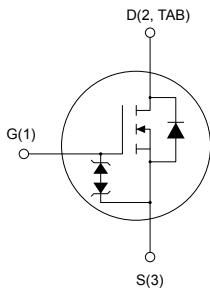
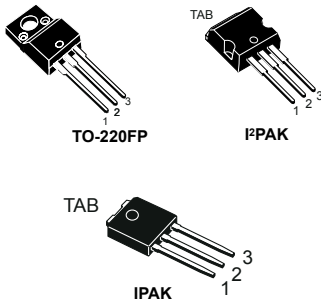




N-channel 620 V, 1.7 Ω typ., 3.8 A MDmesh K3 Power MOSFET in a TO-220FP, I²PAK and IPAK packages



Features

Order codes	V _{DS}	R _{DS(on)} max.	I _D
STF4N62K3	620 V	2 Ω	3.8 A
STI4N62K3			
STU4N62K3			

- 100% avalanche tested
- Extremely high dv/dt capability
- Very low intrinsic capacitance
- Improved diode reverse recovery characteristics
- Zener-protected

Applications

- Switching applications

Description

These MDmesh K3 Power MOSFETs are the result of improvements applied to STMicroelectronics' MDmesh technology, combined with a new optimized vertical structure. These devices boast an extremely low on-resistance, superior dynamic performance and high avalanche capability, rendering them suitable for the most demanding applications.



Product status link

[STF4N62K3](#)

[STI4N62K3](#)

[STU4N62K3](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220FP	I ² PAK IPAK	
V _{DS}	Drain-source voltage	620		V
V _{GS}	Gate-source voltage	±30		V
I _D	Drain current (continuous) at T _C = 25 °C	3.8		A
	Drain current (continuous) at T _C = 100 °C	2		
I _{DM} ⁽¹⁾	Drain current (pulsed)	15.2		A
P _{TOT}	Total power dissipation at T _C = 25 °C	25	70	W
dv/dt ⁽²⁾	Peak diode recovery voltage slope	12		V/ns
ESD	Gate-source human body model (R = 1.5 kΩ, C = 100 pF)	2.5		kV
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s, T _C = 25 °C)	2.5	-	kV
T _{stg}	Storage temperature range	-55 to 150		°C
T _J	Maximum operating junction temperature	150		°C

1. Pulse width is limited by safe operating area.

2. $I_{SD} \leq 3.8 \text{ A}$, $di/dt = 400 \text{ A}/\mu\text{s}$, $V_{DS} (\text{peak}) < V_{(BR)DSS}$, $V_{DD} = 496 \text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value			Unit
		TO-220FP	I ² PAK	IPAK	
R _{thJC}	Thermal resistance, junction-to-case	5	1.79		°C/W
R _{thJA}	Thermal resistance, junction-to-ambient	62.5		100	°C/W

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I _{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T _J max.)	3.8	A
E _{AS}	Single pulse avalanche energy (starting T _J = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	115	mJ

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified.

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	620	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 620\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 620\text{ V}$, $T_C = 125\text{ °C}^{(1)}$	-	-	50	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$	-	-	± 10	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 50\text{ }\mu\text{A}$	3	3.75	4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 1.9\text{ A}$	-	1.7	2	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	550	-	pF
C_{oss}	Output capacitance		-	42	-	pF
C_{rss}	Reverse transfer capacitance		-	7	-	pF
$C_{oss\ eq.}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }496\text{ V}$, $V_{GS} = 0\text{ V}$	-	27	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	2 ⁽²⁾	5	10 ⁽²⁾	Ω
Q_g	Total gate charge	$V_{DD} = 496\text{ V}$, $I_D = 3.8\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 19. Test circuit for gate charge behavior)	-	22	-	nC
Q_{gs}	Gate-source charge		-	4	-	nC
Q_{gd}	Gate-drain charge		-	13	-	nC

1. $C_{oss\ eq.}$ 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} .

