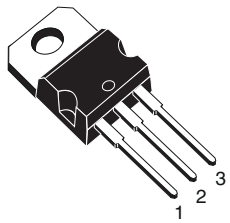
STP62NS04Z

N-channel clamped 12.5mΩ - 62A - TO-220
Fully protected MESH OVERLAY™ Power MOSFET

General features

Type	V_{DSS} (@Tjmax)	$R_{DS(on)}$	I_D
STP62NS04Z	Clamped	<0.015Ω	62A

- 100% avalanche tested
- Low capacitance and gate charge
- 175° C maximum junction temperature

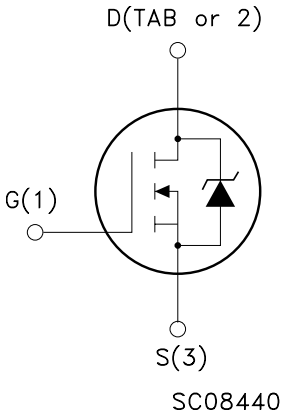


TO-220

Description

This fully clamped MOSFET is produced by using the latest advanced Company's Mesh Overlay process which is based on a novel strip layout. The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitable for the harshest operation conditions such as those encountered in the automotive environment. Any other application requiring extra ruggedness is also recommended.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STP62NS04Z	P62NS04Z	TO-220	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	Clamped	V
V_{GS}	Gate-source voltage	Clamped	V
I_D	Drain current (continuous) at T_C = 25°C	62	A
I_D	Drain current (continuous) at T_C=100°C	37.5	A
I_{DG}	Drain gate current (continuous)	± 50	
I_{GS}	Gate sourcecurrent (continuous)	± 50	
I_{DM} (1)	Drain current (pulsed)	248	A
P_{TOT}	Total dissipation at T_C = 25°C	110	W
	Derating factor	0.74	W/°C
dv/dt (2)	Peak diode recovery voltage slope	8	V/ns
E_{AS} (3)	Single Pulse Avalanche Energy	500	mJ
V_{ESD}	ESD (HBM - C = 100pF, R = 1.5 kΩ)	8	V
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	°C

1. Pulse width limited by safe operating area
2. I_{SD} ≤40A, di/dt ≤100A/µs, V_{DD} ≤$V_{(BR)DSS}$, T_j ≤T_{JMAX}
3. Starting T_J = 25 °C, I_D = 20A, V_{DD} = 20V

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case Max	1.36	°C/W
R_{thJA}	Thermal resistance junction-ambient Max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS}= 0	33			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 16V			10	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±10V			10	µA
V_{GSS}	Gate-Source Breakdown Voltage	I_{GS} = 100 µA	18			V
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 30A		12.5	15	mΩ

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15V, I_D = 30A		20		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25V, f = 1 MHz, V_{GS} = 0		1330 420 135		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 20V, I_D = 40A V_{GS} =10V		34 10 11.5	47	nC nC nC

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

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD}= 20V, I_D= 20A, R_G=4.7Ω, V_{GS} = 10V *Figure 13 on page 8*		13 104 41 42		ns ns ns ns
$t_{r(Voff)}$ t_f t_c	Off-voltage rise time Fall time Cross-over time	V_{clamp} = 30V, I_D = 40A R_G = 4.7Ω, V_{GS} = 10V *Figure 13 on page 8*		30 54 90		ns ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				62	A
I_{SDM}(1)	Source-drain current (pulsed)				248	A
V_{SD}(2)	Forward on voltage	I_{SD} = 62A, V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 40A, di/dt = 100A/µs, V_{DD} = 20V, T_J = 150°C *Figure 15 on page 8*		45 65 2.9		ns µC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

