Halogen-Free Product

Advanced Power Electronics Corp.

N-CHANNEL ENHANCEMENT MODE

POWER MOSFET

▼ **Low Gate Charge**

▼ **Simple Drive Requirement**

▼ **Fast Switching Characteristic**

▼ **RoHS Compliant & Halogen-Free**
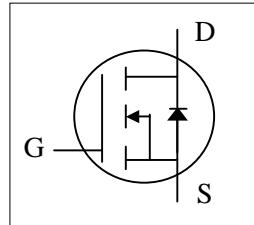
BV_{DSS}	60V
$R_{DS(ON)}$	12mΩ
I_D	72A

TO-263(S)

TO-220(P)
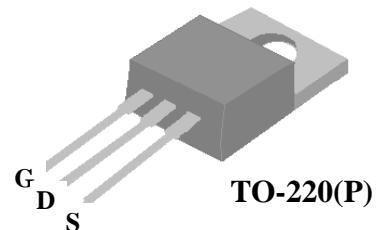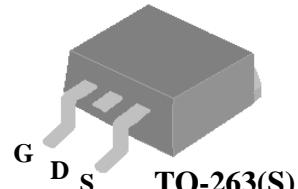
Description

AP9974 series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The TO-263 package is widely preferred for all commercial-industrial surface mount applications using infrared reflow technique and suited for high current application due to the low connection resistance. The through-hole version (AP9974GP) are available for low-profile applications.

Absolute Maximum Ratings@T$_j$=25°C(unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	$\pm$20	V
I_D@T$_C$=25℃	Drain Current, V_{GS} @ 10V	72	A
I_D@T$_C$=100℃	Drain Current, V_{GS} @ 10V	46	A
I_{DM}	Pulsed Drain Current[1]	300	A
P_D@T$_C$=25℃	Total Power Dissipation	104	W
	Linear Derating Factor	0.8	W/℃
E_{AS}	Single Pulse Avalanche Energy[3]	45	mJ
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Value	Units
Rthj-c	Maximum Thermal Resistance, Junction-case	1.2	℃/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient (PCB mount)[4]	40	℃/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	62	℃/W

Data and specifications subject to change without notice

Electrical Characteristics@T$_j$=25°C(unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V, I$_D$=250uA	60	-	-	V
$\triangle$BV$_{DSS}$/$\triangle$T$_j$	Breakdown Voltage Temperature Coefficient	Reference to 25℃, I$_D$=1mA	-	0.07	-	V/℃
R$_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V$_{GS}$=10V, I$_D$=45A	-	-	12	mΩ
		V$_{GS}$=4.5V, I$_D$=30A	-	-	15	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$, I$_D$=250uA	1	-	3	V
g$_{fs}$	Forward Transconductance	V$_{DS}$=10V, I$_D$=30A	-	50	-	S
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=60V, V$_{GS}$=0V	-	-	10	uA
I$_{GSS}$	Gate-Source Leakage	V$_{GS}$=±20V, V$_{DS}$=0V	-	-	±100	nA
Q$_g$	Total Gate Charge	I$_D$=30A	-	43	69	nC
Q$_{gs}$	Gate-Source Charge	V$_{DS}$=48V	-	8	-	nC
Q$_{gd}$	Gate-Drain ("Miller") Charge	V$_{GS}$=4.5V	-	31	-	nC
t$_{d(on)}$	Turn-on Delay Time	V$_{DS}$=30V	-	14	-	ns
t$_r$	Rise Time	I$_D$=30A	-	48	-	ns
t$_{d(off)}$	Turn-off Delay Time	R$_G$=3.3Ω	-	42	-	ns
t$_f$	Fall Time	V$_{GS}$=10V	-	67	-	ns
C$_{iss}$	Input Capacitance	V$_{GS}$=0V	-	3180	5100	pF
C$_{oss}$	Output Capacitance	V$_{DS}$=25V	-	495	-	pF
C$_{rss}$	Reverse Transfer Capacitance	f=1.0MHz	-	460	-	pF
R$_g$	Gate Resistance	f=1.0MHz	-	1	1.5	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V$_{SD}$	Forward On Voltage[2]	I$_S$=45A, V$_{GS}$=0V	-	-	1.2	V
t$_{rr}$	Reverse Recovery Time	I$_S$=30A, V$_{GS}$=0V,	-	45	-	ns
Q$_{rr}$	Reverse Recovery Charge	dI/dt=100A/µs	-	40	-	nC

Notes:

1.Pulse width limited by Max. junction temperature.

