



STP8NM60 - STP8NM60FP STB8NM60 - STD5NM60 - STD5NM60-1

N-CHANNEL 650V @Tjmax-0.9Ω-8A TO-220/FP/D/IPAK/D²PAK
STripFET™ II MOSFET

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D	P _w
STP8NM60	650 V	< 1 Ω	8 A	100 W
STP8NM60FP	650 V	< 1 Ω	8 A(*)	30 W
STD5NM60	650 V	< 1 Ω	5 A	96 W
STD5NM60-1	650 V	< 1 Ω	5 A	96 W
STB8NM60	650 V	< 1 Ω	5 A	96 W

- TYPICAL R_{DS(on)} = 0.9Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE

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 completion's products.

APPLICATIONS

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

Figure 1: Package

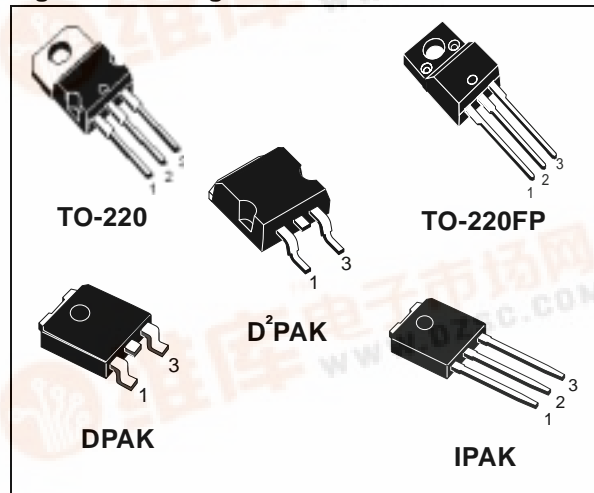


Figure 2: Internal Schematic Diagram

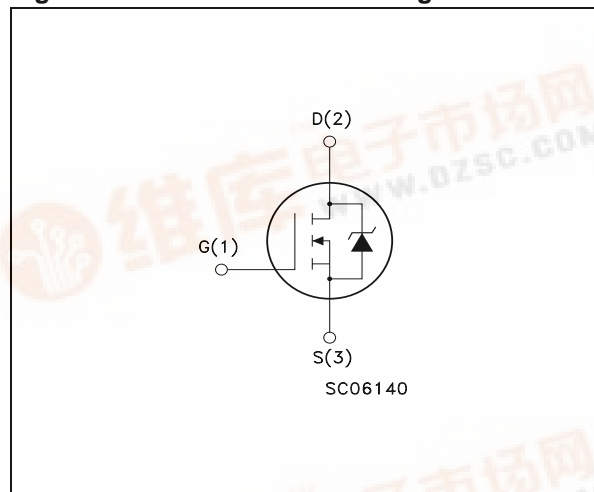


Table 2: Order Codes

Sales Type	Marking	Package	Packaging
STP8NM60	P8NM60	TO-220	TUBE
STP8NM60FP	P8NM60FP	TO-220FP	TUBE
STD5NM60	D5NM60	DPAK	TAPE & REEL
STD5NM60-1	D5NM60	IPAK	TUBE
STB8NM60	B8NM60	D ² PAK	TAPE & REEL

STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value			Unit
		TO-220/D ² PAK	TO-220FP	DPAK/IPAK	
V _{GS}	Gate- source Voltage	± 30			V
I _D	Drain Current (continuous) at T _C = 25°C	8	8 (*)	5	A
I _D	Drain Current (continuous) at T _C = 100°C	5	5 (*)	3.1	A
I _{DM} (•)	Drain Current (pulsed)	32	32 (*)	20	A
P _{TOT}	Total Dissipation at T _C = 25°C	100	30	96	W
	Derating Factor	0.8	0.24	0.4	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	15	15	15	V/ns
V _{ISO}	Insulation Withstand Voltage (DC)	-	2500	-	V
T _j T _{stg}	Operating Junction Temperature Storage Temperature	-55 to 150			°C

(•) Pulse width limited by safe operating area

(1) I_{SD} ≤ 5A, di/dt ≤ 400A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

(*) Limited only by maximum temperature allowed

Table 4: Thermal Data

		TO-220/D ² PAK	TO-220FP	DPAK/IPAK	
R _{thj-case}	Thermal Resistance Junction-case Max	1.25	4.16	1.3	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient Max	62.5			°C/W
T _l	Maximum Lead Temperature For Soldering Purpose	300			°C

Table 5: Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	2.5	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	200	mJ

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

Table 6: On/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
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 = 2.5 A		0.9	1	Ω

STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60 - STB8NM60

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 7: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{DS} = I_{D(on)} \times R_{DS(on)max}$, $I_D = 2.5A$		2.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25V$, $f = 1\text{ MHz}$, $V_{GS} = 0$		440 100 10		pF pF pF
$C_{oss\ eq. (2)}$	Equivalent Output Capacitance	$V_{GS} = 0V$, $V_{DS} = 0V\text{ to }480V$		50		pF
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 300\text{ V}$, $I_D = 2.5\text{ A}$ $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load see, Figure 3)		14 10		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 400V$, $I_D = 5\text{ A}$, $V_{GS} = 10V$		13 5 6	18	nC nC nC

Table 8: Switching On/Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off Delay Time Fall Time	$V_{DD} = 300\text{ V}$, $I_D = 2.5\text{ A}$ $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load see, Figure 3)		23 10		ns ns
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 480V$, $I_D = 5\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 10V$ (Inductive Load see, Figure 5)		7 10 17		ns ns ns

Table 9: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				8 32	A A
$V_{SD} (2)$	Forward On Voltage	$I_{SD} = 5\text{ A}$, $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5\text{ A}$, $di/dt = 100A/\mu s$ $V_{DD} = 100\text{ V}$, $T_j = 25^\circ C$ (see test circuit, Figure 5)		300 1950 13		ns μC A
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5\text{ A}$, $di/dt = 100A/\mu s$ $V_{DD} = 100\text{ V}$, $T_j = 150^\circ C$ (see test circuit, Figure 5)		445 3005 13.5		ns μC A

