



STP45NF06 STB45NF06

N-CHANNEL 60V - 0.022Ω - 38A TO-220/D²PAK
STripFET™II MOSFET

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP45NF06	60 V	< 0.028 Ω	38 A
STB45NF06	60 V	< 0.028 Ω	38 A

- TYPICAL R_{DS(on)} = 0.022Ω
- EXCEPTIONAL dv/dt CAPABILITY
- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED

DESCRIPTION

This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- SOLENOID AND RELAY DRIVERS
- DC-DC & DC-AC CONVERTERS

Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP45NF06	P45NF06	TO-220	TUBE
STB45NF06T4	B45NF06	D ² PAK	TAPE & REEL

Figure 1: Package

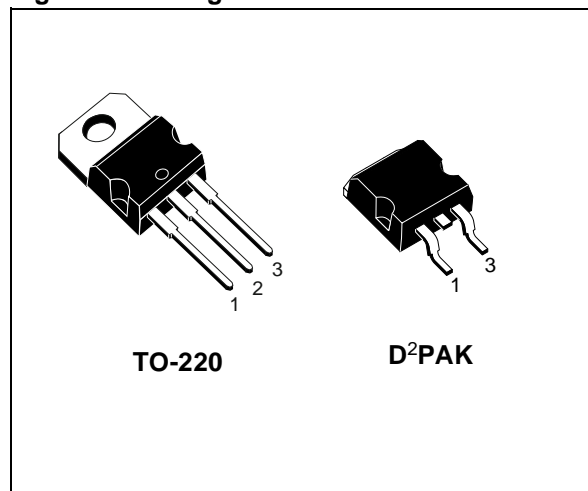


Figure 2: Internal Schematic Diagram

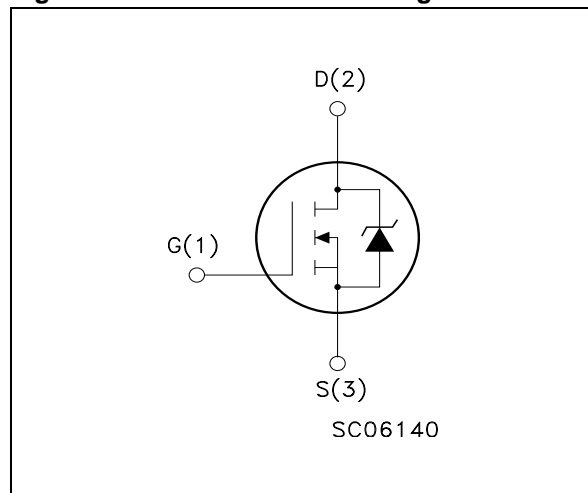


Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	60	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	60	V
V_{GS}	Gate- source Voltage	± 20	V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	38	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	26	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	152	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	80	W
	Derating Factor	0.53	W/ $^\circ\text{C}$
dv/dt (1)	Peak Diode Recovery voltage slope	7	V/ns
T_{stg}	Storage Temperature	-65 to 175	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	175	$^\circ\text{C}$

(\bullet) Pulse width limited by safe operating area

(1) $I_{SD} \leq 38\text{A}$, $di/dt \leq 300\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	1.87	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose	300	$^\circ\text{C}$

Table 5: Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	38	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{V}$)	135	mJ

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

Table 6: Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{V}$			± 100	nA

Table 7: On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{V}$, $I_D = 19\text{A}$		0.022	0.028	Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 8: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $I_D = 19\text{ A}$		24		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		1730 215 63		pF pF pF

Table 9: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30\text{V}$, $I_D = 19\text{A}$		20		ns
t_r	Rise Time	$R_G = 4.7\Omega$, $V_{GS} = 10\text{V}$ (see test circuit, Figure 3)		100		ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 48\text{V}$, $I_D = 38\text{A}$, $V_{GS} = 10\text{V}$		43 9 15	58	nC nC nC

