STD8N65M5, STF8N65M5, STI8N65M5 STP8N65M5, STU8N65M5

N-channel 650 V, 0.56 Ω, 7 A MDmesh™ V Power MOSFET in I²PAK, TO-220, TO-220FP, DPAK and IPAK

Preliminary data

Features

Type	V_{DSS} @ T_{Jmax}	$R_{DS(on)}$ max	I_D
STD8N65M5	710 V	< 0.6 Ω	7 A
STF8N65M5	710 V	< 0.6 Ω	7 A (1)
STI8N65M5	710 V	< 0.6 Ω	7 A
STP8N65M5	710 V	< 0.6 Ω	7 A
STU8N65M5	710 V	< 0.6 Ω	7 A

1. Limited only by maximum temperature allowed

- Worldwide best $R_{DS(on)}$ * area
- Higher V_{DSS} rating
- High dv/dt capability
- Excellent switching performance
- Easy to drive
- 100% avalanche tested

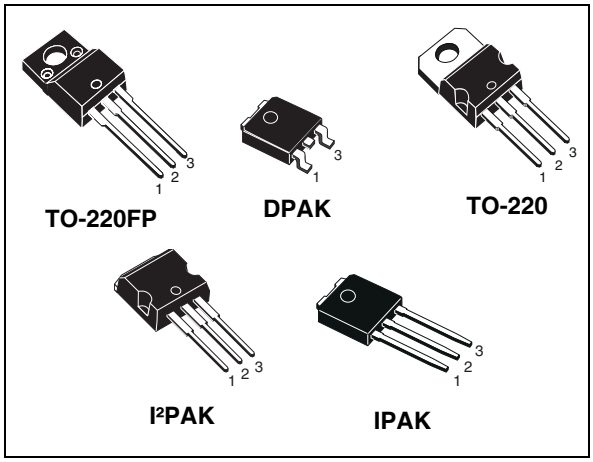
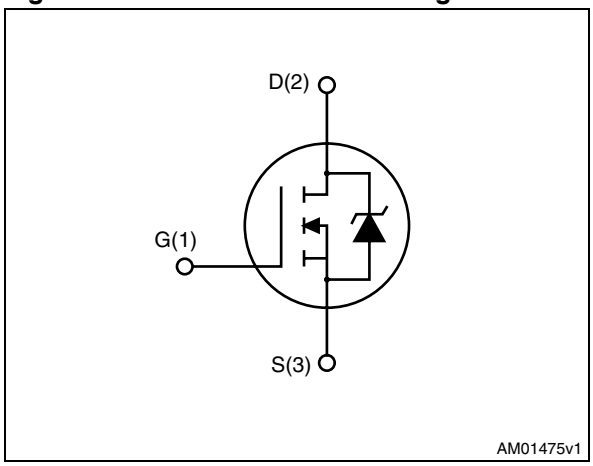


Figure 1. Internal schematic diagram



Application

- Switching applications

Description

MDmesh™ V is a revolutionary Power MOSFET technology based on an innovative proprietary vertical process, which is combined with STMicroelectronics' well-known PowerMESH™ horizontal layout structure. The resulting product has extremely low on-resistance, which is unmatched among silicon-based Power MOSFETs, making it especially suitable for applications which require superior power density and outstanding efficiency.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STD8N65M5	8N65M5	DPAK	Tape and reel
STF8N65M5	8N65M5	TO-220FP	Tube
STI8N65M5	8N65M5	I²PAK	Tube
STP8N65M5	8N65M5	TO-220	Tube
STU8N65M5	8N65M5	IPAK	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220, IPAK DPAK, I²PAK	TO-220FP	
V_{GS}	Gate- source voltage	± 25		V
I_D	Drain current (continuous) at T_C = 25 °C	7	7 (1)	A
I_D	Drain current (continuous) at T_C = 100 °C	4.4	4.4 (1)	A
I_{DM} (2)	Drain current (pulsed)	28	28 (1)	A
P_{TOT}	Total dissipation at T_C = 25 °C	70	25	W
I_{AR}	Max current during repetitive or single pulse avalanche (pulse width limited by T_{JMAX})	TBD		A
E_{AS}	Single pulse avalanche energy (starting T_j = 25°C, I_D = I_{AR}, V_{DD} = 50V)	TBD		mJ
dv/dt (3)	Peak diode recovery voltage slope	TBD		V/ns
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; Tc = 25 °C)		2500	V
T_{stg}	Storage temperature	-55 to 150		°C
T_j	Max. operating junction temperature	150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 33$ A, di/dt $\leq$ 400 A/µs, $V_{Peak} < V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value					Unit
		DPAK	IPAK	TO-220	I²PAK	TO-220FP	
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.79				5	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max		100	62.5			°C/W
$R_{thj\text{-}pcb}$	Thermal resistance junction-pcb max	50					°C/W
T_l	Maximum lead temperature for soldering purpose	300					°C