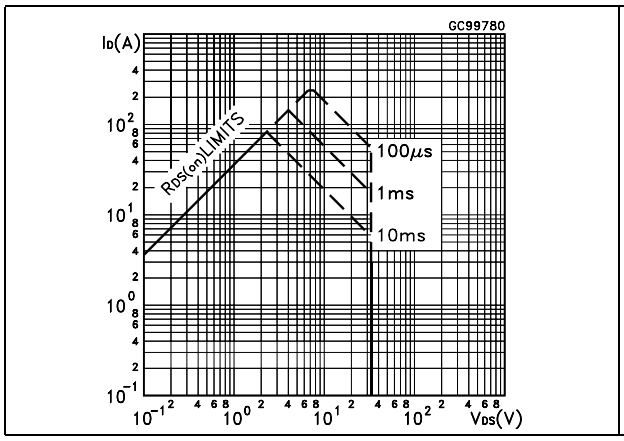


Figure 2. Thermal impedance

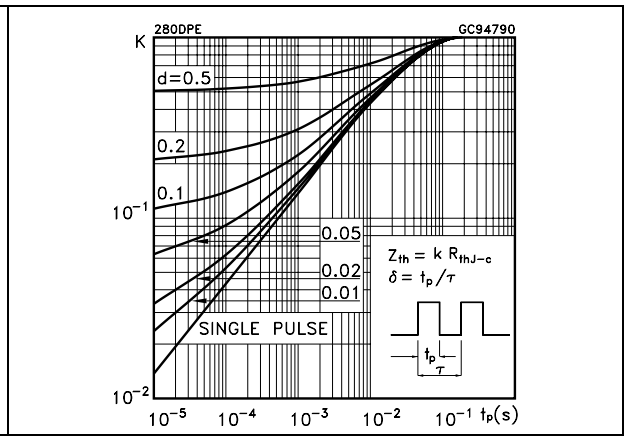


Figure 3. Output characterisics

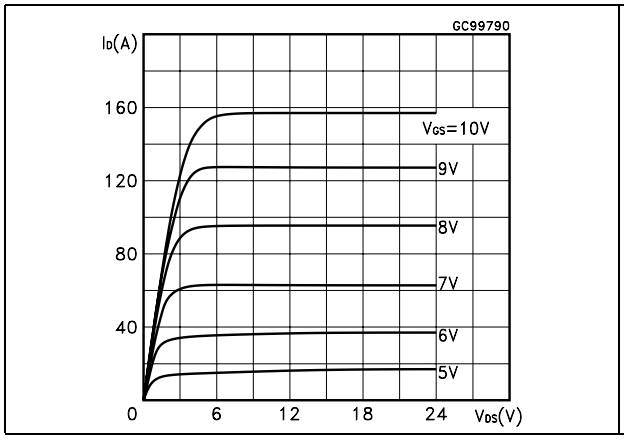


Figure 4. Transfer characteristics

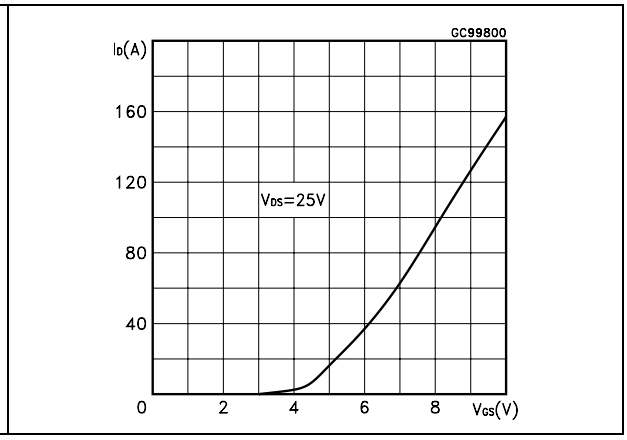


Figure 5. Transconductance

