



STP50NE10

N-channel 100V - 0.021 Ω - 50A TO-220
STripFET™ Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D
STP50NE10	100V	<0.027 Ω	50A

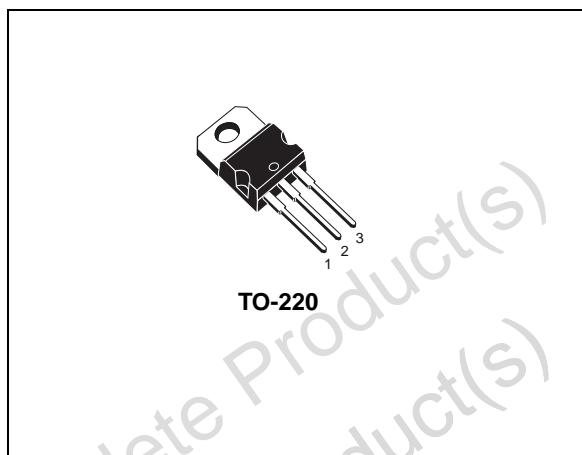
- Exceptional high dv/dt capability
- 100% avalanche tested
- Low gate charge at 100 °C
- Application oriented characterization

Description

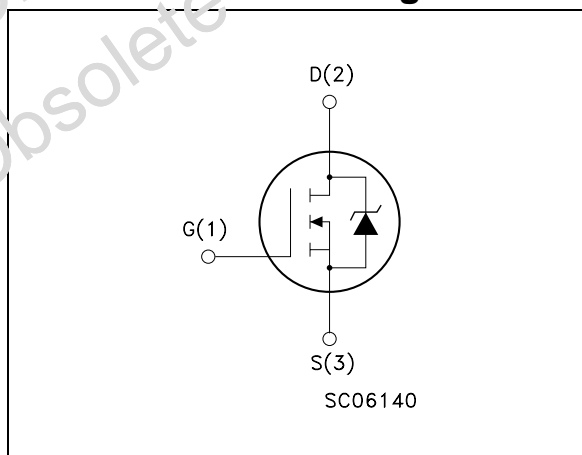
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STP50NE10	P50NE10	TO-220	Tube

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Obsolete Product(s) - Obsolete Product(s)
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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	100	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20K\Omega$)	100	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25^\circ C$	50	A
I_D	Drain current (continuous) at $T_C = 100^\circ C$	35	A
$I_{DM}^{(1)}$	Drain current (pulsed)	200	A
P_{TOT}	Total dissipation at $T_C = 25^\circ C$	180	W
	Derating factor	1	W/°C
$dv/dt^{(2)}$	Peak diode recovery voltage slope	6	V/ns
T_J	Operating junction temperature	175	°C
T_{stg}	Storage temperature	-65 to 175	°C

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 50A$, $di/dt \leq 300A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq T_{JM, X}$

Table 2. Thermal data

$R_{thj-case}$	Thermal resistance junction-case Max	1	°C/W
R_{thj-a}	Thermal resistance junction-ambient Max	62.5	°C/W
$R_{thc-sink}$	Thermal resistance case-sink typ	0.5	°C/W
T_L	Maximum lead temperature for soldering purpose	300	°C

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J Max)	50	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25^\circ C$, $I_D = I_{AR}$, $V_{DD} = 50V$)	300	mJ

2 Electrical characteristics

($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	100			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating @ } 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20V$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 25A$		0.021	0.027	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_D = 25A$	20	35		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		4350 5000 175	6000 675 238	pF pF pF
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 50V, I_D = 25A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		25 100	34 135	ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 80V, I_D = 50A$ $V_{GS} = 10V$		123 24 47	166	nC nC nC

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

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				6	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				24	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=50A, V_{GS}=0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=50A,$ $di/dt = 100A/\mu s,$ $V_{DD}=30V, T_j=150^\circ C$ (see Figure 14)		155 700 9		ns μC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