2 Electrical characteristics

(T_C = 25 °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 mA, V_{GS} = 0	650			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating V_{DS} = Max rating, T_C=125 °C			1 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 25 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	3	4	5	V
$R_{DS(on}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 3.5 A		0.56	0.6	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 100 V, f = 1 MHz, V_{GS} = 0	-	TBD TBD TBD	-	pF pF pF
$C_{o(er)}$(1)	Equivalent output capacitance energy related	V_{GS} = 0, V_{DS} = 0 to 520 V	-	TBD	-	pF
$C_{o(tr)}$(2)	Equivalent output capacitance time related	V_{GS} = 0, V_{DS} = 0 to 520 V	-	TBD	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain	-	TBD	-	Ω
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 520 V, I_D = 3.5 A, V_{GS} = 10 V (see *Figure 3*)	-	190 TBD TBD	-	nC nC nC

1. $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}
2. $C_{o(tr)}$ is a constant capacitance value that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	V_{DD} = 400 V, I_D = 4A,	-	TBD	-	ns
t_r	Rise time	R_G = 4.7 Ω, V_{GS} = 10 V		TBD		ns
t_c	Cross time	(see *Figure 4*)		TBD		ns
t_f	Fall time	(see *Figure 7*)		TBD		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		7	A
I_{SDM} (1)	Source-drain current (pulsed)				28	A
V_{SD} (2)	Forward on voltage	I_{SD} = 7 A, V_{GS} = 0	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 7 A, di/dt = 100 A/µs	-	TBD		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 100 V		TBD		µC
I_{RRM}	Reverse recovery current	(see *Figure 4*)		TBD		A
t_{rr}	Reverse recovery time	I_{SD} = 7 A, di/dt = 100 A/µs	-	TBD		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 100 V, T_j = 150 °C		TBD		µC
I_{RRM}	Reverse recovery current	(see *Figure 4*)		TBD		A

