



STB4N62K3, STF4N62K3 STI4N62K3, STP4N62K3

N-channel 620 V, 1.8 Ω , 3.8 A SuperMESH3™ Power MOSFET
D²PAK, TO-220FP, I²PAK, TO-220

Preliminary data

Features

Type	V _{DSS}	R _{DS(on) max}	I _D	P _w
STB4N62K3	620 V	< 1.95 Ω	3.8 A	70 W
STF4N62K3				25 W
STI4N62K3				70 W
STP4N62K3				70 W

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

Application

- Switching applications

Description

These devices are made using the SuperMESH3™ Power MOSFET technology that is obtained via improvements applied to STMicroelectronics' SuperMESH™ technology combined with a new optimized vertical structure. The resulting product has an extremely low on resistance, superior dynamic performance and high avalanche capability, making it especially suitable for the most demanding applications.

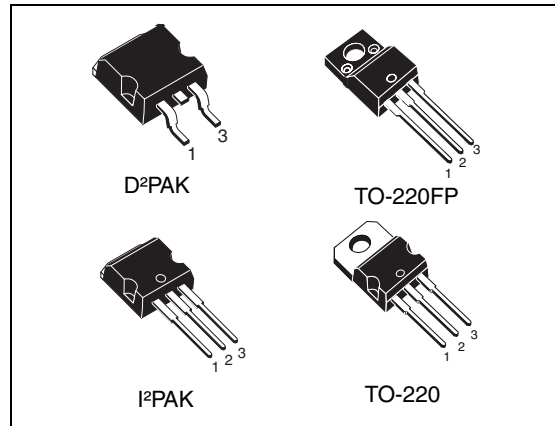


Figure 1. Internal schematic diagram

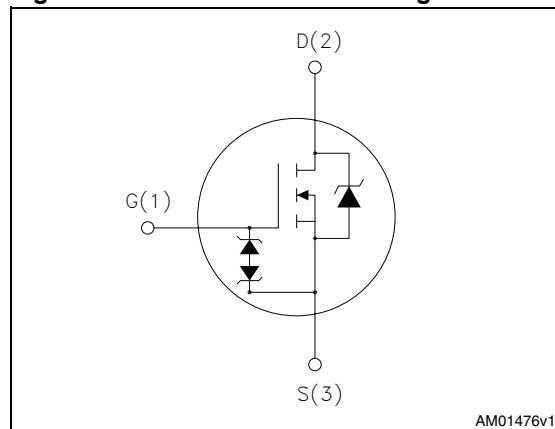


Table 1. Device summary

Order codes	Marking	Package	Packaging
STB4N62K3	4N62K3	D ² PAK	Tape and reel
STF4N62K3		TO-220FP	Tube
STI4N62K3		I ² PAK	Tube
STP4N62K3		TO-220	Tube

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value				Unit
		TO-220	D ² PAK	I ² PAK	TO-220FP	
V _{DS}	Drain-source voltage (V _{GS} = 0)	620				V
V _{GS}	Gate- source voltage	± 30				V
I _D	Drain current (continuous) at T _C = 25 °C	3.8		3.8 ⁽¹⁾		A
I _D	Drain current (continuous) at T _C = 100 °C	2		2 ⁽¹⁾		A
I _{DM} ⁽²⁾	Drain current (pulsed)	15.2		15.2 ⁽¹⁾		A
P _{TOT}	Total dissipation at T _C = 25 °C	70		25		W
I _{AR}	Avalanche current, repetitive or not-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} = 50V)	TBD				mJ
V _{ESD(G-S)}	Gate source ESD(HBM-C = 100 pF, R = 1.5 kΩ)	2500				V
dv/dt ⁽³⁾	Peak diode recovery voltage slope	12				V/ns
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T _C = 25 °C)	2500				V
T _{stg}	Storage temperature	- 55 to 150				°C
T _j	Max. operating junction temperature	150				°C

- Limited by package
- Pulse width limited by safe operating area
- I_{SD} ≤ 3.8 A, di/dt = 200 A/μs, V_{DD} = 80% V_{(BR)DSS}.

