N-channel Enhancement-mode Power MOSFET

PRODUCT SUMMARY

BV_{DSS}	60V
$R_{DS(ON)}$	12mΩ
I_D	72A

Pb-free; RoHS-compliant TO-220 and TO-263 (D^{2}PAK)

TO-220 (suffix P)   TO-263 (suffix S)

DESCRIPTION

The SSM9974 acheives fast switching performance with low gate charge without a complex drive circuit. It is suitable for low voltage applications such as DC/DC converters and general load-switching circuits.

The SSM9974GS is in a TO-263 package, which is widely used for commercial and industrial surface-mount applications.

The through-hole version, the SSM9974GP in TO-220, is available for vertical mounting, where a small footprint is required on the board, and/or an external heatsink is to be attached.

These devices are manufactured with an advanced process, providing improved on-resistance and switching performance.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Units
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	±20	V
I_D	Continuous drain current, T_C = 25°C	72	A
	T_C = 100°C	46	A
I_{DM}	Pulsed drain current[1]	300	A
P_D	Total power dissipation, T_C = 25°C	104	W
	Linear derating factor	0.8	W/°C
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-55 to 150	°C

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Units
$R_{\Theta JC}$	Maximum thermal resistance, junction-case	1.2	°C/W
$R_{\Theta JA}$	Maximum thermal resistance, junction-ambient	62	°C/W

Notes:

1.Pulse width must be limited to avoid exceeding the safe operating area.

2.Pulse width <300us, duty cycle <2%.

ELECTRICAL CHARACTERISTICS (at Tj = 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
$\Delta BV_{DSS}/\Delta Tj$	Breakdown voltage temperature coefficient	Reference to 25°C, I_D=1mA	-	0.07	-	V/°C
$R_{DS(ON)}$	Static drain-source on-resistance	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
		V_{DS}=48V, V_{GS}=0V, Tj = 150°C	-	-	100	uA
I_{GSS}	Gate-source leakage current	V_{GS}=±20V	-	-	±100	nA
Q_g	Total gate charge [2]	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 [2]	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, V_{GS}=10V	-	42	-	ns
t_f	Fall time	R_D=1Ω	-	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
Rg	Gate Resistance	f=1.0MHz	-	1	1.5	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward 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 must be limited to avoid exceeding the maximum junction temperature of 150°C.
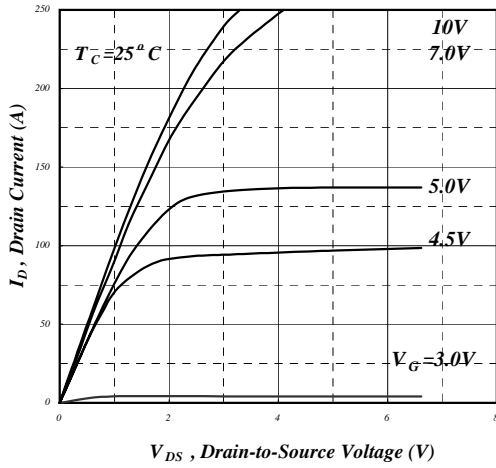
2.Pulse width <300us, duty cycle <2%.
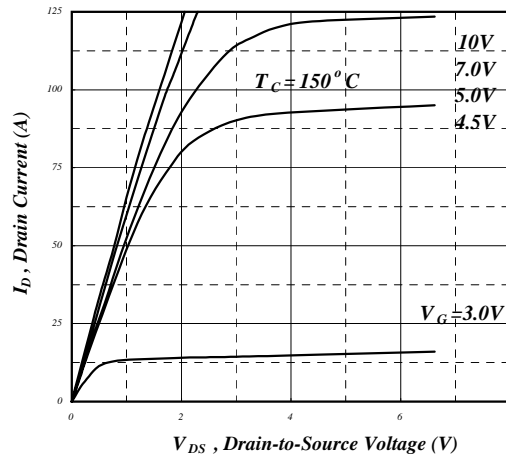
Fig 1. Typical Output Characteristics

