



STB55NF06, STP55NF06, STP55NF06FP

N-channel 60 V, 0.015 Ω , 50 A STripFET™ II Power MOSFET in D²PAK, TO-220 and TO-220FP packages

Datasheet — production data

Features

Order code	V _{DSS}	R _{DS(on)} max.	I _D
STB55NF06	60 V	< 0.018 Ω	50 A
STP55NF06			50 A ⁽¹⁾
STP55NF06FP			50 A ⁽¹⁾

1. Refer to soa for the max allowable current value on FP-type due to R_{th} value

- 100% avalanche tested
- Exceptional dv/dt capability

Applications

- Switching application

Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

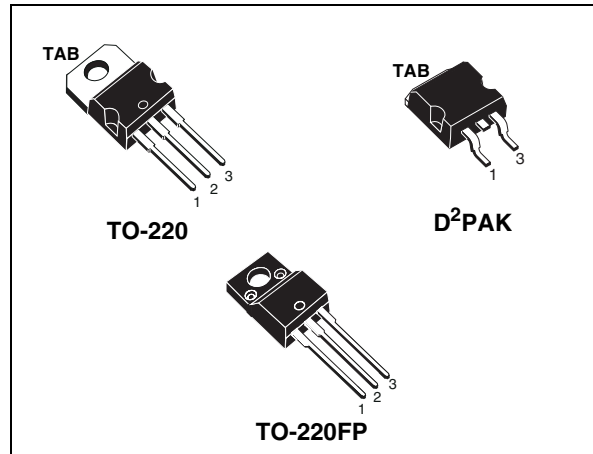
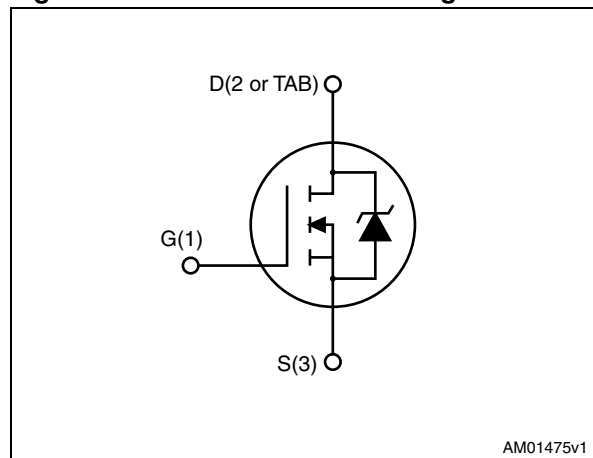


Figure 1. Internal schematic diagram



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Table 1. Device summary

Order code	Marking	Package	Packaging
STB55NF06	B55NF06	D ² PAK	Tape and reel
STP55NF06	P55NF06	TO-220	Tube
STP55NF06FP	P55NF06FP	TO-220	

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220, D ² PAK	TO-220FP	
V _{DS}	Drain-source voltage	60		V
V _{GS}	Gate- source voltage	± 20		V
I _D	Drain current (continuous) at T _C = 25 °C	50	50 ⁽¹⁾	A
I _D	Drain current (continuous) at T _C = 100 °C	35	35 ⁽¹⁾	A
I _{DM} ⁽²⁾	Drain current (pulsed)	200	200 ⁽¹⁾	A
P _{tot}	Total dissipation at T _C = 25 °C	110	30	W
	Derating factor	0.73	0.20	W/°C
E _{AS} ⁽³⁾	Single pulse avalanche energy	340		mJ
dv/dt ⁽⁴⁾	Peak diode recovery voltage slope	7		V/ns
V _{ISO}	Insulation withstand voltage (DC)		2500	V
T _{stg}	Storage temperature	-55 to 175		°C
T _j	Max. operating junction temperature			

1. Refer to soa for the max allowable current value on FP-type due to R_{th} value
2. Pulse width limited by safe operating area.
3. Starting T_j = 25 °C, V_{DD} = 30 V, I_D = 25 A
4. I_{SD} ≤ 50 A, di/dt ≤ 400 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

Table 3. Thermal data

Symbol	Parameter	Value			Unit
		D ² PAK	TO-220	TO-220FP	
R _{thj-case}	Thermal resistance junction-case max	1.36		5	°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5			°C/W

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60 \text{ V}$ $V_{DS} = 60 \text{ V}$, @ $T_J = 125^{\circ}\text{C}$			1 10	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$			± 100	nA
$V_{GS(th)}$	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	$V_{GS} = 10 \text{ V}$, $I_D = 27.5 \text{ A}$		0.015	0.018	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$, $f = 1\text{MHz}$, $V_{GS} = 0$	-	1300		pF
C_{oss}	Output capacitance			300		pF
C_{rss}	Reverse transfer capacitance			105		pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30 \text{ V}$, $I_D = 27.5 \text{ A}$ $R_G = 4.7 \Omega$, $V_{GS} = 10 \text{ V}$ (see Figure 15)	-	20		ns
t_r	Rise time			50		ns
$t_{d(off)}$	Turn-off delay time			36		ns
t_f	Fall time			15		ns
Q_g	Total gate charge	$V_{DD} = 48 \text{ V}$, $I_D = 55 \text{ A}$, $V_{GS} = 10 \text{ V}$ (see Figure 16)	-	44.5	60	nC
Q_{gs}	Gate-source charge			10.5		nC
Q_{gd}	Gate-drain charge			17.5		nC

