STP4N150
STW4N150

N-CHANNEL 1500V - 5Ω - 4A TO-220/TO-247
Very High Voltage PowerMESH™ MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D	Pw
STP4N150	1500 V	< 7 Ω	4 A	160 W
STW4N150	1500 V	< 7 Ω	4 A	160 W

- TYPICAL $R_{DS}(on)$ = 5 Ω
- AVALANCHE RUGGEDNESS
- GATE CHARGE MINIMIZED
- VERY LOW INTRINSIC CAPACITANCES
- HIGH SPEED SWITCHING

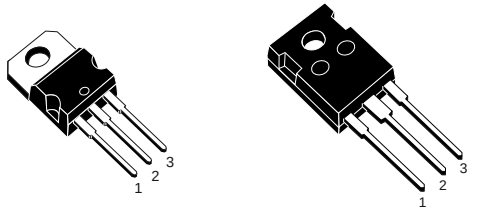
DESCRIPTION

Using the well consolidated high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of Power MOSFETs with outstanding performances. The strengthened layout coupled with the Company's proprietary edge termination structure, gives the lowest RDS(on) per area, unrivalled gate charge and switching characteristics.

APPLICATIONS

- SWITCH MODE POWER SUPPLIES

Figure 1: Package



TO-220 TO-247

Figure 2: Internal Schematic Diagram

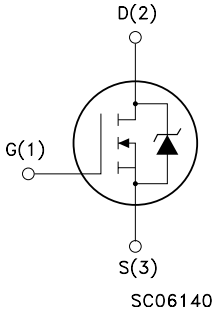


Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP4N150	P4N150	TO-220	TUBE
STW4N150	W4N150	TO-247	TUBE

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1500	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	1500	V
V_{GS}	Gate- source Voltage	± 30	V
I_D	Drain Current (continuous) at T_C = 25°C	4	A
I_D	Drain Current (continuous) at T_C = 100°C	2.5	A
I_{DM} (•)	Drain Current (pulsed)	12	A
P_{TOT}	Total Dissipation at T_C = 25°C	160	W
	Derating Factor	1	W/°C
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 150	°C

(●) Pulse width limited by safe operating area
(*) Limited only by maximum temperature allowed

Table 4: Thermal Data

		TO-220	TO-247	
Rthj-case	Thermal Resistance Junction-case Max	0.78		°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	50	°C/W

Table 5: Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	350	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 = 1 mA, V_{GS} = 0	1500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating,T_C = 125°C			10 500	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30 V			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V, I_D = 2 A		5	7	Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 7: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} = 30 V , I_D = 2 A		3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		1300 120 12		pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Delay Time Rise Time Turn-off-Delay Time Fall Time	V_{DD} = 750 V, I_D = 2 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 19)		35 30 45 45		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 600 V, I_D = 4 A, V_{GS} = 10 V (see Figure 22)		30 10 9	50	nC nC nC

Table 8: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				4 12	A A
V_{SD} (1)	Forward On Voltage	I_{SD} = 4 A, V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A, di/dt = 100 A/µs V_{DD} = 45V (see Figure 20)		510 3 12		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A, di/dt = 100 A/µs V_{DD} = 45V, T_j = 150°C (see Figure 20)		650 4 12.6		ns µC A