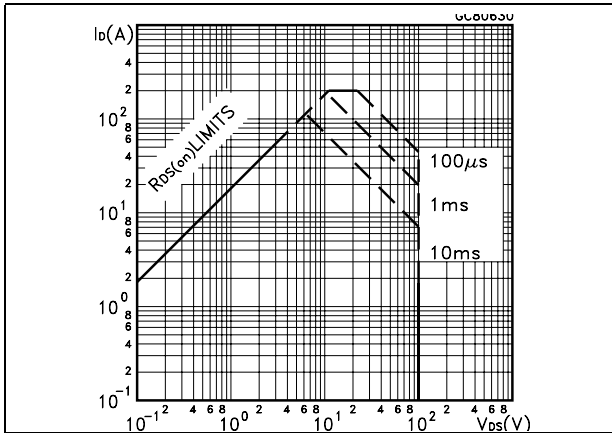


Figure 2. Thermal impedance

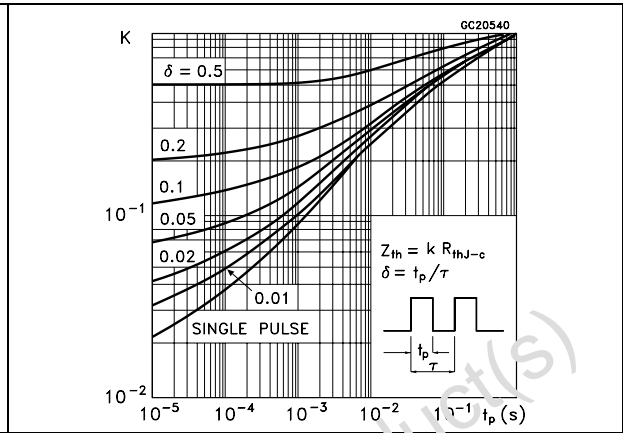


Figure 3. Output characteristics

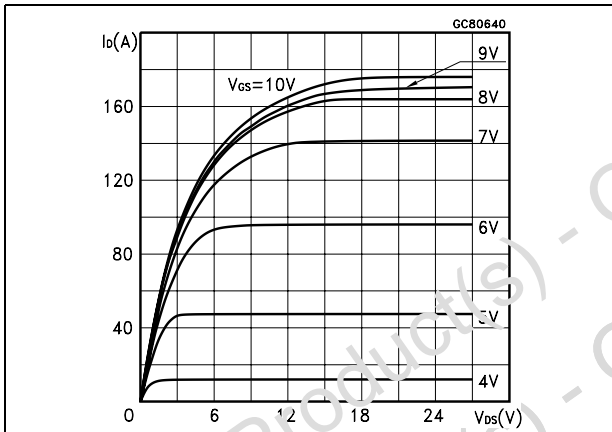


Figure 4. Transfer characteristics

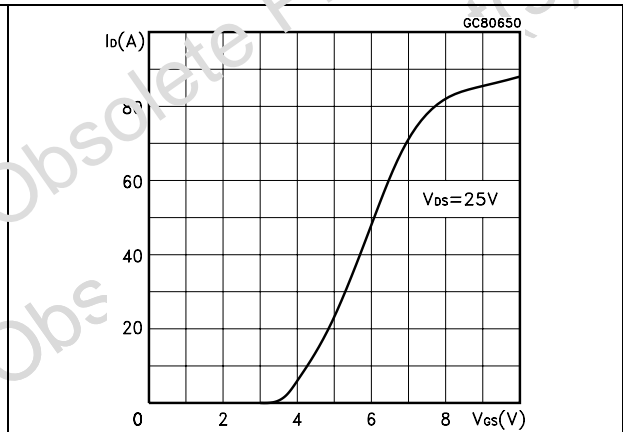


Figure 5. Transconductance

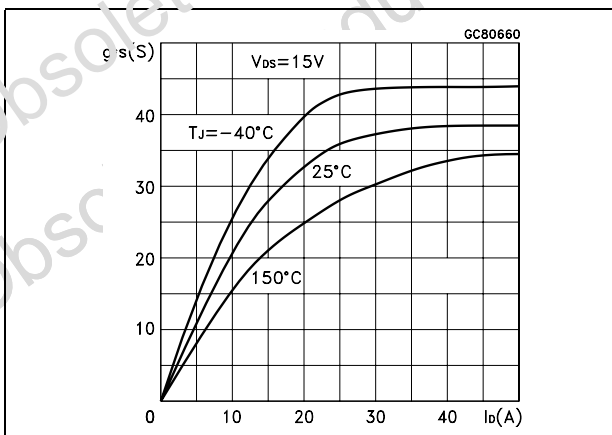