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		50 200	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 50 \text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 50 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 30 \text{ V}$, $T_j = 150 \text{ }^\circ\text{C}$ (see Figure 17)	-	75 170 4.5		ns nC 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 2. Safe operating area for TO-220, D²PAK

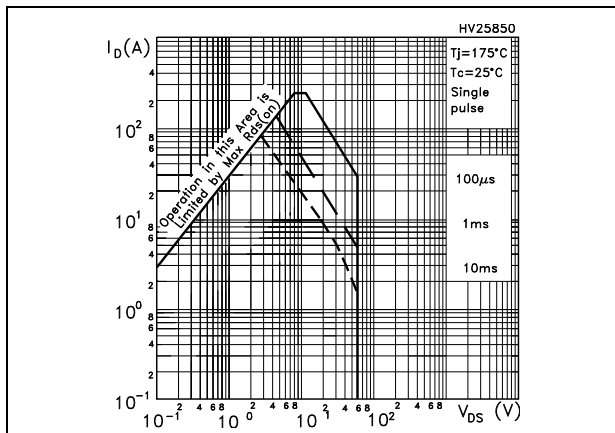


Figure 3. Thermal impedance for TO-220, D²PAK

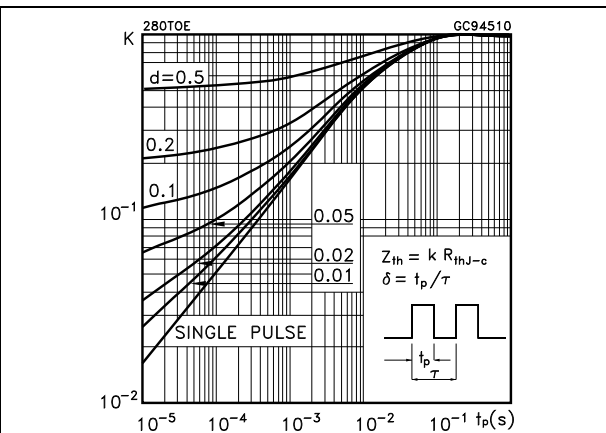


Figure 4. Safe operating area for TO-220FP

