Known Good Die (KGD) & Wafer Solutions

High Speed and Low Power Wafer/Die Solutions

DRAM
- Mobile SDR
- Mobile DDR
- SDR/DDR/DDR2
- EDO/Fast Page

SRAM
- 5V Asynchronous
  - High Speed
  - Low Power
- Synchronous
- DDR-II/QUAD

PSRAM
- Asynch/Page
- CRAM

APPLICATIONS
- Mobile processors (PMP, PDA, MID, Mobile TV)
- Display (TCON)
- Consumer products
- Flash MCPs
- Industrial/High Reliability
- Automotive

Resin

Die

SDRAM

SRAM

PROCESSOR

Au Wire

Solder Ball

Adhesive

Substrate
**Known Good Die (KGD)/Wafer Level Memories**

### Introduction

Die-level customers require a memory partner who can meet their many unique needs for high quality, long term support, guaranteed availability, and low total cost of ownership. ISSI is a provider of high quality specialty memory solutions for DRAMs, PSRAMs and SRAMs. Core to our strategy is to provide long term support for applications such as automotive, communications and industrial markets where design cycles can be 3-4 years from concept to production, followed by 5-6 years product life. Recognizing the unique fit of ISSI products with die-level customers needs, ISSI created a business unit to focus on die-level products to provide highest quality products with long term support.

For your stacked die product to be successful you require a memory supplier who has extensive experience directly supporting the die-level market. This means a dedicated engineering team developing products which are specifically defined, designed, and tested to meet die customer needs.

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<thead>
<tr>
<th>KGD CUSTOMER NEEDS</th>
<th>ISSI SOLUTIONS</th>
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</table>
| **Product Portfolio** | • Low to medium density SDRAMs: 16Mb-512Mb, SDR, DDR, DDR2  
  • Broadest portfolio of SRAMs and PSRAMs in the industry |
| **Low Power Solutions** | • Lowest power mobile devices in the industry  
  • 16Mb-512Mb LP-SDR & LP-DDR options, PSRAMs, Ultra-Low Power SRAMs |
| **Long Life Cycle** | • Long product life: 7-10 years typical  
  • Advanced process nodes for future products |
| **High Quality (Low ppm)** | • KGD test flow includes Wafer Level Burn In (WLBI) & Speed-Sort  
  • MCP Final Test Yield Target >99.9% for KGD |
| **Reliable Supply** | • Wafer Bank to support volume production  
  • Volume wafer purchase for lower total cost |
| **Test Flow options** | • Full KGD test flow option  
  • Proprietary voltage and temperature stress scheme emulates package level burn-in |
| **Custom Pad Layout** | • Pad layouts designed for KGD use  
  • ReDistribution Layer (RDL) or Bumped Die for custom pad layout |

### Summary

ISSI has a proven track record providing wafer & die solutions to many leading chipset and system companies. We are committed to working with our customers to provide them with the most cost-effective and highest quality products, so when you begin planning your next generation MCP or Stacked Die contact ISSI and see how we can "enable your MCP to be successful".
Selecting a Die Product

Space Constraints?
- Stacked die offers smallest form factor, lower cost, improved reliability

Memory Type?
- LP-SDR, LP-DDR, SDR/DDDR, DDR2, EDO/Fast Page DRAM
- PSRAM, SRAM

Electrical Specs?
- 1.8V, 2.5V and 3.3V
- 5V option for EDO/FP DRAMs and Async. SRAMs
- Speed and temperature grades

Bonding pads?
- Bonding pads on two-edges
- RDL & bumped die options for flip chip and CSP

Technical Support?
- Technical support, assembly information, SIP/MCP level testing

KGD@issi.com

Terminology

- Wafer probe = Test die in wafer form using Probe Card
- CP = Chip Probe (aka wafer probe test step)
- WLBI = Wafer Level Burn In
- Speed Sort = High speed wafer test
- Sorted Die or Tested Die = Die that has limited testing, i.e. Sort test only

- KGD = Known Good Die (fully tested die including WLBI and speed sort)
- SIP = System In Package
- MCP = Multi Chip Package
- MCM = Multi-Chip Module
- POP = Package on Package
- COB = Chip On Board
- SOC = System On Chip
## SDRAM and PSRAM Selection Guide

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### Notes:
1. SDR = Single Data rate, DDR = Double Data rate, LP = Low Power or Mobile
2. x16 and x32 configuration selected by bonding option
3. Die Shrink - recommended for new designs
4. ISSI continues to introduce new DDR2 devices in a range of densities

### Status:
- **S** = Samples
- **Prod** = Production

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## EDO & Fast Page Mode DRAM Selection Guide

