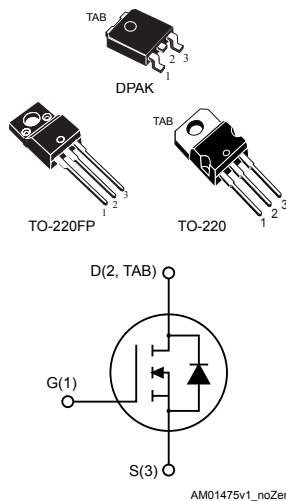


## N-channel 250 V, 0.140 $\Omega$ typ., 17 A STripFET™ II Power MOSFETs in DPAK, TO-220FP and TO-220 packages



### Features

Order code	$V_{DS}$	$R_{DS(on)max.}$	$I_D$	$P_{TOT}$
STD17NF25	250 V	0.165 $\Omega$	17 A	90 W
STF17NF25				25 W
STP17NF25				90 W

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

### Applications

- Switching applications

### 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.

#### Product status link

[STD17NF25](#)
[STF17NF25](#)
[STP17NF25](#)

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		TO-220, DPAK	TO-220FP	
$V_{DS}$	Drain-source voltage	250		V
$V_{GS}$	Gate-source voltage	$\pm 20$		V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	17	17 <sup>(1)</sup>	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	10	10 <sup>(1)</sup>	A
$I_{DM}$ <sup>(2)</sup>	Drain current (pulsed)	68	68 <sup>(1)</sup>	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	90	25	W
$dv/dt$ <sup>(3)</sup>	Peak diode recovery voltage slope	10		V/ns
$V_{ISO}$	Insulation withstand voltage (RMS) from all three leads to external heat sink ( $t = 1\text{ s}$ ; $T_C = 25\text{ }^\circ\text{C}$ )	2.5		kV
$T_j$	Operating junction temperature range	-55 to 150		$^\circ\text{C}$
$T_{stg}$	Storage temperature range			

- Limited by maximum junction temperature.
- Pulse width limited by safe operating area.
- $I_{SD} \leq 17\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DSpeak} \leq V_{(BR)DSS}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$ .

**Table 2. Thermal data**

Symbol	Parameter	Value			Unit
		DPAK	TO-220FP	TO-220	
$R_{thj-case}$	Thermal resistance junction-case	1.38	5	1.38	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5			
$R_{thj-pcb}$ <sup>(1)</sup>	Thermal resistance junction-pcb	50			

- When mounted on 1inch<sup>2</sup> FR-4, 2 Oz copper board.

**Table 3. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AR}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ Max)	17	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	100	mJ

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$	250			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 250\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 250\text{ V}$ , $T_C = 125\text{ °C}$ <sup>(1)</sup>			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$ , $I_D = 8.5\text{ A}$		0.140	0.165	$\Omega$

1. Defined by design, not subject to production test.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	1000	-	$\mu\text{F}$
$C_{oss}$	Output capacitance			178		
$C_{rss}$	Reverse transfer capacitance			28		
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0\text{ to }200\text{ V}$ , $V_{GS} = 0\text{ V}$	-	135	-	$\mu\text{F}$
$R_g$	Gate input resistance	$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	2	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 200\text{ V}$ , $I_D = 17\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 15. Test circuit for gate charge behavior)	-	29.5	-	nC
$Q_{gs}$	Gate-source charge			4.8		
$Q_{gd}$	Gate-drain charge			15.6		

1.  $C_{oss\text{ eq.}}$  is defined as a constant equivalent capacitance giving the same charging time as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .

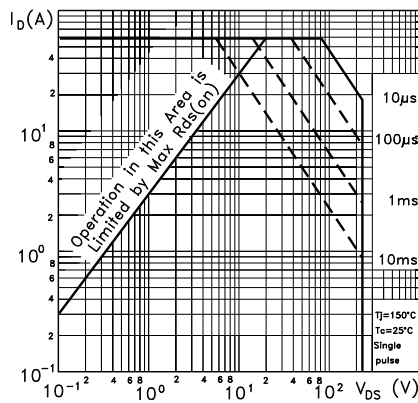
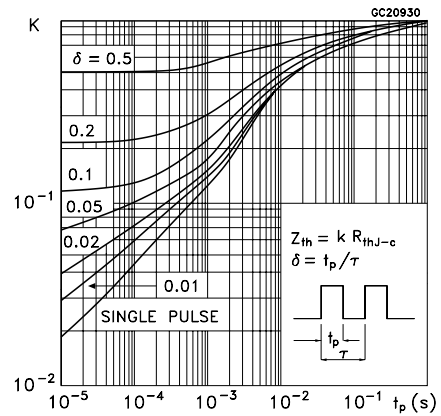
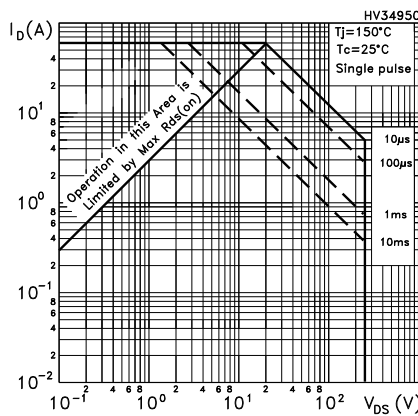
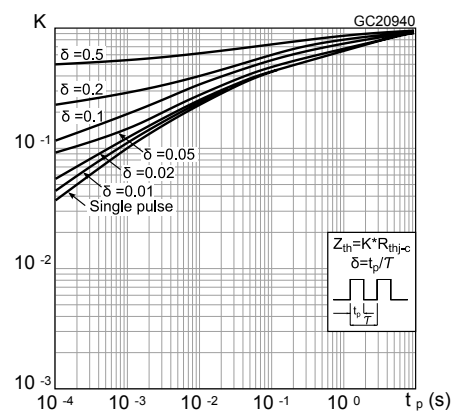
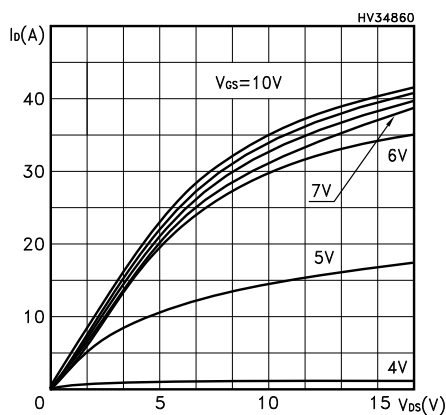
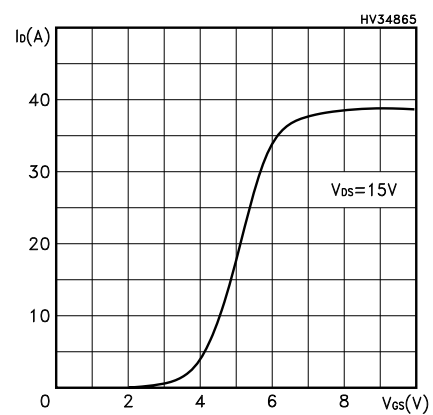
**Table 6. Switching times**

