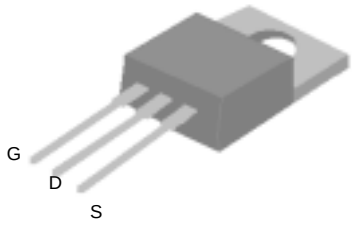
N-channel Enhancement-mode Power MOSFET

PRODUCT SUMMARY

BV_{DSS}	650V
$R_{DS(ON)}$	2.4Ω
I_D	4A

Pb-free; RoHS-compliant TO-220



TO-220 (suffix P)

DESCRIPTION

The SSM04N70BGP-A achieves fast switching performance with low gate charge without a complex drive circuit. It is suitable for high voltage applications such as AC/DC converters, SMPS and general off-line switching circuits.

The SSM04N70BGP-A is in TO-220 for through-hole 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	650	V
V_{GS}	Gate-source voltage	±30	V
I_D	Continuous drain current, T_C = 25°C	4	A
	T_C = 100°C	2.5	A
I_{DM}	Pulsed drain current[1]	15	A
P_D	Total power dissipation, T_C = 25°C	62.5	W
	Linear derating factor	0.5	W/°C
E_{AS}	Single pulse avalanche energy[3]	100	mJ
I_{AR}	Avalanche current	4	A
E_{AR}	Repetitive avalanche energy	4	mJ
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	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%.
3. Starting Tj = 25°C, V_{DD}=50V , L=25mH , R_G=25Ω , I_{AS}= 4A.

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= 1mA	650	-	-	V
$\Delta BV_{DSS}/\Delta Tj$	Breakdown voltage temperature coefficient	Reference to 25°C, I_D=1mA	-	0.6	-	V/°C
$R_{DS(ON)}$	Static drain-source on-resistance	V_{GS}=10V, I_D=2A	-	-	2.4	Ω
$V_{GS(th)}$	Gate threshold voltage	V_{DS}=V_{GS}, I_D=250uA	2	-	4	V
g_{fs}	Forward transconductance	V_{DS}=20V, I_D=1A	-	2.5	-	S
I_{DSS}	Drain-source leakage current	V_{DS}=600V, V_{GS}=0V	-	-	10	uA
		V_{DS}=480V ,V_{GS}=0V, Tj = 150°C	-	-	100	uA
I_{GSS}	Gate-source leakage current	V_{GS}=±30V	-	-	±100	nA
Q_g	Total gate charge [2]	I_D=4A	-	16.7	-	nC
Q_{gs}	Gate-source charge	V_{DS}=480V	-	4.1	-	nC
Q_{gd}	Gate-drain ("Miller") charge	V_{GS}=10V	-	4.9	-	nC
$t_{d(on)}$	Turn-on delay time [2]	V_{DS}=300V	-	11	-	ns
t_r	Rise time	I_D=4A	-	8.3	-	ns
$t_{d(off)}$	Turn-off delay time	R_G=10Ω , V_{GS}=10V	-	23.8	-	ns
t_f	Fall time	R_D=75Ω	-	8.2	-	ns
C_{iss}	Input capacitance	V_{GS}=0V	-	950	-	pF
C_{oss}	Output capacitance	V_{DS}=25V	-	65	-	pF
C_{rss}	Reverse transfer capacitance	f=1.0MHz	-	6	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward voltage [2]	I_S= 4A, V_{GS}=0V	-	-	1.5	V
I_S	Continuous source current (body diode)	V_D=V_G=0V , V_S=1.3V	-	-	4	A
I_{SM}	Pulsed source current (body diode)[1]		-	-	15	A

Notes:

1.Pulse width must be limited to avoid exceeding the maximum junction temperature of 150°C.

