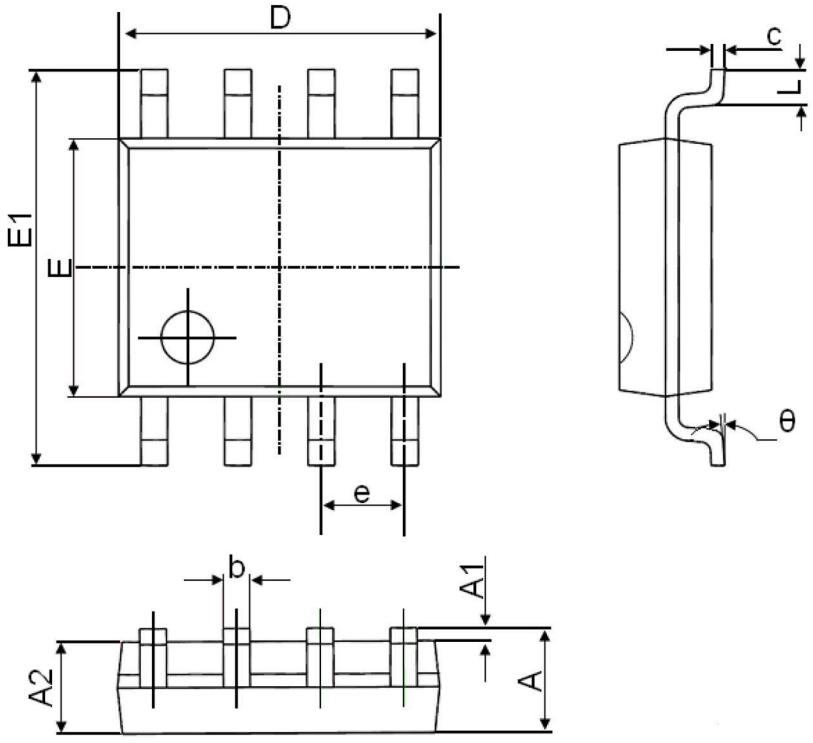
Figure 10 Power De-rating




Square Wave Pluse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

## SOP-8 Package Information

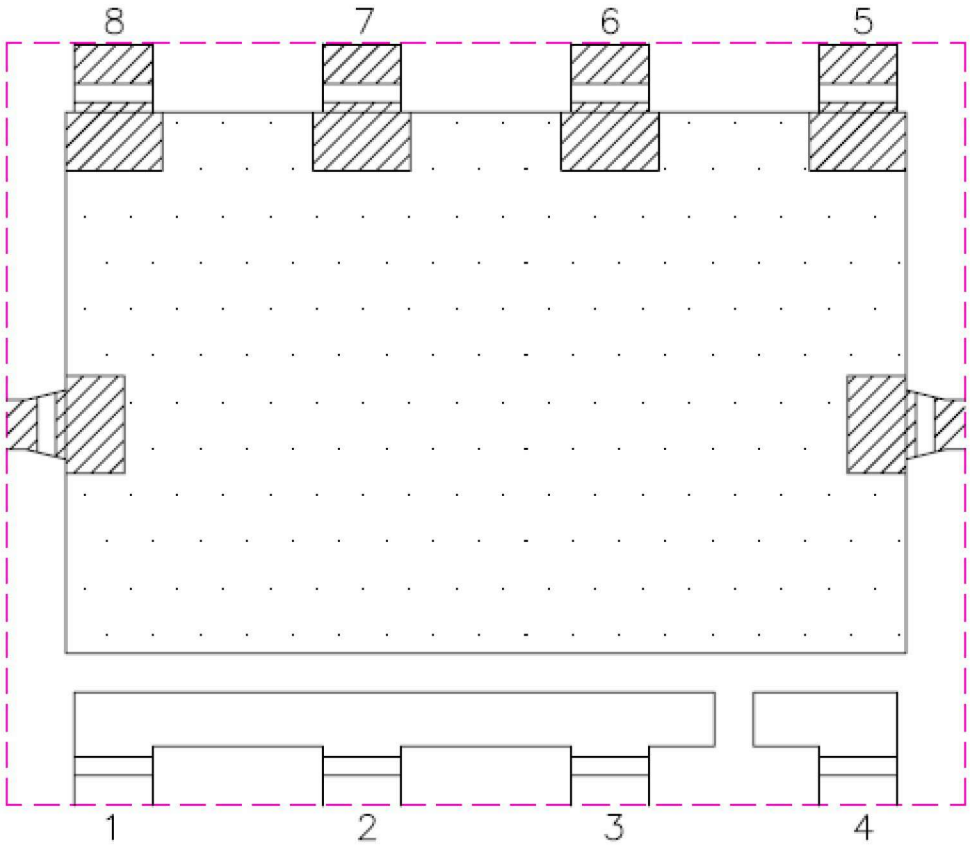



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

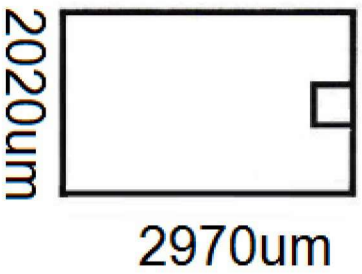
主材清单

| 构成部品名<br>Name | 构成部品供应商名称(2nd)<br>Supplier(2nd) | 均质材质名<br>(原资材)<br>Homogeneous materials | 均质材质供应商名称(3rd)<br>Supplier(3rd) |
|---|---|---|---|
| 部品型号 | 部品制造商 | Lead Frame<br>( A194 ) | ASM |
| | | Epoxy<br>( 8062T ) | ABLESTIK |
| | | Mold Compound<br>( CEL-8240HF10GK ) | 日立化成工业（苏州）有限公司 |
| | | Wire | 贺利氏招远；韩国喜尚 |
| | | Wire | 韩国喜尚<br>日本 NMC |
| | | Sn | 云南锡业 |