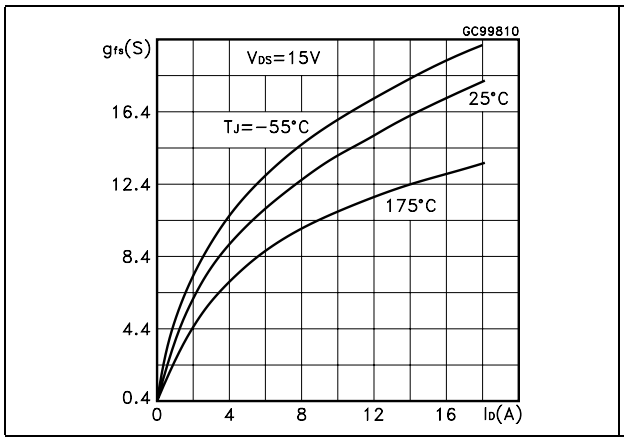


Figure 6. Static drain-source on resistance

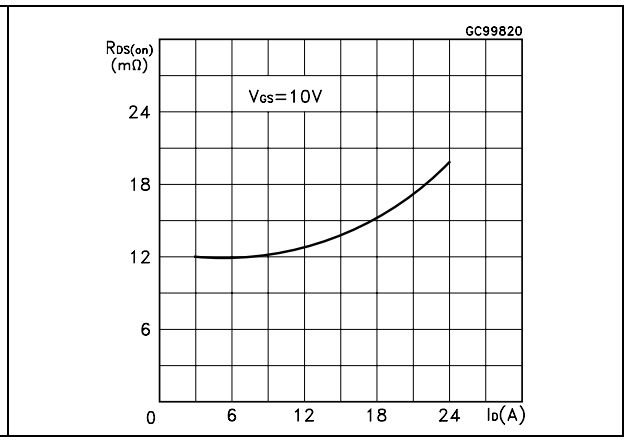


Figure 7. Gate charge vs gate-source voltage

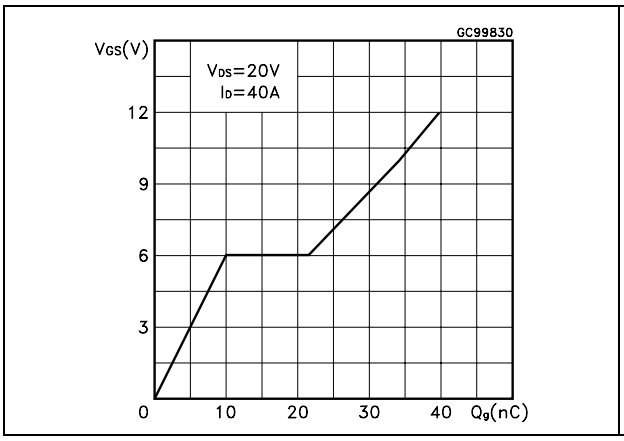


Figure 8. Capacitance variations

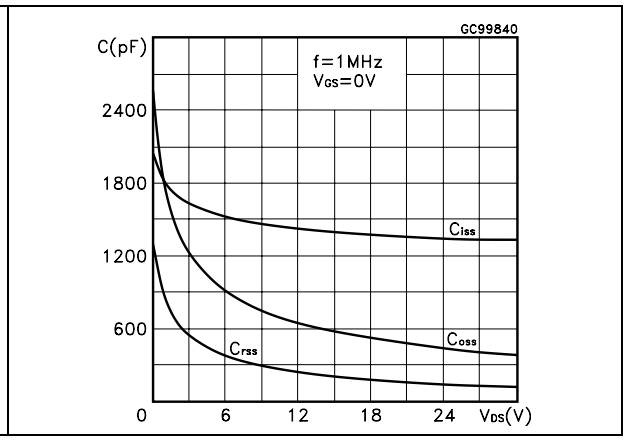


