



STP11NM60

N-CHANNEL 600V - 0.4Ω - 11A TO-220

MDmesh™ Power MOSFET

PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP11NM60	600V	<0.45Ω	11 A

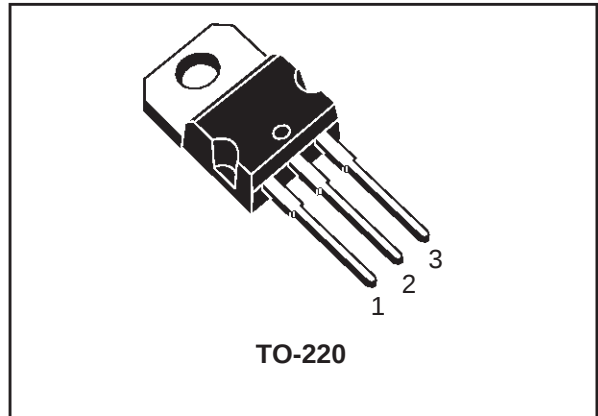
- TYPICAL R_{DS(on)} = 0.4Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTURING YIELDS

DESCRIPTION

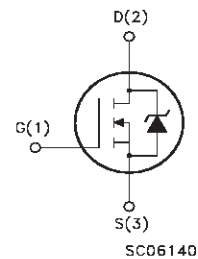
The MDmesh™ is a new revolutionary MOSFET technology that associates the Multiple Drain process with the Company's PowerMESH™ horizontal layout. The resulting product has an outstanding low on-resistance, impressively high dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary strip technique yields overall dynamic performance that is significantly better than that of similar competition's products.

APPLICATIONS

The MDmesh™ family is very suitable for increasing power density of high voltage converters allowing system miniaturization and higher efficiencies.



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	600	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	600	V
V _{GS}	Gate- source Voltage	±30	V
I _D	Drain Current (continuous) at T _C = 25°C	11	A
I _D	Drain Current (continuous) at T _C = 100°C	7	A
I _{DM} (●)	Drain Current (pulsed)	44	A
P _{TOT}	Total Dissipation at T _C = 25°C	110	W
	Derating Factor	0.88	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	6	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}<11A, di/dt<200A/μs, V_{DD}<V_{(BR)DSS}, T_J<T_{JMAX}

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THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1.13	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink	Typ	0.5	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	11	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	400	mJ

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 µA, V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C			1 10	µA µA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ±30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250µA	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 5.5A		0.4	0.45	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{DS(on)} max, V _{GS} = 10V	11			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)} max, I _D = 5.5A		5.2		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		980		pF
C _{oss}	Output Capacitance			220		pF
C _{rss}	Reverse Transfer Capacitance			20		pF
R _G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		1.6		Ω

Note: 1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.

ELECTRICAL CHARACTERISTICS (CONTINUED)
SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 250V$, $I_D = 5.5A$		20		ns
t_r	Rise Time	$R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 3)		10		ns
Q_g	Total Gate Charge	$V_{DD} = 400V$, $I_D = 11A$,		30		nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 10V$		10		nC
Q_{gd}	Gate-Drain Charge			21		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 400V$, $I_D = 11A$,		19		ns
t_f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 5)		8		ns
t_c	Cross-over Time			18		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				11	A
$I_{SDM(2)}$	Source-drain Current (pulsed)				44	A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 11A$, $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 11A$, $di/dt = 100A/\mu s$,		350		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 100V$, $T_j = 150^\circ C$ (see test circuit, Figure 5)		5.25		μC
I_{RRM}	Reverse Recovery Current			30		A

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
 2. Pulse width limited by safe operating area.