Table 3. Thermal data

Symbol	Parameter	Value				Unit
		TO-220	D ² PAK	I ² PAK	TO-220FP	
R _{thj-case}	Thermal resistance junction-case max	1.79		5		°C/W
R _{thj-pcb} ⁽¹⁾	Thermal resistance junction-pcb max		30			°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5		62.5		°C/W
T _I	Maximum lead temperature for soldering purpose	300		300		°C

- When mounted on 1inch sq FR-4 board, 2 oz Cu

2 Electrical characteristics

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

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	620			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}$, $T_C = 125\text{ °C}$			1 50	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 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	$V_{GS} = 10\text{ V}$, $I_D = 1.9\text{ A}$		1.8	1.95	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	450	-	pF
C_{oss}	Output capacitance			60		pF
C_{rss}	Reverse transfer capacitance			10		pF
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }496\text{ V}$, $V_{GS} = 0$	-	TBD	-	pF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related			TBD		pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	TBD	-	Ω
Q_g	Total gate charge	$V_{DD} = 496\text{ V}$, $I_D = 3.8\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 3)	-	14	-	nC
Q_{gs}	Gate-source charge			TBD		nC
Q_{gd}	Gate-drain charge			TBD		nC

1. Time related 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. Energy related is defined as a constant equivalent capacitance giving the same stored energy 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	$V_{DD} = 300\text{ V}$, $I_D = 1.9\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 2)	-	TBD	-	ns
t_r	Rise time			TBD		ns
$t_{d(off)}$	Turn-off-delay time			TBD		ns
t_f	Fall time			TBD		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	$I_{SD} = 3.8\text{ A}$, $V_{GS} = 0$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 3.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 60\text{ V}$ (see Figure 7)	-	TBD		ns
Q_{rr}	Reverse recovery charge			TBD		nC
I_{RRM}	Reverse recovery current			TBD		A
t_{rr}	Reverse recovery time	$I_{SD} = 3.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 7)	-	TBD		ns
Q_{rr}	Reverse recovery charge			TBD		nC
I_{RRM}	Reverse recovery current			TBD		A

1. Pulse width limited by safe operating area

2. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%

Table 8. Gate-source Zener diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$BV_{GSO}^{(1)}$	Gate-source breakdown voltage	$I_{GS} = \pm 1\text{ mA}$ (open drain)	30	-		V