2. Specified by design, not tested in production.

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 1.9\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	10	-	ns
t_r	Rise time		-	9	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 18. Test circuit for resistive load switching times and Figure 23. Switching time waveform)	-	29	-	ns
t_f	Fall time		-	19	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	3.8	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	15.2	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 3.8\text{ A}$	-	-	1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 3.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	220	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$	-	1.4	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 20. Test circuit for inductive load switching and diode recovery times)	-	13	-	A
t_{rr}	Reverse recovery time	$I_{SD} = 3.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	270	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	1.9	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 20. Test circuit for inductive load switching and diode recovery times)	-	14	-	A

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

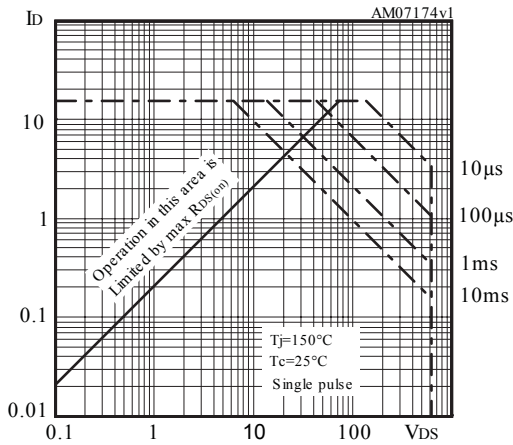
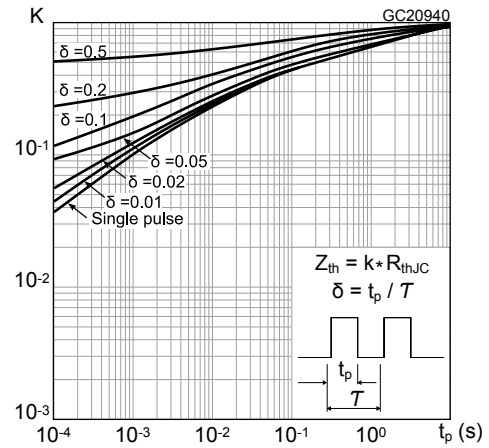
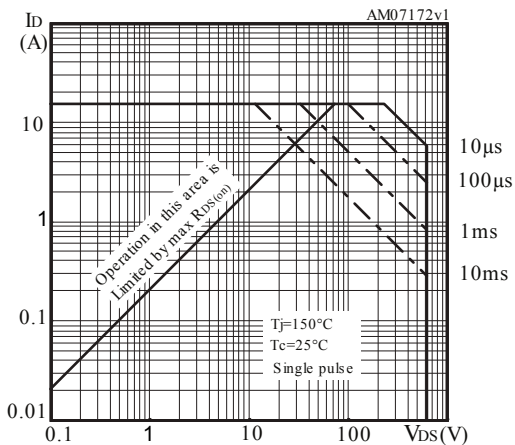
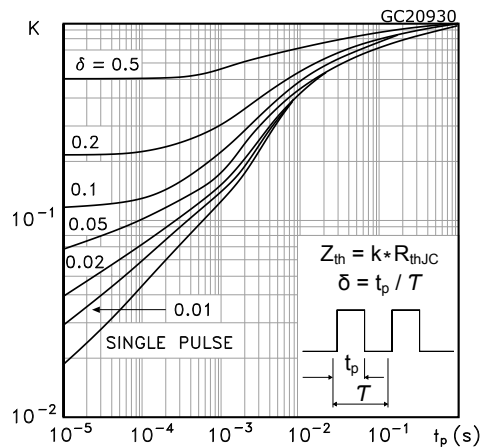
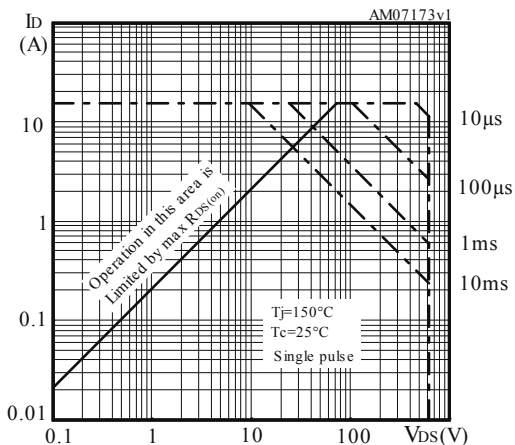
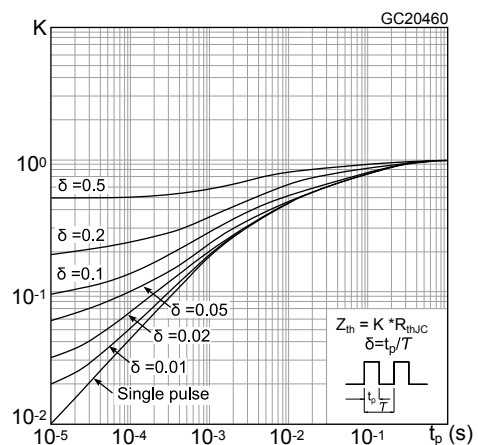
2.1 Electrical characteristics (curves)
Figure 1. Safe operating area for TO-220FP