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

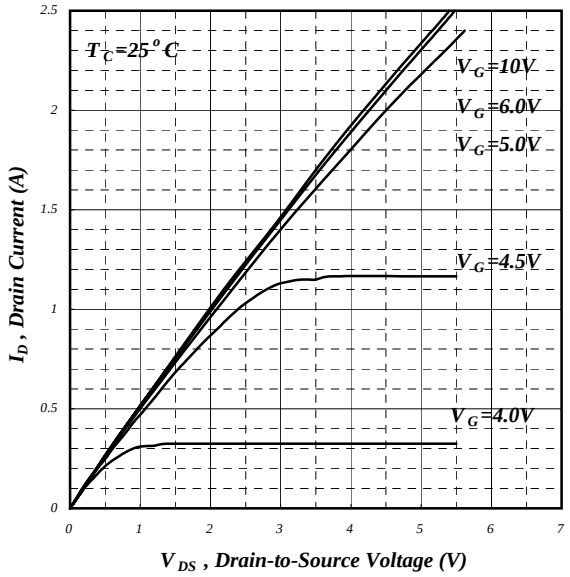


Fig 1. Typical Output Characteristics

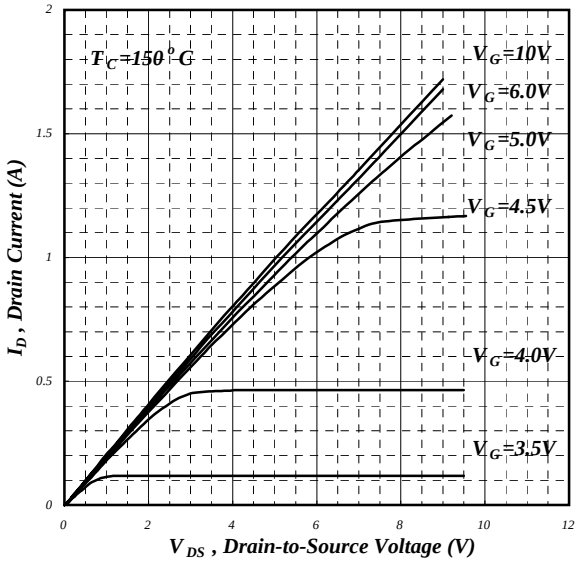


Fig 2. Typical Output Characteristics

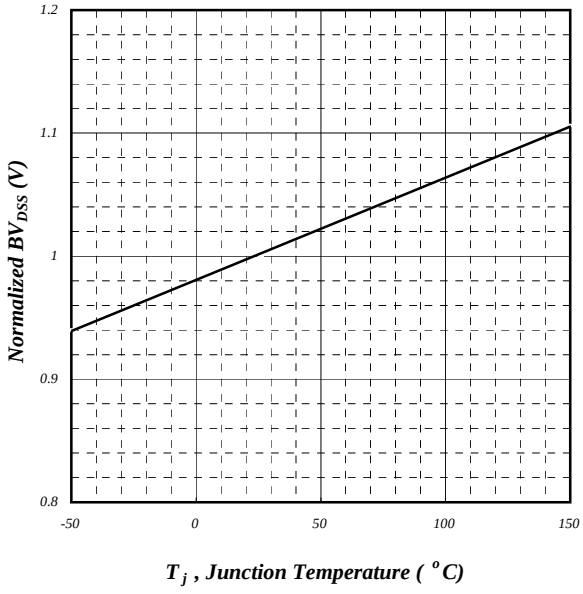


Fig 3. Normalized BVDSS vs. Junction Temperature

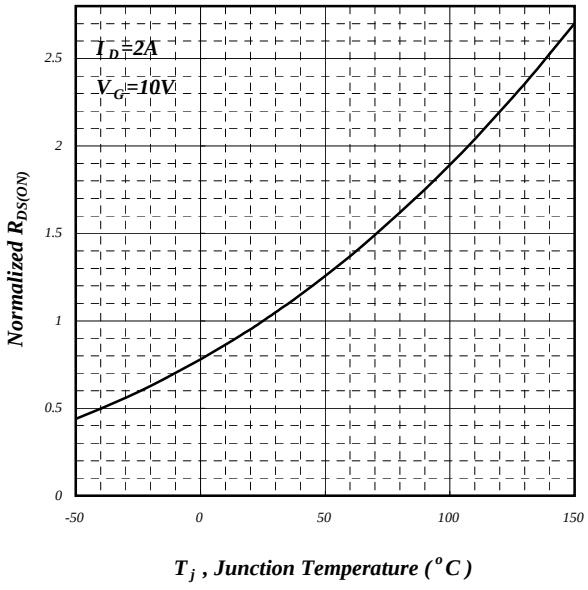