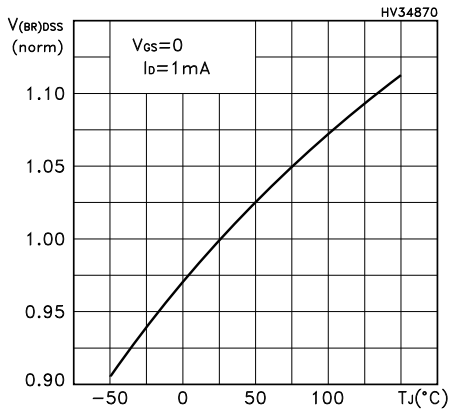
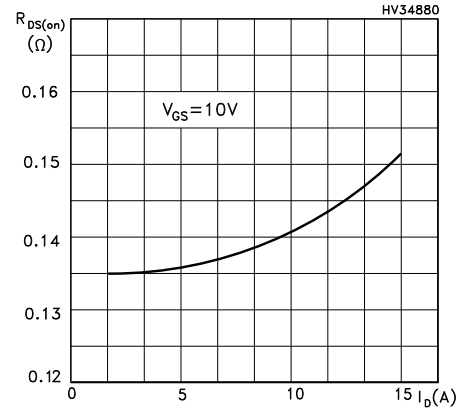
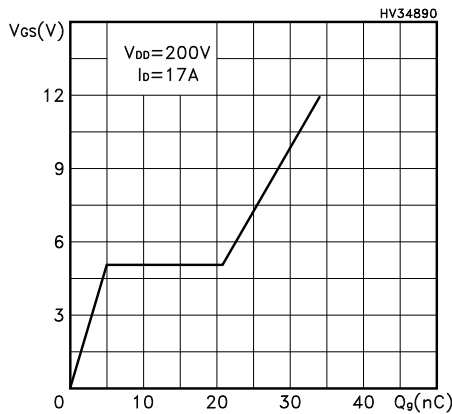
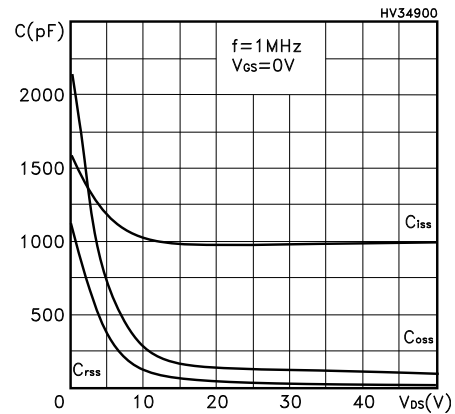
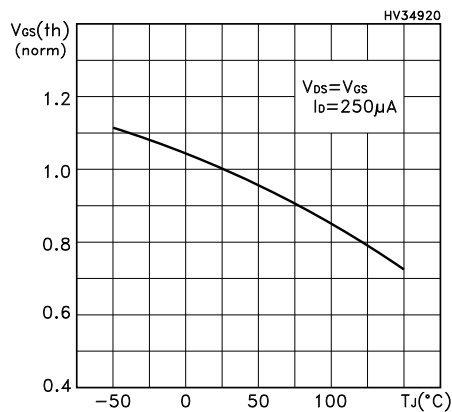
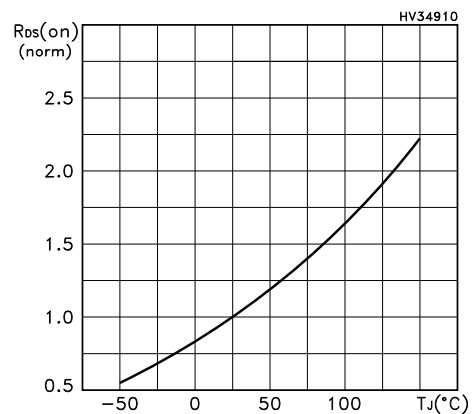
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 125\text{ V}$ , $I_D = 8.5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 14. Test circuit for resistive load switching times and Figure 19. Switching time waveform)	-	8.8	-	ns
$t_r$	Rise time			17.2		
$t_{d(off)}$	Turn-off delay time			21		
$t_f$	Fall time			8.8		

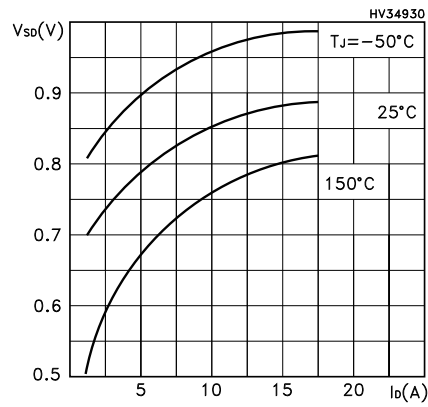
**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current				17	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		68	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 17\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 17\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		157		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 50\text{ V}$ (see <a href="#">Figure 16. Test circuit for inductive load switching and diode recovery times</a> )	-	0.91		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current			11.6		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 17\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		196		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 50\text{ V}$ (see <a href="#">Figure 16. Test circuit for inductive load switching and diode recovery times</a> )	-	1.34		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current			13.7		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

