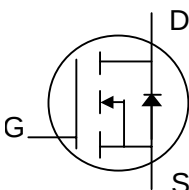




N-channel Enhancement-mode Power MOSFET

100% Avalanche-Tested
Simple Drive Requirement
Fast Switching Performance
RoHS-compliant, halogen-free

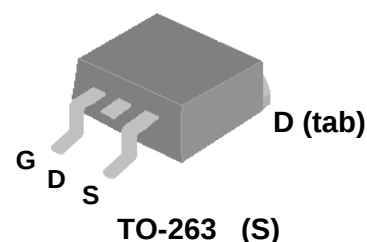


BV_{DS}	600V
$R_{DS(ON)}$	0.6Ω
I_D	10A

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP3990S-HF-3 is in the TO-263 surface-mount package which is widely used for commercial and industrial surface-mount applications. This device is well suited for use in high voltage applications such as off-line AC/DC converters.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	600	V
V_{GS}	Gate-Source Voltage	±30	V
I_D at $T_C=25^{\circ}\text{C}$	Continuous Drain Current	10	A
I_D at $T_C=100^{\circ}\text{C}$	Continuous Drain Current	6.5	A
I_{DM}	Pulsed Drain Current ¹	40	A
P_D at $T_C=25^{\circ}\text{C}$	Total Power Dissipation	174	W
P_D at $T_A=25^{\circ}\text{C}$	Total Power Dissipation ⁴	3.13	W
E_{AS}	Single Pulse Avalanche Energy ³	50	mJ
I_{AR}	Avalanche Current	10	A
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Value	Units
Rthj-c	Maximum Thermal Resistance, Junction-case	0.72	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	40	°C/W

Ordering Information

AP3990S-HF-3TR : in RoHS-compliant halogen-free TO-263, shipped on tape and reel (800 pcs/reel)



Electrical Specifications at $T_j=25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1.0mA$	600	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ³	$V_{GS}=10V, I_D=5.0A$	-	-	0.6	Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4.5	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=5A$	-	5	-	S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=480V, V_{GS}=0V$	-	-	100	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 30V$	-	-	± 100	nA
Q_g	Total Gate Charge ³	$I_D=10A$	-	34	57	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=480V$	-	11	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	11	-	nC
$t_{d(on)}$	Turn-on Delay Time ³	$V_{DD}=300V$	-	19	-	ns
t_r	Rise Time	$I_D=10A$	-	28	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=10\Omega, V_{GS}=10V$	-	43	-	ns
t_f	Fall Time	$R_D=30\Omega$	-	22	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	2030	3250	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	225	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	-	9	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ³	$I_S=10A, V_{GS}=0V$	-	-	1.5	V
t_{rr}	Reverse Recovery Time ³	$I_S=10A, V_{GS}=0V,$	-	600	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100A/\mu s$	-	12	-	μC

Notes:

1. Pulse width limited by maximum junction temperature.
2. Starting $T_j=25^{\circ}\text{C}$, $V_{DD}=50V$, $L=1mH$, $R_G=25\Omega$, $I_{AS}=10A$
3. Pulse test
4. Surface mounted on 1 in² copper pad of FR4 board