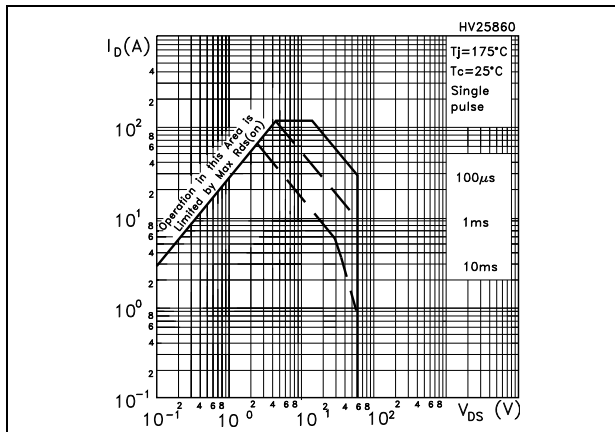


Figure 5. Thermal impedance TO-220FP

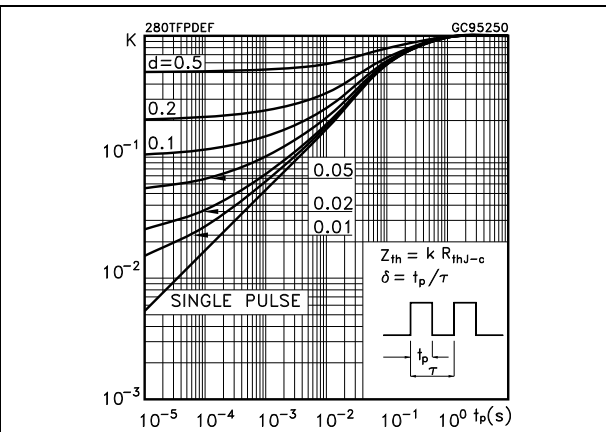


Figure 6. Output characteristics

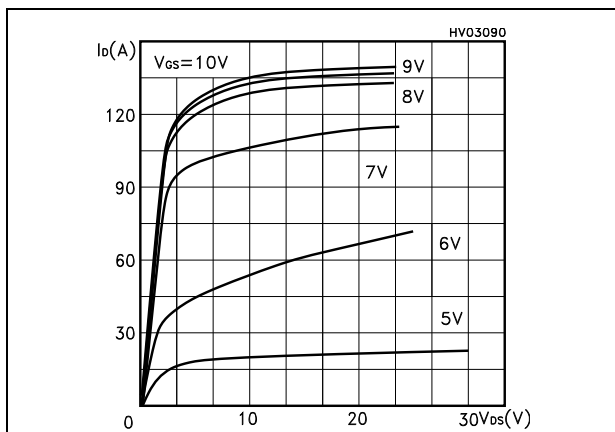


Figure 7. Transfer characteristics

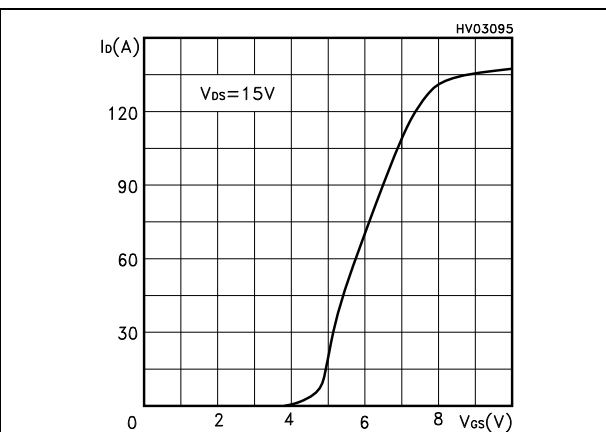


Figure 8. Transconductance

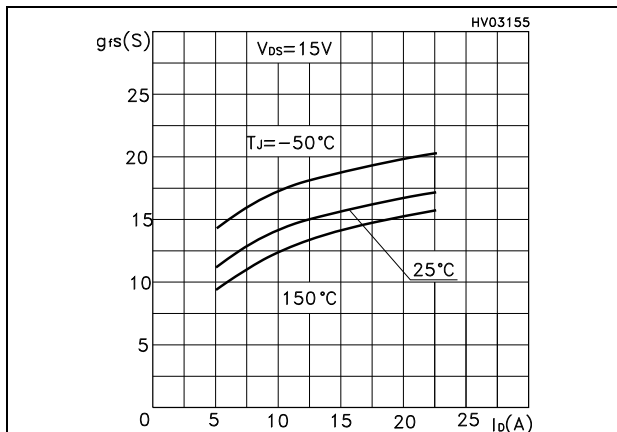


Figure 9. Static drain-source on-resistance

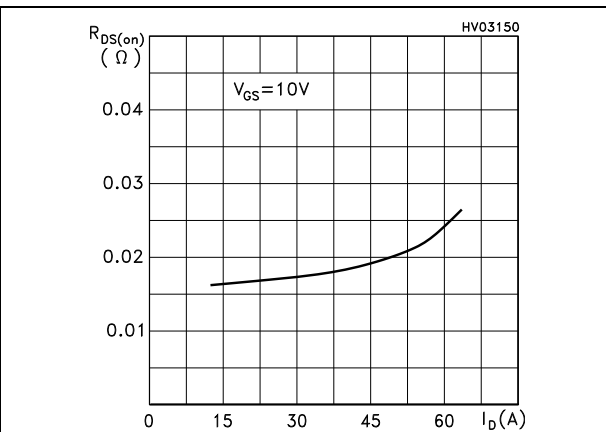


Figure 10. Gate charge vs gate-source voltage Figure 11. Capacitance variations

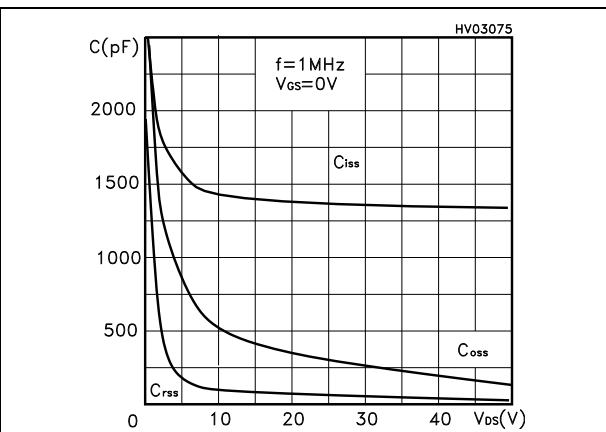
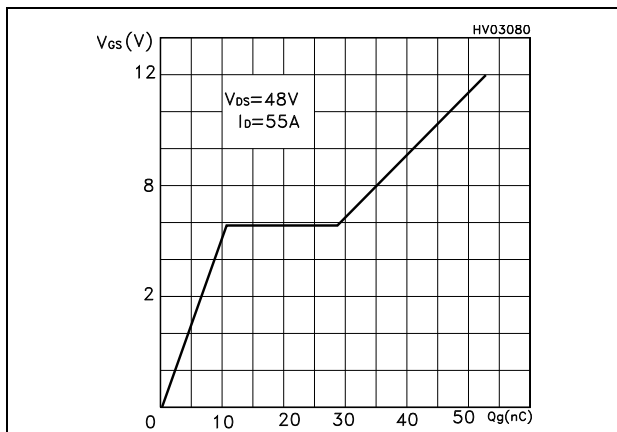