2.Pulse test

3.Starting T$_j$=25°C, L=0.1mH , R$_G$=25Ω , I$_{AS}$=30A.

4.Surface mounted on 1 in^2 copper pad of FR4 board
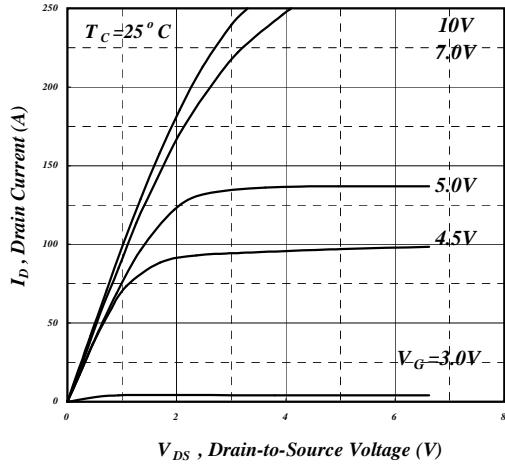
Fig 1. Typical Output Characteristics
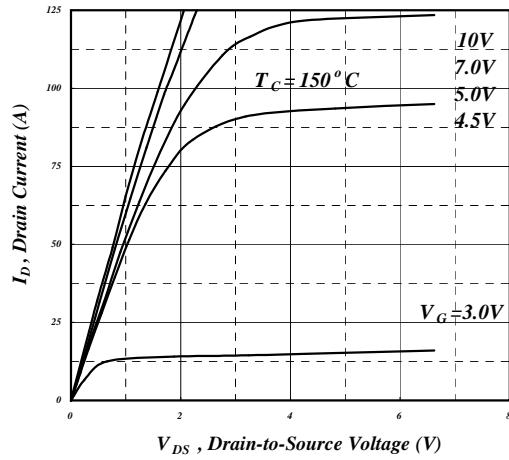
**Fig 2. Typical Output Characteristics**
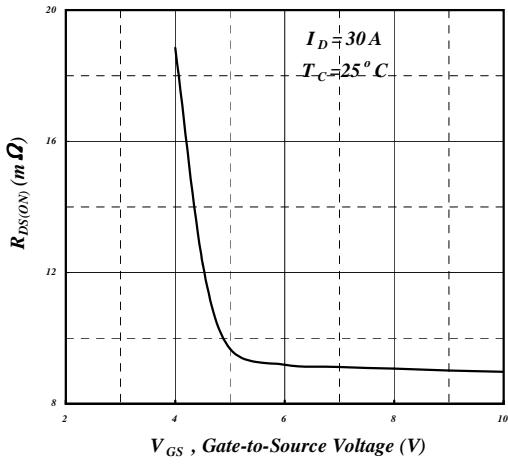