**2.1 Electrical characteristics curves**
**Figure 1. Safe operating area for DPAK, TO-220**

**Figure 2. Thermal impedance for DPAK, TO-220**

**Figure 3. Safe operating area for TO-220FP**

**Figure 4. Thermal impedance for TO-220FP**

**Figure 5. Output characteristics**

**Figure 6. Transfer characteristics**


**Figure 7. Normalized  $V_{(BR)DSS}$  vs temperature**

**Figure 8. Static drain-source on resistance**

**Figure 9. Gate charge vs gate-source voltage**

**Figure 10. Capacitance variations**

**Figure 11. Normalized gate threshold voltage vs temperature**

**Figure 12. Normalized on resistance vs temperature**


**Figure 13. Source-drain diode forward characteristics**


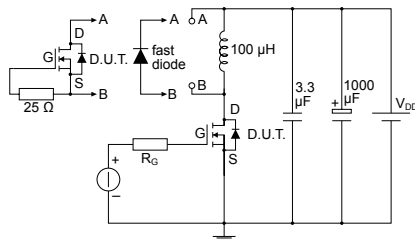
### 3 Test circuits

**Figure 14. Test circuit for resistive load switching times**

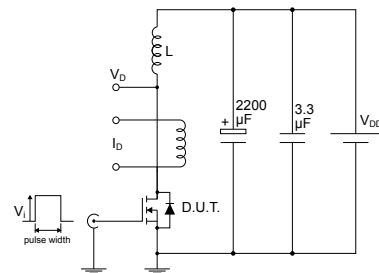

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**Figure 15. Test circuit for gate charge behavior**


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**Figure 16. Test circuit for inductive load switching and diode recovery times**


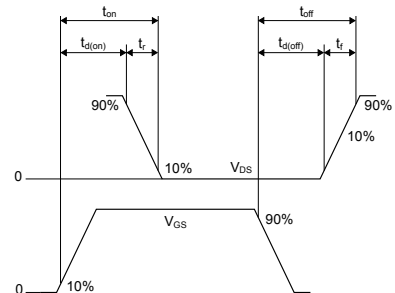
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**Figure 17. Unclamped inductive load test circuit**


AM01471v1

**Figure 18. Unclamped inductive waveform**


AM01472v1

**Figure 19. Switching time waveform**


AM01473v1



## 4 Package information

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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](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 DPAK (TO-252) type A2 package information

Figure 20. DPAK (TO-252) type A2 package outline



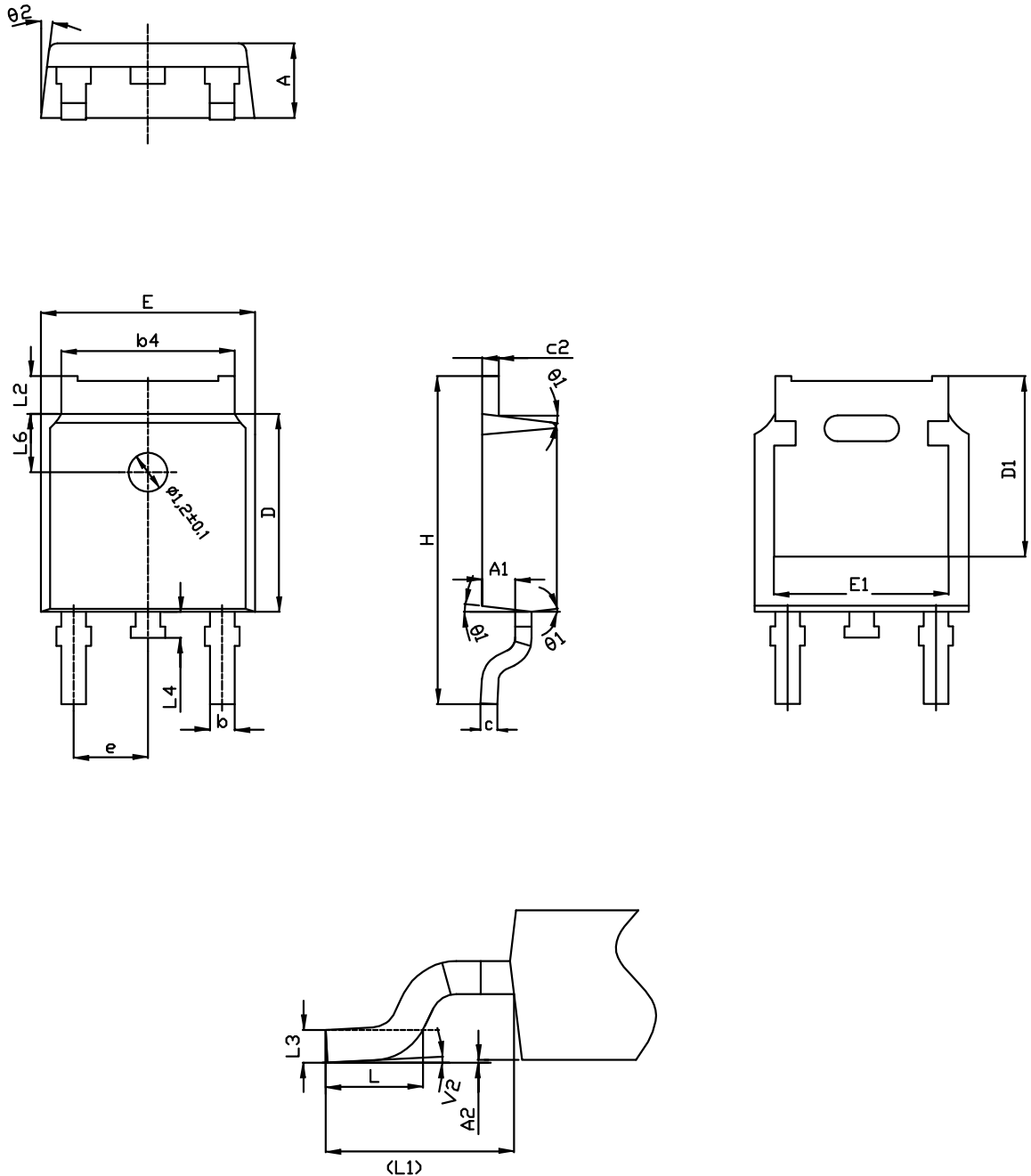
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**Table 8. DPAK (TO-252) type A2 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