1. The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components

3 Test circuits

Figure 2. Switching times test circuit for resistive load

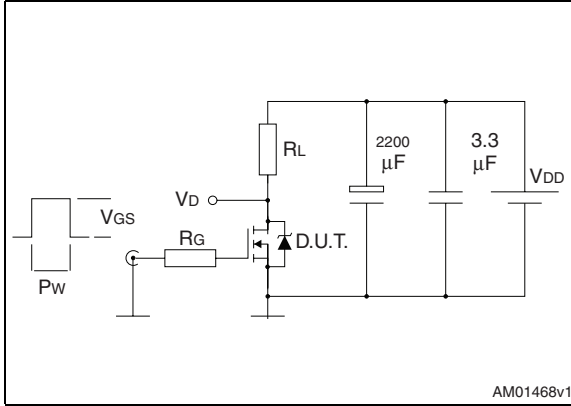


Figure 3. Gate charge test circuit

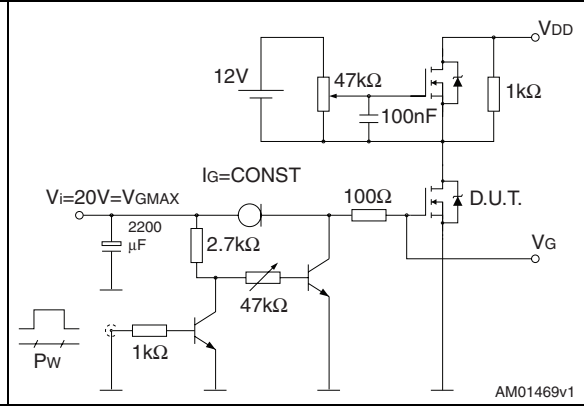


Figure 4. Test circuit for inductive load switching and diode recovery times

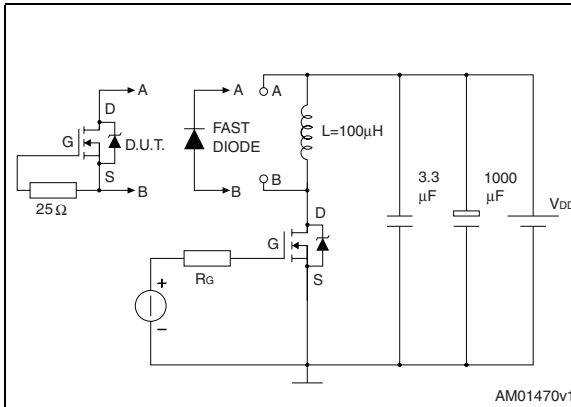


Figure 5. Unclamped Inductive load test circuit

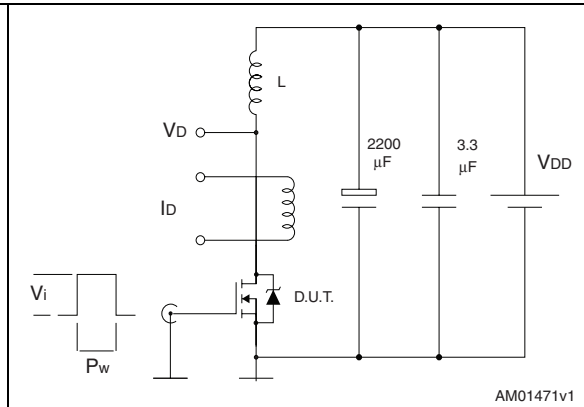


Figure 6. Unclamped inductive waveform

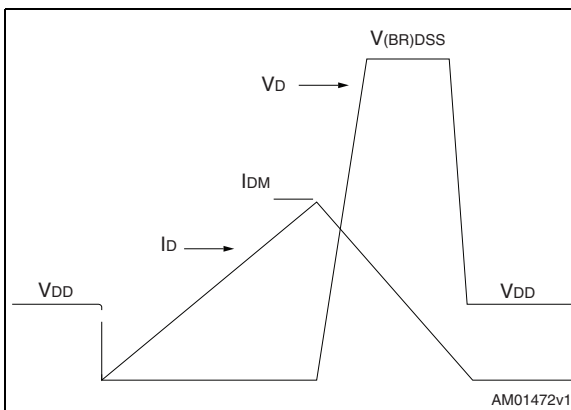
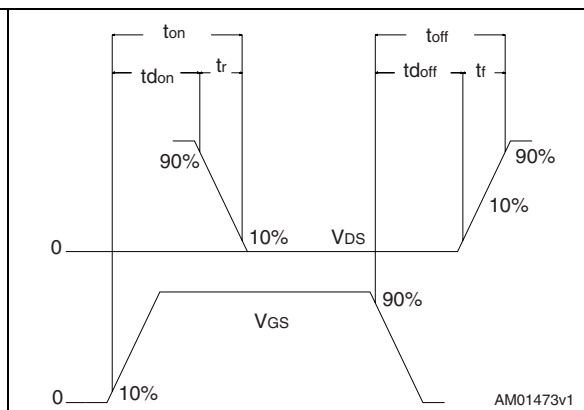


Figure 7. Switching time waveform



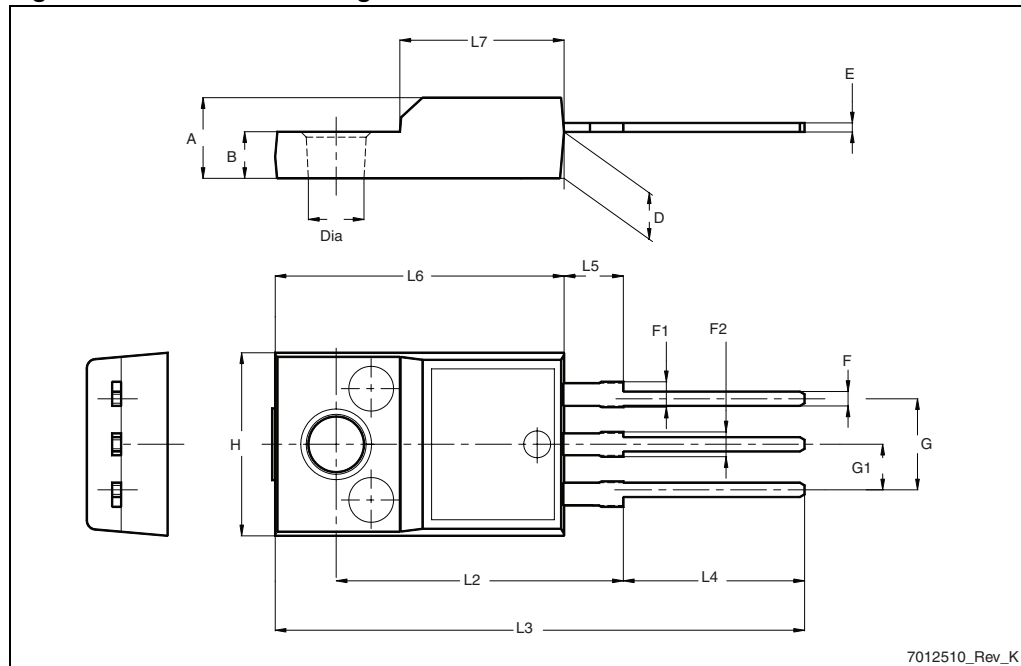
4 Package mechanical data

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 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