Figure 6. Static drain-source on resistance

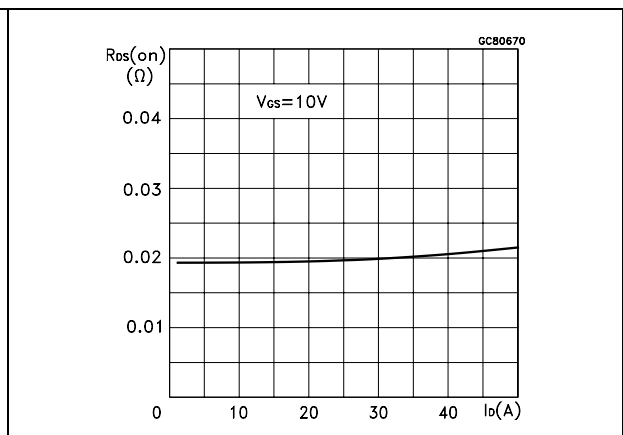


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

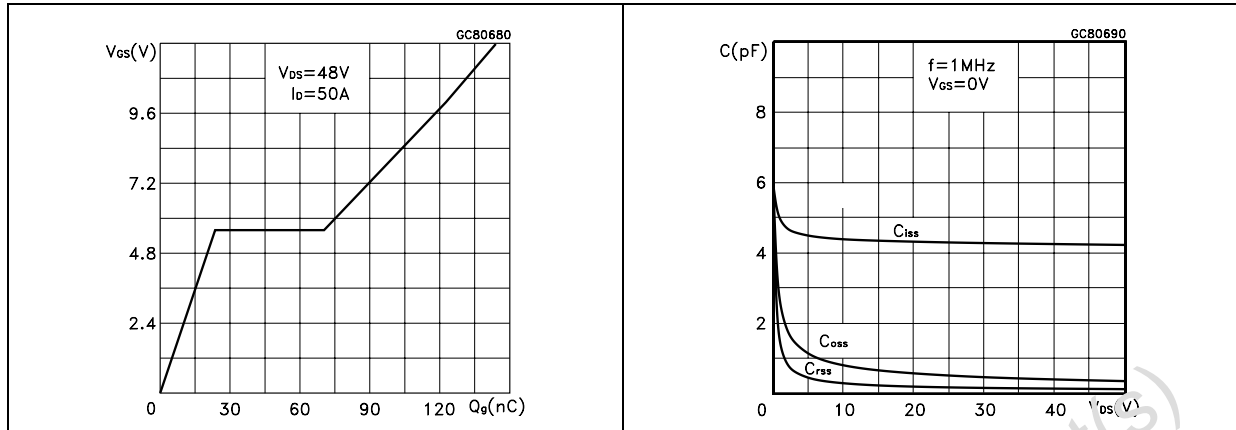


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

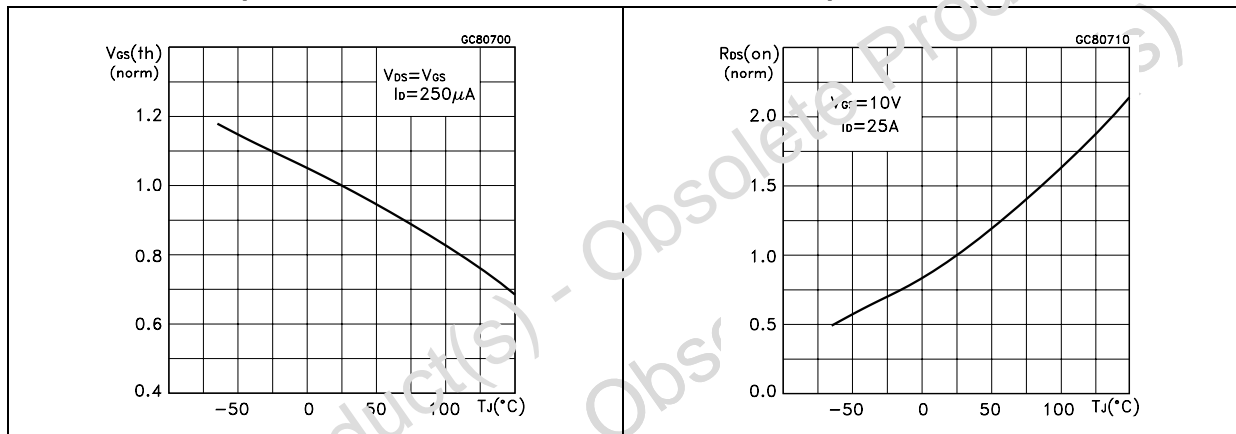
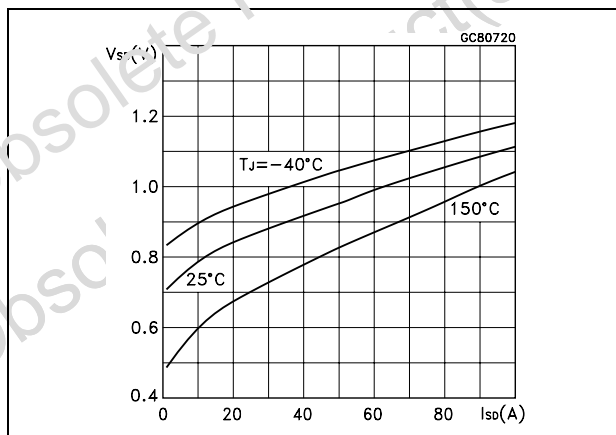