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

STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60

Figure 3: Safe Operating Area for TO-220/ D²PAK

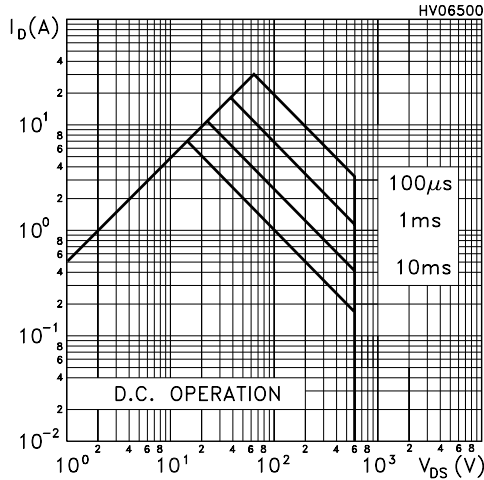


Figure 4: Safe Operating Area for TO-220FP

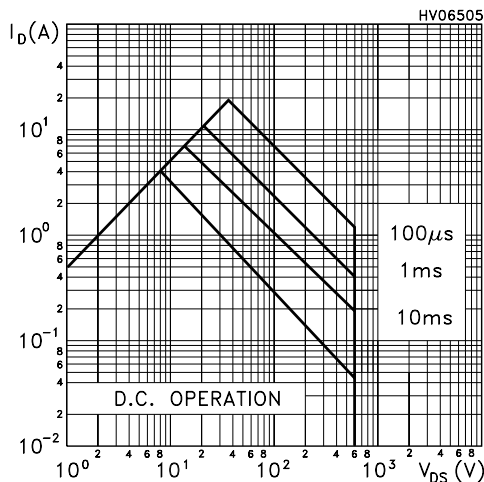


Figure 5: Safe Operating Area for DPAK/IPAK

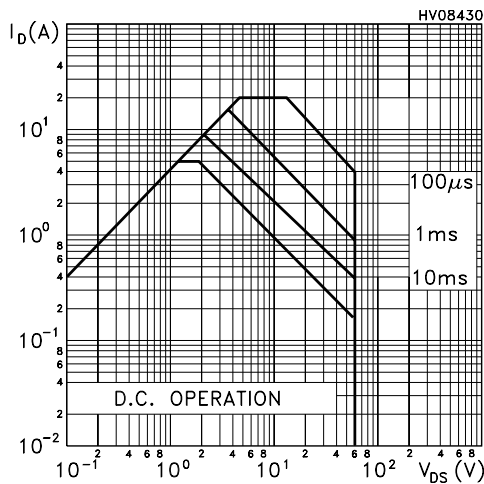


Figure 6: Thermal Impedance for TO-220/ D²PAK

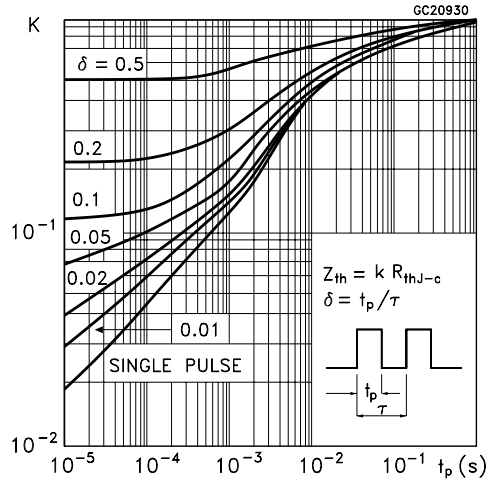


Figure 7: Thermal Impedance for TO-220FP

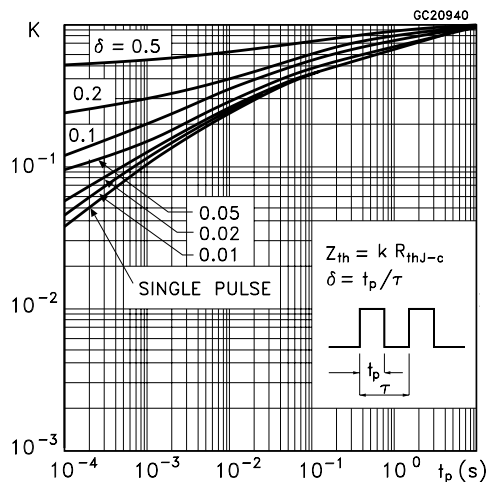


Figure 8: Thermal Impedance for DPAK/IPAK

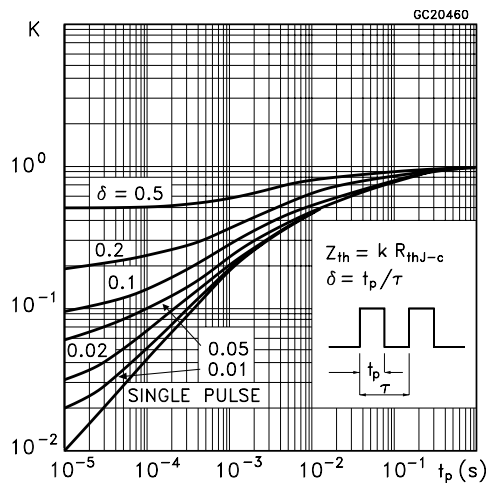