**4.2 DPAK (TO-252) type C2 package information**

Figure 21. DPAK (TO-252) type C2 package outline



0068772\_C2\_25

**Table 9. DPAK (TO-252) type C2 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

Figure 22. DPAK (TO-252) recommended footprint (dimensions are in mm)



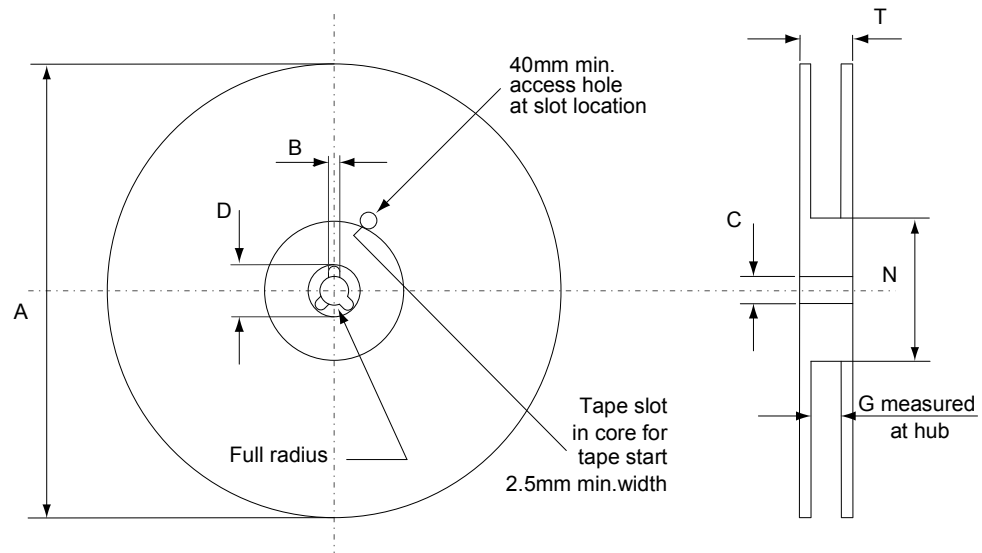
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### 4.3 DPAK (TO-252) packing information

Figure 23. DPAK (TO-252) tape outline



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**Figure 24. DPAK (TO-252) reel outline**