Table 10: Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 30\text{V}$, $I_D = 19\text{A}$,		50		ns
t_f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10\text{V}$ (see test circuit, Figure 3)		20		ns
$t_{d(off)}$	Off-voltage Rise Time	$V_{clamp} = 48\text{V}$, $I_D = 38\text{A}$		45		ns
t_f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10\text{V}$		42		ns
t_c	Cross-over Time	(see test circuit, Figure 5)		60		ns

Table 11: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				38	A
I_{SDM} (1)	Source-drain Current (pulsed)				152	A
V_{SD} (2)	Forward On Voltage	$I_{SD} = 38\text{A}$, $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 38\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$,		95		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 100\text{V}$, $T_j = 150^\circ\text{C}$		260		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		5.5		A

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

(2) Pulse width limited by safe operating area.

Figure 3: Safe Operating Area

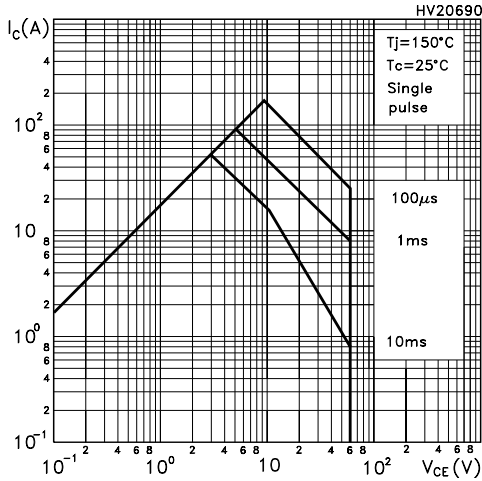


Figure 4: Output Characteristics

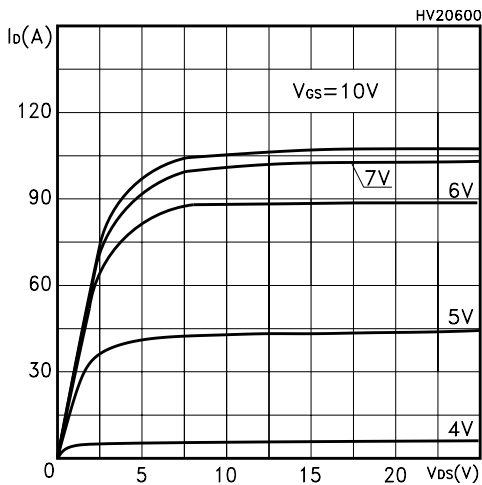


