

# Equipos

Area de Ingeniería Telemática  
<http://www.tlm.unavarra.es>

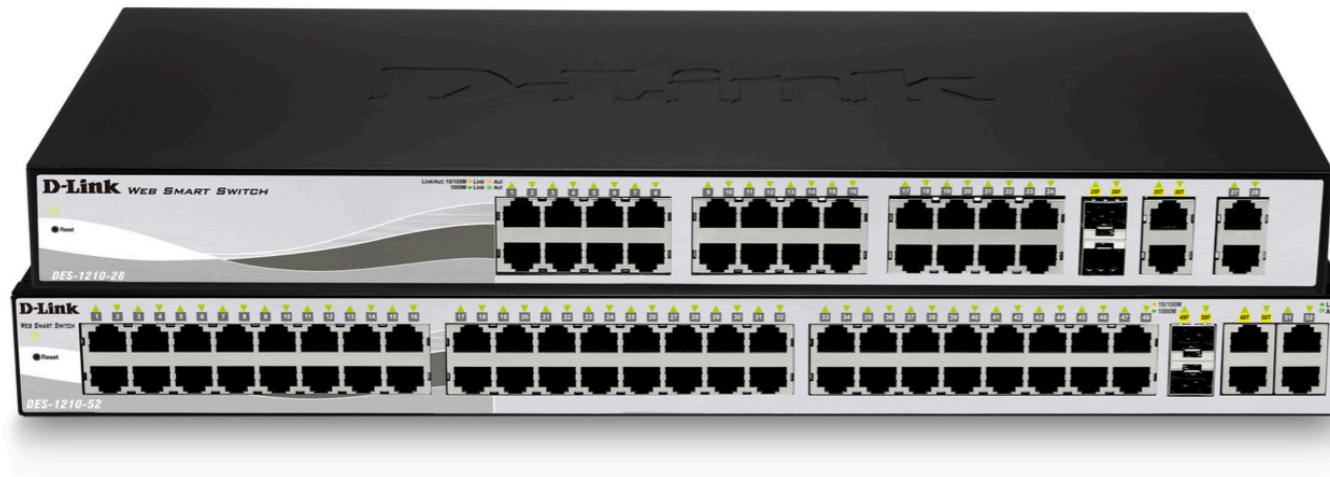
Programación de Redes  
Grado en Ingeniería Informática, 3º

# Temas de teoría

1. Introducción
2. Campus LAN
3. Encaminamiento
4. Tecnologías de acceso y WAN

# Conmutador gestionable

- D-Link DES-1210-28/52



# D-Link DES-1210-28/52

## Overview

The D-Link® DES-1210 Series is the latest generation of Web Smart Switches. Equipped with 24 or 48 10/100Mbps ports, two 10/100/1000BASE-T ports, and two combo 10/100/1000BASE-T/SFP ports, the series integrates advanced management and security functions to provide performance and scalability. While easy to use, the DES-1210 Series provides a complete and affordable solution for small and medium businesses. Management options for the switches include SNMP, Web Management, SmartConsole Utility, and compact Command Lines. The series also supports ACL filtering and the D-Link Safeguard Engine™. Furthermore, the DES-1210 Series uses Auto Voice VLAN, ensuring higher priority for voice traffic. Both models come with an innovative fanless design in 19" metal cases.

## Seamless Integration

The Web Smart Switches are designed to provide SMB users complete control over the network. With Ethernet and Gigabit copper ports capable of connecting to existing Cat.5 twisted-pair cables, these switches eliminate the need for a complex reconfiguration process. The DES-1210 Series allows for a flexible connection to a backbone or servers. Additionally, all ports support auto-negotiation of MDI/MDI-X crossover, or configurable auto MDI, and therefore do away with crossover cables or uplink ports. This brings inexpensive and easy connectivity to your desktop.

## Extensive Layer 2 Features

Equipped with a complete lineup of L2 features, these switches include IGMP Snooping, Port Mirroring, Spanning Tree and Link Aggregation Control Protocol (LACP). The IEEE 802.3x Flow Control function allows servers to directly connect to the switch for fast, reliable data transfer. At 2000Mbps Full Duplex, the Gigabit ports provide high-speed data pipes to servers with minimum data transfer loss. Network maintenance features include Loopback Detection and Cable Diagnostics. Loopback Detection is used to detect loops created by a specific port and automatically shut down the affected port. Cable Diagnostics are designed for network administrators to quickly examine the quality of the copper cables and determine the type of cable error.