Figure 9. Normalized gate threshold voltage vs temperature

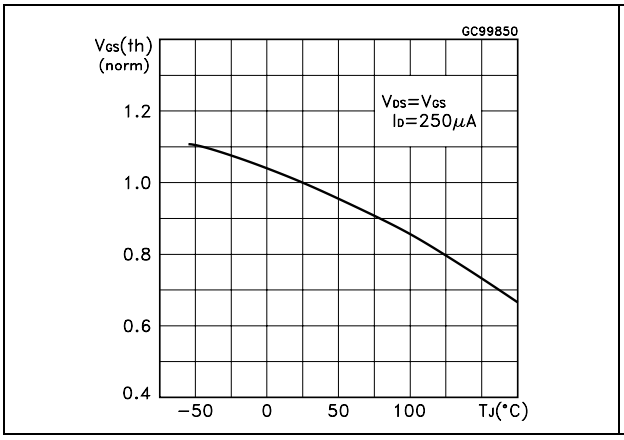


Figure 10. Normalized on resistance vs temperature

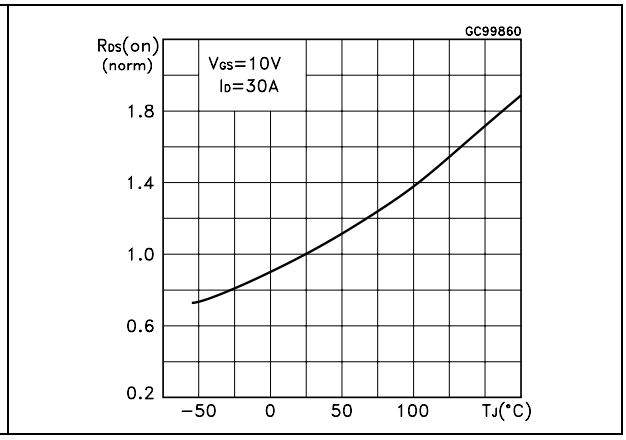


Figure 11. Source-drain diode forward characteristics

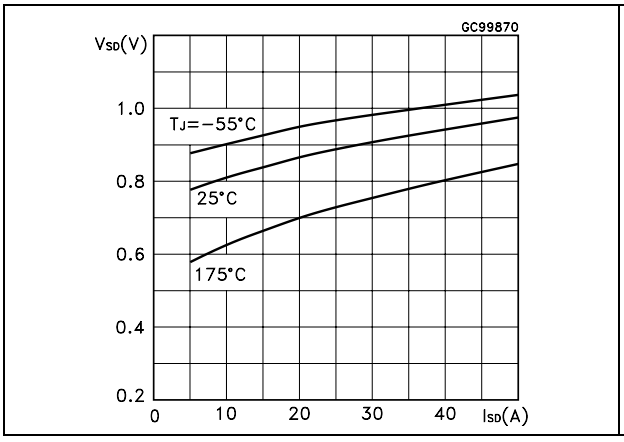
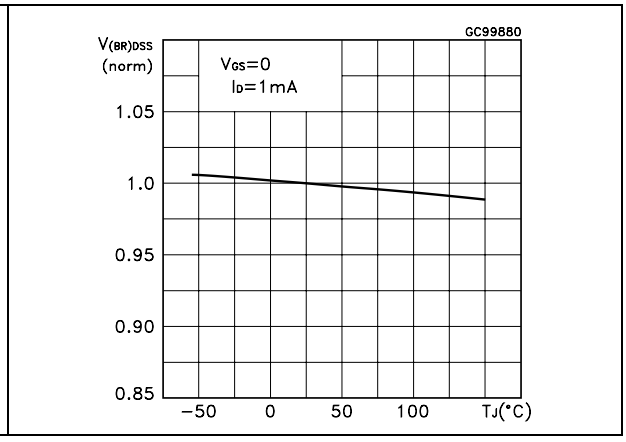