Fig 3. On-Resistance v.s. Gate Voltage
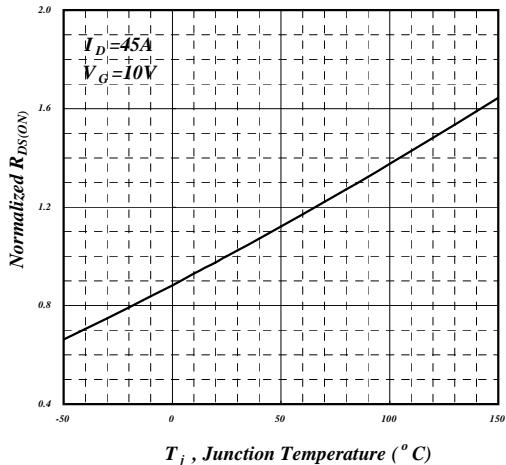
**Fig 4. Normalized On-Resistance
v.s. Junction Temperature**
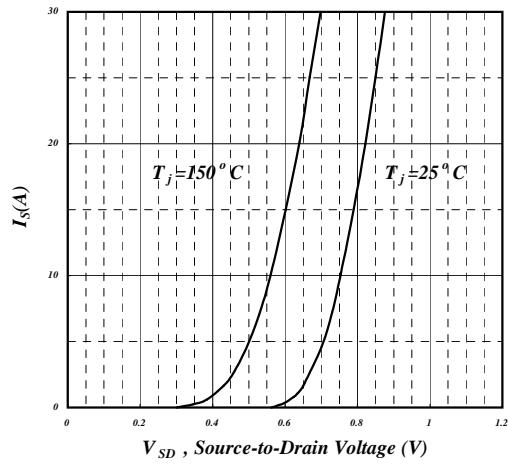
**Fig 5. Forward Characteristic of
Reverse Diode**
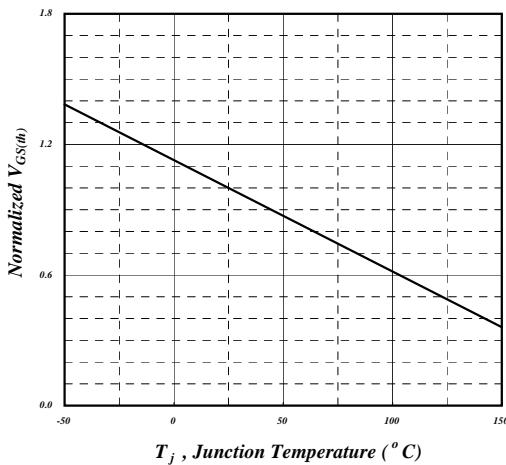

**Fig 6. Gate Threshold Voltage v.s.
Junction Temperature**
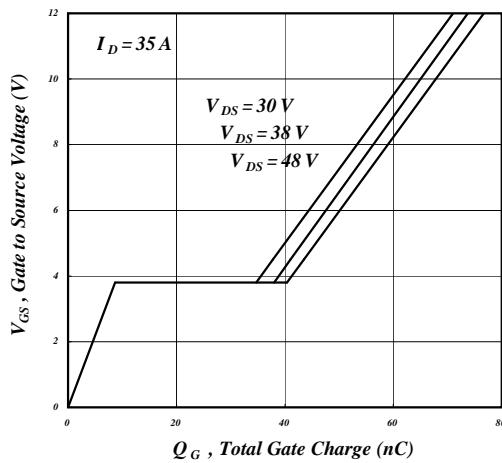
Fig 7. Gate Charge Characteristics

$I_D = 35 A$

$V_{DS} = 30 V$
$V_{DS} = 38 V$
$V_{DS} = 48 V$

V_{GS} , Gate to Source Voltage (V)

Q_G , Total Gate Charge (nC)
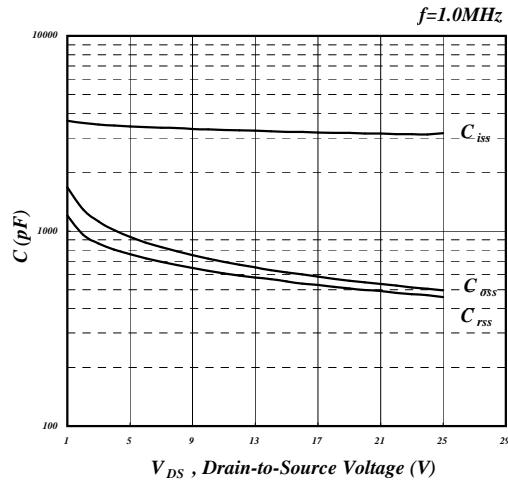
Fig 8. Typical Capacitance Characteristics

f=1.0MHz

C_{iss}
C_{oss}
C_{rss}

C (pF)