Figure 9: Output Characteristics

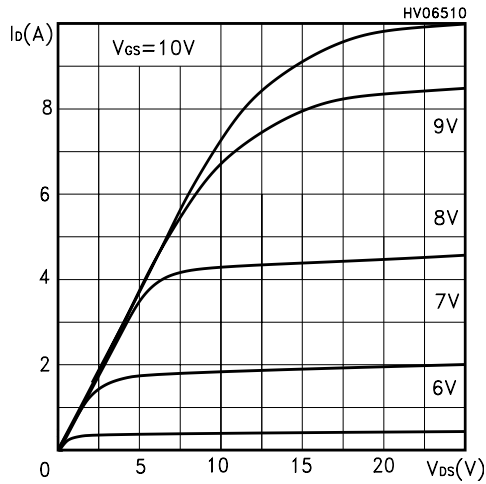


Figure 10: Transconductance

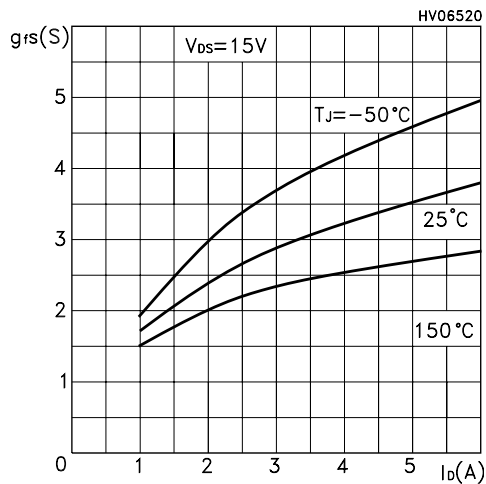


Figure 11: Gate Charge vs Gate source Voltage

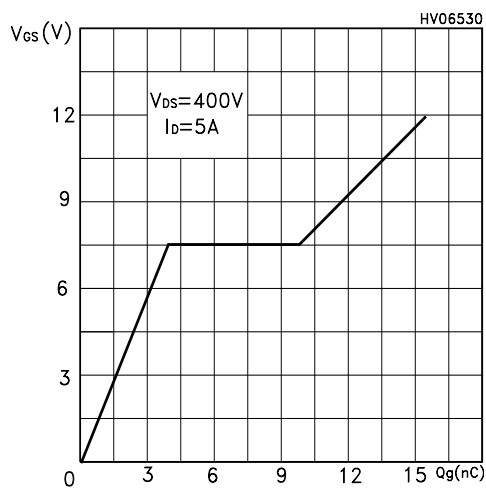


Figure 12: Transfer Characteristics

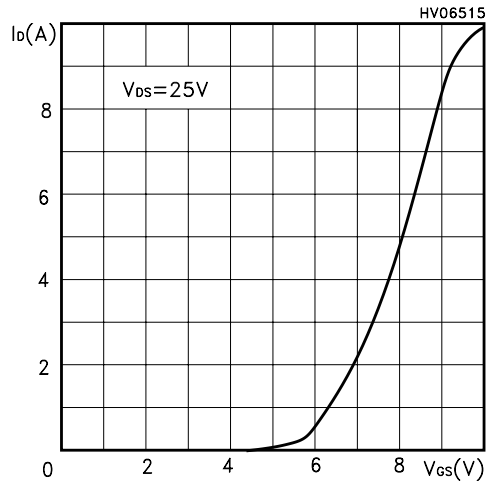


Figure 13: Static Drain-Source on Resistance

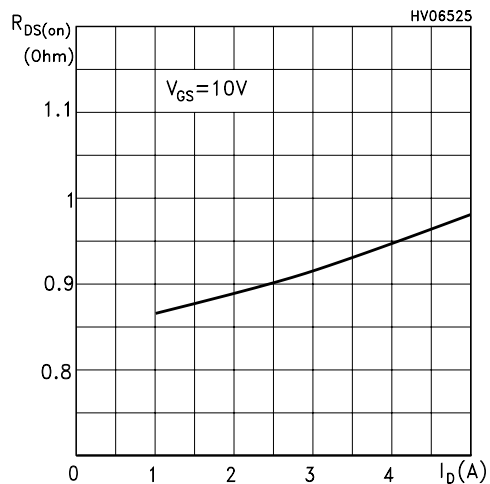


Figure 14: Capacitance Variations

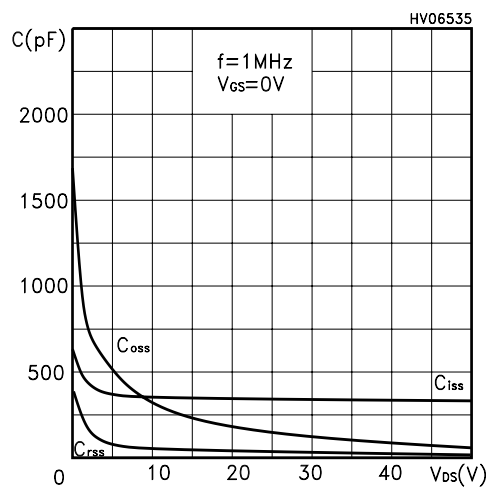


Figure 15: Normalized Gate Threshold Voltage vs Temperature j

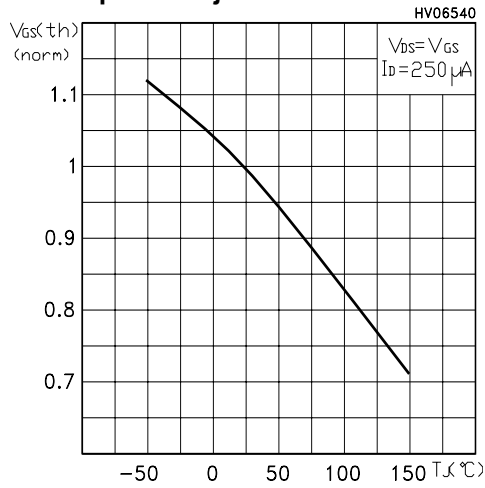