Figure 2. Normalized transient thermal impedance for TO-220FP

Figure 3. Safe operating area for I²PAK

Figure 4. Normalized transient thermal impedance for I²PAK

Figure 5. Safe operating area for IPAK

Figure 6. Normalized transient thermal impedance for IPAK


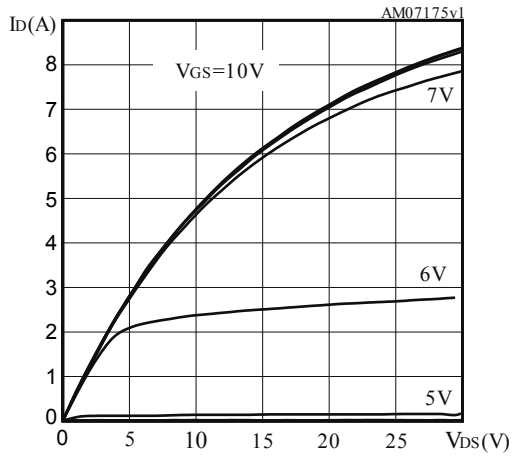
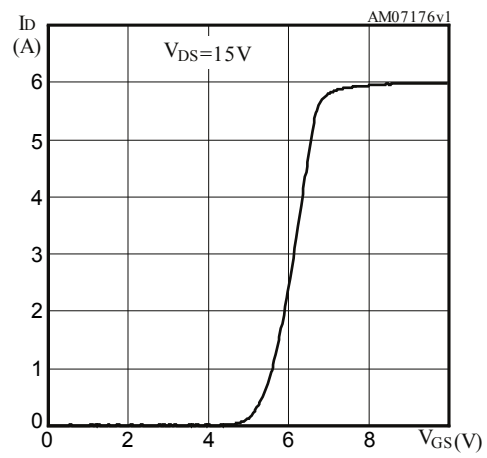
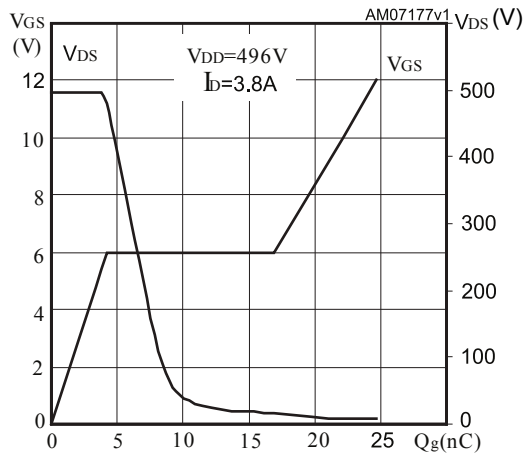
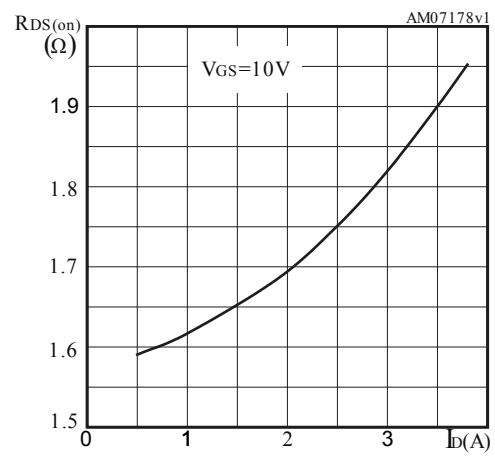