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

Figure 3: Safe Operating Area For TO-220

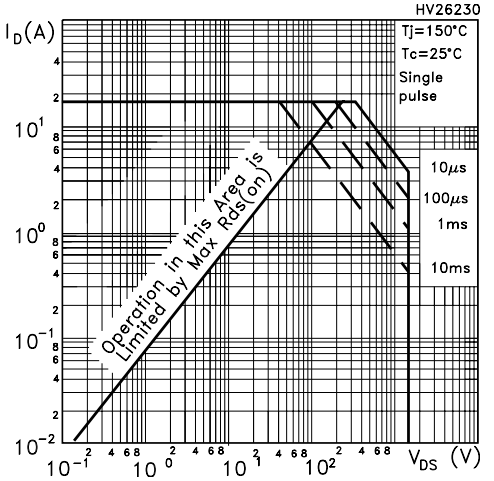


Figure 4: Safe Operating Area For TO-247

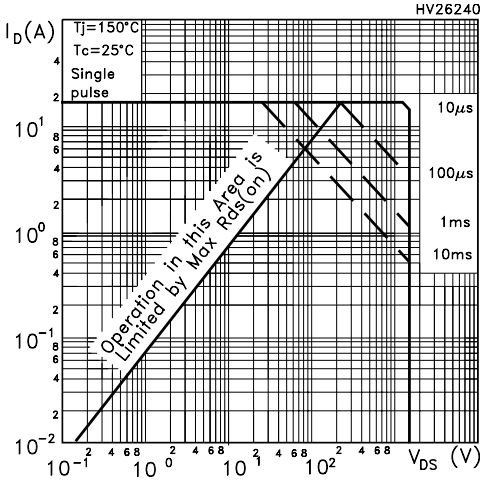


Figure 5: Output Characteristics

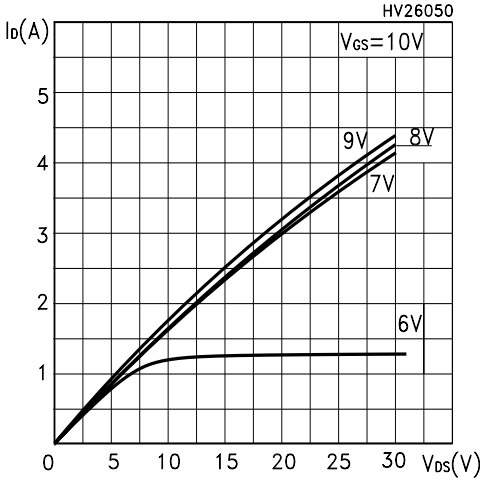


Figure 6: Thermal Impedance For TO-220

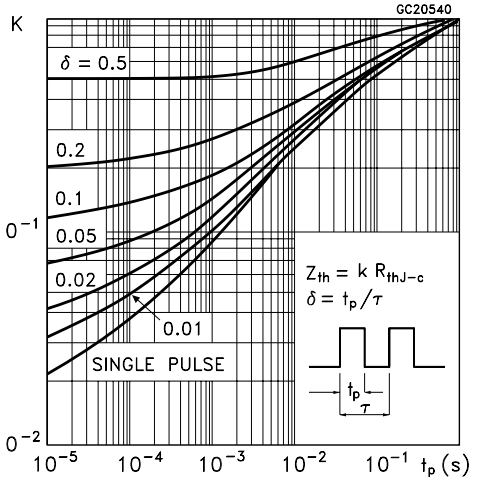


Figure 7: Thermal Impedance For TO-247

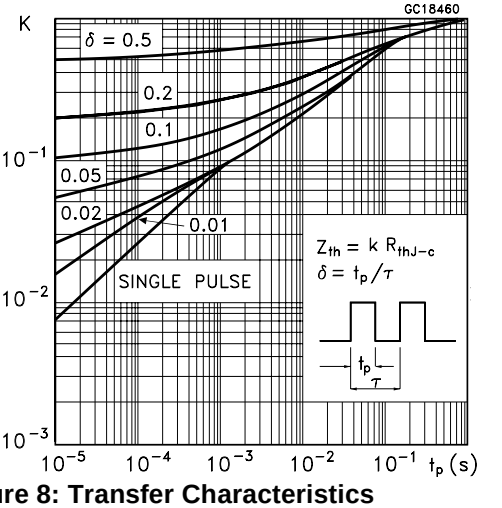