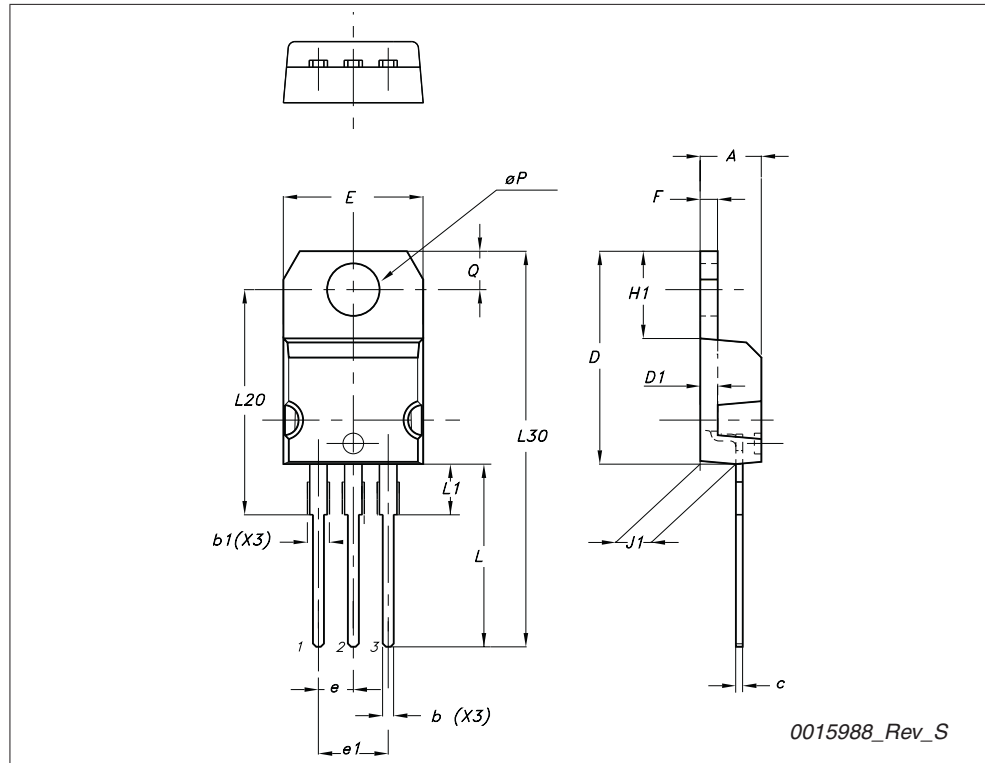
Figure 8. TO-220FP drawing



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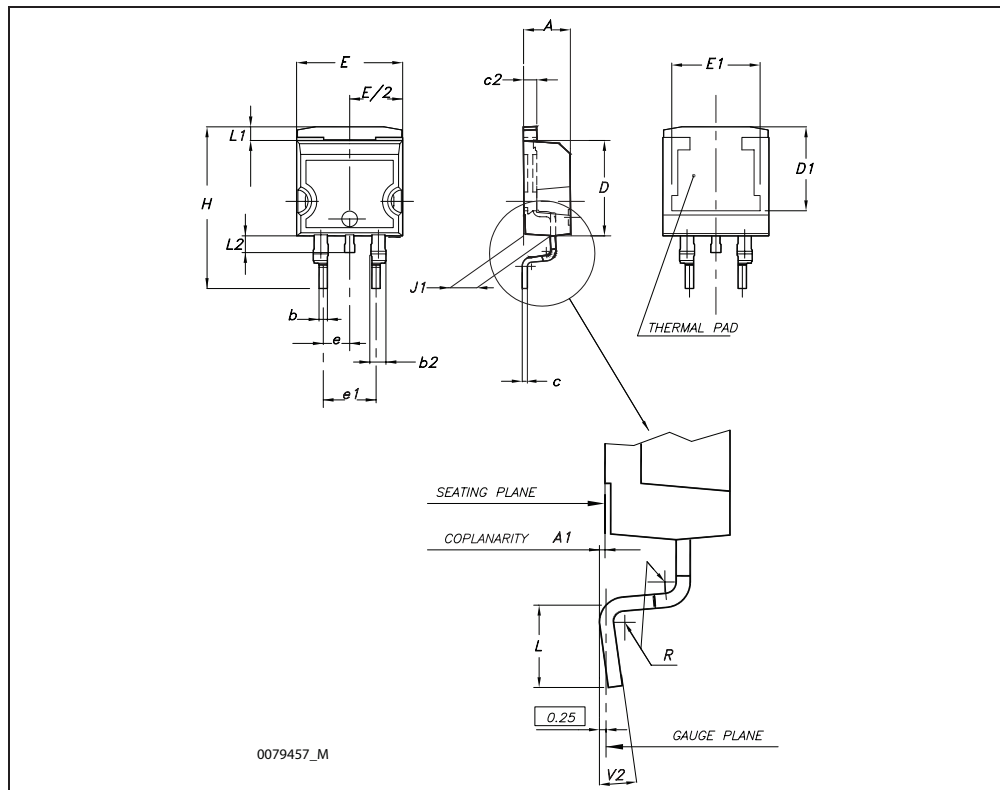
TO-220 type A mechanical data