Figure 5: Transconductance

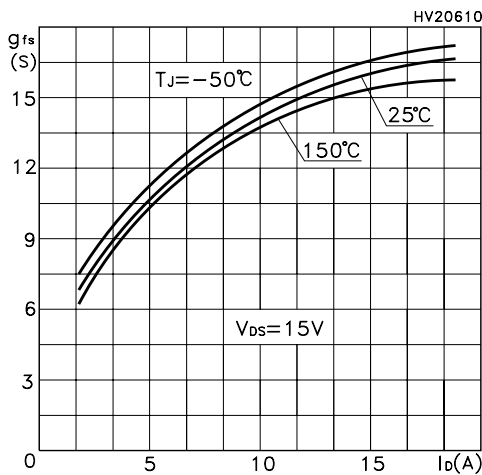


Figure 6: Thermal Impedance

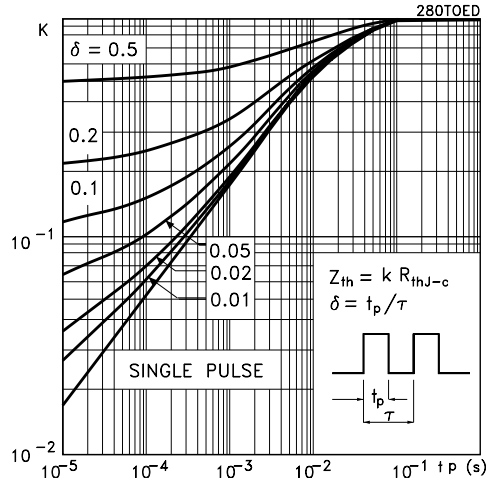


Figure 7: Transfer Characteristics

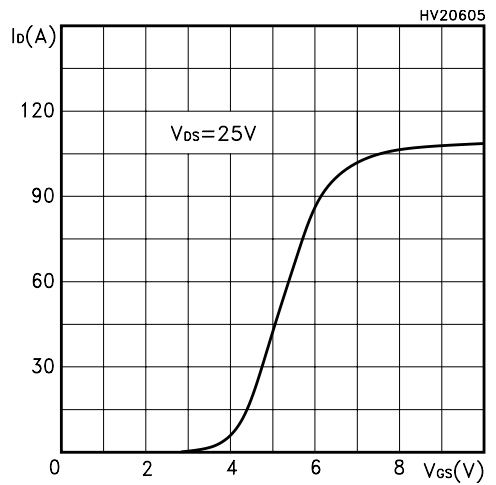


Figure 8: Static Drain-source On Resistance

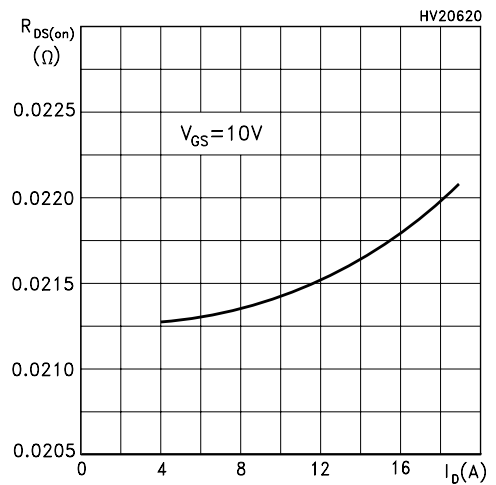


Figure 9: Gate Charge vs Gate-source Voltage

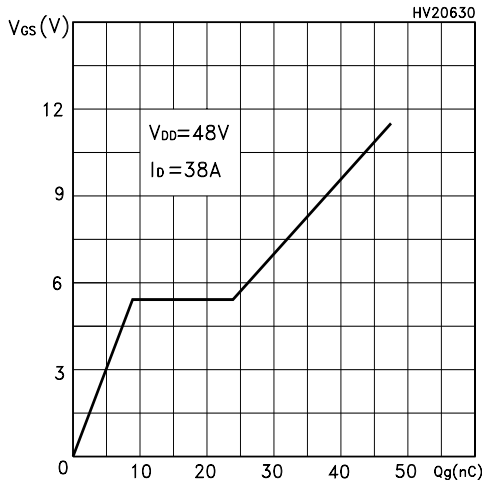


Figure 10: Normalized Gate Threshold Voltage vs Temperature

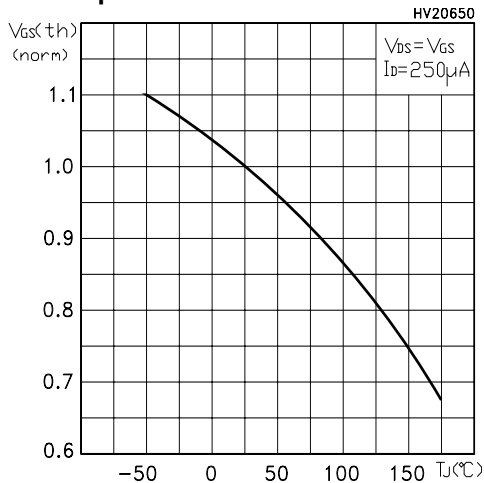


Figure 11: Dource-Drain Diode Forward Characteristics