Figure 8: Transfer Characteristics

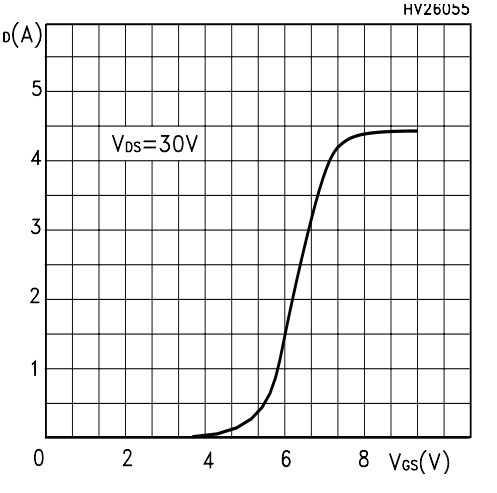


Figure 9: Transconductance

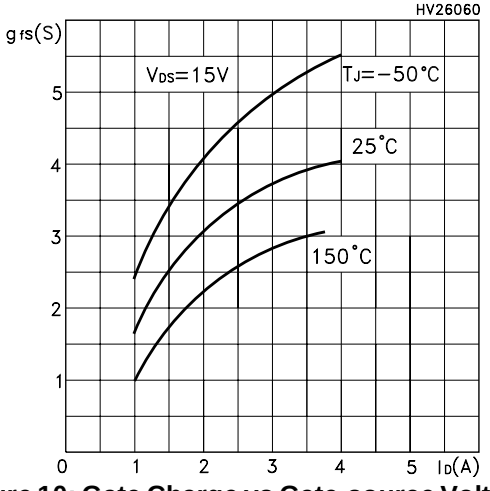


Figure 10: Gate Charge vs Gate-source Voltage

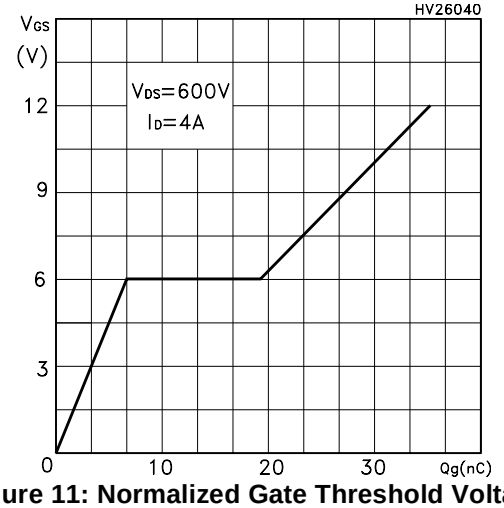


Figure 11: Normalized Gate Threshold Voltage vs Temperature

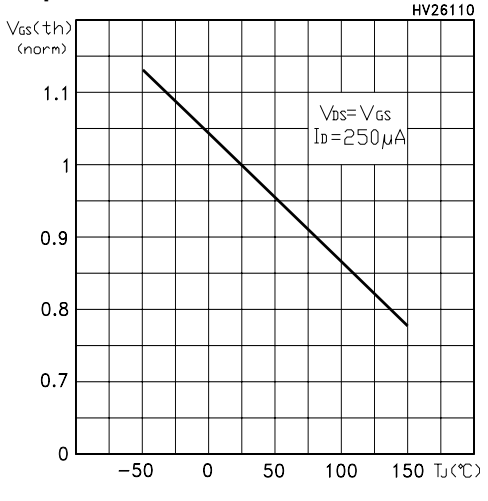


Figure 12: Static Drain-source On Resistance

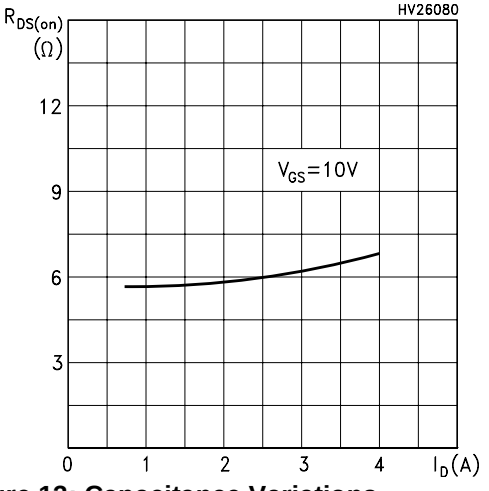