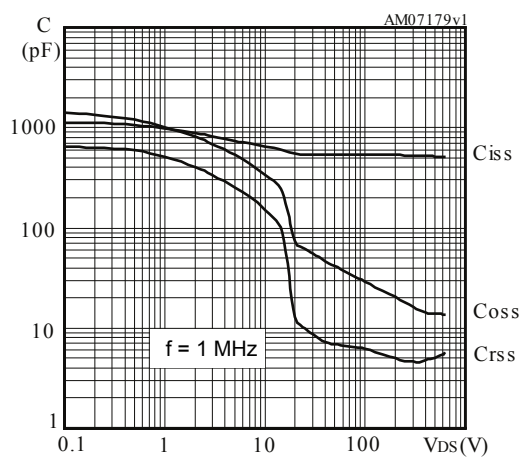
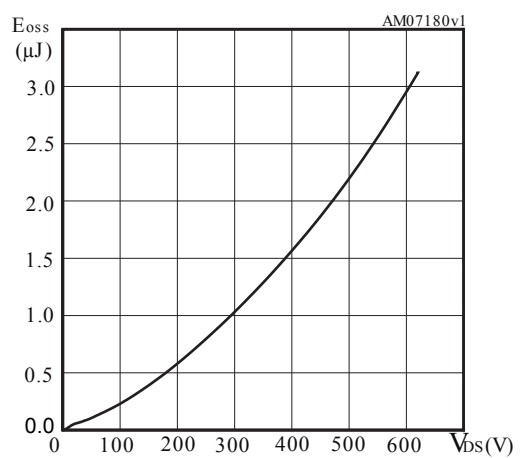
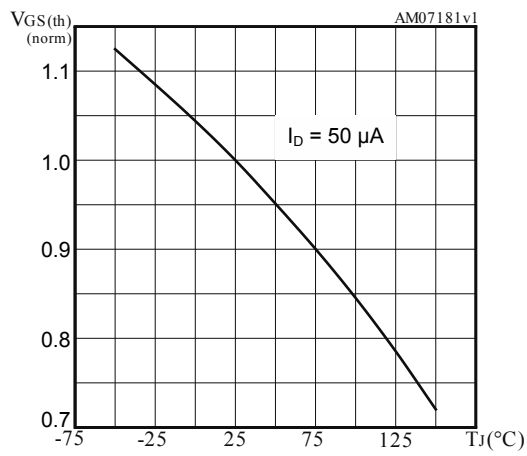
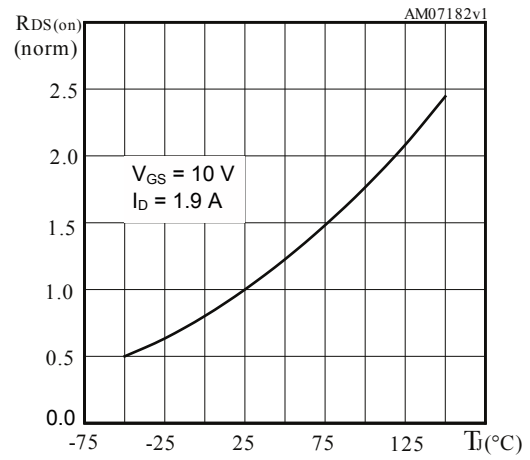
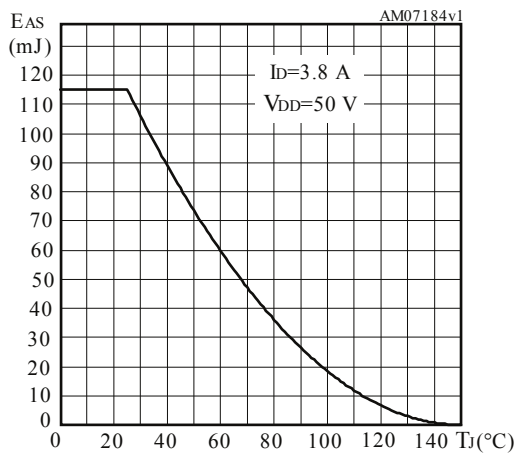
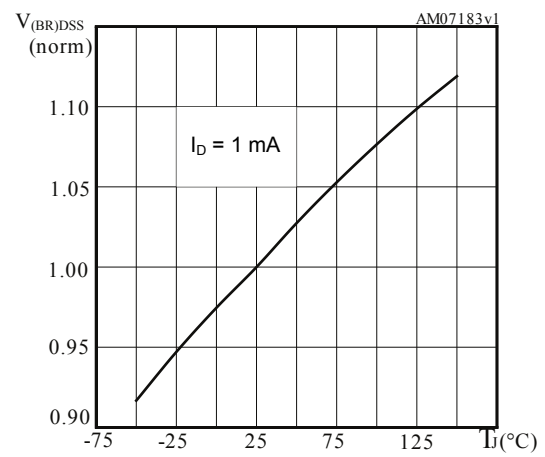
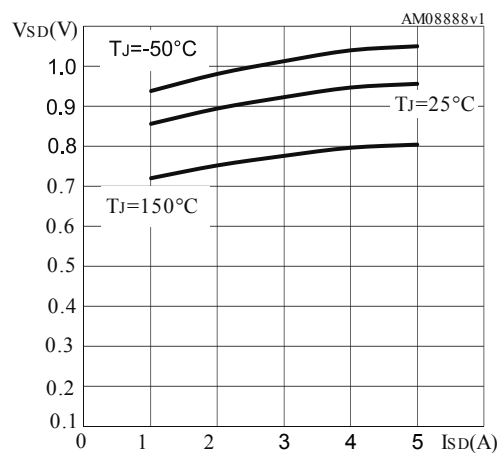
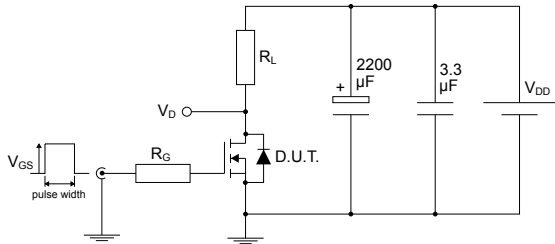
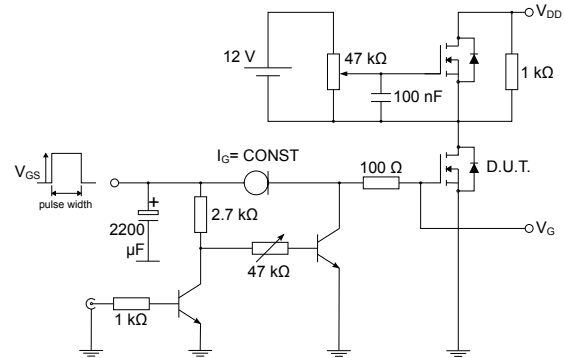
Figure 7. Typical output characteristics