Fig. 1: Unclamped Inductive Load Test Circuit

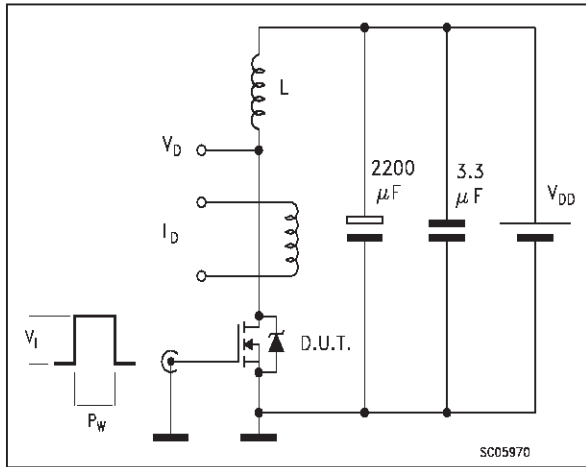


Fig. 2: Unclamped Inductive Waveform

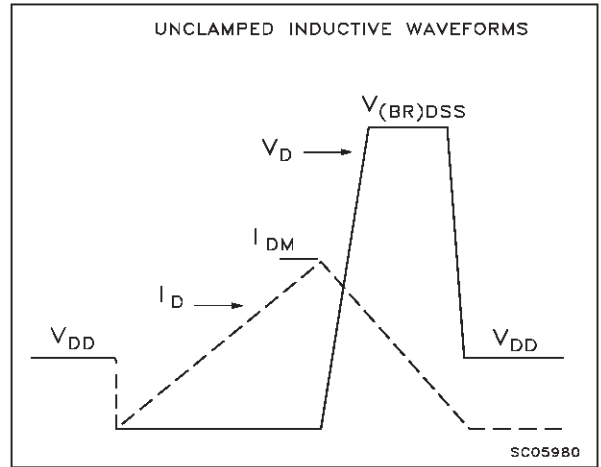


Fig. 3: Switching Times Test Circuit For Resistive Load

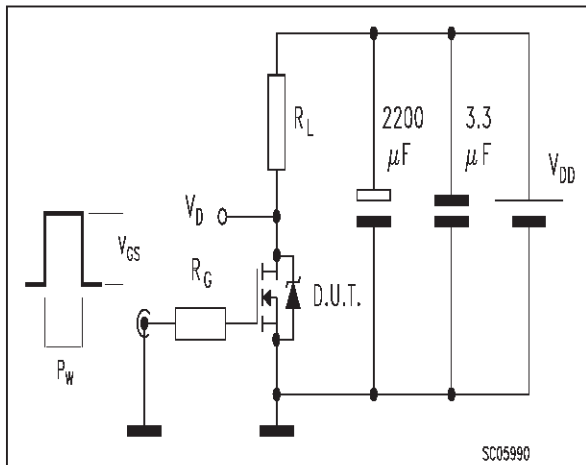


Fig. 4: Gate Charge test Circuit

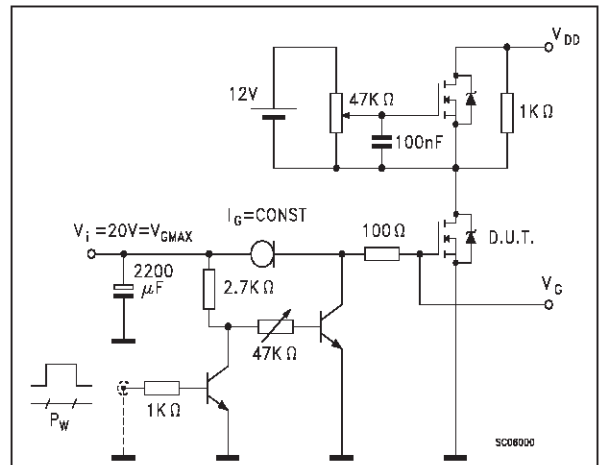
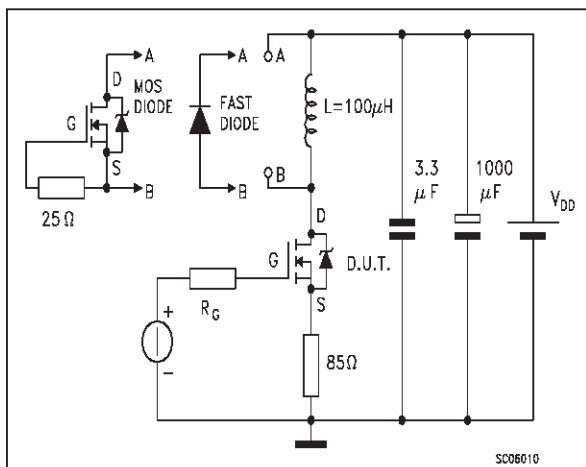
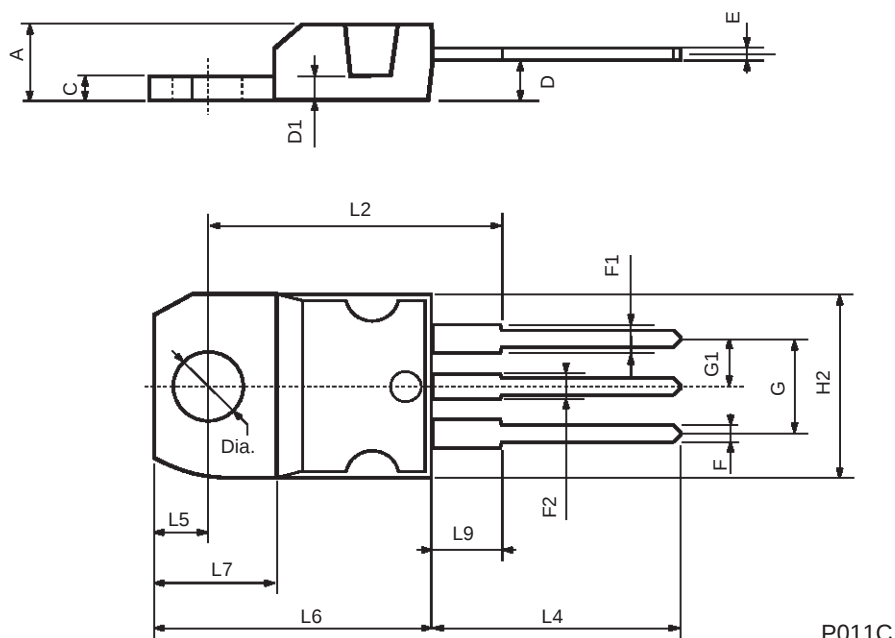


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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