

ESD LEVEL BY PRODUCT FAMILY

Several ESD standards exist worldwide for which 3D PLUS is frequently questioned. 3D PLUS provides [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 5.2-1998	STM 5.3-1998
JEDEC	JEDEC 22-A114		JESD22-A115-F	JEDEC 22-C101
IEC	IEC61340-3-1		IEC61340-3-2	N/A
AEC	AEC-Q101-002		AEC-Q101-002	N/A
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 1 pulse per polarity 0.3 sec interval between pulses
Machine Model	ESD STM 5.2-1999	C=200pF / R=0 kΩ 3 pulses per polarity 1 sec interval between pulses
Charged Device Model	ESD STM 5.3.1-1999	Direct charging method 3 pulses per polarity 1 sec 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

INTERFACES

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

POWER SOLUTIONS

Family Name	Test Item	Standard References	ESD voltage
<i>POL converters</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

PROTECTION

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

RADIATION MITIGATION SOLUTIONS

Family Name	Test Item	Standard References	ESD voltage
<i>Majority Voter</i>	Human Body Model	JS-001-2014	>4000V

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

Family Name	Test Item	Standard References	ESD voltage
<i>12 Mpx Space Camera Head family</i>	Human Body Model	ED-4701/302	>1000V
	Charged Device Model	ED-4701/302	>1000V

Family Name	Test Item	Standard References	ESD voltage
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**1.31 Mpx SWIR
Space Camera Head
family**

Human Body Model	ED-4701/302	>1000V
Charged Device Model	ED-4701/302	>1000V