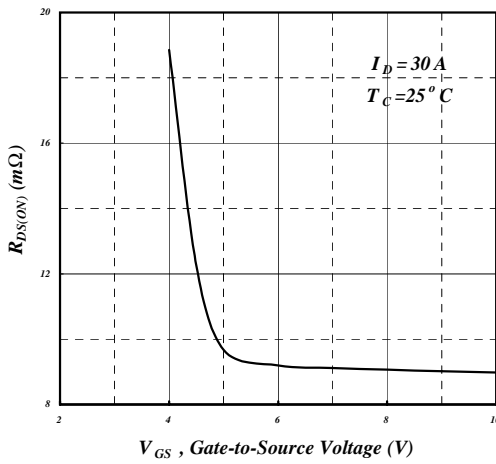Fig 2. Typical Output Characteristics
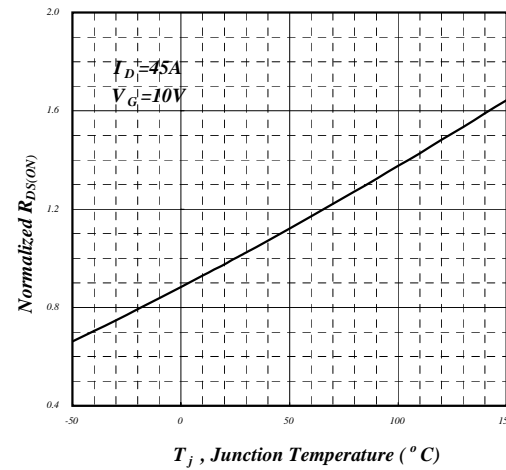

Fig 3. On-Resistance vs. Gate Voltage

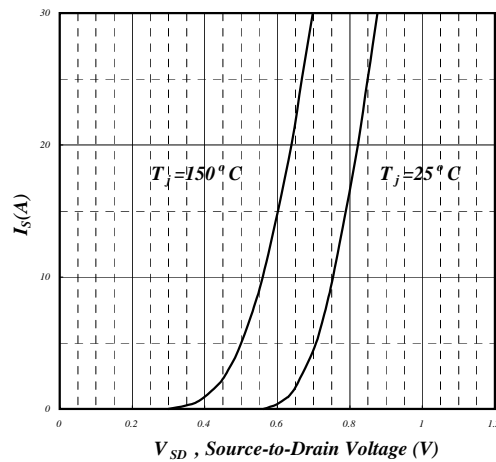Fig 4. Normalized On-Resistance
vs. Junction Temperature

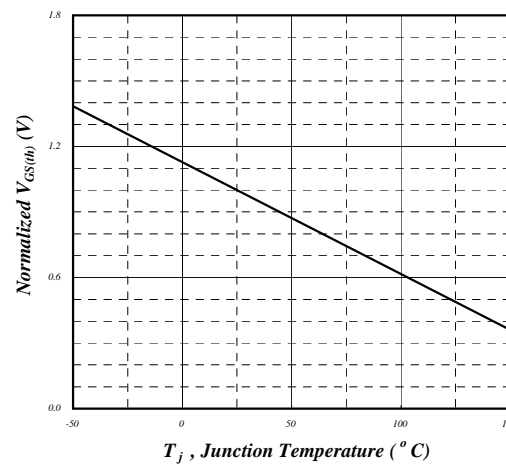Fig 5. Forward Characteristic of
Reverse Diode