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

3 Test circuits

Figure 2. Switching times test circuit for resistive load

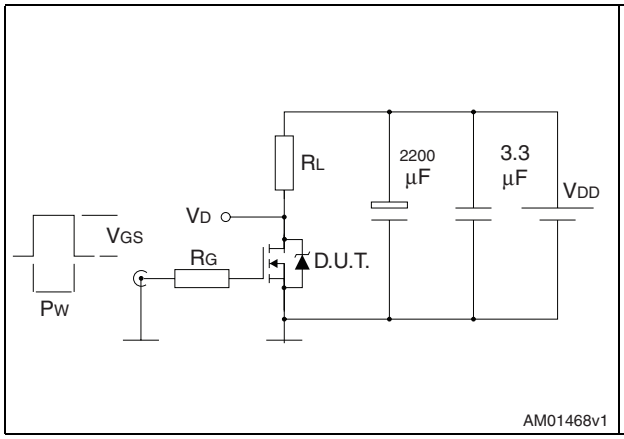


Figure 3. Gate charge test circuit

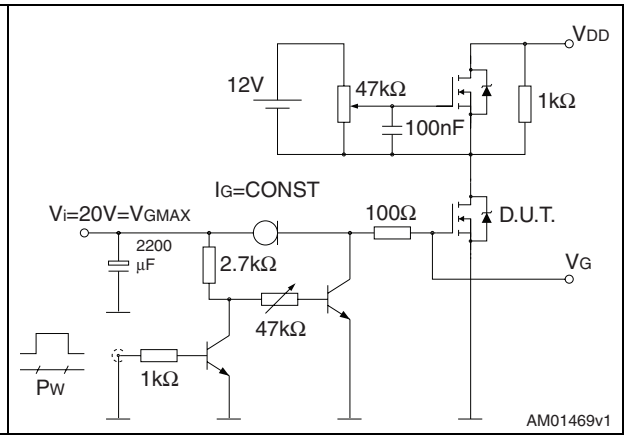


Figure 4. Test circuit for inductive load switching and diode recovery times

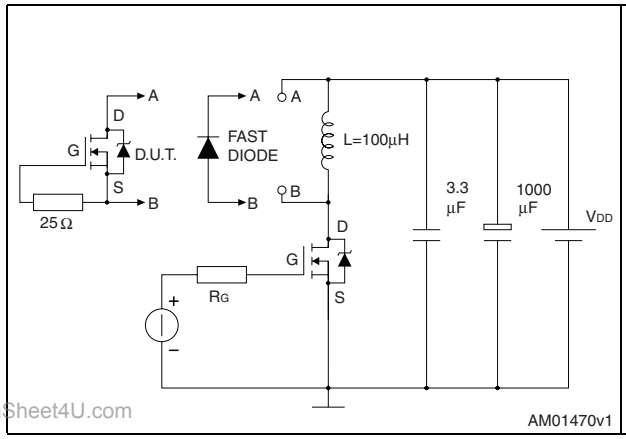


Figure 5. Unclamped inductive load test circuit

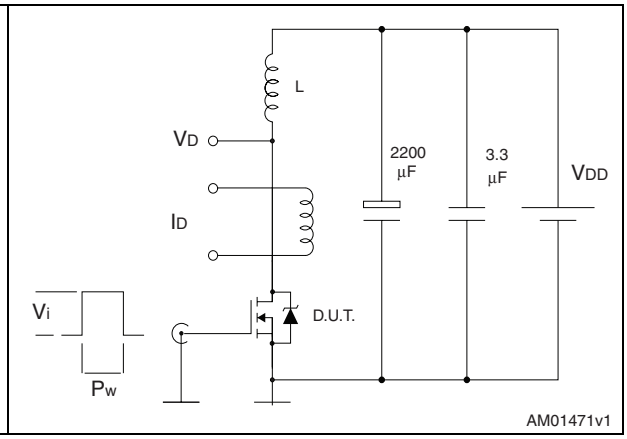


Figure 6. Unclamped inductive waveform

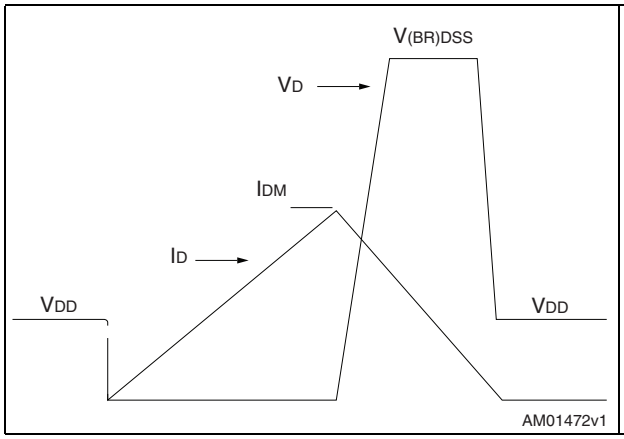
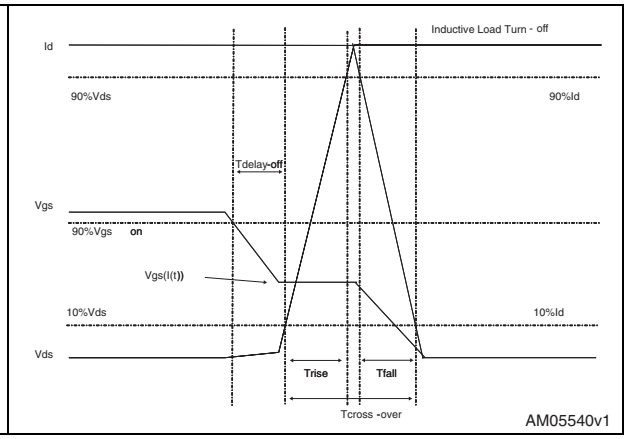