Figure 17: Normalized on Resistance vs Temperature

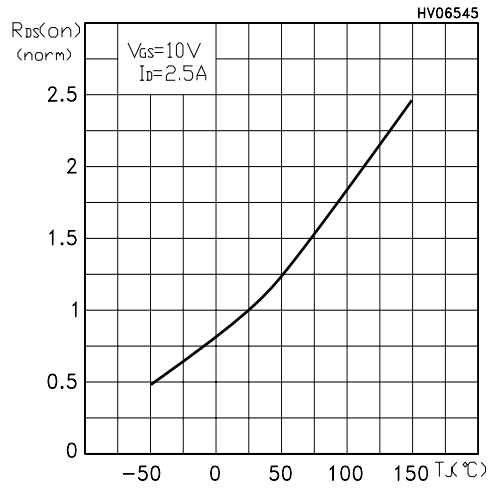


Figure 16: Source Drain Diode Forward Characteristics

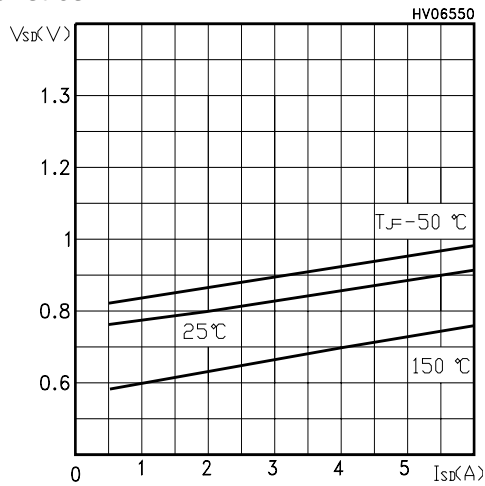


Figure 18: Unclamped Inductive Load Test Circuit

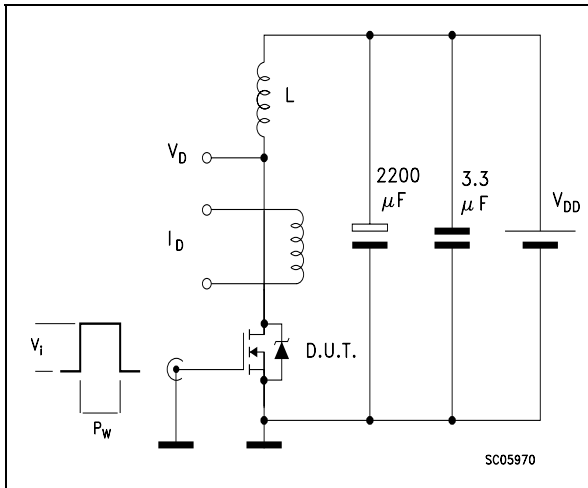


Figure 19: Switching Times Test Circuit For Resistive Load

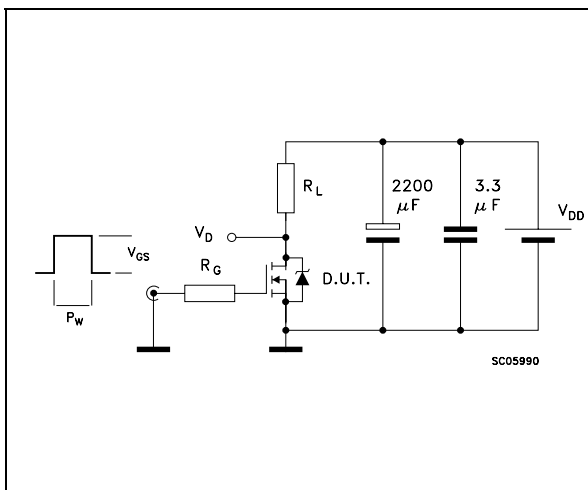


Figure 20: Test Circuit For Inductive Load Switching and Diode Recovery Times

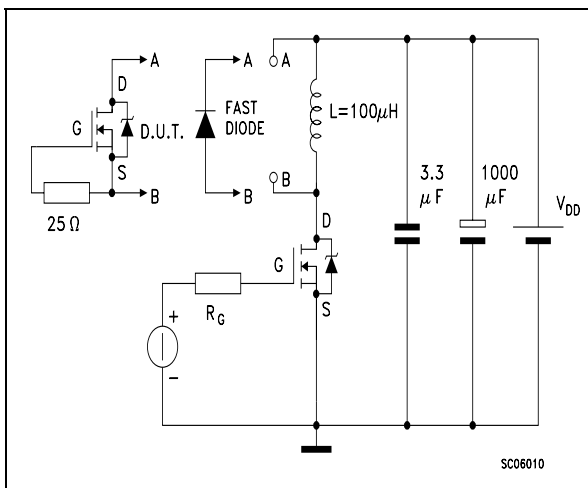


Figure 21: Unclamped Inductive Wafeform

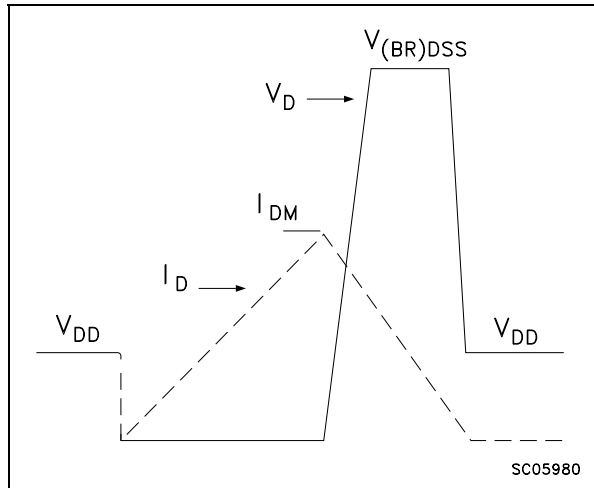
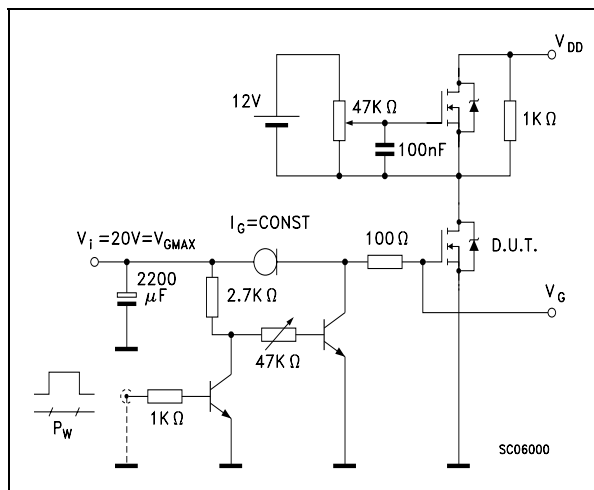