Figure 8. Typical transfer characteristics

Figure 9. Typical gate charge characteristics

Figure 10. Typical drain-source on-resistance

Figure 11. Typical capacitance characteristics

Figure 12. Typical output capacitance stored energy


Figure 13. Normalized gate threshold vs temperature

Figure 14. Normalized on-resistance vs temperature

Figure 15. Maximum avalanche energy vs temperature

Figure 16. Normalized breakdown voltage vs temperature

Figure 17. Typical reverse diode forward characteristics


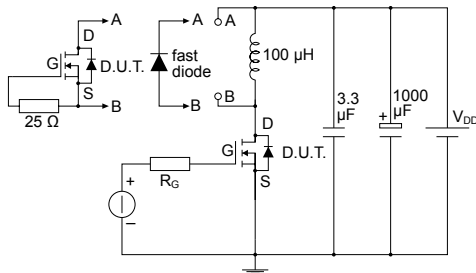
3 Test circuits

Figure 18. Test circuit for resistive load switching times


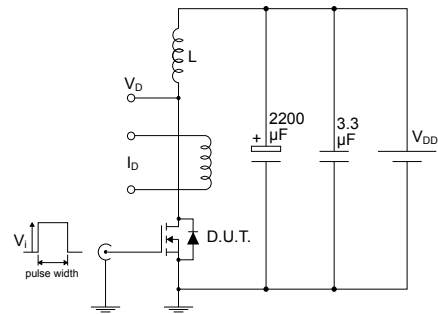
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Figure 19. Test circuit for gate charge behavior


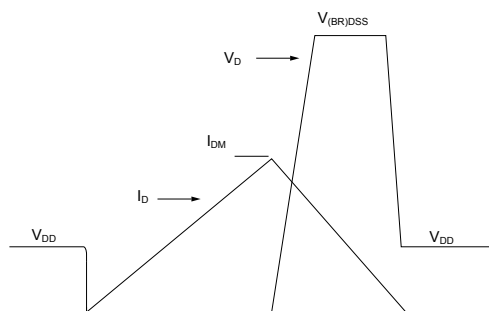
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Figure 20. Test circuit for inductive load switching and diode recovery times


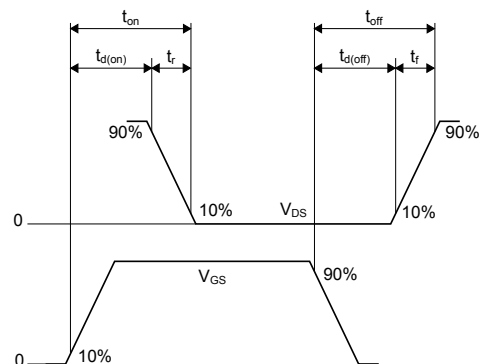
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Figure 21. Unclamped inductive load test circuit


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Figure 22. Unclamped inductive waveform


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Figure 23. Switching time waveform