Fig 6. Gate Threshold Voltage vs.
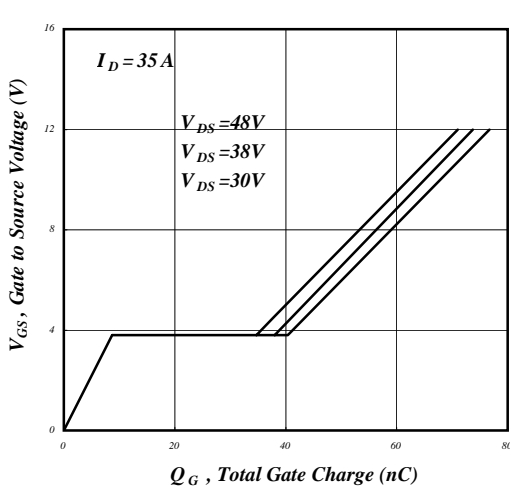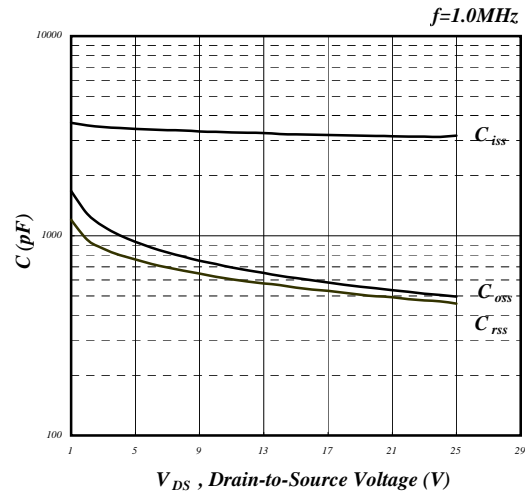Junction Temperature

Fig 7. Gate Charge Characteristics
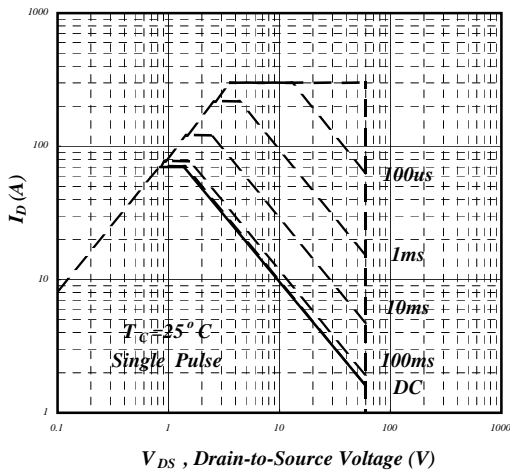

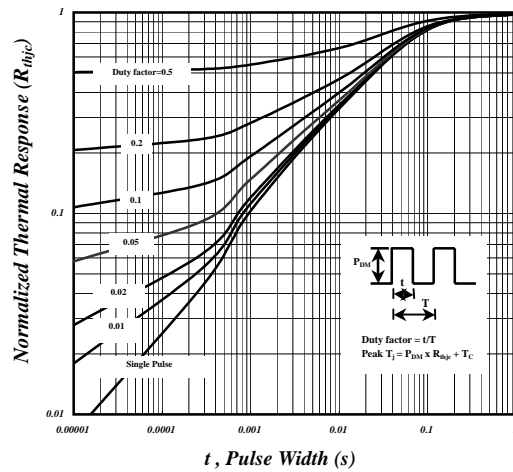Fig 8. Typical Capacitance Characteristics