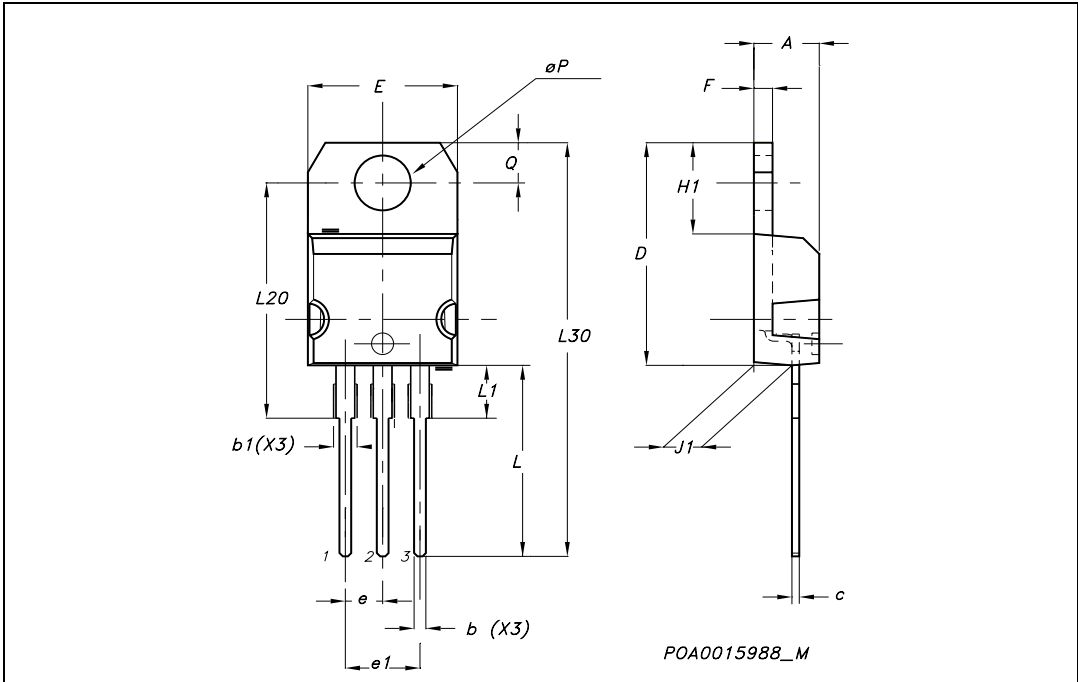
Figure 22: Gate Charge Test Circuit



STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60

TO-220 MECHANICAL DATA

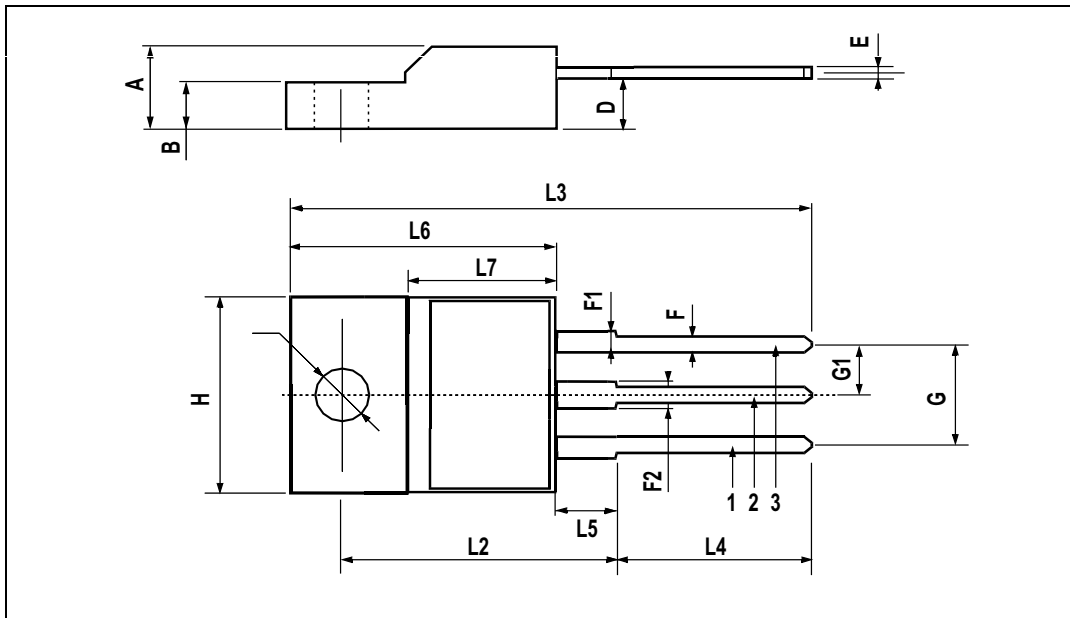
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60 - STB8NM60