V_{DS} , Drain-to-Source Voltage (V)
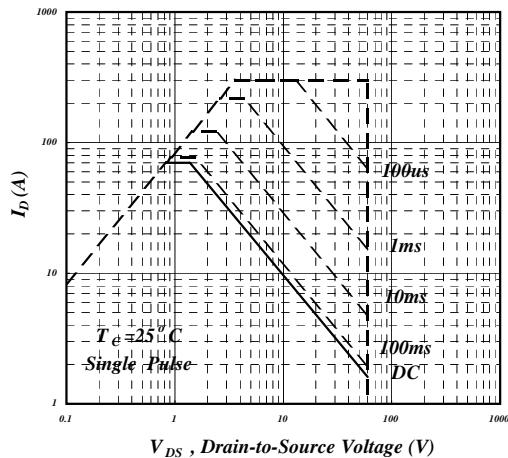
Fig 9. Maximum Safe Operating Area

100us
1ms
10ms
100ms
DC

$T_c = 25^o C$
Single Pulse

I_D (A)

V_{DS} , Drain-to-Source Voltage (V)
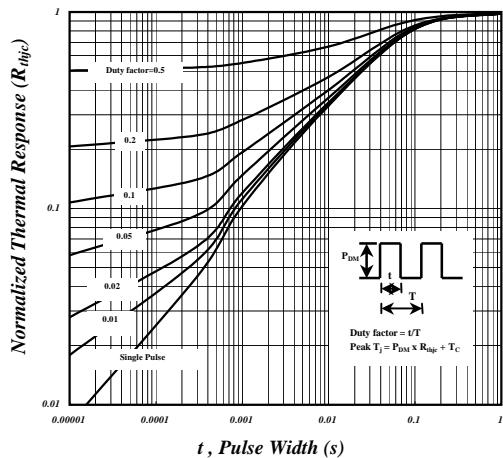
Fig 10. Effective Transient Thermal Impedance

Duty factor=0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse

Duty factor = t/T
Peak T_j = P_{DM} x R_{thjc} + T_C

P_{DM}
t
T

Normalized Thermal Response (R_{thjc})

t , Pulse Width (s)
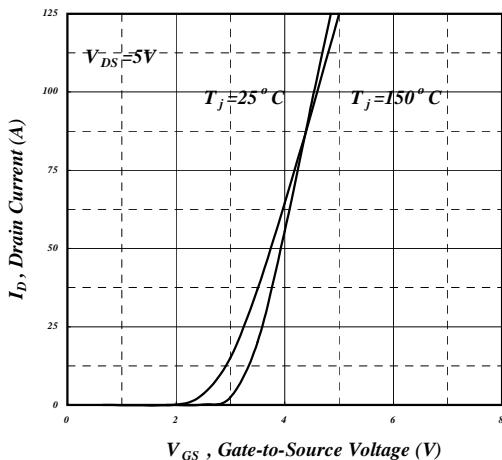
Fig 11. Transfer Characteristics

$V_{DS} = 5V$

$T_j = 25^o C$ $T_j = 150^o C$

I_D , Drain Current (A)

V_{GS} , Gate-to-Source Voltage (V)
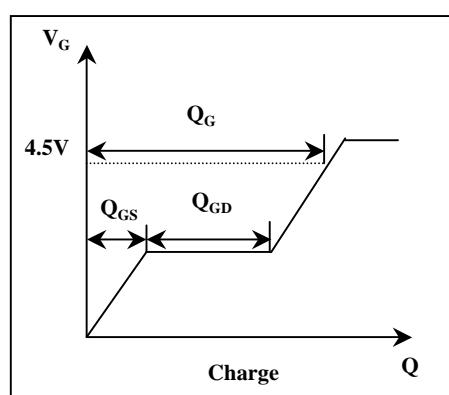
Fig 12. Gate Charge Waveform

V_G

Q_G

4.5V

Q_{GS} Q_{GD}

Charge

Q

MARKING INFORMATION

TO-263

9974GS

YWWSSS

Part Number

meet Rohs requirement
for low voltage MOSFET only

Package Code

Date Code (YWWSSS)
Y：Last Digit Of The Year
WW：Week
SSS：Sequence

TO-220

9974GP

YWWSSS

Part Number

meet Rohs requirement
for low voltage MOSFET only

Package Code

Date Code (YWWSSS)
Y：Last Digit Of The Year
WW：Week
SSS：Sequence