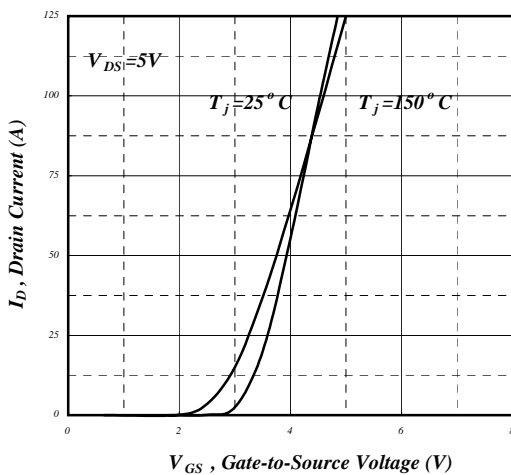Fig 9. Maximum Safe Operating Area

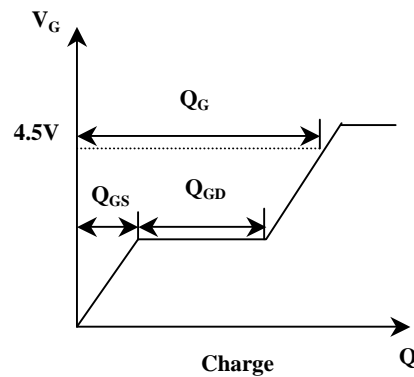Fig 10. Effective Transient Thermal Impedance
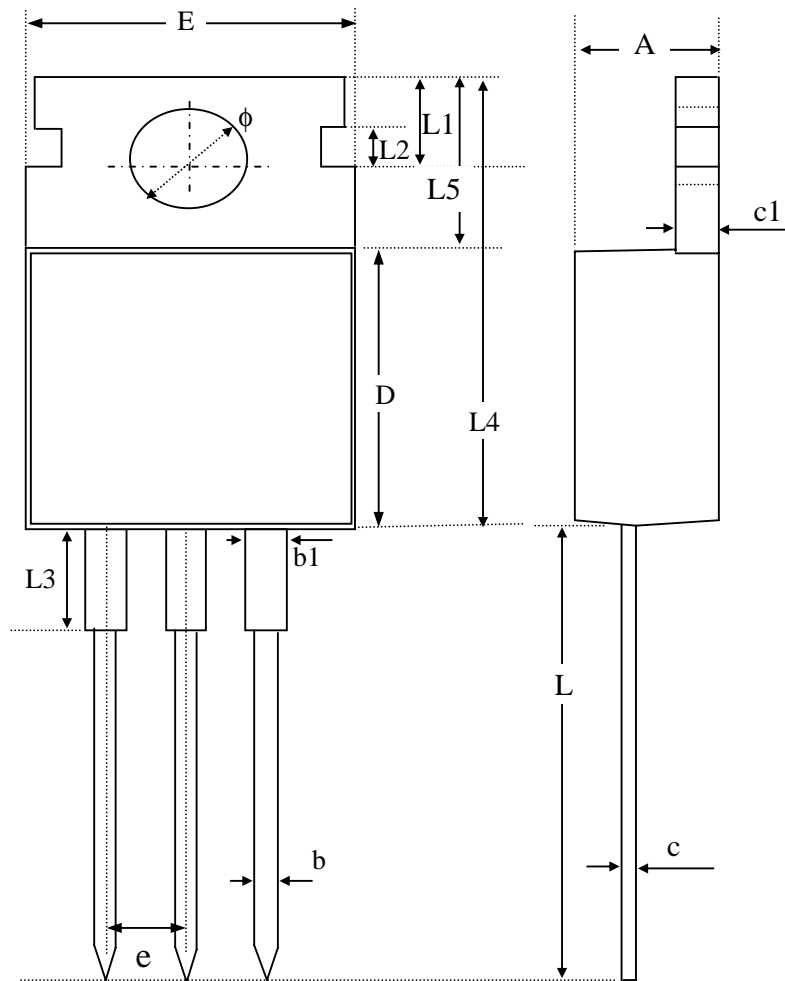