Figure 13: Capacitance Variations

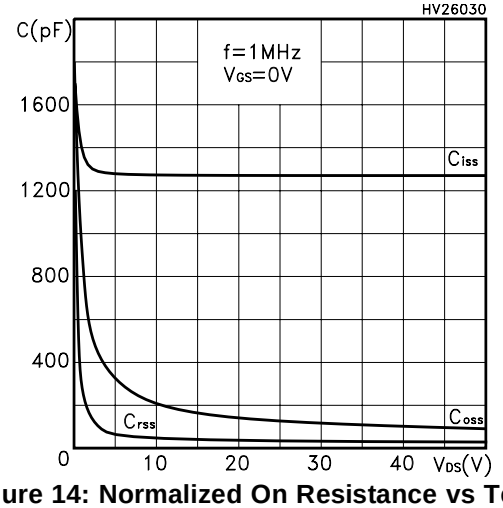


Figure 14: Normalized On Resistance vs Temperature

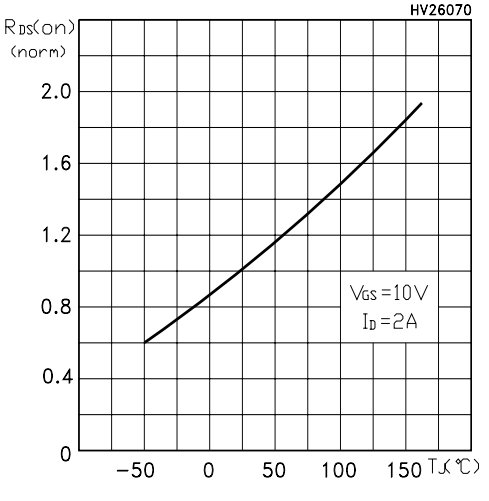


Figure 15: Source-Drain Forward Characteristics

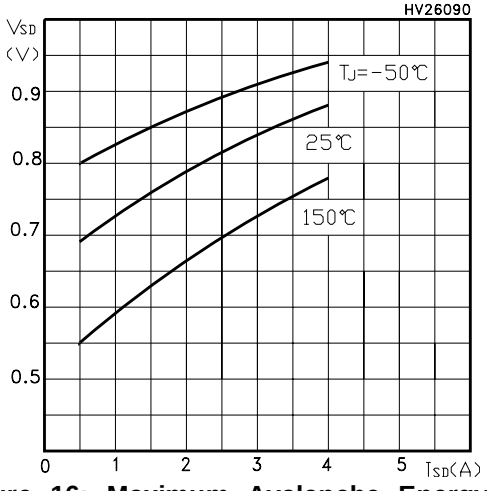


Figure 16: Maximum Avalanche Energy vs Temperature

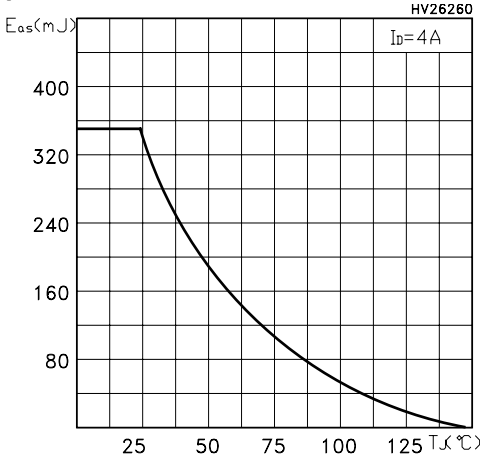


Figure 17: Normalized BVdss vs Temperature

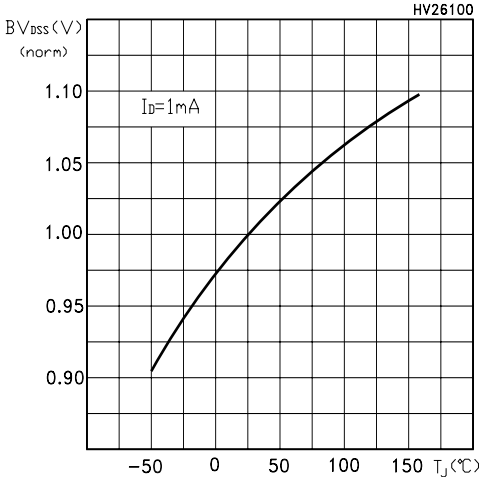


Figure 18: Unclamped Inductive Load Test Circuit