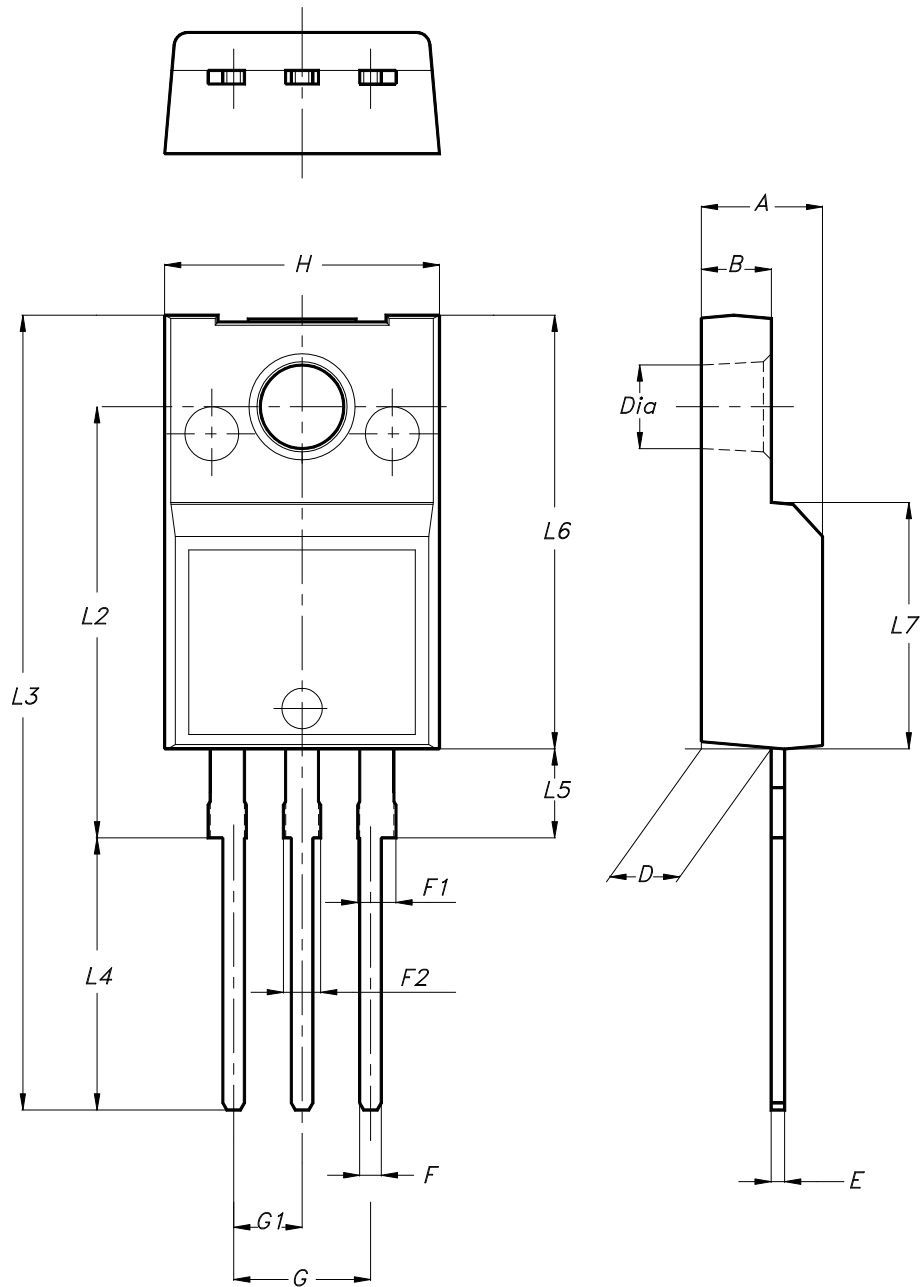
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4 Package information

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.