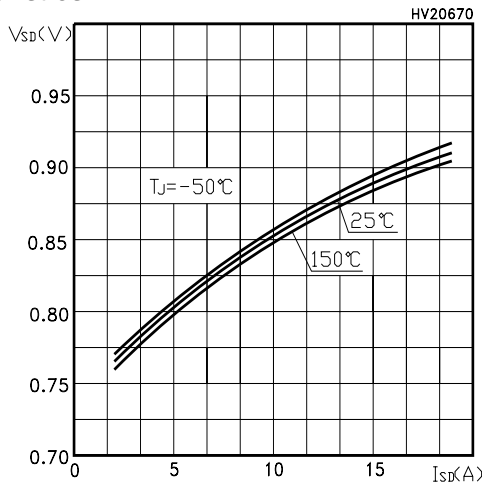


Figure 12: Capacitance Variations

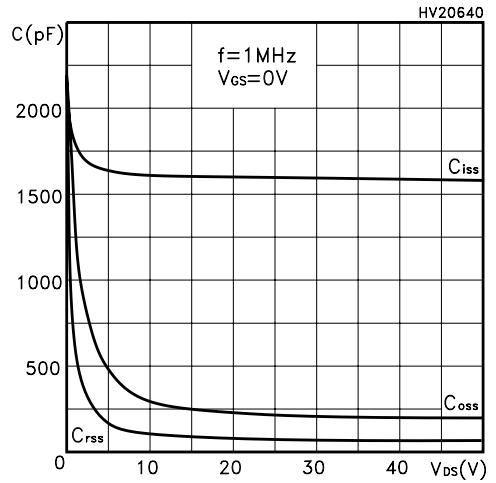


Figure 13: Normalized On Resistance vs Temperature

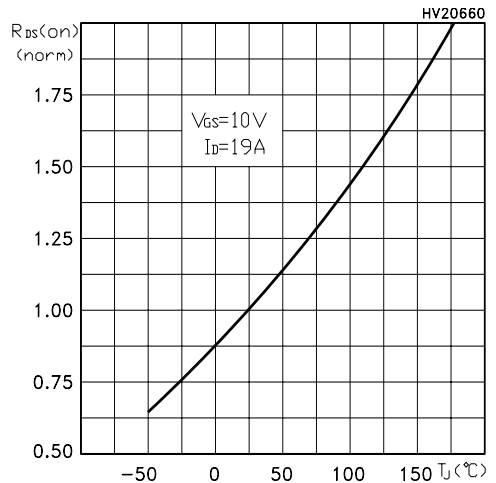


Figure 14: Normalized Breakdown Voltage vs Temperature

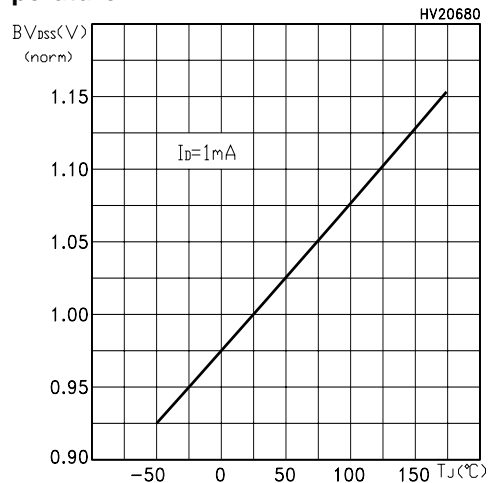


Figure 15: Unclamped Inductive Load Test Circuit

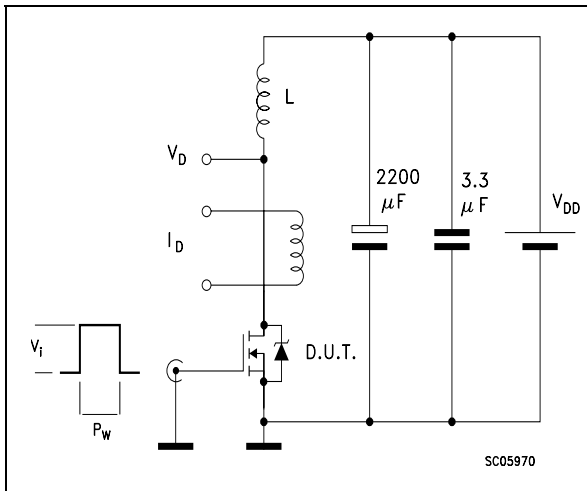


Figure 16: Switching Times Test Circuit For Resistive Load

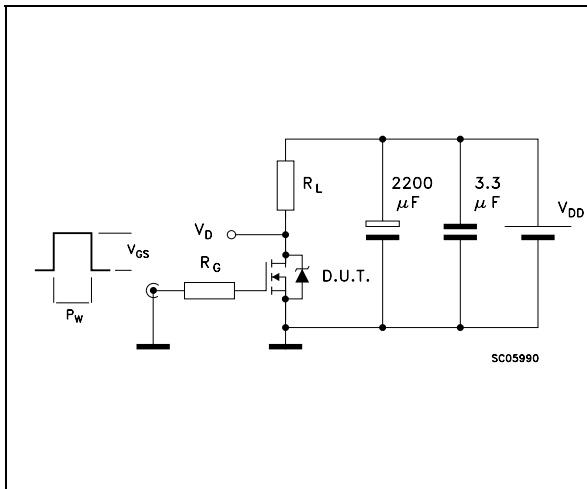


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

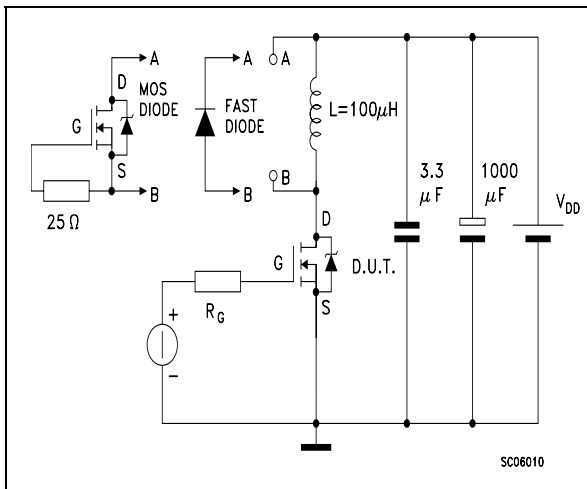