框架示意图

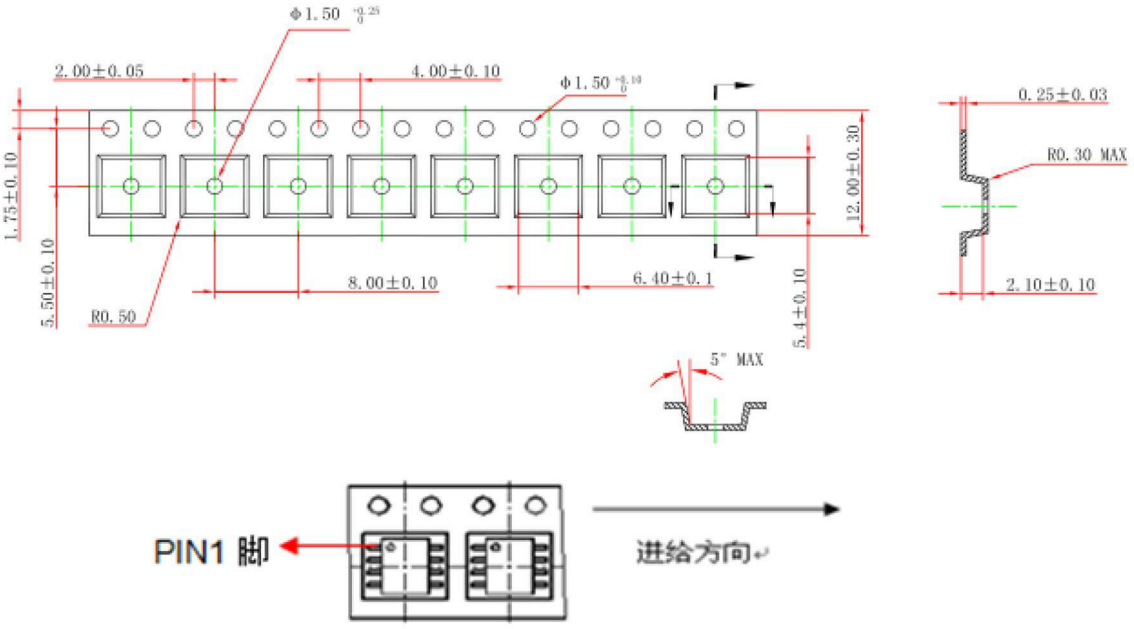



晶圆尺寸



包装信息

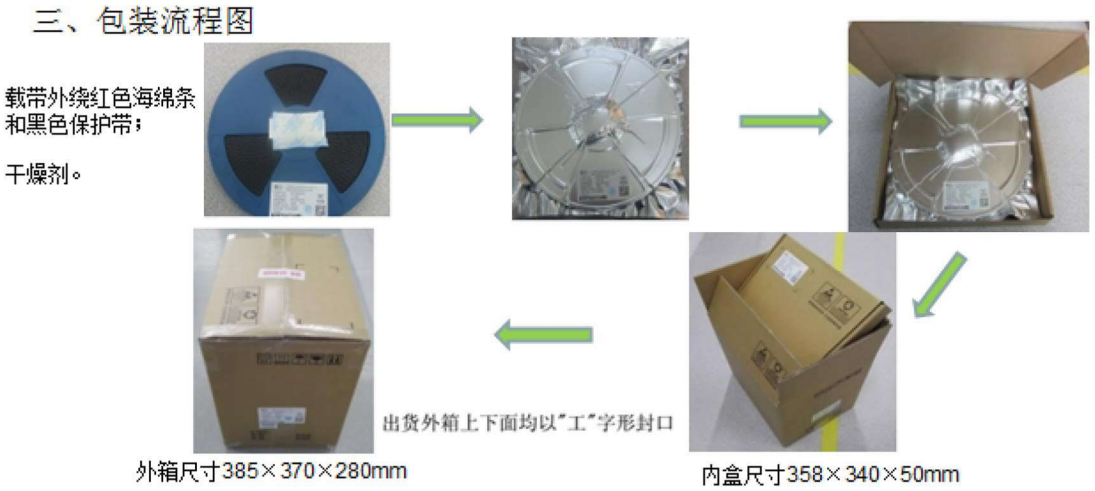
一、载带图纸与产品搭载方向示意图：




二、包装信息表（满箱信息）

| 封装形式 | 包装方式 | 盘尺寸 | 只/盘 | 盘/内盒 | 只/内盒 | 内盒/箱 | 只/箱 |
|---|---|---|---|---|---|---|---|
| SOP8 | 编带 | 13寸 | 4000 | 1 | 4000 | 5 | 20000 |

三、包装流程图




存储规范

**6012AS SOP-8** 温湿度敏感等级三级

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