## QoS, Bandwidth Control

The switches are perfect for deployment in a VoIP environment, as they support Auto Voice VLAN and Differentiated Services Code Point (DSCP) QoS for VoIP application. Auto Voice VLAN will automatically place voice traffic from an IP phone to an assigned VLAN and by doing so enhance the VoIP service.



# D-Link DES-1210-28/52

With a higher priority and individual VLAN, this feature guarantees the quality and security of VoIP traffic.

DSCP marks parts of an IP packet, enabling different levels of service to be assigned for network traffic. With Bandwidth Control, the network administrator can reserve bandwidth for important functions that require a larger bandwidth or might have high priority.

## Secure Your Network

The innovative D-Link Safeguard Engine function protects the switches against traffic flooding caused by virus attacks. The switches support 802.1X port-based authentication, allowing the network to be authenticated through external RADIUS servers. In addition, the Access Control List (ACL) feature enhances network security and helps to protect the internal IT network by allowing an administrator to restrict the access of a network through a variety of means including MAC address, IP, UDP/TCP, and even VLAN ID.



## Fanless Design

- Provides silent operation
- Saves energy while lowering costs
- Provides continuous, reliable and eco-friendly operation

## Security Features

- Access Control List secures network
- D-Link Safeguard Engine™ protects CPU from Broadcast/Multicast/Unicast flooding
- Port security supports 64 MACs per port

## Intuitive Management

- Manage using SmartConsole or web-based GUI
- Built-in MIB browser for SNMP Management
- D-View 6.0 module support
- Compact CLI through Telnet

## VoIP Deployment

- Highest priority for VoIP services
- Auto Voice VLAN

## QoS

- Ensure time-sensitive data gets delivered efficiently
- Supports IEEE 802.1p QoS up to four 802.1p Priority Queues
- DSCP QoS

## Trap & Logs

- SNMP Trap supports link and STP state change
- Trap for SmartConsole Utility

## Advanced Features

- Loopback detection auto disables port when loop is detected
- Cable Diagnostics allows administrator to determine cable status
- Configurable MDI/MDI-X

## Online Help

- Link to local support web site
- Downloadable user guide
- Real-time manual checks



# D-Link DES-1210-28/52

Technical Specifications		
	DES-1210-28	DES-1210-52
Number of Ports	<ul style="list-style-type: none"> <li>• 24 10/100Mbps</li> <li>• 2 10/100/1000BASE-T</li> <li>• 2 combo 10/100/1000BASE-T/SFP</li> </ul>	<ul style="list-style-type: none"> <li>• 48 10/100Mbps</li> <li>• 2 10/100/1000BASE-T</li> <li>• 2 combo 10/100/1000BASE-T/SFP</li> </ul>
Port Standards & Functions	<ul style="list-style-type: none"> <li>• IEEE 802.3 10BASE-T Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3u 100BASE-TX Fast Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3ab 1000BASE-T Gigabit Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3z Gigabit Ethernet (fiber) ANSI/IEEE 802.3</li> <li>• Auto-negotiation</li> <li>• IEEE 802.3x Flow Control</li> </ul>	<ul style="list-style-type: none"> <li>• IEEE 802.3 10BASE-T Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3u 100BASE-TX Fast Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3ab 1000BASE-T Gigabit Ethernet (twisted-pair copper)</li> <li>• IEEE 802.3z Gigabit Ethernet (fiber) ANSI/IEEE 802.3</li> <li>• Auto-negotiation</li> <li>• IEEE 802.3x Flow Control</li> </ul>
Network Cables	<ul style="list-style-type: none"> <li>• UTP Cat.5, Cat.5e (100m max)</li> <li>• EIA/TIA-568 100-ohm STP (100m max)</li> </ul>	<ul style="list-style-type: none"> <li>• UTP Cat.5, Cat.5e (100m max)</li> <li>• EIA/TIA-568 100-ohm STP (100m max)</li> </ul>
Full/Half Duplex	<ul style="list-style-type: none"> <li>• Full/half duplex for 10/100Mbps speeds</li> <li>• Full duplex for Gigabit speed</li> </ul>	<ul style="list-style-type: none"> <li>• Full/half duplex for 10/100Mbps speeds</li> <li>• Full duplex for Gigabit speed</li> </ul>
Media Interface Exchange	<ul style="list-style-type: none"> <li>• Auto MDI/MDI-X adjustment for all twisted pair ports</li> </ul>	<ul style="list-style-type: none"> <li>• Auto MDI/MDI-X adjustment for all twisted pair ports</li> </ul>
Switching Capacity	<ul style="list-style-type: none"> <li>• 12.8Gbps</li> </ul>	<ul style="list-style-type: none"> <li>• 17.6Gbps</li> </ul>
Transmission Method	<ul style="list-style-type: none"> <li>• Store-and-forward</li> </ul>	<ul style="list-style-type: none"> <li>• Store-and-forward</li> </ul>
MAC Address Table	<ul style="list-style-type: none"> <li>• 8K entries per device</li> </ul>	<ul style="list-style-type: none"> <li>• 8K entries per device</li> </ul>
MAC Address Update	<ul style="list-style-type: none"> <li>• Up to 256 static MAC entries</li> <li>• Enable/disable auto-learning of MAC addresses</li> </ul>	<ul style="list-style-type: none"> <li>• Up to 256 static MAC entries</li> <li>• Enable/disable auto-learning of MAC addresses</li> </ul>
Maximum 64 bytes packet forwarding rate	<ul style="list-style-type: none"> <li>• 9.5Mpps</li> </ul>	<ul style="list-style-type: none"> <li>• 13.1Mpps</li> </ul>



