



ESD LEVEL BY PRODUCT FAMILY

Several ESD standards exist worldwide for which 3D PLUS is frequently questioned. 3D PLUS use to provide [ESD values by product family](#) based on [ESDA standard](#).

| Standard | Human Body Model | Machine Model | Charged Device Model |
|----------|-------------------|-----------------|----------------------|
| ESDA | STM 5.1-1998 | JS-001-2014 (*) | STM 5.3-1998 |
| JEDEC | JEDEC 22-A114 | | JEDEC 22-C101 |
| IEC | IEC61340-3-1 | IEC61340-3-2 | N/A |
| AEC | AEC-Q101-001 | AEC-Q101-002 | AEC-Q100-002 |
| MIL | MIL-STD-883 M3015 | N/A | N/A |

(*) ESDA/JEDEC Joint Technical Report User Guide of ANSI/ESDA/JEDEC JS-001 Human Body Model Testing of Integrated Circuits
Results by STM 5.1-1998 are equivalent with JS-001-2014 per 3D PLUS Note-0370-1.

ESDA STANDARD

| Test Item | Standard references | Test Condition |
|----------------------|---------------------|---|
| Human Body Model | ESD STM 5.1-1998 | C=100pF / R=1.5kΩ 1pulse per polarity 0.3sec interval between pulses |
| Machine Model | ESD STM 5.2-1999 | C=200pF / R=0 kΩ 3pulses per polarity 1sec interval between pulses |
| Charged Device Model | ESD STM 53.1-1999 | Direct charging method 3pulses per polarity 1sec interval between pulses |

ESDA VALUES BY PRODUCT FAMILY

VOLATILE MEMORY

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|----------------------|---------------------|-------------|
| DDR4 | Human Body Model | MIL-STD-883-3015 | >2000V |
| | Charged Device Model | JEDEC 22-C101 | >500V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|----------------------|---------------------|-------------|
| DDR3 | Human Body Model | JEDEC 22-A114 | >2000V |
| | Machine Model | JEDEC 22-A115 | >200V |
| | Charged Device Model | JEDEC 22-C101 | >1000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|----------------------|---------------------|-------------|
| DDR2 | Human Body Model | MIL-STD-883-3015 | >2000V |
| | Machine Model | JEDEC 22-A115 | >200V |
| | Charged Device Model | JEDEC 22-C101 | >1000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|------------------|---------------------|-------------|
| DDR | Human Body Model | ESD STM 5.1-1998 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|--------------|----------------------|---------------------|-------------|
| SDRAM | Human Body Model | ESD STM 5.1-1998 | >2000V |
| | Machine Model | ESD STM 5.2-1999 | ±200V |
| | Charged Device Model | ESD STM 53.1-1999 | ±1000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|----------------------|---------------------|-------------|
| SRAM | Human Body Model | ESD STM 5.1-1998 | >2000V |
| | Machine Model | ESD STM 5.2-1999 | >200V |
| | Charged Device Model | ESD STM 53.1-1999 | >300V |

NON VOLATILE MEMORY

| Family Name | Test Item | Standard References | ESD voltage |
|--------------------------------|---------------------|---------------------|-------------|
| Asynchronous Nand Flash | Human Body Model | ESD STM 5.1-1998 | >2000V |
| | Charged Device Mode | ESD STM 53.1-1999 | >500V |
| Synchronous Nand Flash | Human Body Model | ESD STM 5.1-1998 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|------------------|----------------------|---------------------|-------------|
| Flash NOR | Human Body Model | ESD STM 5.1-1998 | >2000V |
| | Charged Device Model | ESD STM 53.1-1999 | >1000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------------------------|------------------|---------------------|-------------|
| SPI and QSPI NOR FLASH | Human Body Model | JS-001-2014 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|--------------------------|------------------|---------------------|-------------|
| SPI NOR FLASH TMR | Human Body Model | JS-001-2014 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|--------------------|------------------|---------------------|-------------|
| RTIMS FLASH | Human Body Model | ESD STM 5.1-1998 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|---------------|----------------------|---------------------|-------------|
| EEPROM | Human Body Model | ESD STM 5.1-1998 | >2000V |
| | Charged Device Model | ESD STM 53.1-1999 | >300V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|----------------------|---------------------|-------------|
| MRAM | Human Body Model | AEC-Q100-002 | >2000V |
| | Charged Device Model | AEC-Q100-011 | >750V |

INTERFACE

| Family Name | Test Item | Standard References | ESD voltage |
|-------------|------------------|---------------------|-------------|
| LVT | Human Body Model | MIL-STD-883-3015 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-------------------------|------------------|---------------------|-------------|
| LVDS Driver | Human Body Model | JS-001-2014 | >8000V |
| LVDS Receiver | Human Body Model | JS-001-2014 | >15000V |
| LVDS Transceiver | Human Body Model | JS-001-2014 | >8000V |

| Family Name | Test Item | Standard References | ESD voltage |
|----------------------|------------------|---------------------|-------------|
| LVDS Repeater | Human Body Model | JS-001-2014 | >8000V |

| Family Name | Test Item | Standard References | ESD voltage |
|--------------------|------------------|---------------------|-------------|
| LVDS SerDes | Human Body Model | JS-001-2014 | >4000V |

POL CONVERTERS

| Family Name | Test Item | Standard References | ESD voltage |
|------------------------------|------------------|---------------------|-------------|
| <i>POL converters</i> | Human Body Model | JS-001-2014 | >2000V |

PERIPHERALS AND PROTECTIONS

| Family Name | Test Item | Standard References | ESD voltage |
|----------------------|------------------|---------------------|-------------|
| <i>SWITCH</i> | Human Body Model | JS-001-2014 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-----------------------|------------------|---------------------|-------------|
| <i>DDR2-TR</i> | Human Body Model | MIL-STD-883-3015 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-----------------------|------------------|---------------------|-------------|
| <i>DDR3-TR</i> | Human Body Model | JS-001-2014 | >2000V |

| Family Name | Test Item | Standard References | ESD voltage |
|-----------------------|------------------|---------------------|-------------|
| <i>DDR4-TR</i> | Human Body Model | JS-001-2014 | >2000V |

COMPUTER CORES

| Family Name | Test Item | Standard References | ESD voltage |
|------------------------|------------------|---------------------|-------------|
| <i>FUSIO RT</i> | Human Body Model | JS-001-2014 | >2000V |

CAMERA HEADS

| Family Name | Test Item | Standard References | ESD voltage |
|--|----------------------|---------------------|--------------|
| <i>4 Mpx Space Camera Head family</i> | Human Body Model | JS-001-2014 | 250V to 500V |
| | Charged Device Model | JEDEC 22-C101 | >500V |