4.1 TO-220FP type B package information

Figure 24. TO-220FP type B package outline



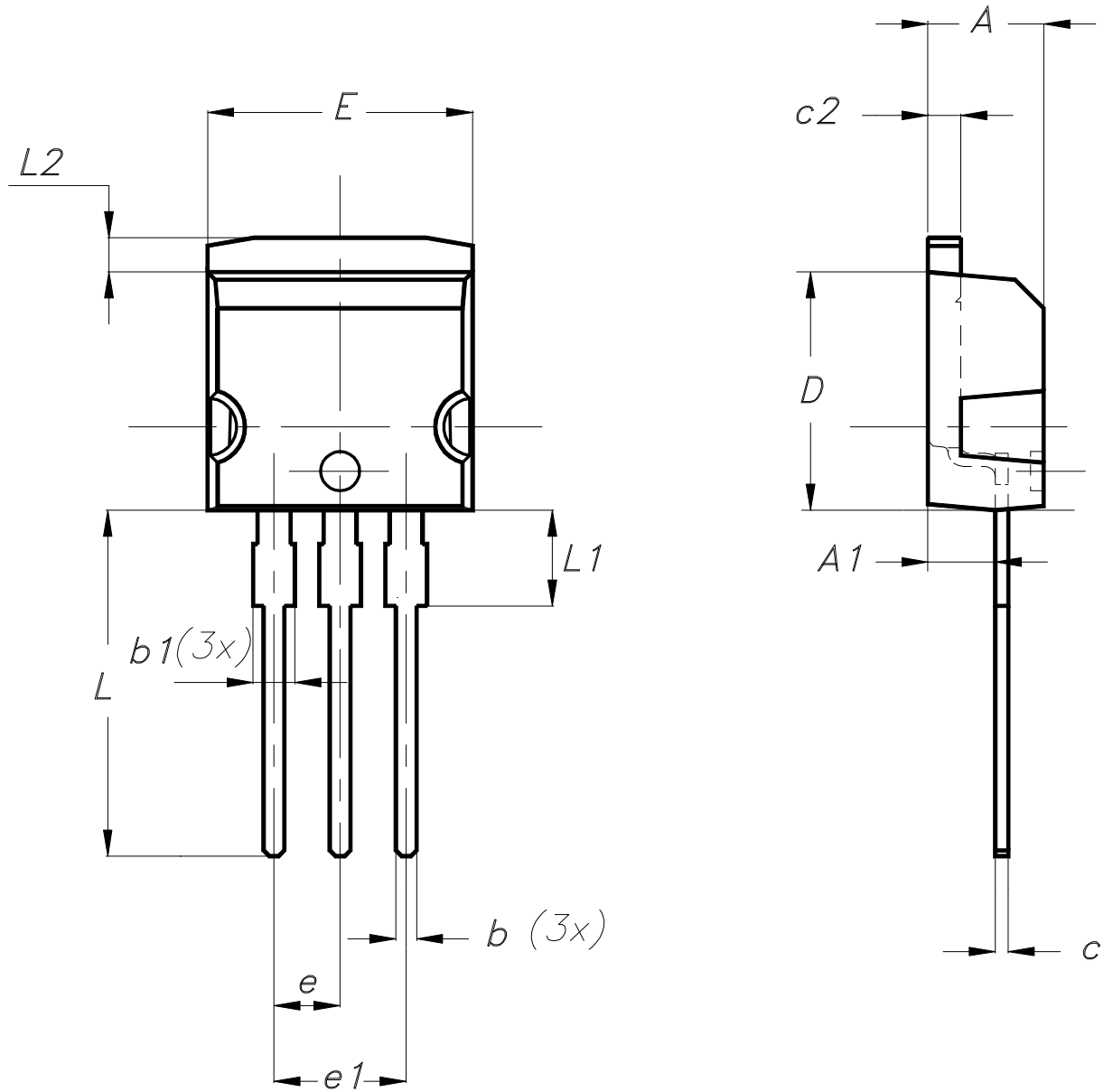
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Table 8. TO-220FP type B package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
B	2.50		2.70
D	2.50		2.75
E	0.45		0.70
F	0.75		1.00
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.20
G1	2.40		2.70
H	10.00		10.40
L2		16.00	
L3	28.60		30.60
L4	9.80		10.60
L5	2.90		3.60
L6	15.90		16.40
L7	9.00		9.30
Dia	3.00		3.20