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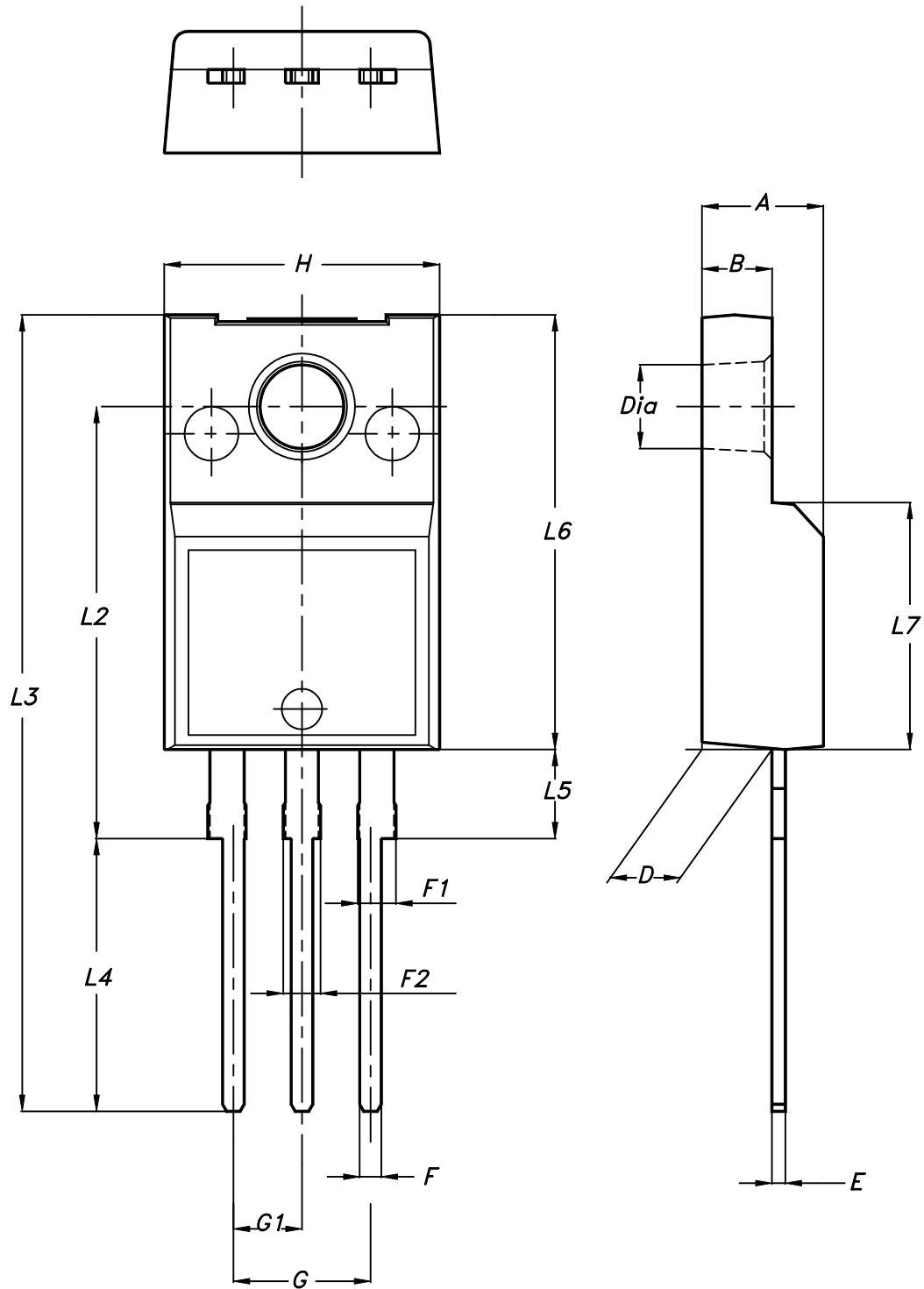
**Table 10. DPAK (TO-252) tape and reel mechanical data**