Figure 12. Normalized gate threshold voltage vs temperature

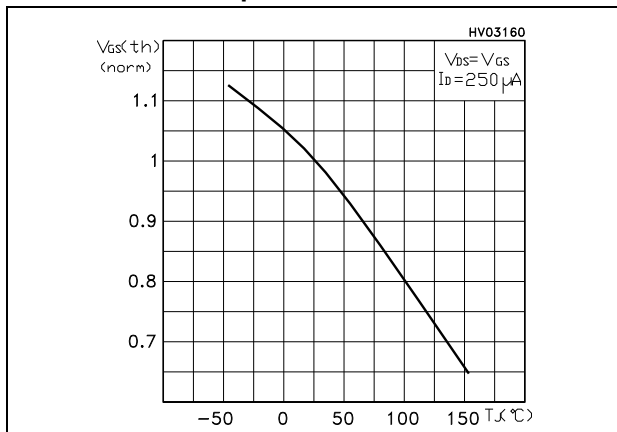


Figure 13. Normalized on-resistance vs temperature

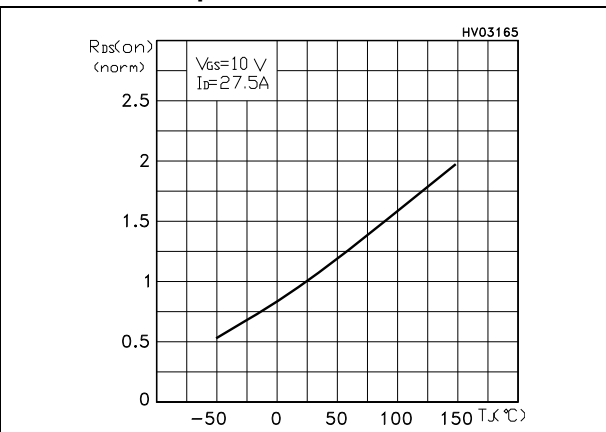
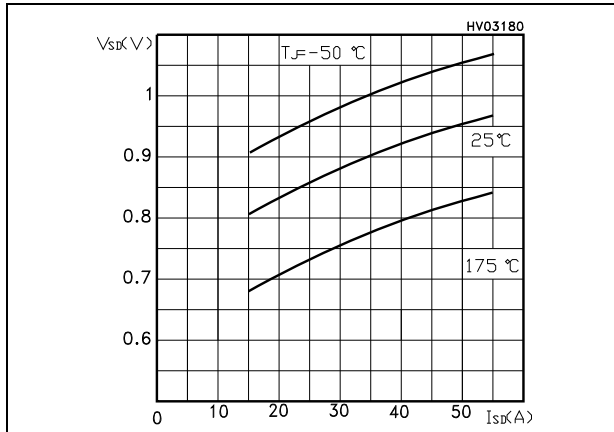


Figure 14. Source-drain diode forward characteristics



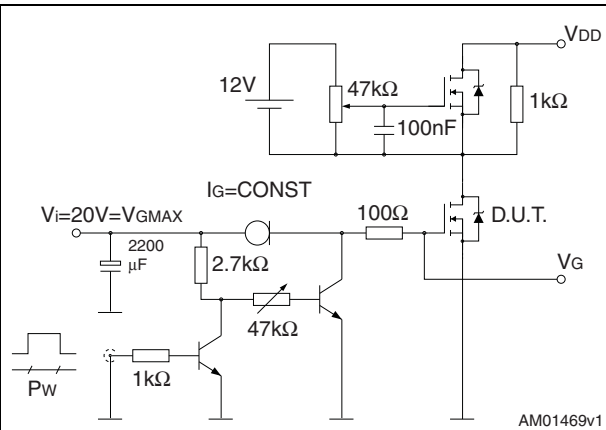
3 Test circuit

Figure 15. Switching times test circuit for resistive load



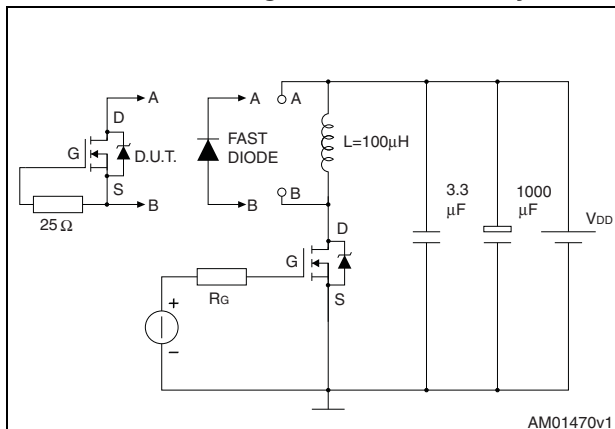
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Figure 16. Gate charge test circuit



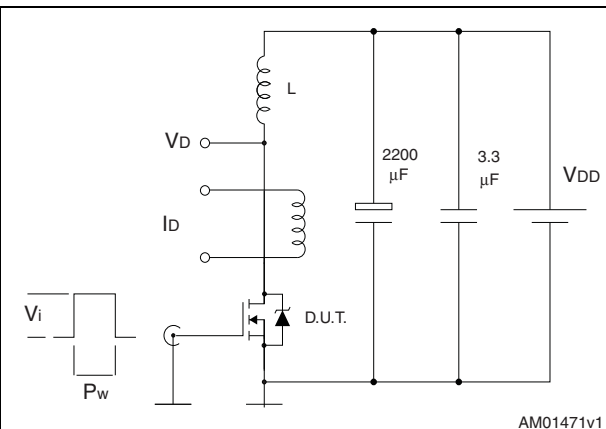
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Figure 17. Test circuit for inductive load switching and diode recovery times