4.2 I²PAK package information

Figure 25. I²PAK package outline



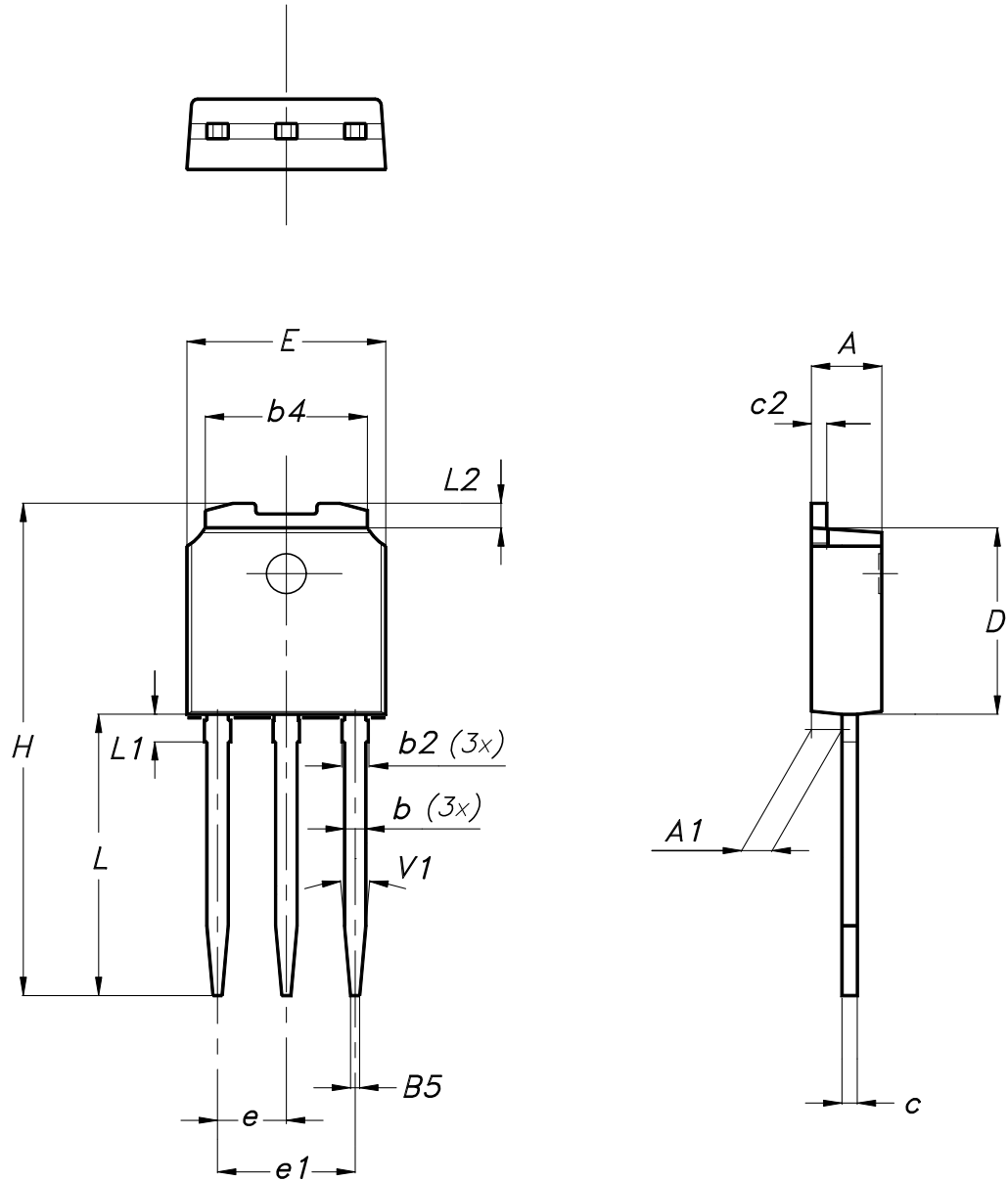
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Table 9. I²PAK package mechanical data

Dim.	mm	
	Min.	Max.
A	4.40	4.60
A1	2.40	2.72
b	0.61	0.88
b1	1.14	1.70
c	0.49	0.70
c2	1.23	1.32
D	8.95	9.35
e	2.40	2.70
e1	4.95	5.15
E	10.00	10.40
L	13.00	14.00
L1	3.50	3.93
L2	1.27	1.40

4.3 IPAK (TO-251) type A package information

Figure 26. IPAK (TO-251) type A package outline



0068771_A_rev.16

Table 10. IPAK (TO-251) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
B5		0.30	
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
L1	0.80		1.20
L2		0.80	1.00
V1		10°	

5 Ordering information

Table 11. Order codes

Order codes	Marking	Package	Packing
STF4N62K3	4N62K3	TO-220FP	Tube
STI4N62K3		I ² PAK	
STU4N62K3		IPAK	

Revision history

Table 12. Document revision history

Date	Revision	Changes
05-May-2010	1	First release.
16-Dec-2010	2	Document status promoted from preliminary data to datasheet.
27-Mar-2012	3	Inserted max and min. values for R_G in <i>Table 5</i> . Updated <i>Section 4: Package mechanical data</i> .
07-Aug-2012	4	Added package, mechanical data: I ² PAKFP. Updated <i>Table 1: Device summary</i> , <i>Table 2: Absolute maximum ratings</i> , <i>Table 3: Thermal data</i> , <i>Table 4: On /off states</i> , <i>Table 13: IPAK (TO-251) mechanical data</i> and <i>Figure 29: IPAK (TO-251) drawing</i> . Minor text changes.
27-Jan-2026	5	Removed order code STF14N62K3 and STP4N62K3. Updated <i>Section 4: Package information</i> . Minor text changes.



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