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			



#### 4.4 TO-220FP package information

Figure 25. TO-220FP package outline



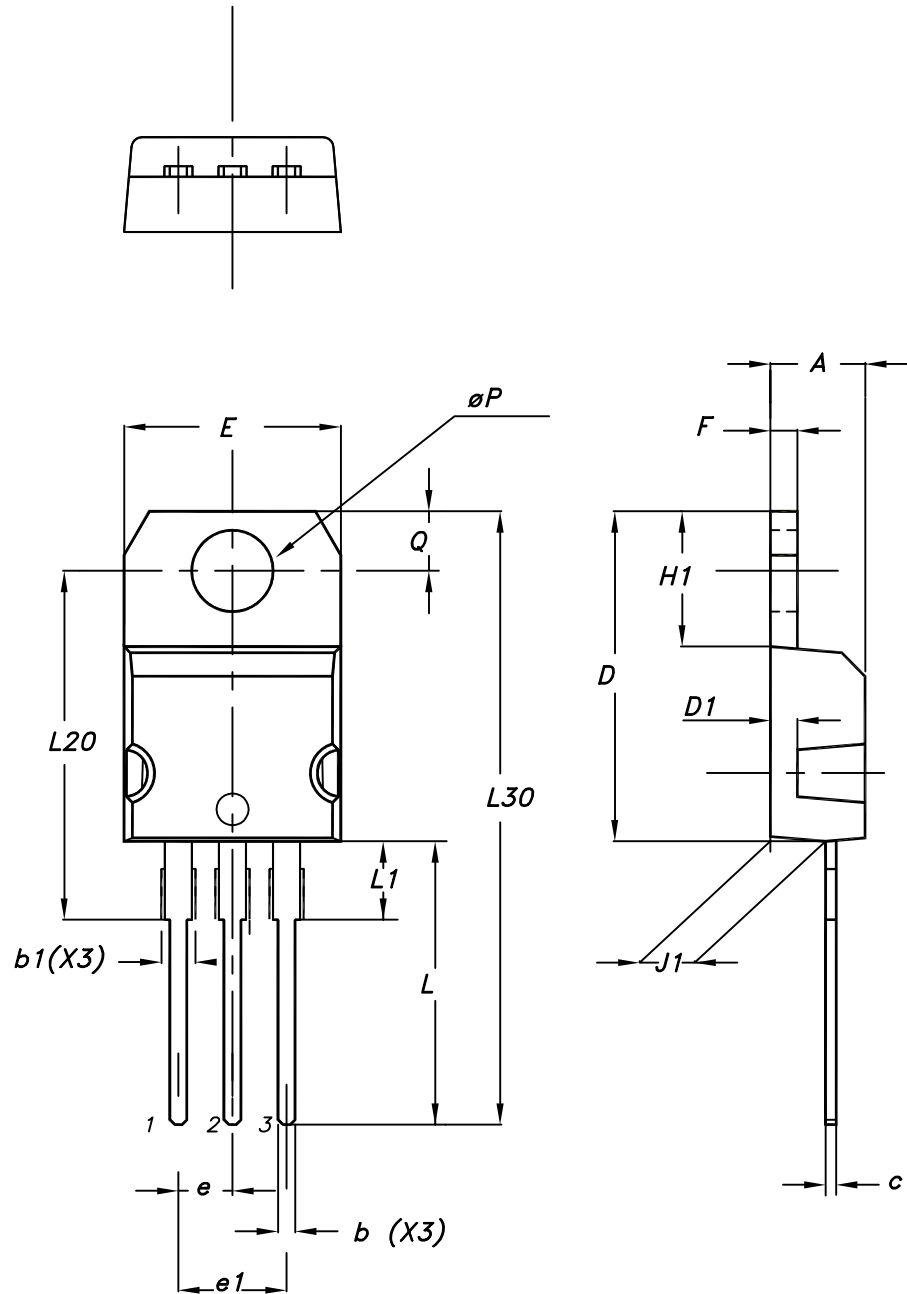
7012510\_Rev\_12\_B

**Table 11. TO-220FP package 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

## 4.5 TO-220 type A package information

Figure 26. TO-220 type A package outline



0015988\_typeA\_Rev\_21

**Table 12. TO-220 type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		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	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

## 5 Ordering information

Table 13. Order codes

Order code	Marking	Package	Packing
STD17NF25	17NF25	DPAK	Tape and reel
STF17NF25		TO-220FP	Tube
STP17NF25		TO-220	

## Revision history

**Table 14. Document revision history**

Date	Version	Changes
01-Feb-2007	1	First release.
07-Nov-2012	2	Minor text changes. The part number ST117NF25 has been moved to a separate datasheet. <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i> have been updated.
28-May-2018	3	Removed maturity status indication from cover page. The document status is production data. Updated title in cover page, <a href="#">Section 1 Electrical ratings</a> , <a href="#">Section 2 Electrical characteristics</a> and <a href="#">Section 4 Package information</a> . Minor text changes

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