

# Test Report

## Next Generation EDS E Series Managed Switches

When dealing with unpredictable weather and environmental conditions, unforeseen lightning strikes, severe electrical transients, and high temperatures can interrupt system communication and even damage industrial network infrastructures. Repairs can be costly and very time consuming, especially at remote application sites.

To address reliability concerns, Moxa's next generation EDS E series industrial Ethernet switches are engineered to create a higher level of protection than typical industrial switches to enhance network immunity against environmental threats, including EMI, surge, noise, shock, vibration, and extreme temperature variations. To verify robust performance of the EDS E series, the switch was subjected to a series of reliability tests. Detailed test parameters and test results are shown below.

### EDS E Series Reliability Verification

#### Level 4 EMS Protection

Electromagnetic Susceptibility (EMS) is the inability of an electronic device to operate unaffected in the presence of interfering electromagnetic energy. By passing the highest level of Level 4 EMS certification, the EDS E series can provide better protection when electromagnetic interference occurs. Moxa conducted the following three EMS tests according to Level 4 standards under extreme ESD, EFT/Burst, and surge voltage conditions.



#### Electrostatic Discharge Immunity Test

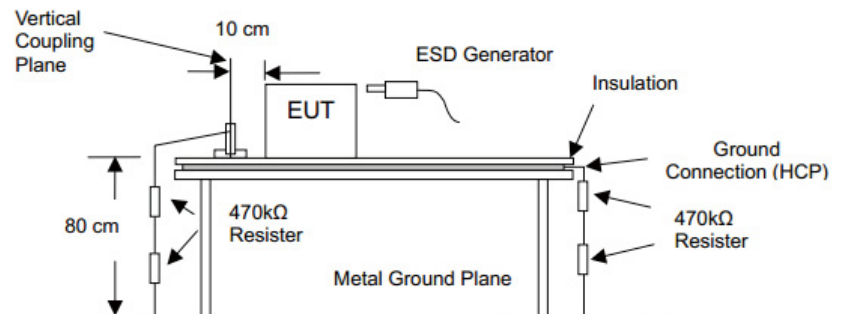
Electrostatic discharge is the sudden transfer of static electricity between two objects and can cause equipment failure and network disruption. For this ESD test, the new EDS switch is able to maintain normal operation even at  $\pm 8$  kV contact discharges or  $\pm 15$  kV air discharges. With Level 4 ESD protection, the new EDS switch was unaffected by the repetitive contact discharges. Click the video to see actual testing process.

#### ESD Testing Environment

Model	EDS-G516E
Temperature	25°C
Humidity	45 %
Atmospheric Pressure	101 Kpa

#### ESD Testing Criteria

Air Discharge	Contact Discharge
$\pm 15$ kV	$\pm 8$ kV



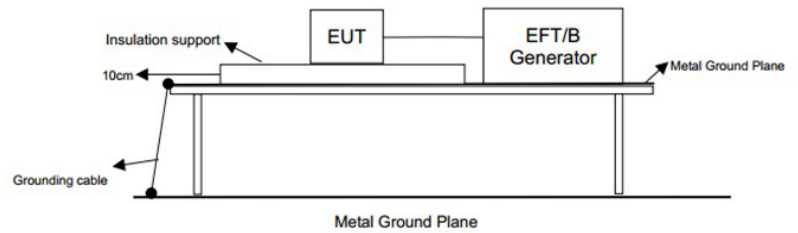


### EFT Immunity Test

Bursts of Electrical Fast Transients are caused by operation of motors and electro-mechanical switches which can damage internal circuitry. In this test, we injected transient voltages as high as 4 kilovolt into the new EDS switch. With Level 4 EFT protection, EFT injections did not affect the performance of the switch. Click the video to see actual testing process.

### EFT Testing Environment

Model	EDS-G516E
Temperature	22°C
Humidity	54 %
Atmospheric Pressure	101 Kpa
Repetition Frequency	5 kHz



### EFT Testing Criteria

Input DC Power Port	Communication Line
±4.0 kV	±2.0 kV

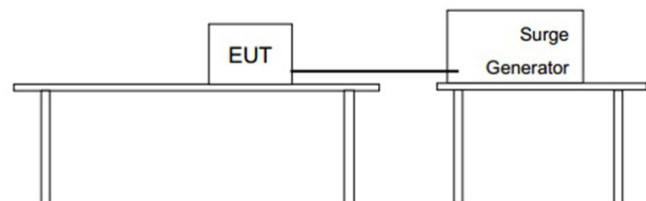


### Surge Immunity Test

Surge can be caused by a short circuit, lightning strike, or power outage recovery, and can generate intense heat, burn wire insulations, and even cause fires and explosions. To verify surge immunity, IEC-compliant testing methods were applied for this surge test. The switch was able to repel a 4 kilovolt surge injection and continue operating unaffected. Click the video to see actual testing process.