Figure 7. Switching time waveform



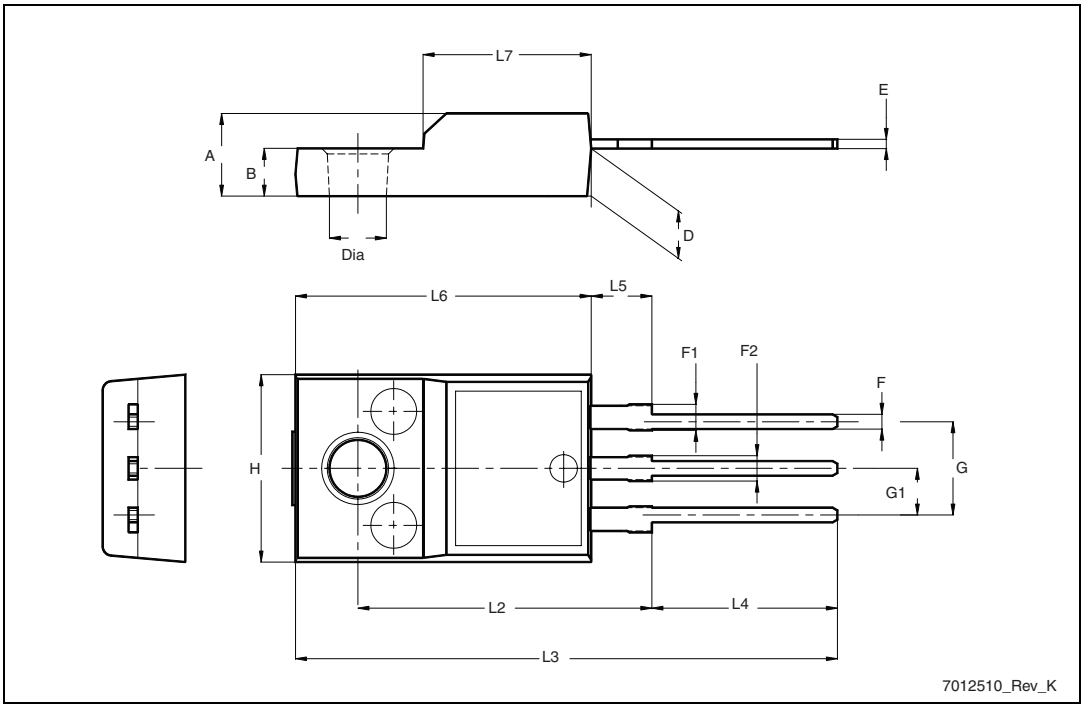
4 Package mechanical data

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 8. TO-220FP mechanical data

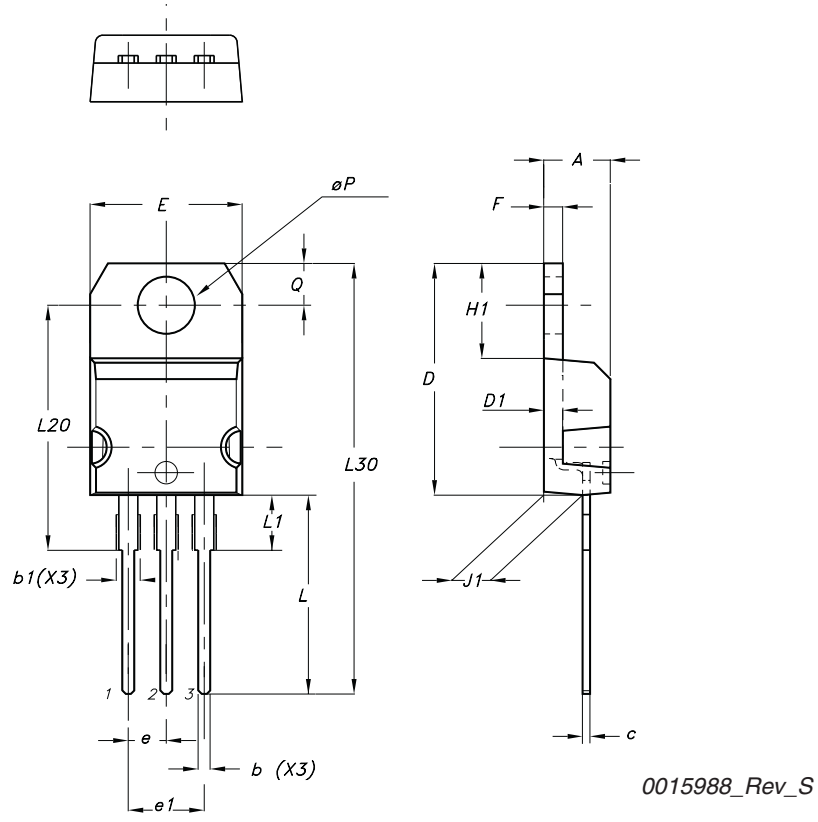
Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 8. TO-220FP drawing mechanical data