Figure 11. Source-drain diode forward characteristics



3 Test circuit

Figure 12. Switching times test circuit for resistive load

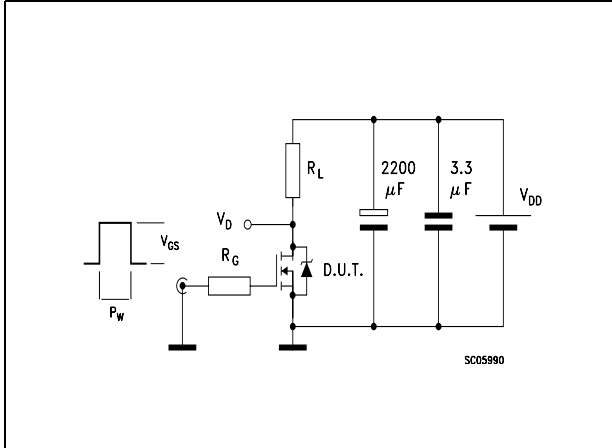


Figure 13. Gate charge test circuit

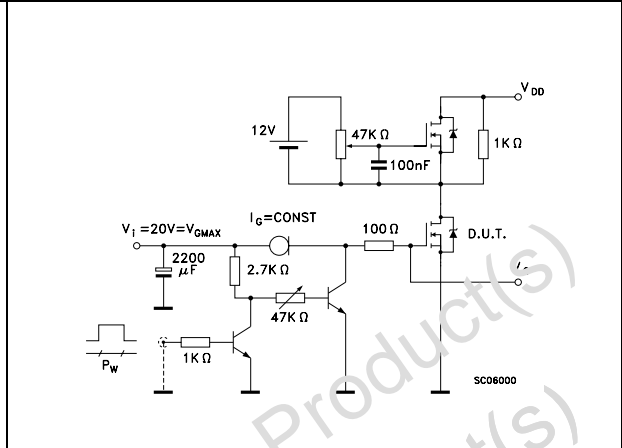


Figure 14. Test circuit for inductive load switching and diode recovery times

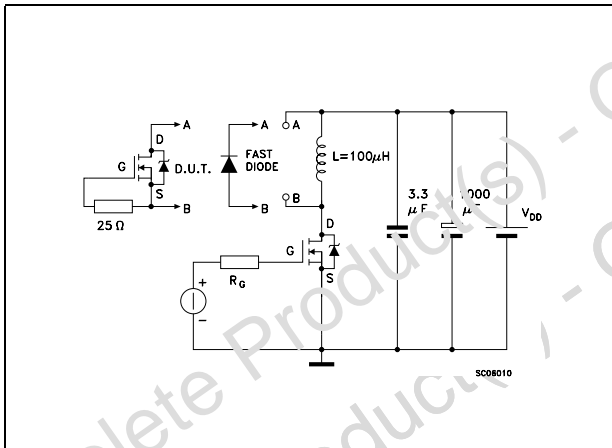


Figure 15. Unclamped Inductive load test circuit

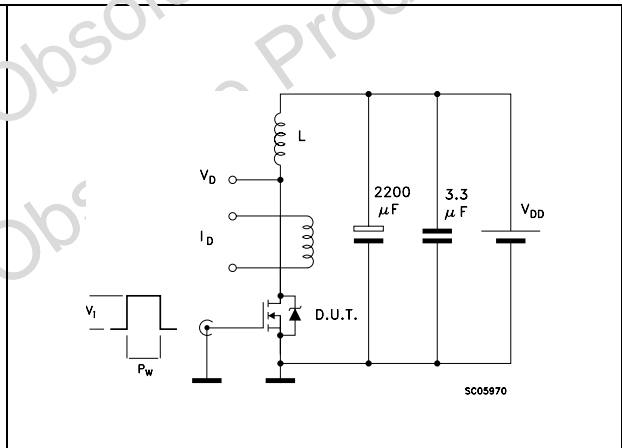


Figure 16. Unclamped inductive waveform

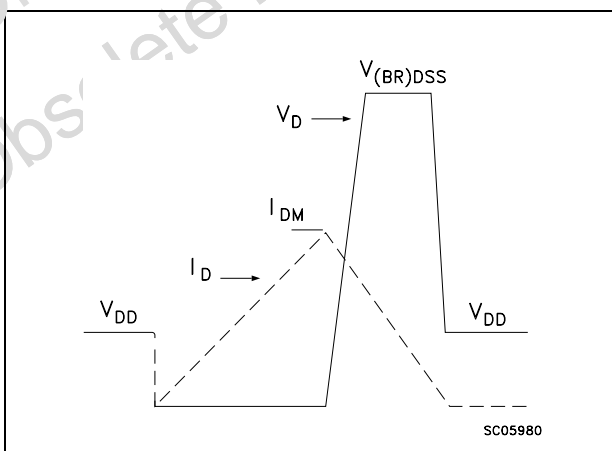