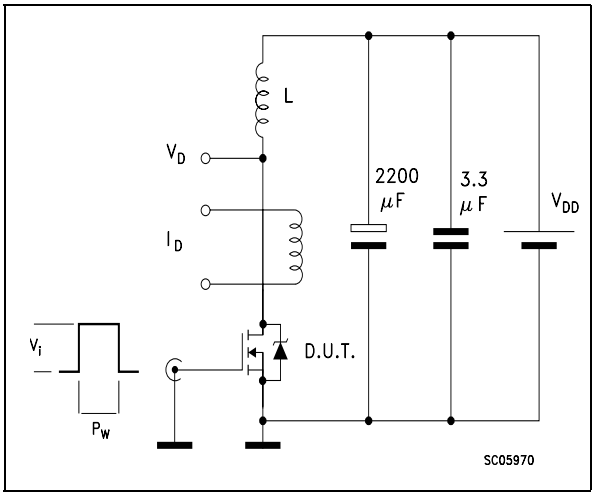


Figure 19: Switching Times Test Circuit For Resistive Load

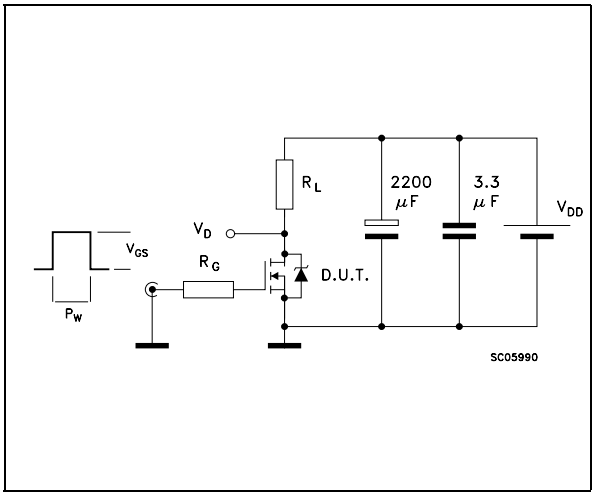


Figure 20: Test Circuit For Inductive Load Switching and Diode Recovery Times

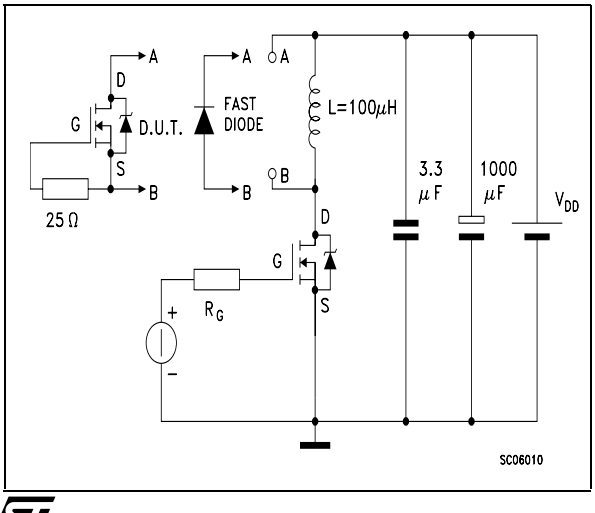


Figure 21: Unclamped Inductive Waveform

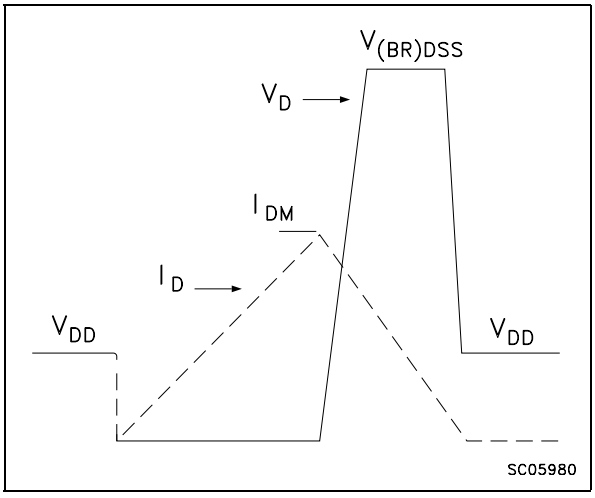
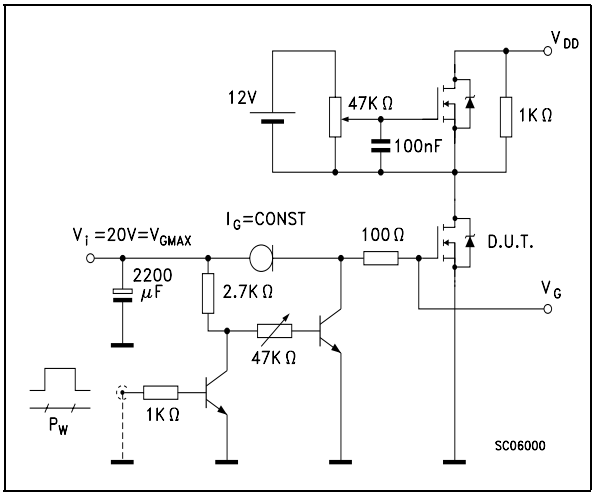
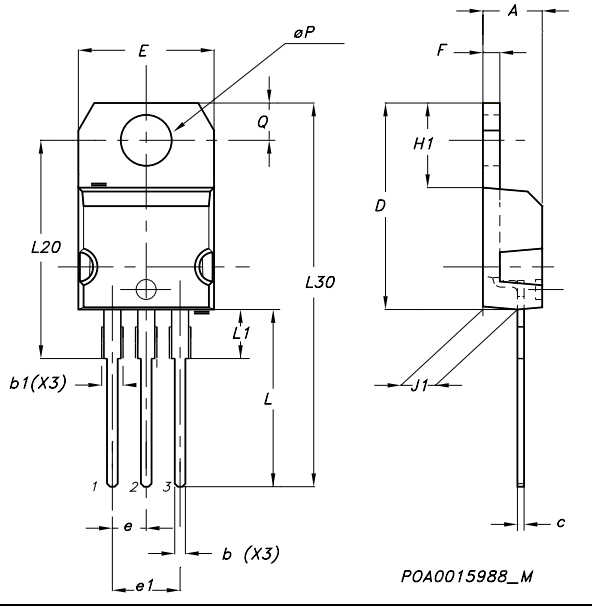