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### SRAM Selection Guide

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### Note:
1. Refer to ISSI Product Selector Guide for complete list of SRAM types and part #. All products can be supported as Probed (sorted) Die
2. Check product datasheet for VCC and VCCQ specs
3. ISSI can support different speed/power and configurations. Contact Marketing for details.
Known Good Die (KGD) Production Flow Options

**Notes:**
- Specific details are defined in the test flow for each device with temperature and voltage guard-bands
- High Speed Tester and “Speed Probe Card” used for CP4

**Test Flow Definitions:**
- **KGD** = Known Good Die: includes WLBI and Speed Sort
- **KTD** = Known Test Die: same as KGD, without Speed Sort
- **PD** = Probed (Sorted) Die: No WLBI, speed or temp sort, CP1 (Hot Temp.) + CP2 (Room Temp.) only
ISSI DIE ORDERING INFORMATION

ISSI Prefix

Product Family
41xx = EDO/FP DRAM
42xx/43xx = SDRAM
61xx/63xx = HS SRAM
62xx = LP SRAM
66xx = SRAM/PSRAM

DRAM Sub Family
S = 3.3V SDR
R = 2.5V SDR / DDR
VS = 1.8V SDR
SM = 3.3V Mobile SDR
RM = 2.5V Mobile SDR
VM = 1.8V Mobile SDR
LR = 1.8V Mobile DDR1
LRR = 2.5V Mobile DDR1
LRS = 3.3V Mobile DDR1
DR = 1.8V DDR2

PSRAM Sub Family
WV = Wide Voltage
A = ADMUX
C = CRAM 1.5
D = CRAM 2.0
E = Async/Page

SRAM Sub Family
61/63 = High Speed
62 = Low Power
66 = Pseudo SRAM

Bus Width
8 = x8
16 = x16
32 = x32

Memory Size
100 = 1M
200 = 2M
400 = 4M
800 = 8M
160 = 16M
320 = 32M

SRAM/PSRAM VDD
ALL = 1.8V
BLL = 3.0V

Die Revision

Speed Grade
‘x’ ns for KGD
‘blank’ for KTD & PD (default is slowest speed grade on datasheet)

Back Grinding Thickness
29 = 29 mil
19 = 19 mil
yy = other thickness (specify)

Inking
N = Inked
U = Un-inked / Electronic Mapping File

Test Flow*
K = KGD at Level 1 temp 0 to +70°C
G = KGD at Level 2 temp -20 to +85°C
D = KGD at Level 3 temp (auto) -40 to +85°C
I = KTD
C = Probed Die-PD (Sorted Die)

Die Type
X = Die (Lead Free)
R = RDL (pads, no bumping)
L = Lead Free Bumping / RDL
P = Leaded Bumping / RDL
C = Cu Lead Free Bumping / RDL

Packing
JP = JAR pack*
WB = Wafer Boat
WP = Waffle Pack
TR = Tape & Reel

Confirm exact part # from ISSI Die Datasheet

1* Jar Pack is default wafer packing option. For other options please contact KGD Product Marketing
2* Not all products are supported with all test flows. Contact KGD Product Marketing for detailed availability.
**Memory Products in Wafer Form**

Addressing the market need for a smaller form factor, lower cost solution, extreme temperature, or custom package, ISSI offers a broad range of memory products in die or wafer form. Consumer products require multi-chip packages (MCPs) to meet the stringent space requirements of cell phones, digital cameras, PDA’s and many other mobile-products. ISSI has experience providing low power KGD at millions of units per month run rate. For other applications such as harsh operating conditions ISSI can supply probed die in volumes starting from a single wafer. Whatever your application or volume requirements ISSI’s wafer level products provide the memories you are familiar with, in a fully tested wafer form, that can be readily used in your MCP or custom package.

**ISSI Specialist Die Distributors**

ISSI, in conjunction with our value added die distributors, can provide a wide range of solutions for your die related needs.

[Image of ISSI Specialist Die Distributors]

**ISSI Sales Offices**

**HEADQUARTERS**

*West Coast Office*
San Jose, CA
408-969-6600 Tel.
408-969-7800 Fax

*Europe Office*
Devon England
44-1803-840110 Tel.
44-1803-865199 Fax

*Brazil Office*
55-11-2574-7270 Tel.
55-11-7985-0505 Tel.
55-11-5181-2387 Fax

**Taiwan Office**
Hsin-Chu
886-3-5780333 Tel.
886-3-5783000 Fax

**China Office**
Shanghai
86-21-50802288 Tel.
86-21-50802028 Fax

**Korea Office**
Kyunggi-Do
82-31-715-6406 Tel.
82-31-715-6209 Fax

**Japan Office**
Tokyo
81-3-5339-2950 Tel.
81-3-5339-2951 Fax

For other locations contact KGD@issi.com

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