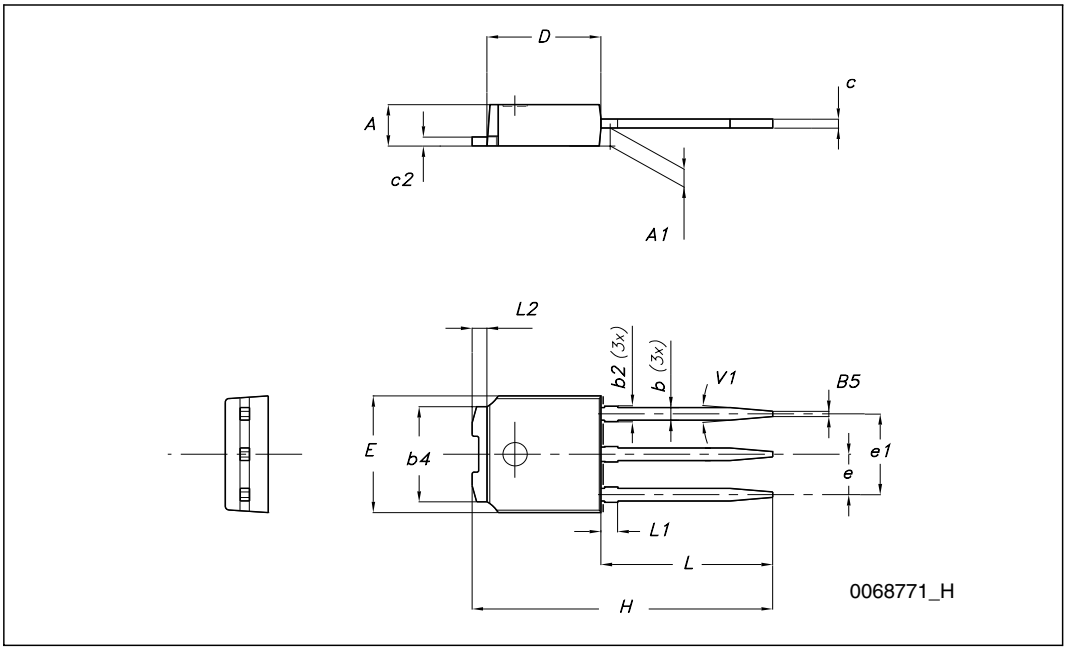
TO-220 type A mechanical data

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



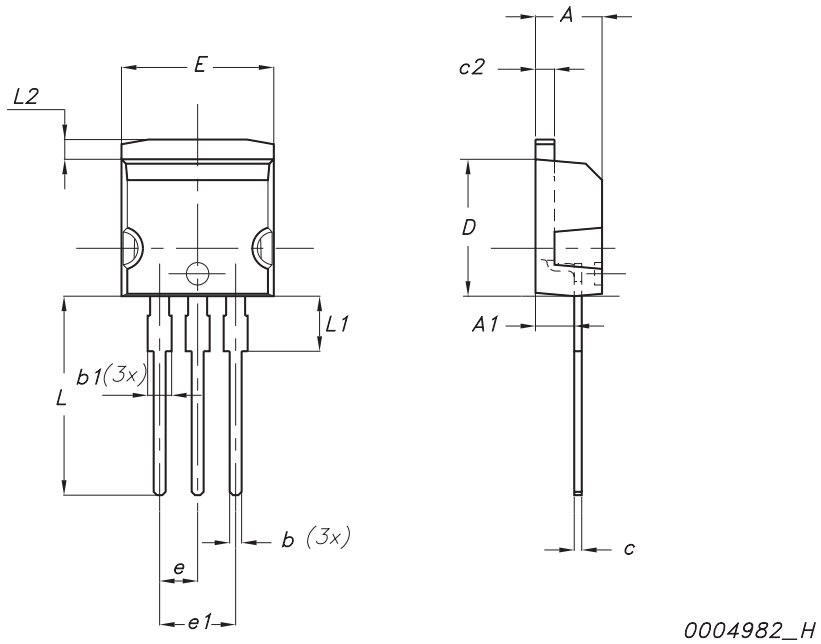
TO-251 (IPAK) mechanical data

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
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	
V1		10 °	