Fig 4. Normalized On-Resistance vs. Junction Temperature

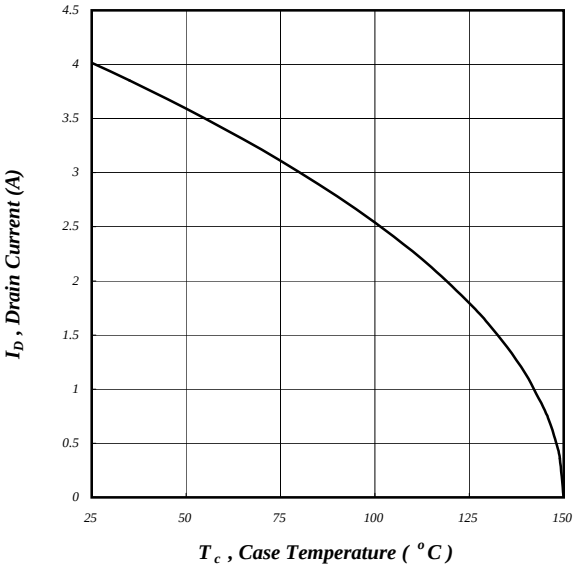


Fig 5. Maximum Drain Current vs. Case Temperature

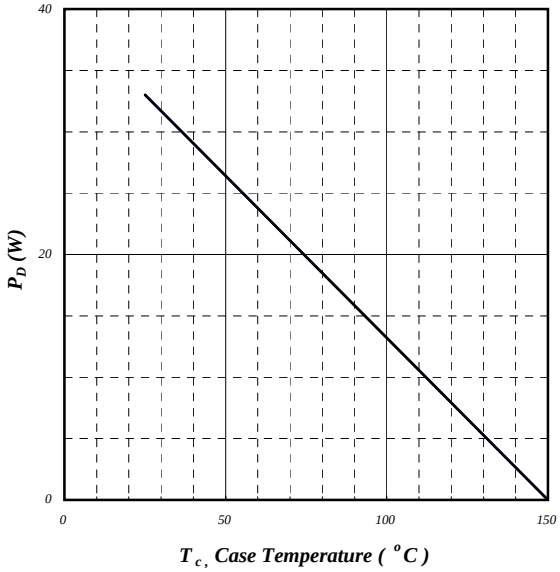


Fig 6. Typical Power Dissipation

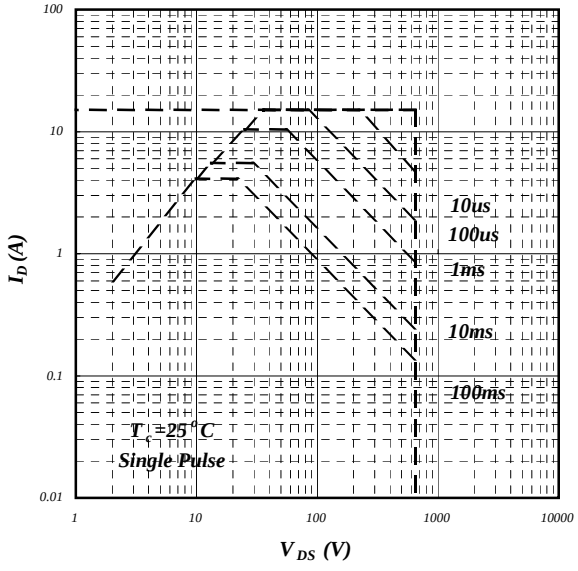


Fig 7. Maximum Safe Operating Area

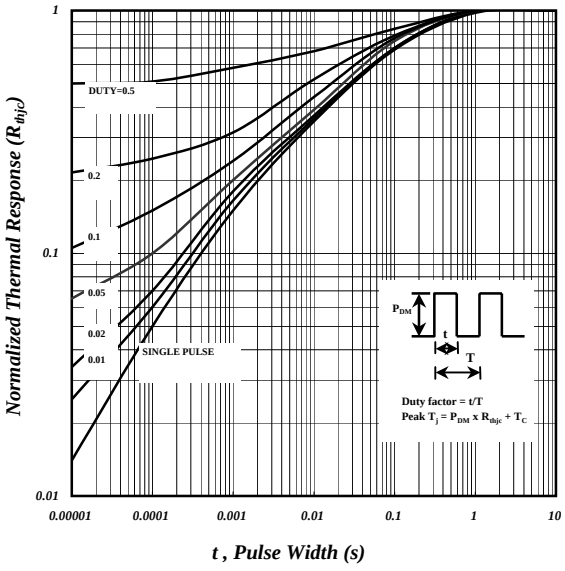