TO-220FP MECHANICAL DATA

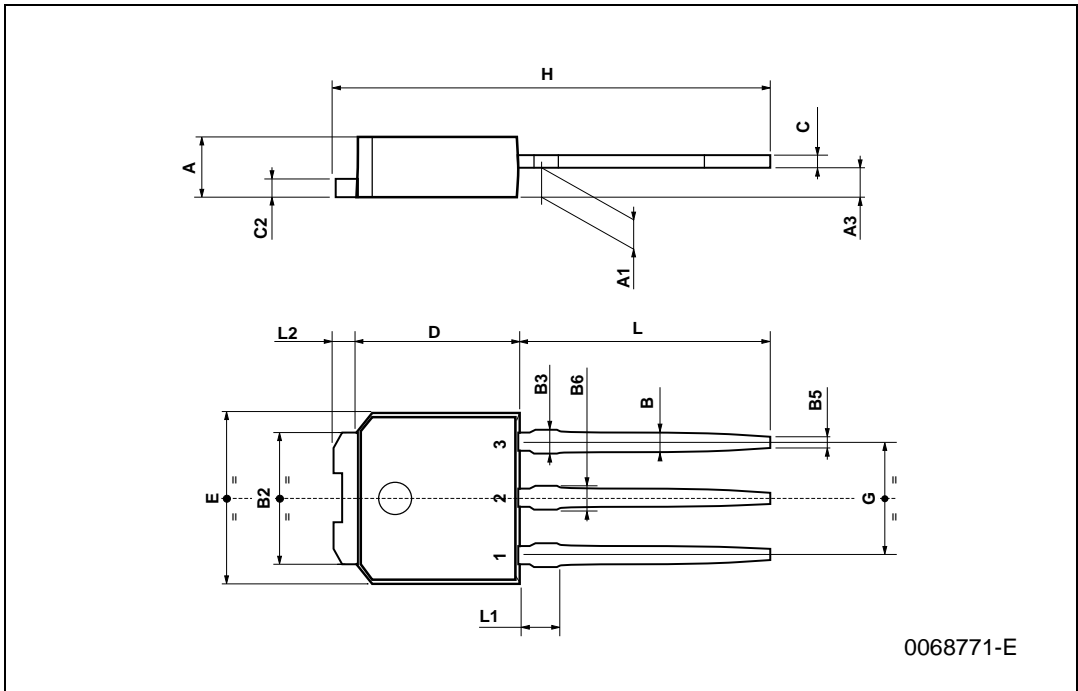
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60

TO-251 (IPAK) MECHANICAL DATA

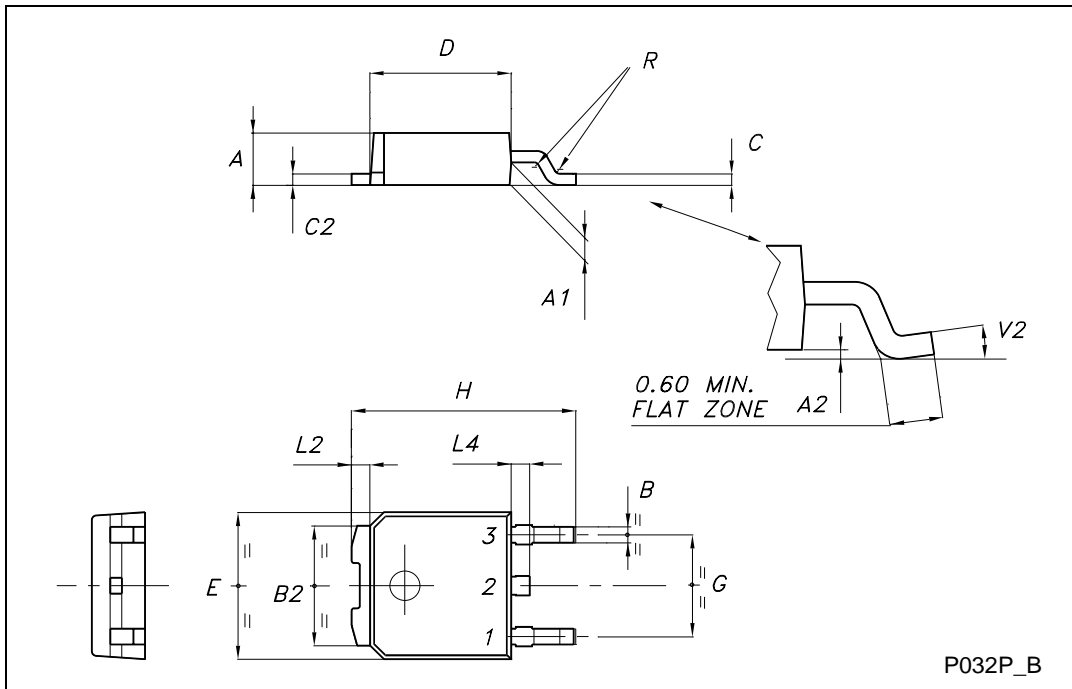
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