Figure 18: Unclamped Inductive Waferform

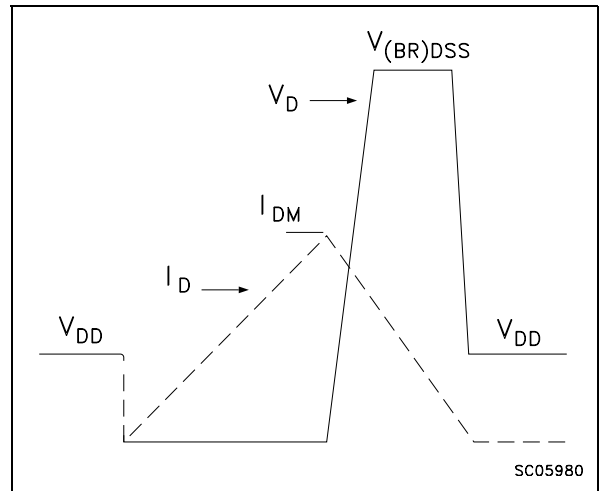


Figure 19: Gate Charge Test Circuit

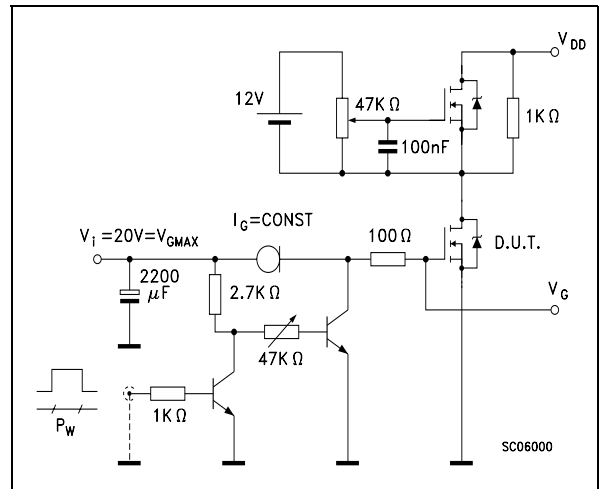
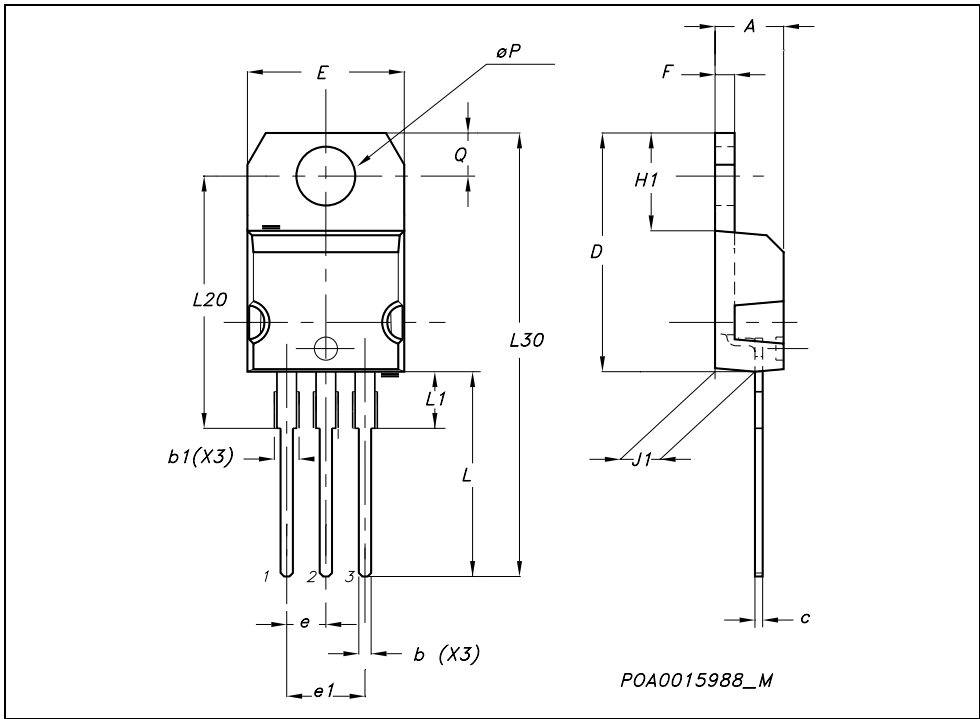


Table 12: Revision History

Date	Revision	Description of Changes
14-June-2004	2	New Stylesheet. No Content Change

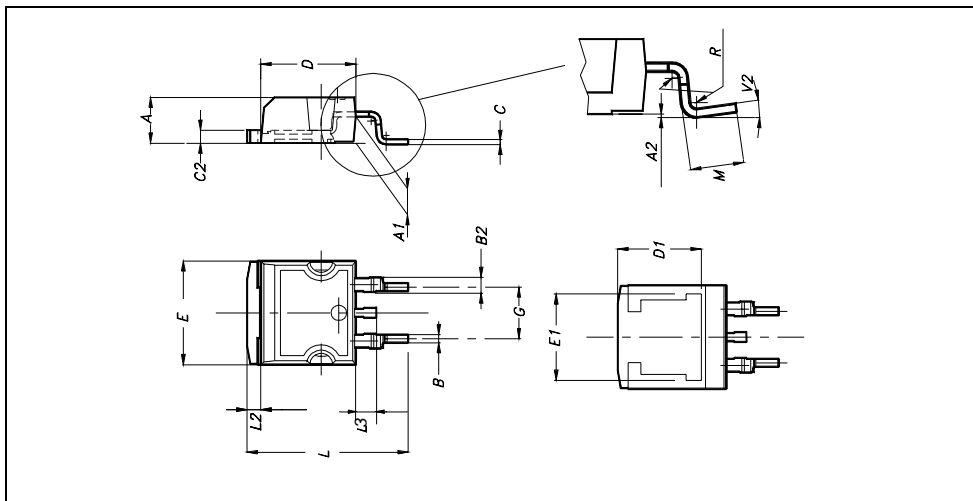
TO-220 MECHANICAL DATA

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



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°			



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