



STB19NB20

N - CHANNEL ENHANCEMENT MODE PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STB19NB20	200 V	< 0.180 Ω	19 A

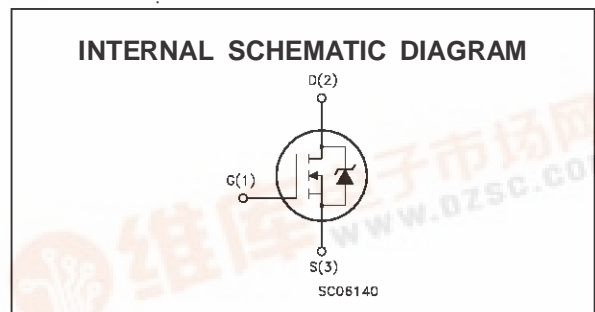
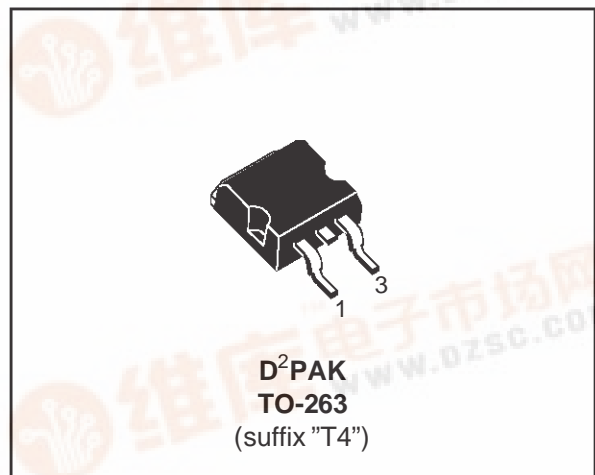
- TYPICAL R_{DS(on)} = 0.150 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of Power MOSFETs with outstanding performance. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	200	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	19	A
I _D	Drain Current (continuous) at T _c = 100 °C	12	A
I _{DM} (●)	Drain Current (pulsed)	76	A
P _{tot}	Total Dissipation at T _c = 25 °C	125	W
	Derating Factor	1	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	5.5	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤ 19A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

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THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	$^{\circ}C/W$
T_l	Maximum Lead Temperature For Soldering Purpose		300	$^{\circ}C$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	19	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	580	mJ

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}C$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	200			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 9.5$ A		0.150	0.180	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	19			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 9.5$ A	3			S
C_{iss}	Input Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		1000	1350	pF
C_{oss}	Output Capacitance			285	385	pF
C_{rss}	Reverse Transfer Capacitance			45	60	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 100\text{ V}$ $I_D = 9.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		15	20	ns
t_r	Rise Time			15	20	ns
Q_g	Total Gate Charge	$V_{DD} = 160\text{ V}$ $I_D = 19\text{ A}$ $V_{GS} = 10\text{ V}$		29	40	nC
Q_{gs}	Gate-Source Charge			9.5		nC
Q_{gd}	Gate-Drain Charge			13		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 160\text{ V}$ $I_D = 19\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		10	15	ns
t_f	Fall Time			10	15	ns
t_c	Cross-over Time			20	30	ns

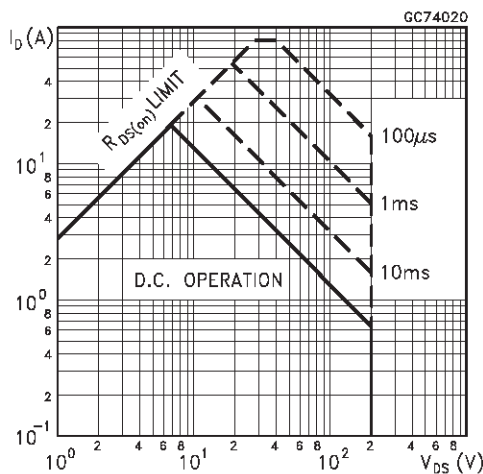
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				19	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				76	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 19\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 19\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		210		ns
Q_{rr}	Reverse Recovery Charge			1.5		μC
I_{RRM}	Reverse Recovery Current			14.5		A

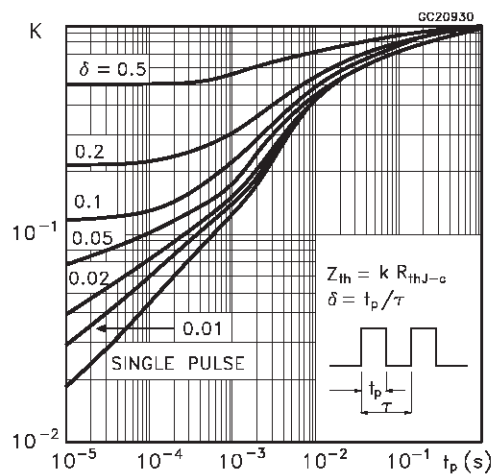
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