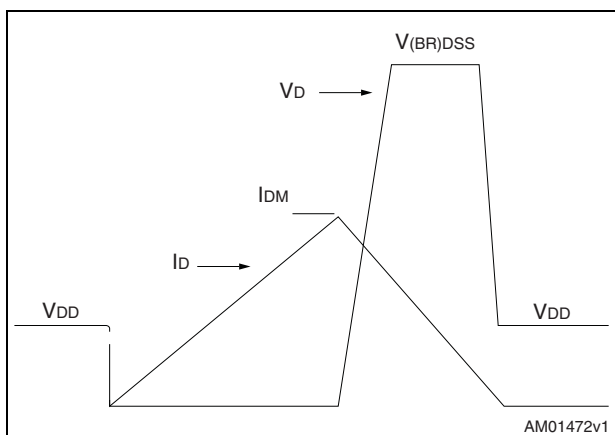
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Figure 18. Unclamped inductive load test circuit



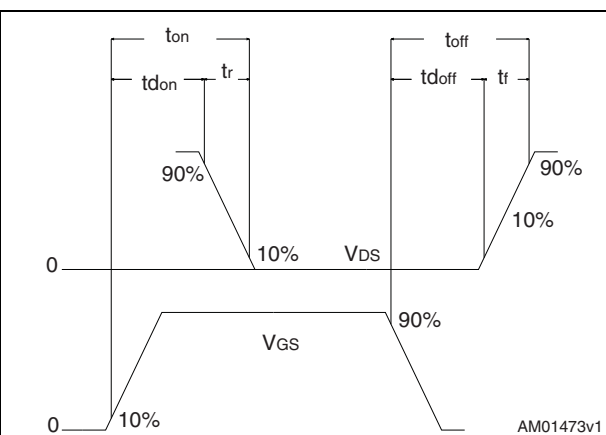
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Figure 19. Unclamped inductive waveform



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Figure 20. Switching time waveform



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4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Table 7. D²PAK (TO-263) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 21. D²PAK (TO-263) drawing

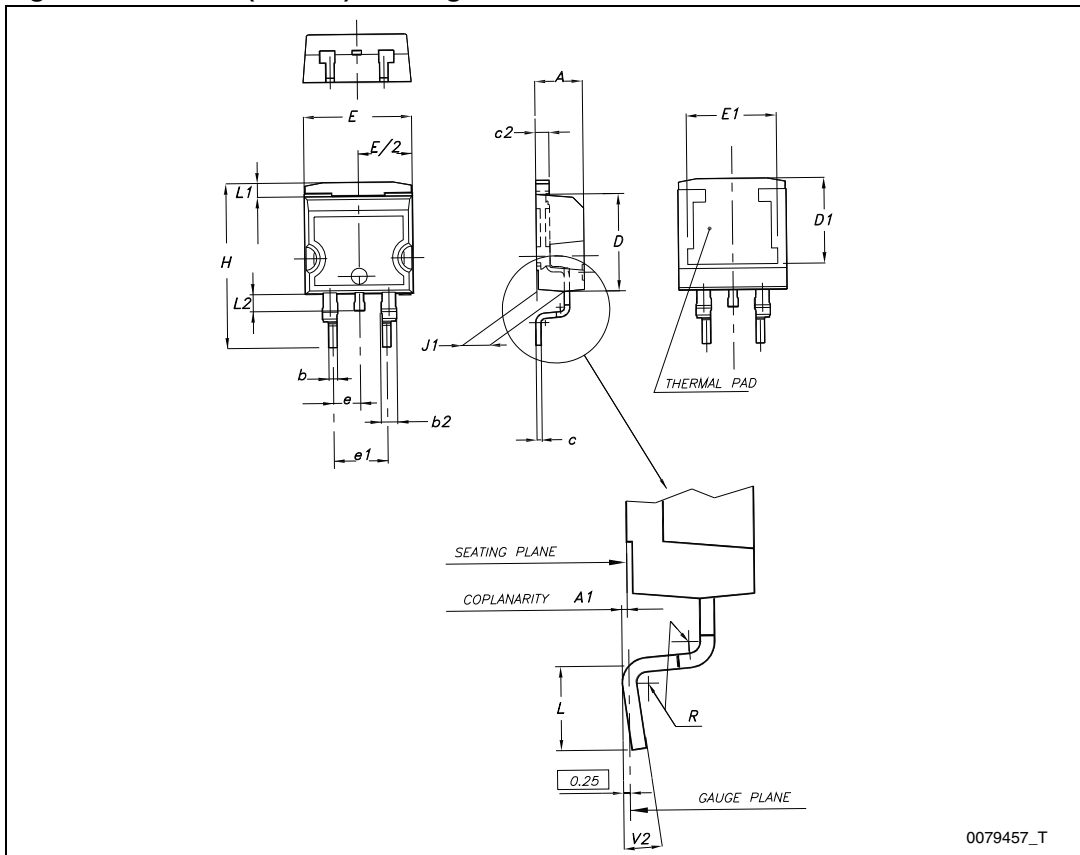
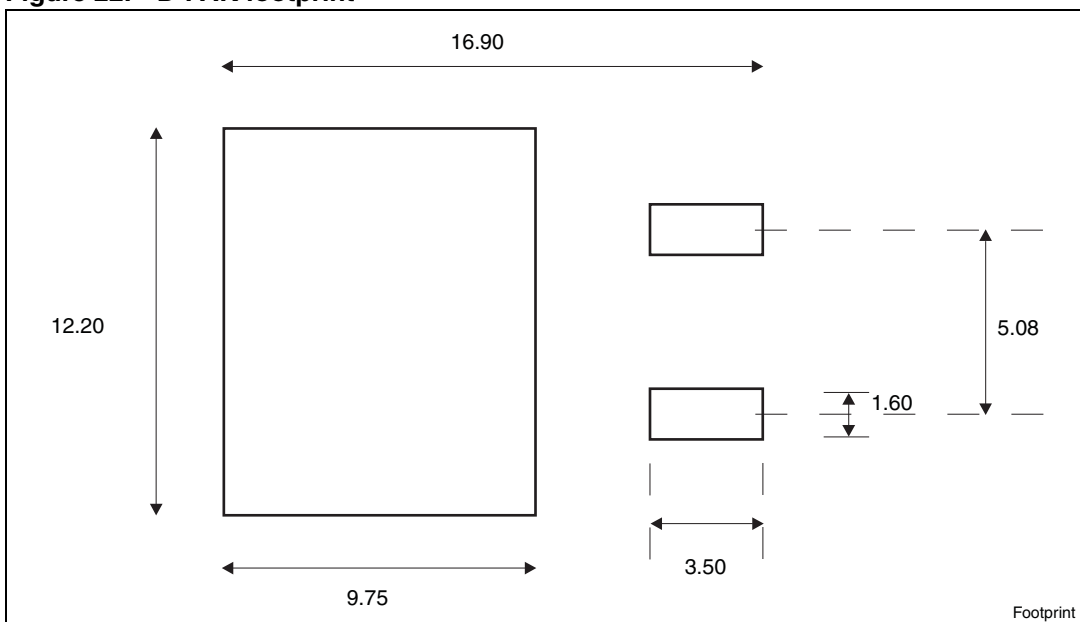