Figure 22: Gate Charge Test Circuit



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



TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	

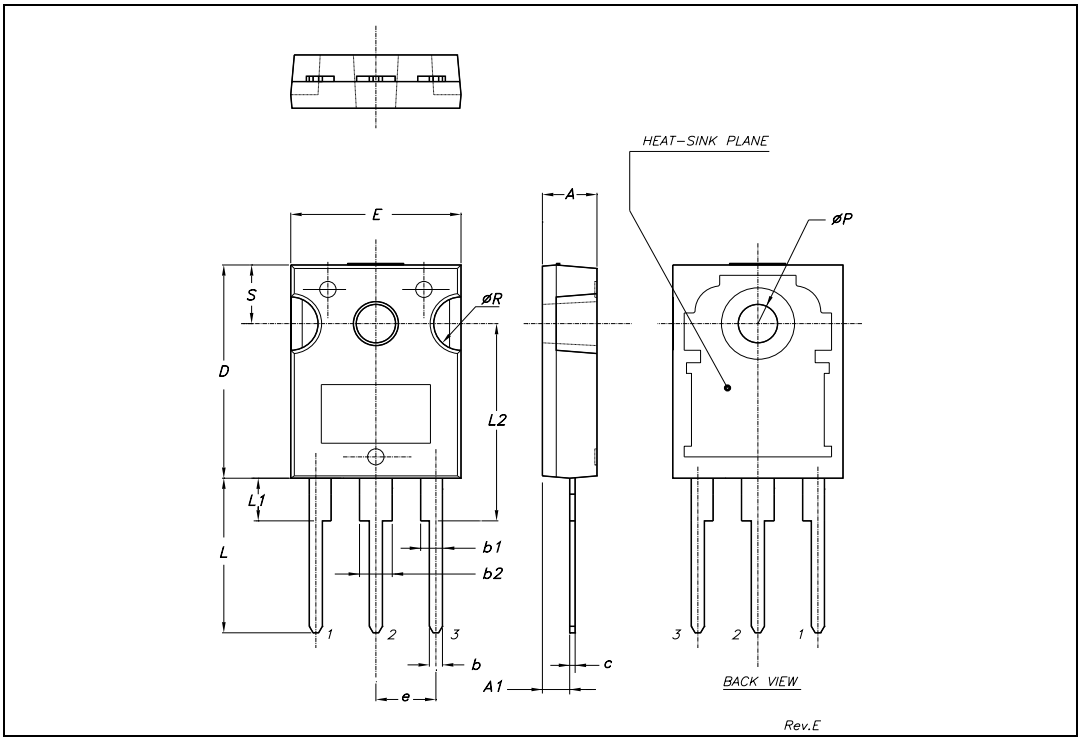


Table 9: Revision History

Date	Revision	Description of Changes
11-Mar-2005	1	First release.
27-Apr-2005	2	Removed TO-220FP
07-Jul-2005	3	Complete version