Safe Operating Area

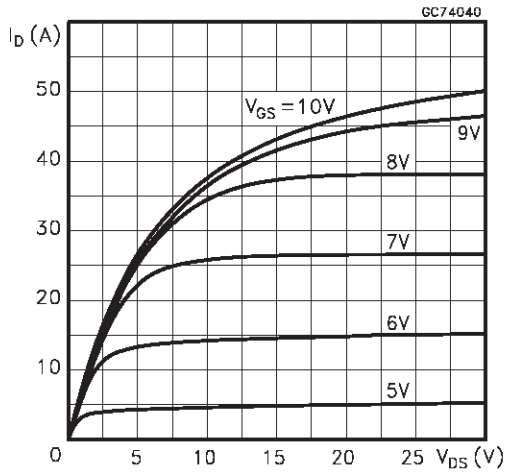


Thermal Impedance

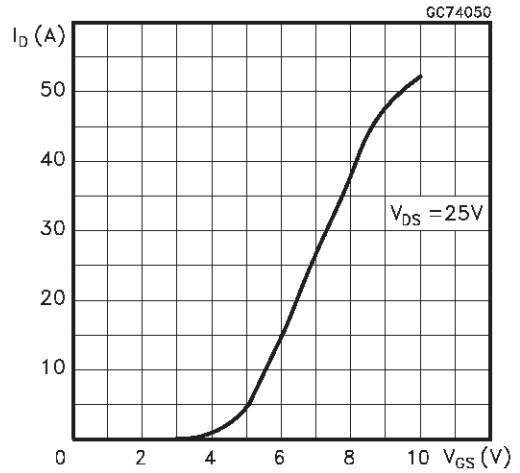


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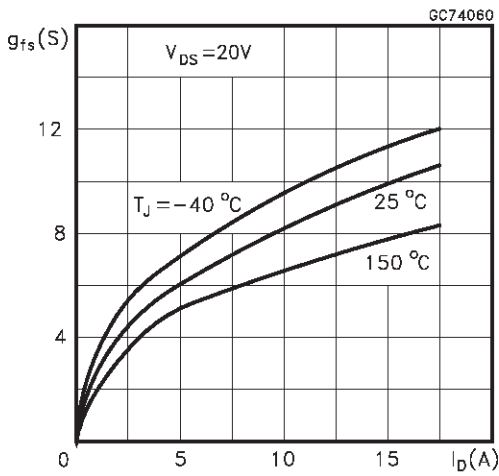
Output Characteristics