# D-Link DES-1210-28/52

RAM Buffer	• 512KB per device	• 1MB per device
AC Input	• 100 to 240 VAC 50/60 internal universal power supply	• 100 to 240 VAC 50/60 internal universal power supply
Maximum Power Consumption	• 17.6W	• 28.9W
Standby Power Consumption	• 7.6W/110V, 7.9W/240V	• 13.2W/110V, 13.3W/240V
Fan Quantity	• 0	• 0
Acoustics	• 0dBA	• 0dBA
Heat Dissipation	• 60.05 BTU/hr	• 98.61 BTU/hr
Operating Temperature	• 32o to 104oF (0o to 40oC)	• 32° to 104°F (0° to 40°C)
Storage Temperature	• 14o to 158oF (-10o to 70oC)	• 14° to 158°F (-10° to 70°C)
Operating Humidity	• 10% to 95% non-condensing	• 10% to 95% non-condensing
Storage Humidity	• 5% to 95% non-condensing	• 5% to 95% non-condensing
Dimensions	• 17.3in x 8.3in x 1.7in (440mm x 210mm x 44mm) • 19-inch standard rack mounting width, 1U height	• 17.4in x 9.8in x 1.7in (441mm x 250mm x 44mm) • 19-inch standard rack mounting width, 1U height
Weight	• 5.73 lbs (2.6kg)	• 7.27 lbs (3.3kg)
Diagnostic LEDs	• Power (per device) • Link/Activity/Speed (per 10/100/1000Mbps port, per 10/100Mbps port, per SFP port)	• Power (per device) • Link/Activity/Speed (per 10/100/1000Mbps port, per 10/100Mbps port, per SFP port)
Emission (EMI)	• FCC Class A, CE Class A, VCCI Class A, C-Tick	• FCC Class A, CE Class A, VCCI Class A, C-Tick
MTBF	• 419,467 hours	• 289,012 hours
Safety	• cUL, LVD	• cUL, LVD



# D-Link DES-1210-28/52

## Software Features

### L2 Features

MAC Address Table	• 8K	
Flow Control	• 802.3x Flow Control	• HOL Blocking Prevention
IGMP Snooping	• IGMP v1/v2 Snooping • Supports at least 64 static multicast addresses • Supports IGMP Snooping Querier	• Supports 256 IGMP groups • IGMP per VLAN
Spanning Tree Protocol	• 802.1D STP	• 802.1w RSTP
Loopback Detection	• Yes	
802.3ad Link Aggregation	• 8 groups per device/8 ports per group	
Port Mirroring	• One-to-One, Many-to-One, Supports Mirroring for Tx/Rx/Both	
Cable Diagnostics	• Yes	
Configurable Auto MDI/MDI-X	• Yes	

### VLAN

802.1Q	• 2003 Edition
VLAN Group	• Max 256 static VLAN groups, max 4094 VID
Management VLAN	• Supports 1 Management VLAN
Asymmetric VLAN	• Yes
Auto Voice VLAN	• Max. 10 user defined OUI, Max. 8 default OUI

### QoS (Quality of Service)

802.1p Quality of Service	• 4 Queues per port
Queue Handling	• Strict, Weighted Round Robin (WRR)
CoS based on	• 802.1p Priority Queues, DSCP
Bandwidth Control	• Port-based (Ingress/Egress, min. granularity 64 Kb/s)