Figure 12. Normalized B_{VDSS} vs temperature



3 Test circuit

Figure 13. Switching times test circuit for resistive load

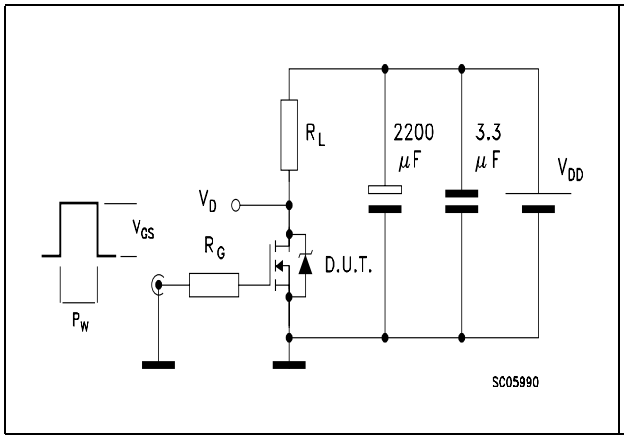


Figure 14. Gate charge test circuit

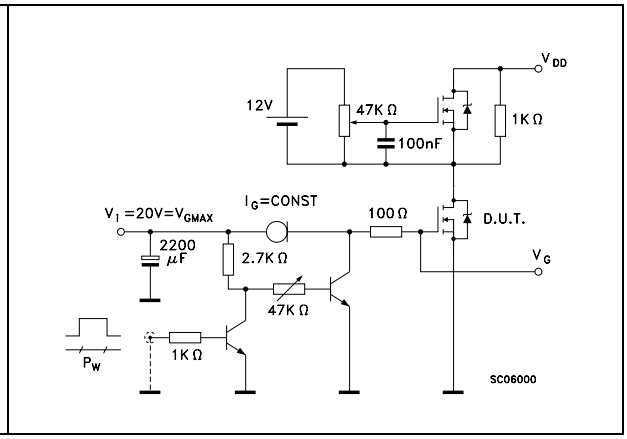


Figure 15. Test circuit for inductive load switching and diode recovery times

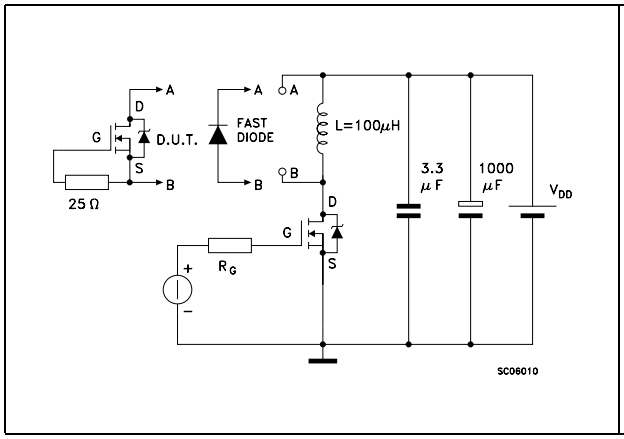


Figure 16. Unclamped Inductive load test circuit

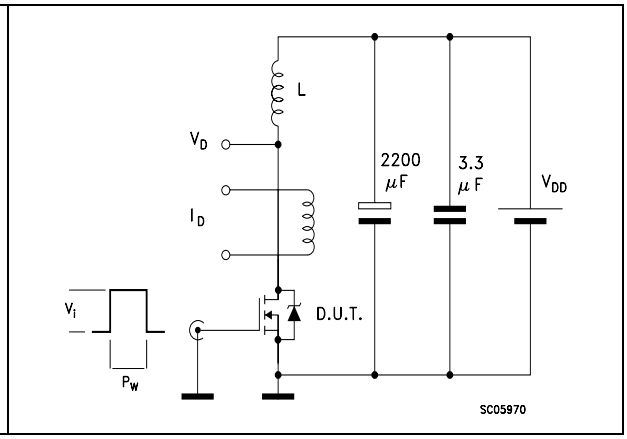
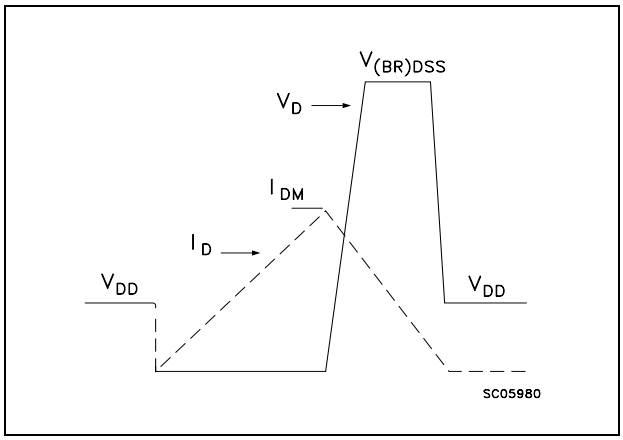


Figure 17. Unclamped inductive waveform

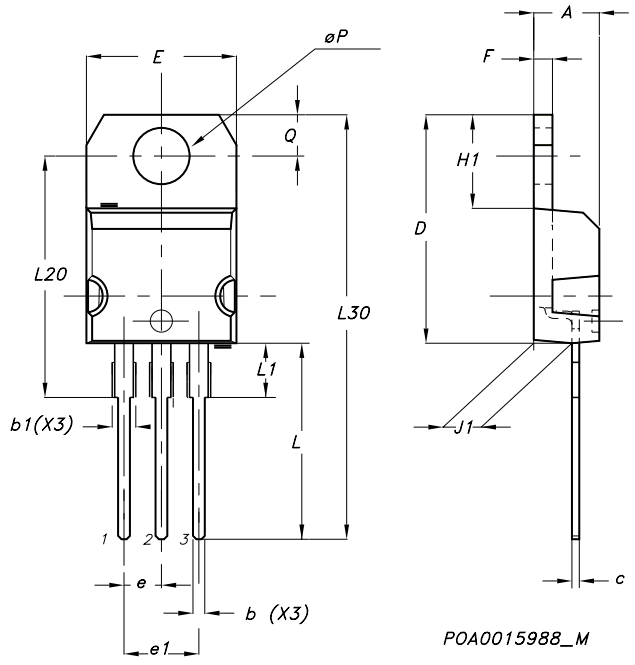


4 Package mechanical data

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

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



5 Revision history

Table 7. Revision history

Date	Revision	Changes
21-Jun-2004	2	Preliminary datasheet
22-Aug-2005	3	Complete document with curves
21-Jan-2006	4	New ECOPAK label
02-Oct-2006	5	New template, no content change

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