

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
STU5NA90	900 V	< 2.4 Ω	5 A

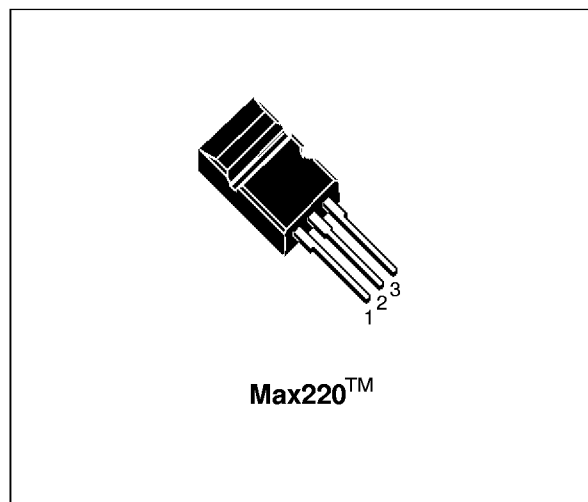
- TYPICAL R_{DS(on)} = 2.1 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- REPETITIVE AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

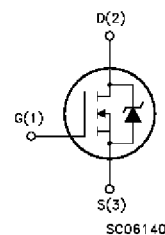
The Max220™ package is a new high volume power package exhibiting the same footprint as the industry standard TO-220, but designed to accommodate much larger silicon chips, normally supplied in bigger packages. The increased die capacity makes the device ideal to reduce component count in multiple paralleled TO-220 designs and save board space with respect to larger packages.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES (UPS)



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	900	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	900	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	5	A
I _D	Drain Current (continuous) at T _c = 100 °C	3.2	A
I _{DM} (●)	Drain Current (pulsed)	20	A
P _{tot}	Total Dissipation at T _c = 25 °C	135	W
	Derating Factor	1.08	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(●) Pulse width limited by safe operating area

STU5NA90

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.92	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	$^{\circ}C/W$
T_j	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, $\delta < 1\%$)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50V$)	270	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	13	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100^{\circ}C$, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

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	$I_D = 250 \mu A$ $V_{GS} = 0$	900			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}C$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30V$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 2.5A$ $V_{GS} = 10V$ $I_D = 2.5A$ $T_c = 125^{\circ}C$		2.1	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10V$	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2.5A$	3.5	5.5		S
C_{iss}	Input Capacitance	$V_{DS} = 25V$ $f = 1MHz$ $V_{GS} = 0$		1350	1900	pF
C_{oss}	Output Capacitance			150	210	pF
C_{rss}	Reverse Transfer Capacitance			40	60	pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 450\text{ V}$ $R_G = 4.7\ \Omega$		13 12	20 19	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 720\text{ V}$ $R_G = 50\ \Omega$		250		A/ μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 720\text{ V}$ $I_D = 5\text{ A}$ $V_{GS} = 10\text{ V}$		60 10 26	85	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 720\text{ V}$ $R_G = 4.7\ \Omega$		15 7 25	25 14 40	ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				5 20	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 5\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5\text{ A}$ $V_{DD} = 100\text{ V}$		1150 17.3 30	1600	ns μC A

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

(\bullet) Pulse width limited by safe operating area

Max220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.3		4.6	0.169		0.181
A1	2.2		2.4	0.087		0.094
A2	2.9		3.1	0.114		0.122
b	0.7		0.93	0.027		0.036
b1	1.25		1.4	0.049		0.055
b2	1.2		1.38	0.047		0.054
c	0.45		0.6		0.18	0.023
D	15.9		16.3		0.626	0.641
D1	9		9.35	0.354		0.368
D2	0.8		1.2	0.031		0.047
D3	2.8		3.2	0.110		0.126
e	2.44		2.64	0.096		0.104
E	10.05		10.35	0.396		0.407
L	13.2		13.6	0.520		0.535
L1	3		3.4	0.118		0.133