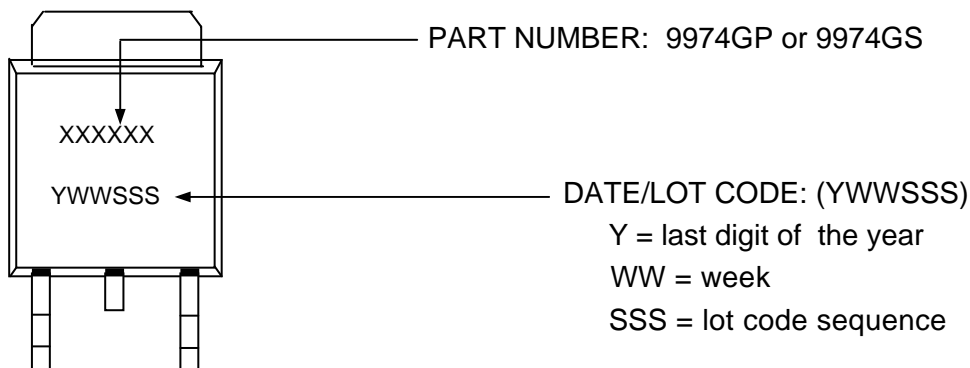Fig 11. Transfer Characteristics

Fig 12. Gate Charge Waveform

PHYSICAL DIMENSIONS - TO-220

SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.25	4.48	4.70
b	0.65	0.80	0.90
b1	1.15	1.38	1.60
c	0.40	0.50	0.60
c1	1.00	1.20	1.40
E	9.70	10.00	10.40
e	----	2.54	----
L	12.70	13.60	14.50
L1	2.60	2.80	3.00
L2	1.00	1.40	1.80
L3	2.6	3.10	3.6
L4	14.70	15.50	16
L5	6.30	6.50	6.70
φ	3.50	3.60	3.70
D	8.40	8.90	9.40

1.All dimensions are in millimeters.

2.Dimensions do not include mold protrusions.

PART MARKING - TO-220 and TO-263

PART NUMBER: 9974GP or 9974GS

DATE/LOT CODE: (YWWSSS)
   Y = last digit of the year
   WW = week
   SSS = lot code sequence

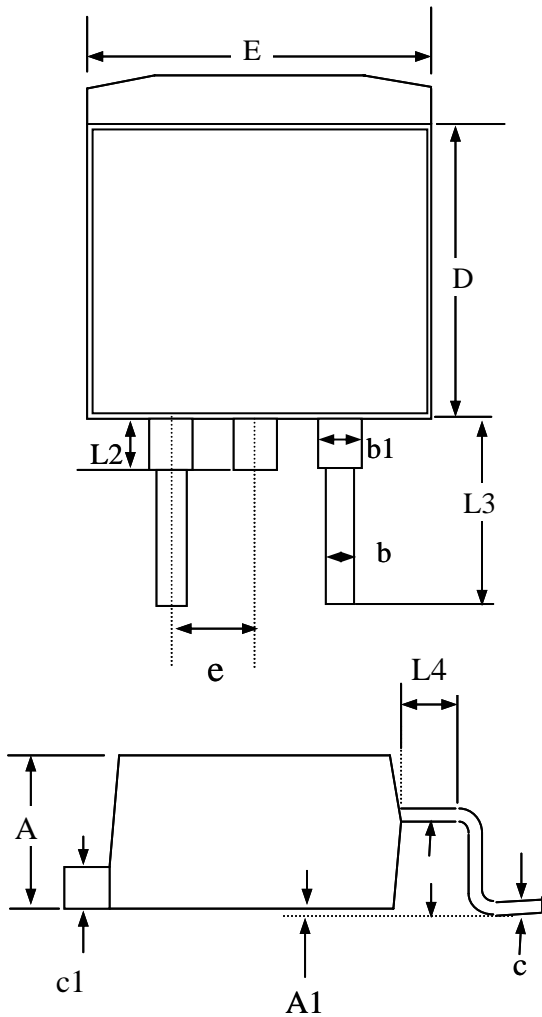## PACKING: Moisture sensitivity level MSL3

TO-263: 800 pcs in antistatic tape on a reel packed inside a moisture barrier bag (MBB).
TO-220: 1000pcs in tubes packed inside a moisture barrier bag (MBB).

PHYSICAL 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	####
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.