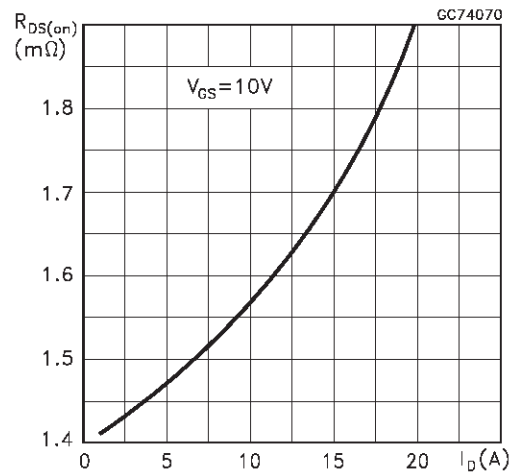
Transfer Characteristics



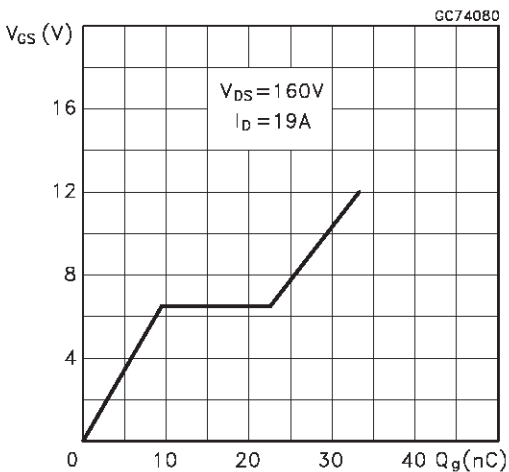
Transconductance



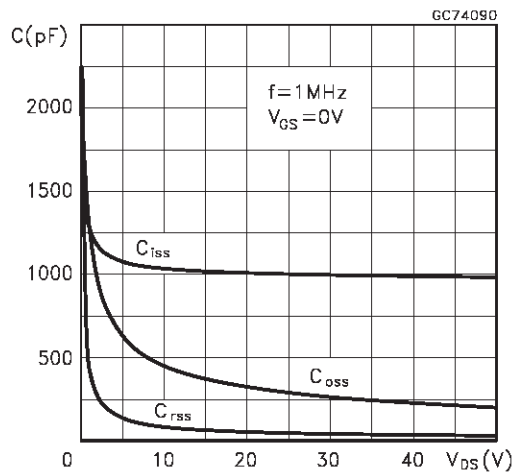
Static Drain-source On Resistance



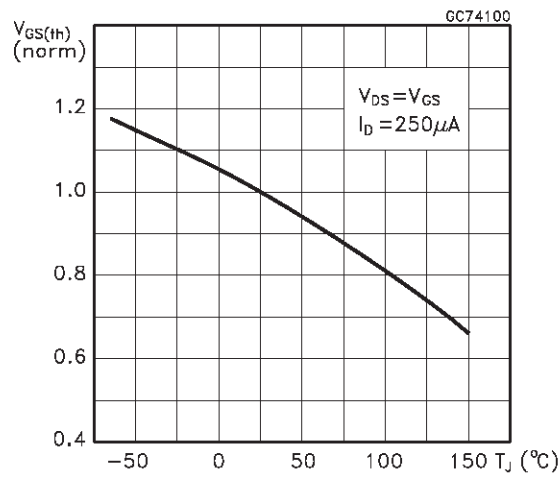
Gate Charge vs Gate-source Voltage



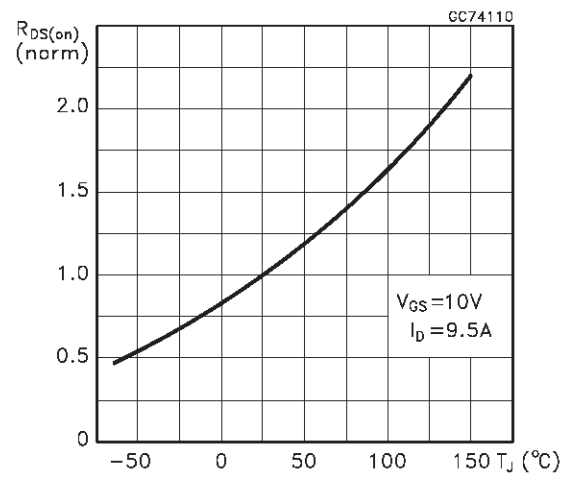
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