Fig 8. Effective Transient Thermal Impedance

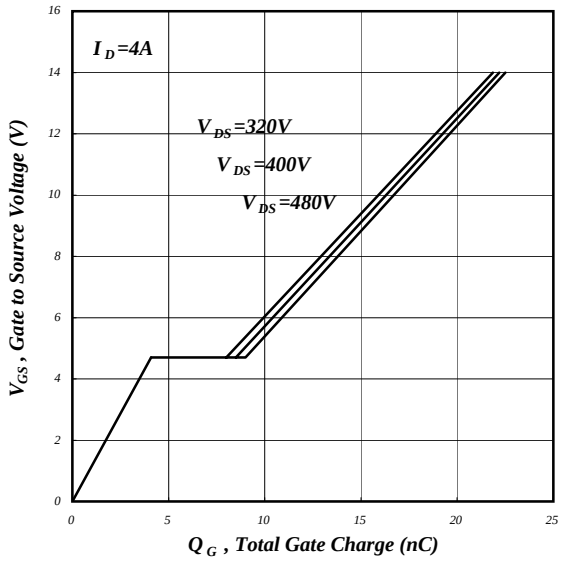


Fig 9. Gate Charge Characteristics

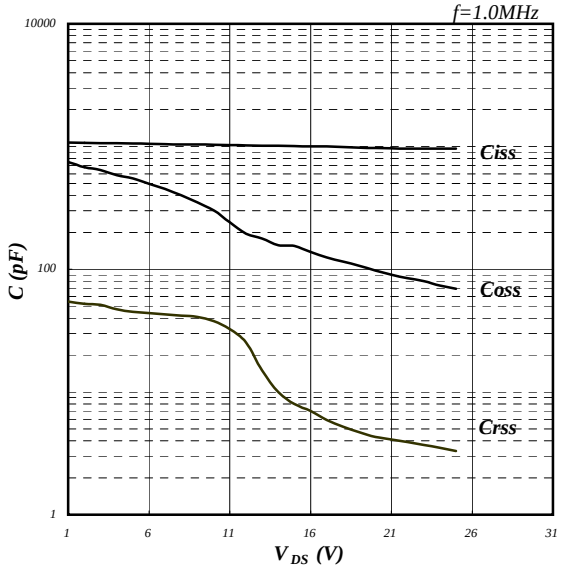


Fig 10. Typical Capacitance Characteristics

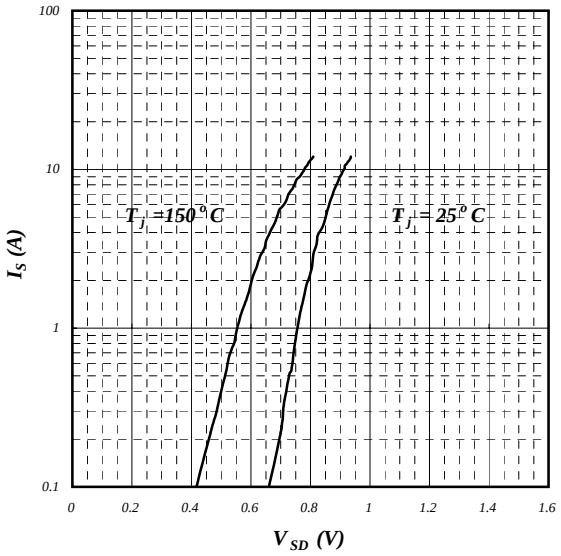


Fig 11. Forward Characteristic of Reverse Diode

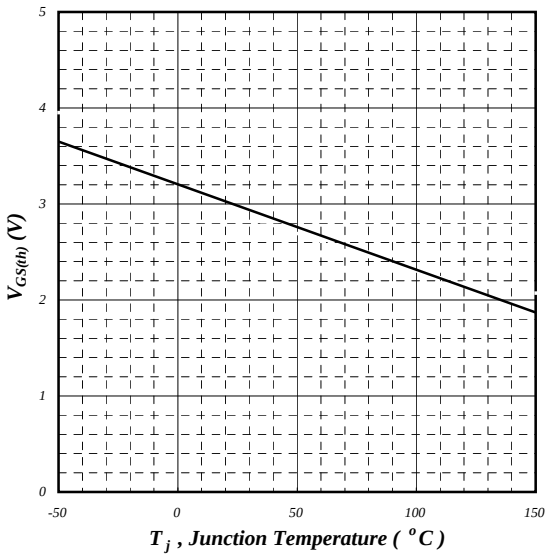


Fig 12. Gate Threshold Voltage vs. Junction Temperature