# D-Link DES-1210-28/52

Access Control List	
Maximum profiles	• 50
Maximum rules shared by profiles	• 240
ACL based on	• MAC Address, IPv4 Address (ICMP/IGMP/TCP/UDP), VLAN ID, 802.1p Priority, DSCP
ACL Actions	• Permit, Deny
Security	
802.1X Port-based Access Control	• Default 802.1X forwarding
Port Security	• Supports up to 64 MAC addresses per port
Traffic Control	• Broadcast/Multicast/Unicast Storm Control
Static MAC	• Supports 256 Static MAC entries
D-Link Safeguard Engine	• Yes
MIB	
MIB	• 1213 MIB II, 1493 Bridge MIB, 1907 SNMP v2 MIB, 1215 Trap Convention MIB, 2233 Interface Group MIB, D-Link Private MIB
RFC Standard Compliance	
RFC	• RFC 768 UDP, RFC 791 IP, RFC 792 ICMP, RFC 793 TCP, RFC 826 ARP, RFC 854 Telnet Server, RFC 855 Telnet Server, RFC 856 Telnet Binary Transmission, RFC 858 Telnet Server, RFC 896 Congestion Control in TCP/IP Network, RFC 903 Reverse Address Resolution Protocol, RFC 951 BootP Client, RFC 1155 MIB, RFC 1157 SNMP v1, RFC 1191 Path MTU Discovery, RFC 1212 Concise MIB Definition, RFC 1213 MIB II, IF MIB, RFC 1215 Traps for use with the SNMP, RFC 1239 Standard MIB, RFC 1350 TFTP, RFC 1493 Bridge MIB, RFC 1519 CIDR, RFC 1945 HTTP/1.0, RFC 2131 DHCP, RFC 2132 DHCP Options and BOOTP Vendor Extensions, RFC 2138 Radius Authentication, RFC 2233 Interface MIB, RFC 2578 Structure of Management Information Version 2 (SMIv2), RFC 2647 802.1p, RFC 3416 SNMP, RFC 3417 SNMP
Ordering Information	
Part Number	Description
DES-1210-28	• Web Smart 24-Port 10/100 Switch, 4GbE, 2 Combo SFP Slots
DES-1210-52	• Web Smart 48-Port 10/100 Switch, 4GbE, 2 Combo SFP Slots
DEM-211	• 100BASE-FX Multimode LC Transceiver, up to 2Km
DEM-310GT	• 1000BASE-LX SFP Module, up to 10Km
DEM-311GT	• 1000BASE-SX SFP Module, up to 550m



# Switch L3

- D-Link DES-3828P



# DES-3828P

## Overview

For the SMB requiring a cost-effective core switching solution, as well as for larger enterprise and Metropolitan Service Provider (MSP) environments needing a managed, feature-rich switch capable of uplinking to backbone switches, the D-Link® xStack® DES-3828P is designed to meet the needs of the most demanding departmental and enterprise connectivity applications. The DES-3828P is a fully managed Layer 3 switch that provides 24 10/100Mbps Fast Ethernet ports each capable of up to 15.4 Watts of IEEE 802.3af PoE and two combo SFP/1000BASE-T Gigabit Ethernet ports. In addition, two fixed 1000BASE-T ports in the back-panel can provide a dedicated trunk connection between devices or core switches. The DES-3828P also provides virtual stacking functionality via D-Link Simple IP Management (SIM) technology allowing up to 32 units to be managed via a single IP address. With support for Q-in-Q Double VLAN tagging, IPv6 aware, Dynamic Layer 3 Routing, IEEE 802.1s, and bandwidth control, the DES-3828P incorporates advanced features suitable for the MSP as well as the SMB and enterprise size networks.

## Metro Switching

Service provider networks are moving from circuit-based access to newer packet-based access that requires highly reliable intelligent switching and demands resiliency and dependability. The DES-3828P meets this demand by supporting industry standards for 802.1s (Multiple Spanning Tree), 802.3ad link aggregation for up to 32 groups, bandwidth rate limiting down to 64k, and support for an external redundant power option for added peace of mind. In addition, the DES-3828P offers Double VLAN Q-in-Q tagging, which adds on an additional tag to a VLAN tag, expanding the VLAN space and allowing service providers to deploy their service quickly and securely. The DES-3828P also incorporates advanced QoS support such as the ability to filter and forward traffic based on Layer 2/3/4, making it an ideal choice for VoIP, video, and audio services targeting business class customers.



# DES-3828P

## Network Security

The DES-3828P is equipped to handle many of today's emerging security vulnerabilities. Up to 800 independent access control lists can be configured with the ability to filter and block traffic based on criteria such as: Port, MAC, 802.1p priority, VLAN, DSCP, IP address, Protocol type, and TCP/UDP port number and content, proving that the DES-3828P provides unparalleled security. In addition, the DES-3828P incorporates 802.1X Port-based and MAC-based RADIUS authentication for secure network logins and SSH/SSL for increased management security. Furthermore, the DES-3828P incorporates MAC-IP-Port Binding and the D-Link Safeguard Engine™ to protect the CPU from broadcast, multicast, and unicast flooding.