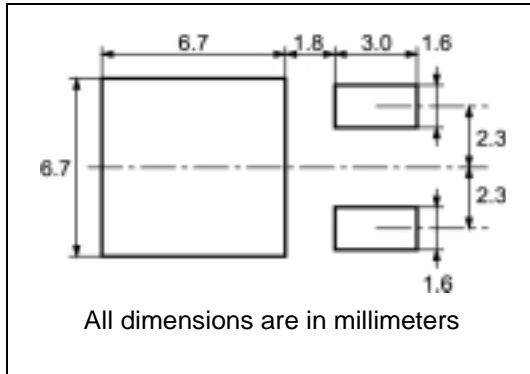
STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60 - STB8NM60

TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



DPAK FOOTPRINT



TAPE AND REEL SHIPMENT

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

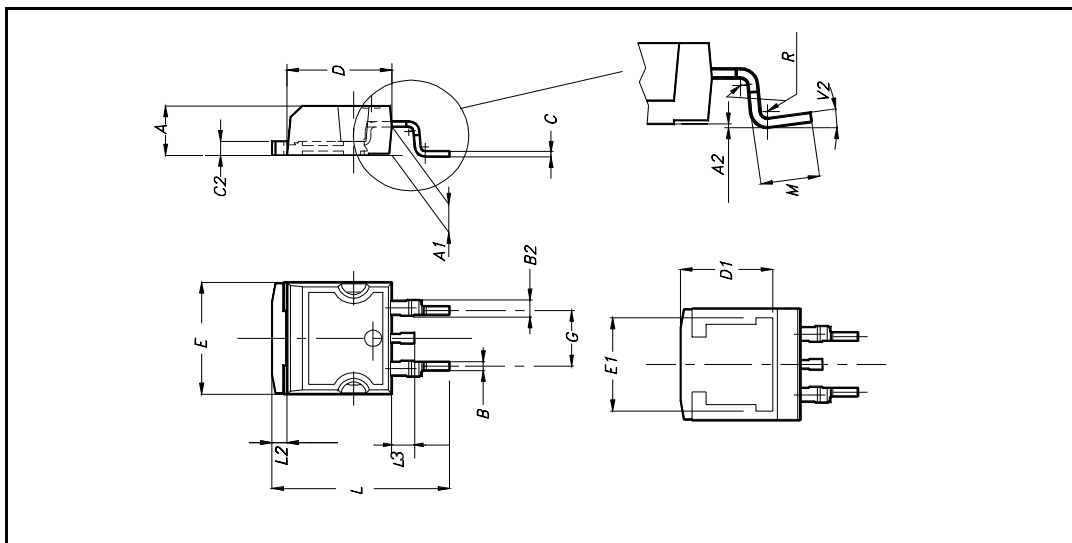
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

BASE QTY	BULK QTY
2500	2500

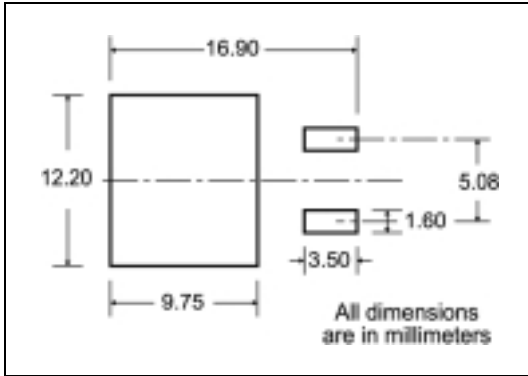
STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60 - STB8NM60

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
A2	0.03		0.23	0.001		0.009
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	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		4°			



D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

* on sales type

STP8NM60 - STP8NM60FP - STD5NM60 - STD5NM60-1 - STB8NM60 - STB8NM60

Table 10: Revision History

Date	Revision	Description of Changes
11-Apr-2005	2	Inserted D ² PAK.

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

All other names are the property of their respective owners

© 2005 STMicroelectronics - All Rights Reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America