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



Typical Electrical Characteristics

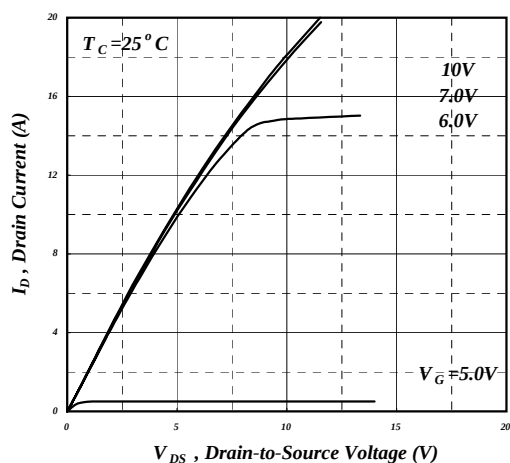


Fig 1. Typical Output Characteristics

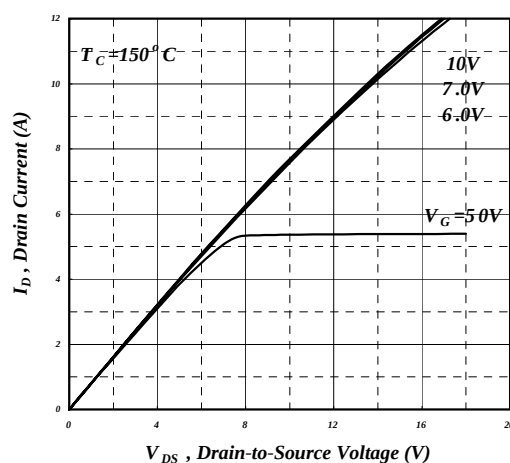


Fig 2. Typical Output Characteristics

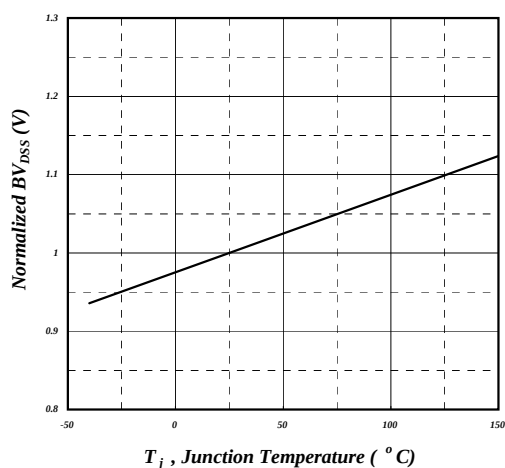


Fig 3. Normalized BV_{DS}
vs. Junction Temperature

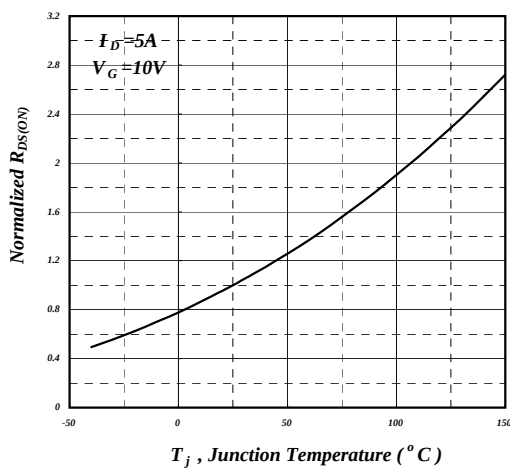


Fig 4. Normalized On-Resistance
vs. Junction Temperature

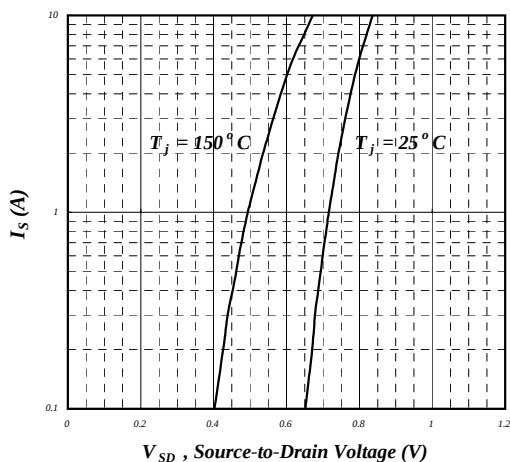


Fig 5. Forward Characteristic of
Reverse Diode

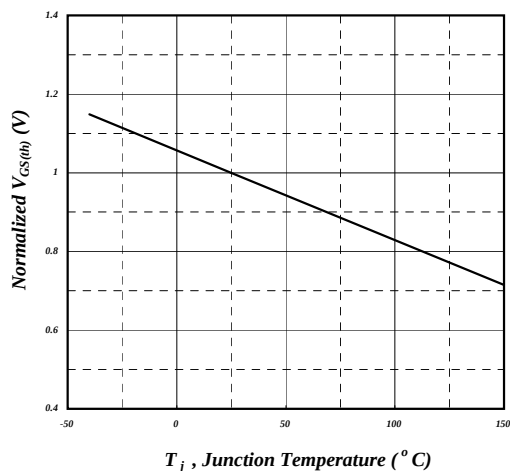


Fig 6. Gate Threshold Voltage vs.
Junction Temperature



Typical Electrical Characteristics (cont.)