## Advanced L3 Routing

The DES-3828P is a high-performance Layer 3 switch that provides an ideal solution by offering advanced Layer 3 routing features such as RIP, OSPF, VRRP, up to ten IP addresses per VLAN, and floating static routes. Multipath Routing<sup>1</sup>, which is the method of establishing multiple paths between given source-destination nodes within a network, is also supported on the xStack DES-3828P. These added routing features provide redundancy, improve network utilization, and provide load balancing for the network.

## IEEE 802.3af Power over Ethernet

The DES-3828P supports 24 ports of 802.3af Power over Ethernet and supplies up to 15.4 watts per port. The need for Power over Ethernet enabled switching devices is growing with the proliferation of PoE capable access points, IP phones, and security cameras. The difficulty and cost often associated with running new AC power outlets to difficult to reach locations has made PoE an indispensable technology for SMBs, schools, and enterprise class networks.





# DES-3828P

## High Performance Switching

- + 24 Full Power 802.3af PoE ports
- + Stack Up to 32 Units Per Stack using D-Link® Single IP Management (SIM)
- + Optional Redundant Power Support
- + Jumbo Frame Support (up to 9K)
- + IPv6 Aware

## Advanced Metro Switching

- + 802.1p Priority (8 Queues)
- + Double VLAN Tagging
- + Bandwidth Control
- + QoS based on L2/3/4
- + 802.3ad (Link Aggregation)
- + 802.1D, 802.1w, 802.1s Spanning Tree
- + 802.1X Port-based/MAC-based Authentication
- + 802.1Q VLANs (Up to 4K Groups)
- + Guest VLAN
- + WAC (Web-based Authentication)
- + MAC (Mac-based Authentication)
- + IP/MAC-Port Binding

## Advanced L3 Function

- + RIP v1/2
- + OSPF
- + DVMRP
- + Multiple IP per VLAN
- + Floating Static Route
- + IGMP v1/2/v3
- + PIM-DM/PIM-SM
- + VRRP

## Network Management

- + Console/Telnet/Web GUI
- + SNMPv1/v2c/v3
- + Port Mirroring
- + SYSLOG
- + SSH, SSL
- + ACL L2/L3/L4
- + RMON (4 Groups)
- + RADIUS/TACACS+
- + Microsoft® NAP Support



# DES-3828P

## Technical Specifications

## Product Specifications

DES-3828P	xStack Managed 24-Port 10/100 Stackable L3 PoE Switch, 4 Gigabit Copper Ports + 2 Combo SFP
Packet Buffer	32MB
MAC Address Table	16K
IP Address Table	4K
IP Routing	128 Static/2k Hardware Routing Table
Aggregated Bandwidth	12.8Gbps
Transmission Method	Store-and-Forward
Forwarding Rate	14,880pps (10M), 148,800pps (100M), 1,488,000pps (1000M)
VLANs Support	Up to 4K Static, 4K Dynamic 802.1Q VLAN Groups
Priority Queues	8 Queues - Strict Priority or Weight Round Robin Queue Scheduling
Classification ACLs	MAC Address, IPv4/v6 Address, TCP/UDP Port Number & Payload, Physical Port, DSCP, 802.1p, VLAN, Protocol Type, IPv6 Traffic Class & Flow Label
Classification QoS	MAC Address, IP Address, TCP/UDP Port Number, Physical Port, DSCP, ToS, IPv6
Multicast Support	IGMP v1/2/3, IGMP Snooping, PIM-SM, PIM-DM, DVMRP, MLD Snooping v1/v2
Jumbo Frames	Up to 9K
Number of IP Interfaces per VLAN	64
Port Security	Supports 16 MAC Addresses per Port
Broadcast Storm Bandwidth Control	Minimum Granularity: 128pkt/s
IP-MAC-Port Binding	Supports 500 Entries per Device
Safeguard Engine™	Protect CPU from Broadcast/Multicast/Unicast Flooding
CPU Monitoring	Utilization via Web/CLI/SNMP, Trap/Logging Notification When Configurable Threshold Reached



## Interface Options

RJ-45	10BASE-T, 100BASE-TX, & 1000BASE-T
LC	With Optional Standard Small Form-Factor Pluggable (SFP) Gigabit Transceivers
RPS	Redundant Power Supply via Optional (DPS-600)