Figure 22. D²PAK footprint^(a)



a. All dimensions are in millimeters

Table 8. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
ØP	3.75		3.85
Q	2.65		2.95

Figure 23. TO-220 type A drawing

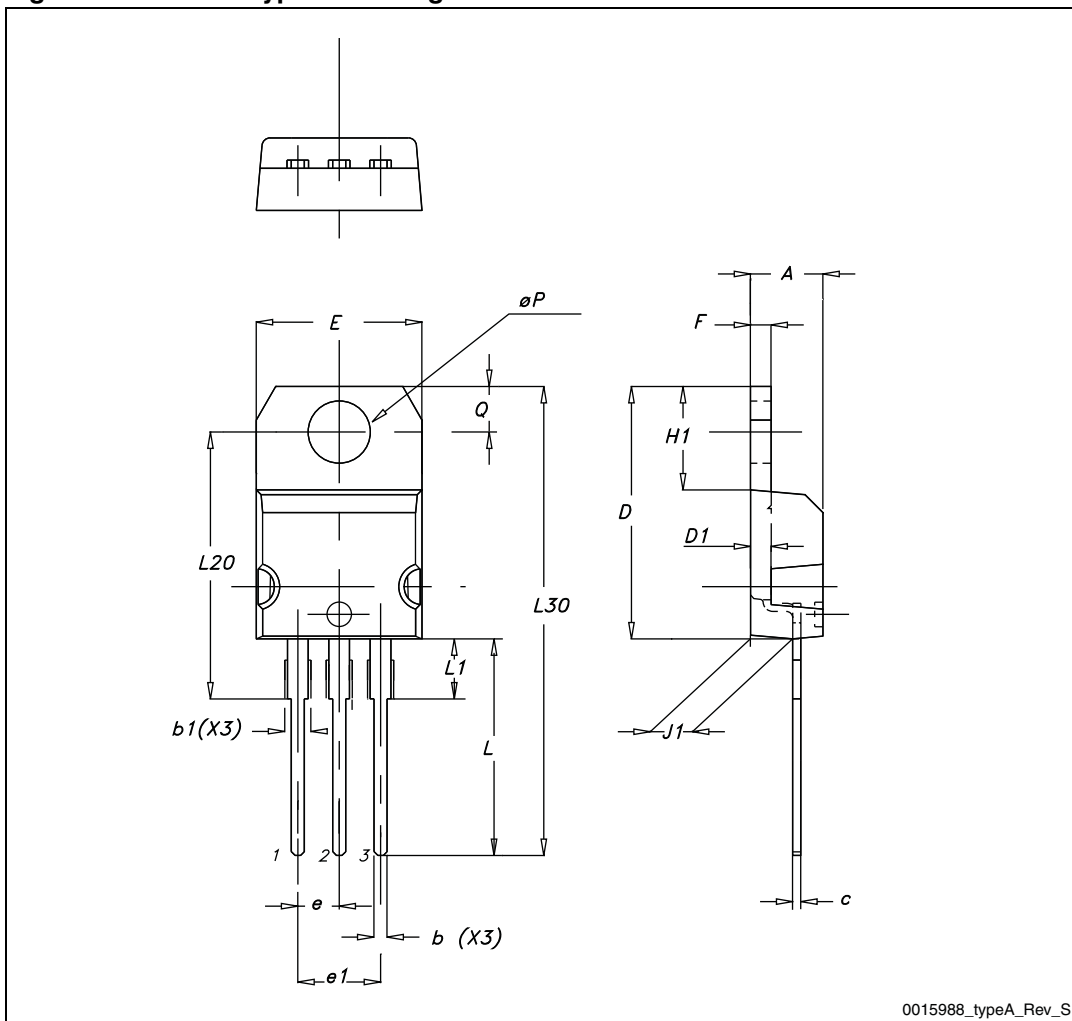
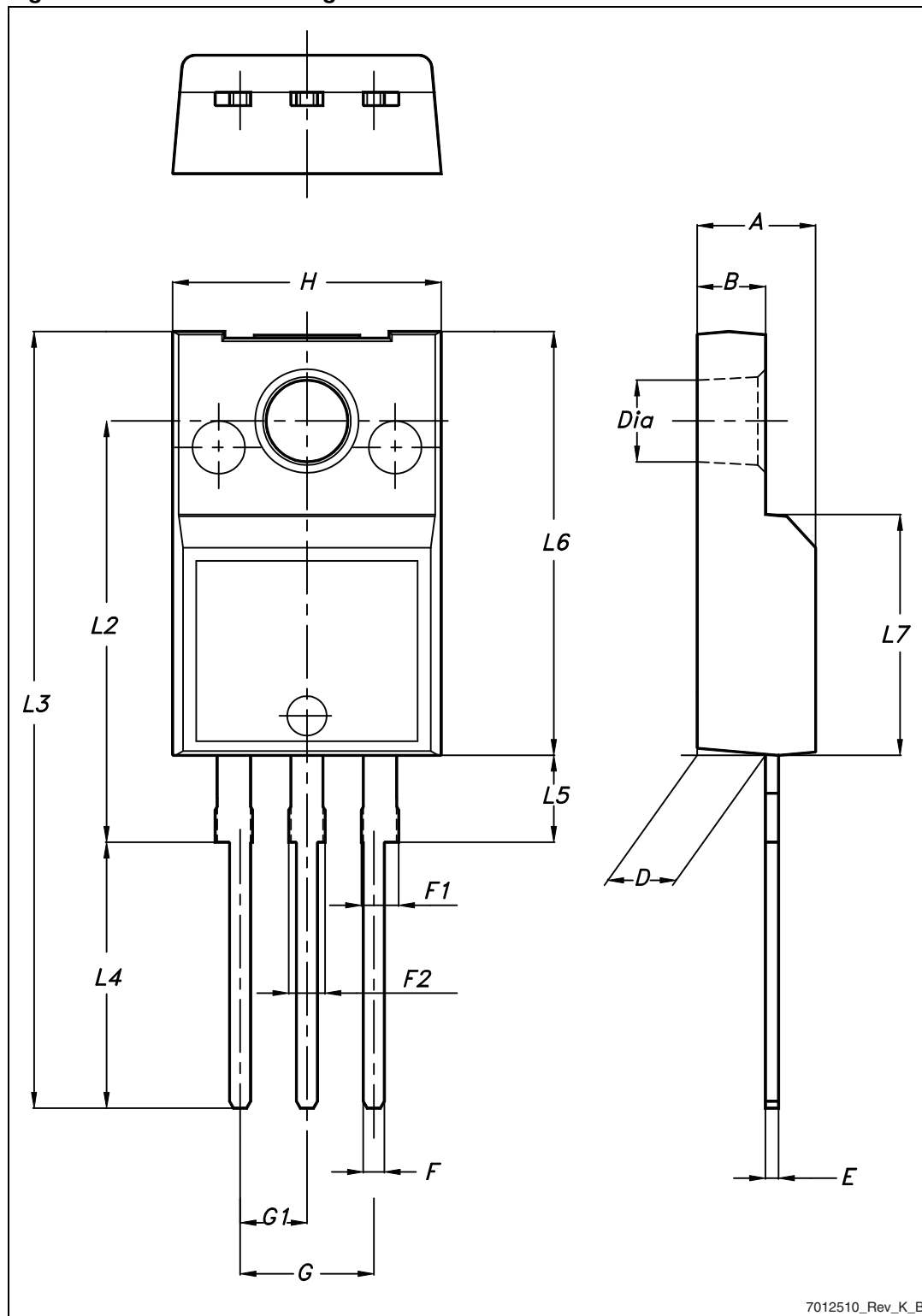


Table 9. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 24. TO-220FP drawing



5 Packaging mechanical data

Table 10. D²PAK (TO-263) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1		Base qty	1000
P2	1.9	2.1		Bulk qty	1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 25. Tape