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	
∅P	3.75		3.85
Q	2.65		2.95



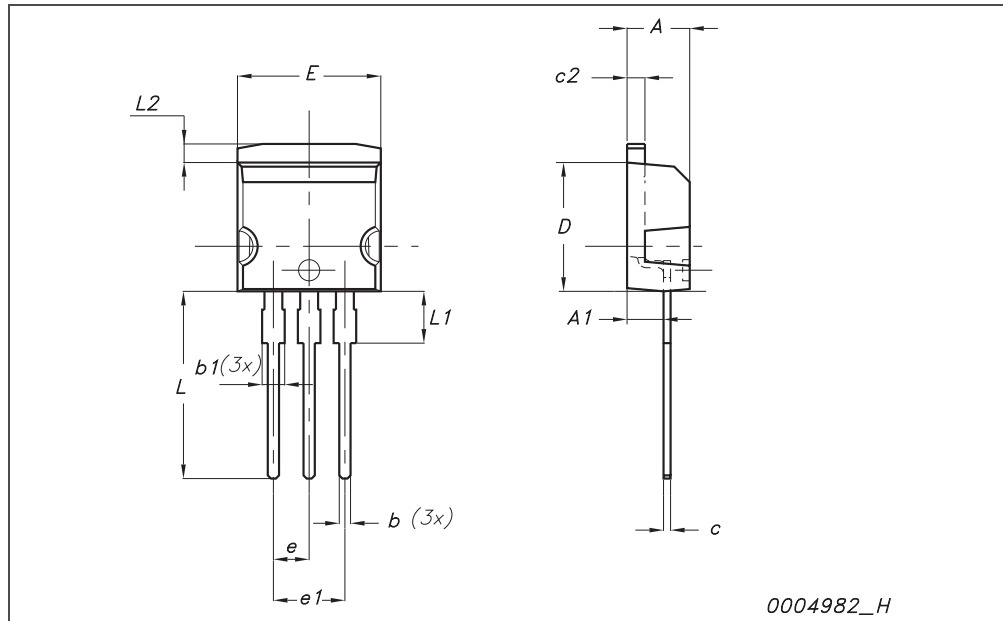
D²PAK (TO-263) mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.027		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.017		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50			0.295		
E	10		10.40	0.394		0.409
E1	8.50			0.334		
e		2.54			0.1	
e1	4.88		5.28	0.192		0.208
H	15		15.85	0.590		0.624
J1	2.49		2.69	0.099		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.05		0.055
L2	1.30		1.75	0.051		0.069
R		0.4			0.016	
V2	0°		8°	0°		8°



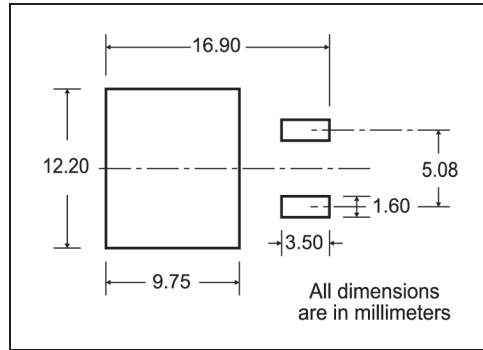
I²PAK (TO-262) mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



5 Package mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

6 Revision history

Table 10. Document revision history

Date	Revision	Changes
05-May-2010	1	First release

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