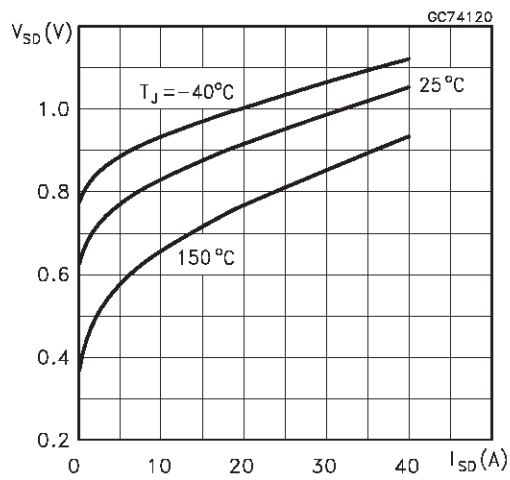


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load

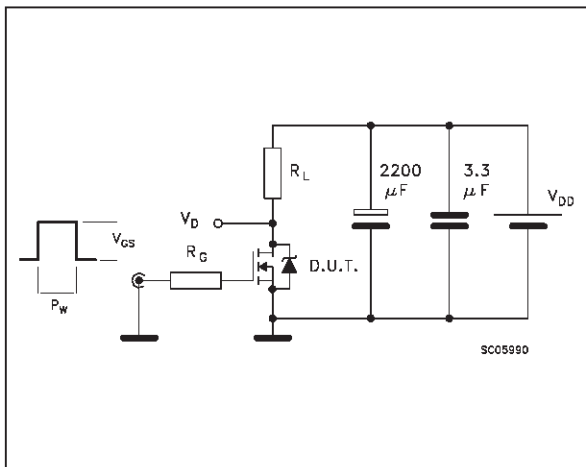


Fig. 4: Gate Charge test Circuit

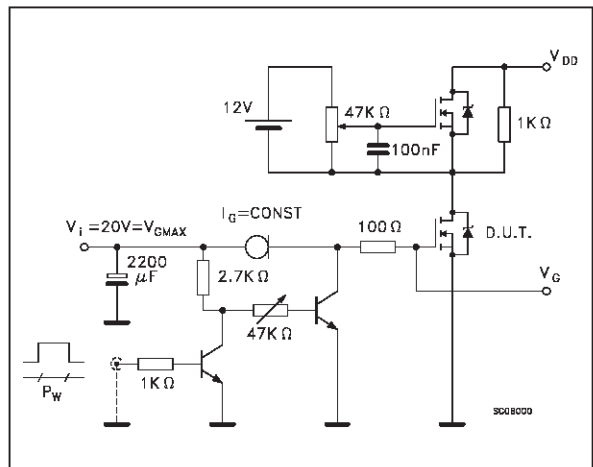
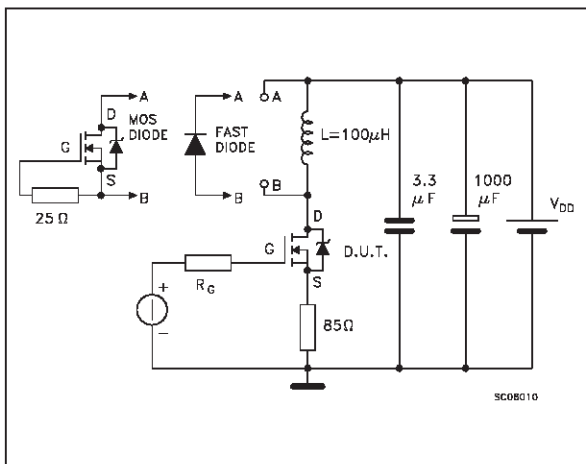
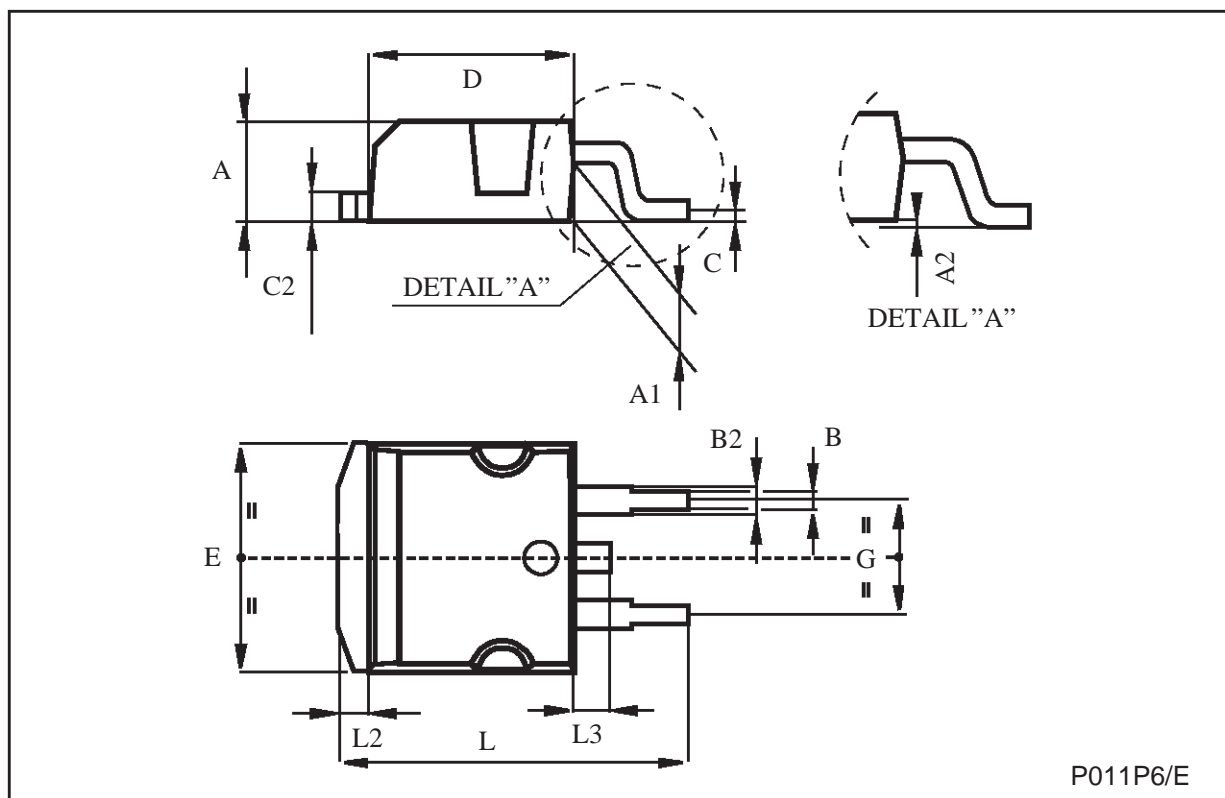


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	8.95		9.35	0.352		0.368
E	10		10.4	0.393		0.409
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068



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