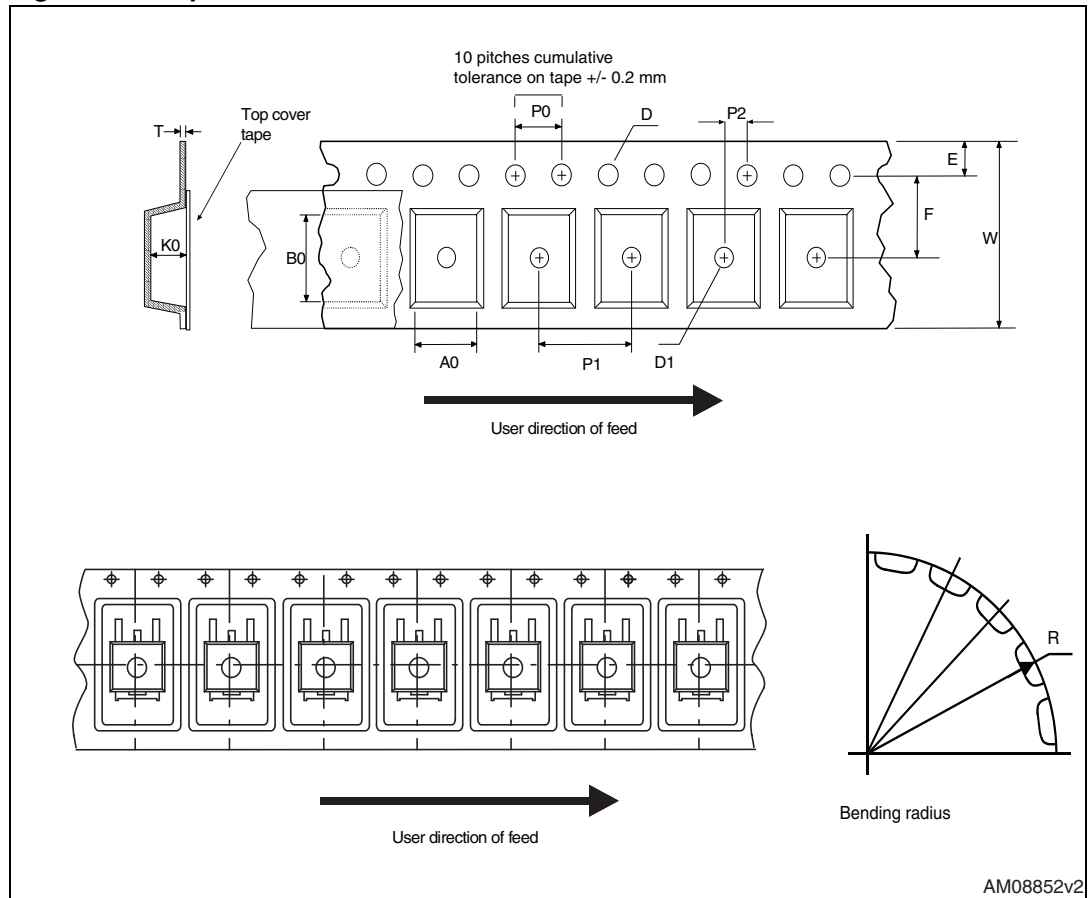
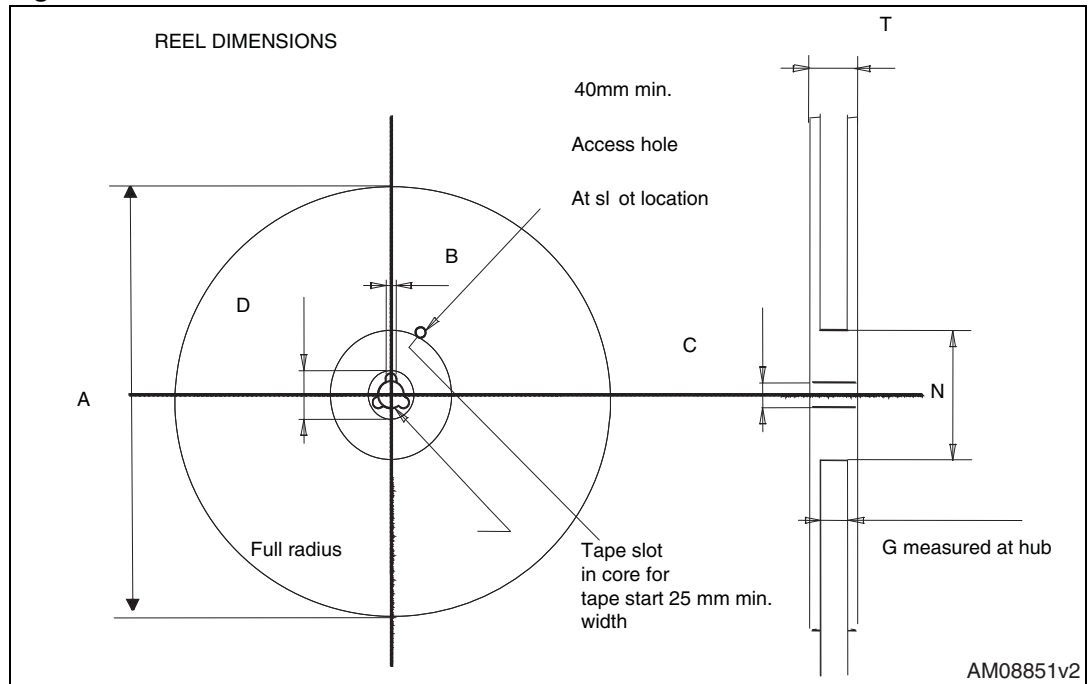


Figure 26. Reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
19-Oct-2005	7	Preliminary document
02-Dec-2005	8	New datasheet according to PCN MLD-PMT/05/1115
28-Mar-2006	9	Inserted ecopack indication
26-Jun-2006	10	New template, no content change
25-May-2012	11	Removed part number STB55NF06-1 in I ² PAK package <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i> have been updated Minor text changes

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