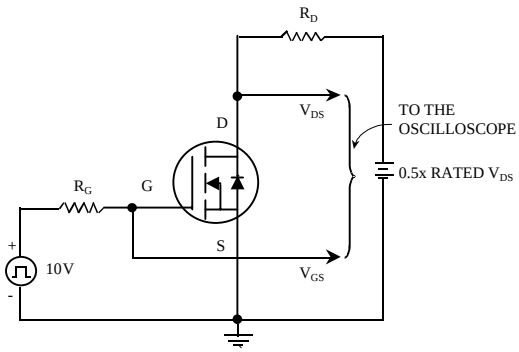


Fig 13. Switching Time Circuit

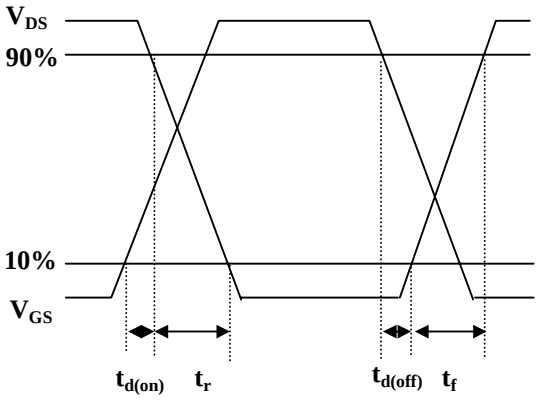


Fig 14. Switching Time Waveform

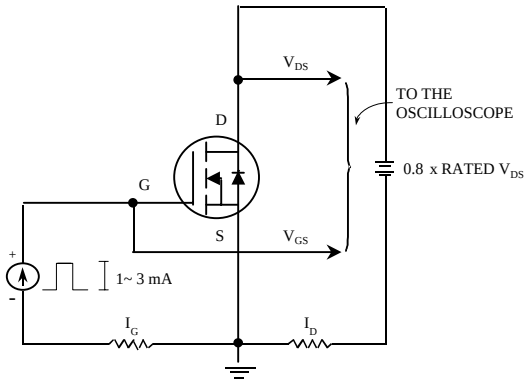


Fig 15. Gate Charge Circuit

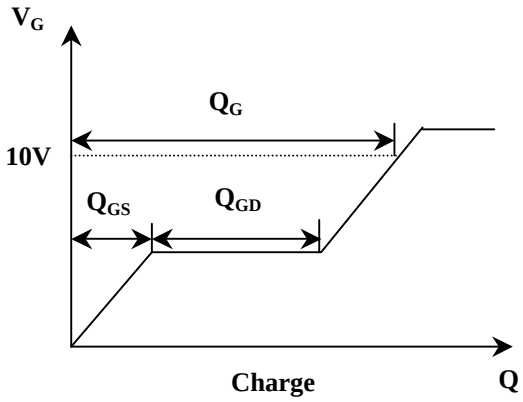
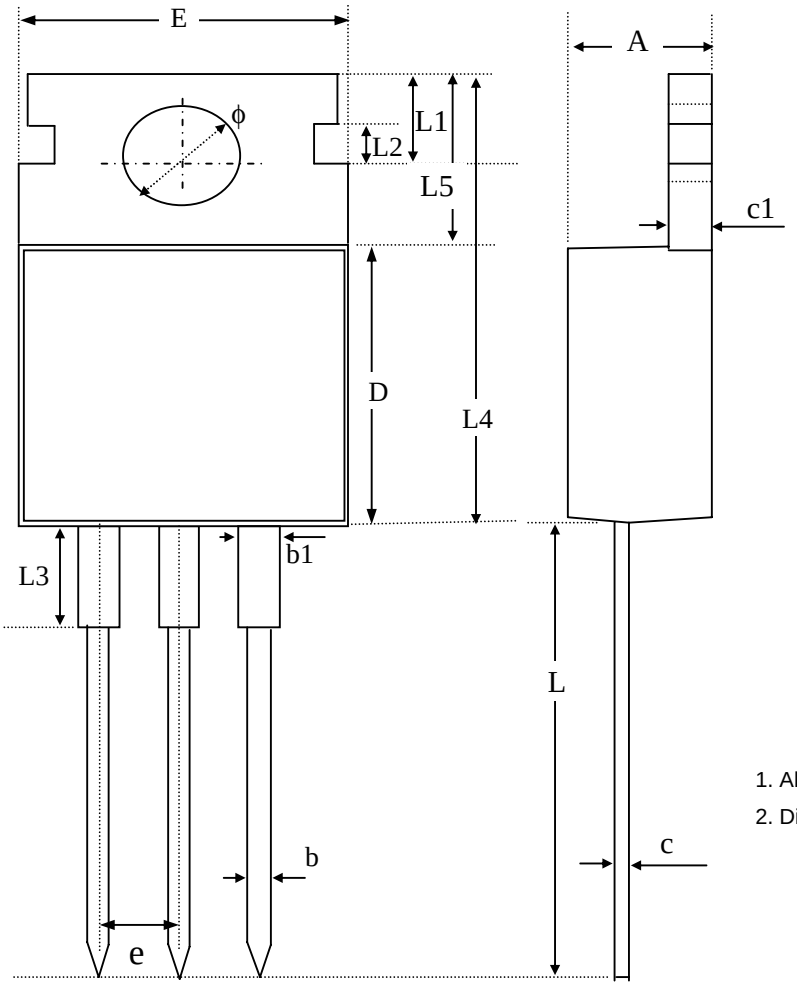


Fig 16. Gate Charge Waveform

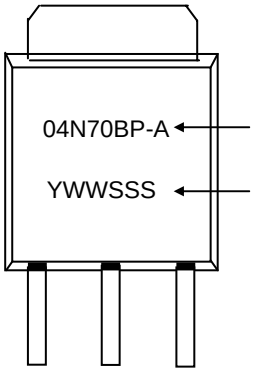
PHYSICAL DIMENSIONS - TO-220



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



PART NUMBER: 04N70BGP-A = SSM04N70BGP-A

DATE/LOT CODE:

Y = last digit of the year

WW = work week (01 -> 52)

SSS = lot code sequence

PACKING: Moisture sensitivity level MSL3

1000pcs in tubes packed inside a moisture barrier bag (MBB).