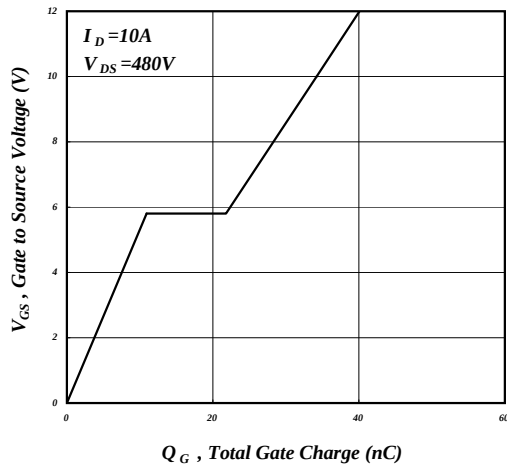


Fig 7. Gate Charge Characteristics

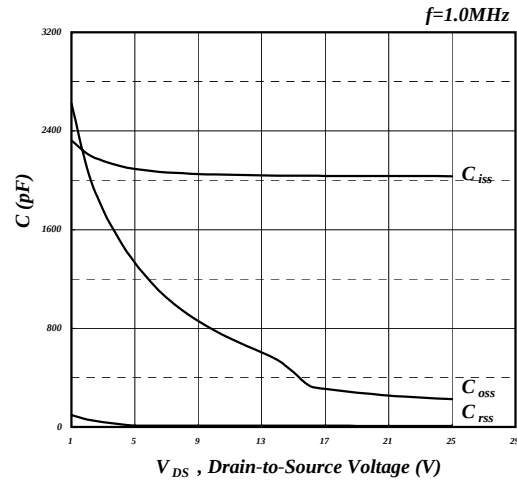


Fig 8. Typical Capacitance Characteristics

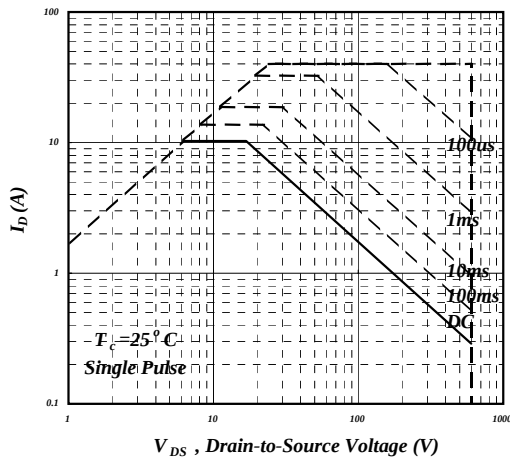


Fig 9. Maximum Safe Operating Area

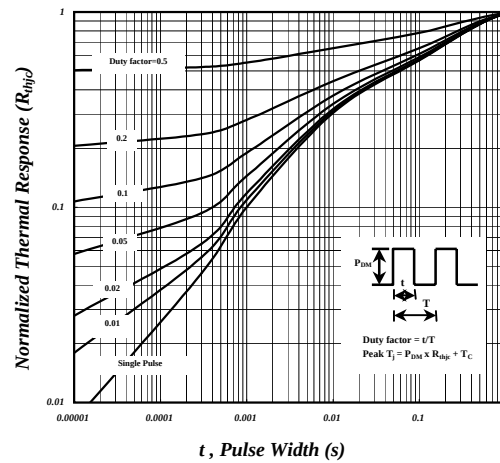


Fig 10. Effective Transient Thermal Impedance

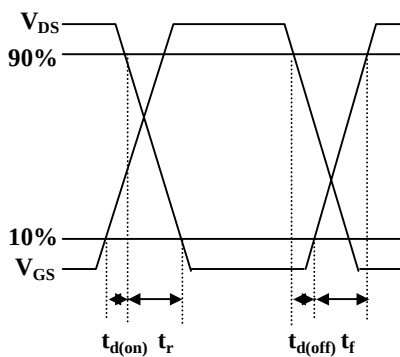


Fig 11. Switching Time Waveforms

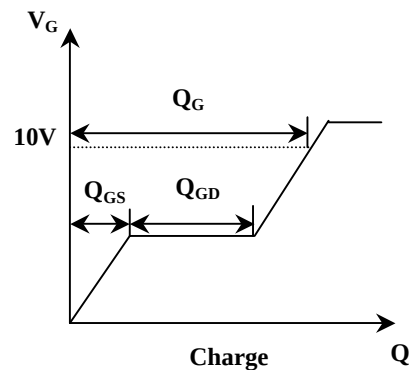
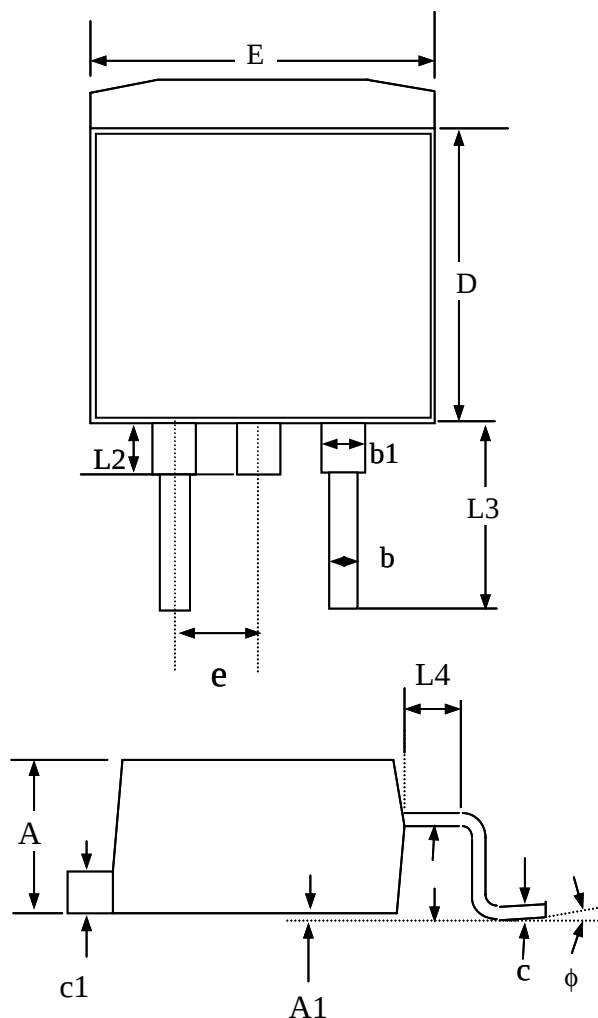


Fig 12. Gate Charge Waveform



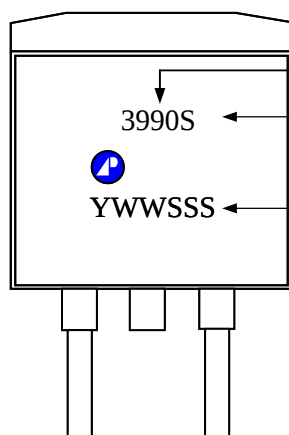
Package Dimensions: TO-263



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.25	4.75	5.20
A1	0.00	0.15	0.30
A2	2.20	2.45	2.70
b	0.70	0.90	1.10
b1	1.07	1.27	1.47
c	0.30	0.45	0.60
c1	1.15	1.30	1.45
D	8.30	8.90	9.40
E	9.70	10.10	10.50
e	2.04	2.54	3.04
L2	-----	1.50	-----
L3	4.50	4.90	5.30
L4	-----	1.50	----

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information:



Product: AP3990

3990S

Package code:

S = RoHS-compliant halogen-free TO-263

YWWSSS

Date Code (YWWSSS)

Y : Last digit of the year

WW : Work week

SSS : Lot code sequence