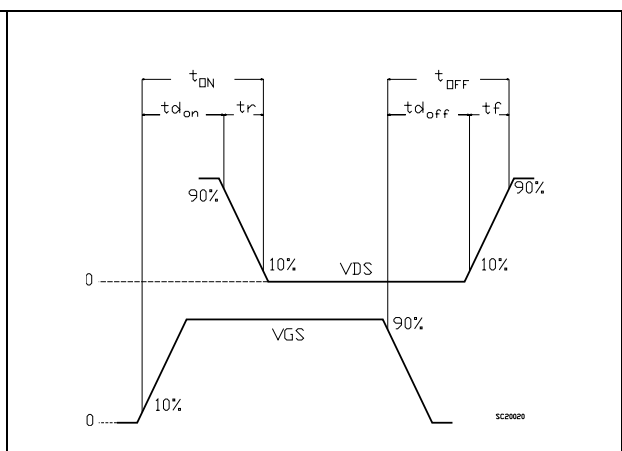


Figure 17. Switching time waveform



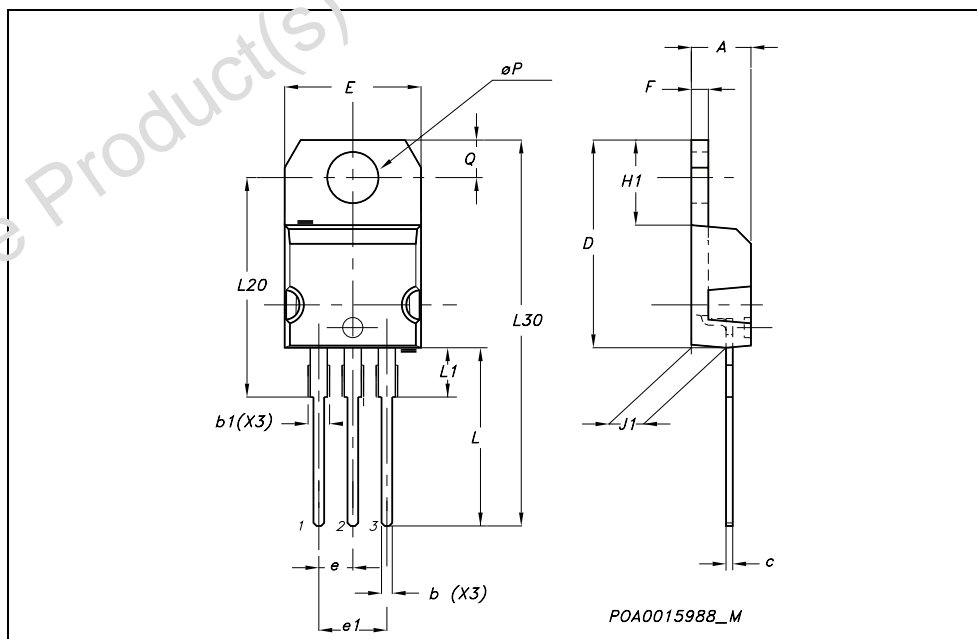
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

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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		2.55	0.104		0.116



5 Revision history

Table 7. Revision history

Date	Revision	Changes
09-Sep-2004	7	Complete version
10-Aug-2006	8	New template, no content change

Obsolete Product(s) - Obsolete Product(s)
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