### Surge Testing Environment

Model	EDS-G516E
Temperature	26°C
Humidity	51 %
Atmospheric Pressure	101 Kpa

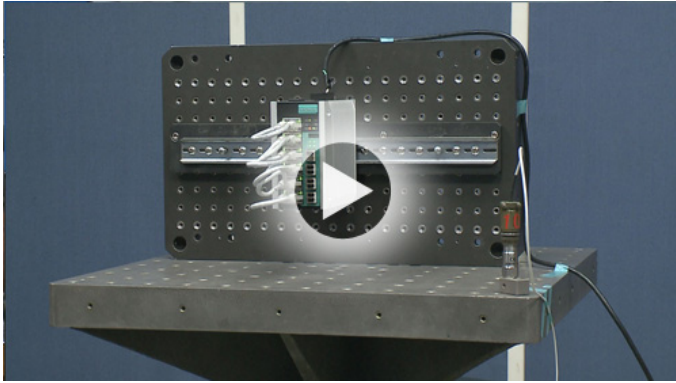


### Surge Testing Criteria

L-PE	N-PE	L-N	Communication Line
± 4.0 kV	± 4.0 kV	±2.0 kV	±2.0 kV

## Anti Vibration and Shock Resistant Test

For industrial applications in the presence of moving vehicles and heavy machinery, long-term exposure to shock and vibration can eventually disable a device by shaking loose wires for power, data, and redundancy. The switch was subjected to continuous multi-axis shock and vibration tests. The new design of the DIN rail mount allows easy installation and provides a high level of protection against severe shock/vibration. Click the video to see actual testing process.



### Testing Environment

Model	EDS-G516E
Temperature	25°C (±5)
Humidity	60% RH (±20)

### Random Vibration Testing Criteria (Operating)

Frequency	Acceleration	Duration	Total Testing Time
5 to 150 Hz	0.70 m/s <sup>2</sup> rms (longitudinal) 0.45 m/s <sup>2</sup> rms (transverse) 1.0 m/s <sup>2</sup> rms (vertical)	10 minutes (each axis)	30 minutes

### Random Vibration Testing Criteria (Non-operating)

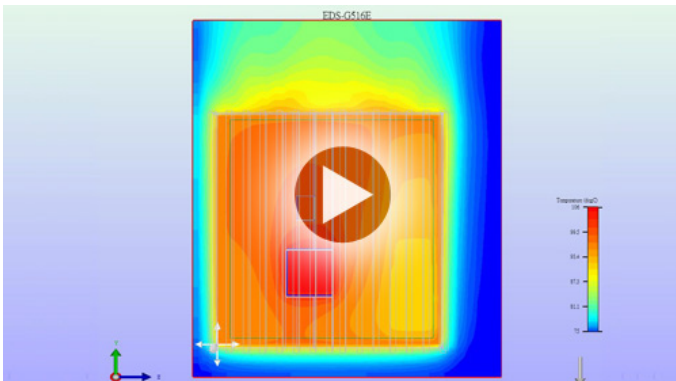
Frequency	Acceleration	Duration	Total Testing Time
5 to 150 Hz	5.5 m/s <sup>2</sup> rms (Longitudinal) 3.5 m/s <sup>2</sup> rms (Transverse) 8 m/s <sup>2</sup> rms (Vertical)	5 hours (each axis)	15 hours

### Shock Testing Criteria

Acceleration	Duration	Test Axis	Testing Method
5 g	30 minutes	±, X, Y, Z	3 pulses/axis

## Optimized Thermal Design Simulation

Heat is another factor affecting device reliability. In the numerical simulation of thermal dissipation, the new EDS switch expels heat across both side panels of thermal convection fins. The test is setting at the same condition of a 75°C ambient temperature at a burn room; it shows the hot spots on both the switch surface and inside the switch were much lower when the switch was equipped with the outer thermal panels than it was open to the air without the panels. Click the video to see simulation.



### Thermal Fin Simulation Comparison

Model	EDS-G516E	Switch without Thermal Fin Design
Environment Temperature	75°C	75°C
System Temperature	95°C	100°C
CPU Temperature	98°C	106°C

## Summary

The above tests show overall design enhancements of the EDS E series. Through a series of stringent tests, including Level 4 EMS protection, shock and vibration resistance, and thermal fin simulation, the design of next generation EDS E series switches were proven to be extremely reliable and highly robust industrial Ethernet solutions for mission-critical applications, even in the most rigorous environments.

The EDS E series delivers ultra-robust performance with up to 16 Gigabit Ethernet ports of copper and SFP fiber slot combinations for high-speed data transmission, Level 4 EMS protection against electromagnetic interference, and over 700,000 hours MTBF for utmost network reliability. Furthermore, the EDS E series also has many user-centric features that enhance versatility and productivity. For more information, please visit the EDS E series product pages below:

**EDS-510E Series** 7+3G-port Gigabit managed Ethernet switches

▶ <http://www.moxa.com/product/EDS-510E.htm>

**EDS-G500E Series** 8G/12G/16G-port full Gigabit managed Ethernet switches

▶ <http://www.moxa.com/product/EDS-G500E.htm>