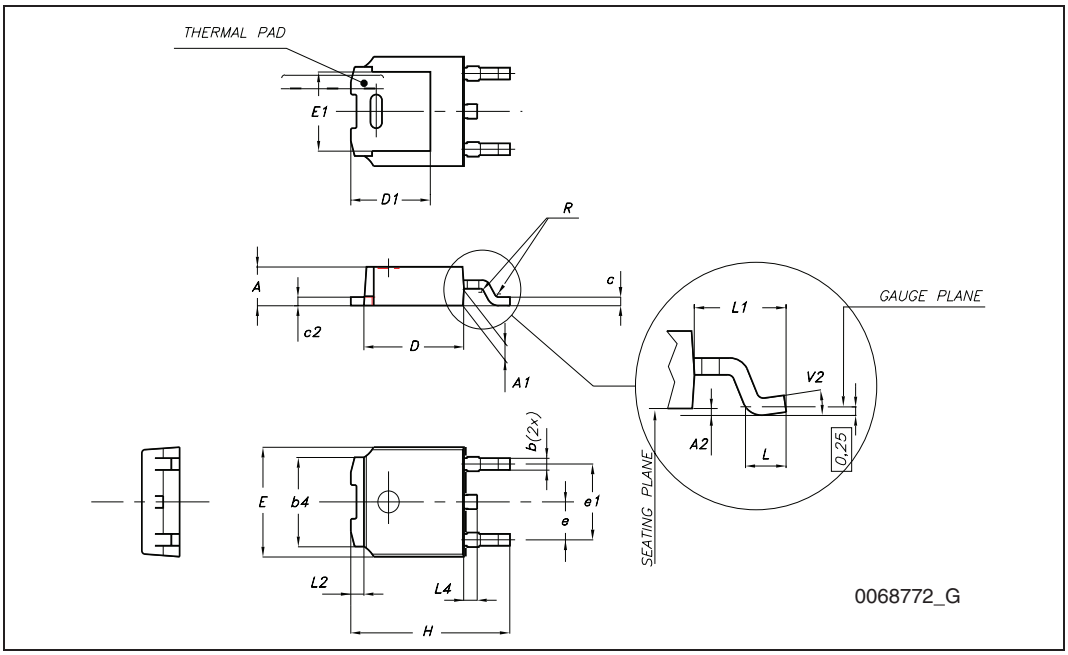
I²PAK (TO-262) mechanical data

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



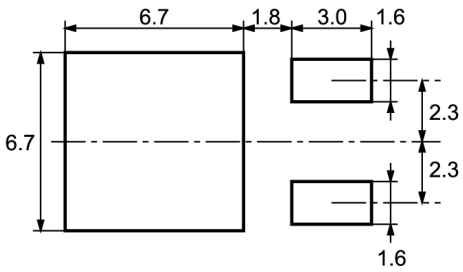
TO-252 (DPAK) mechanical data

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		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0 °		8 °



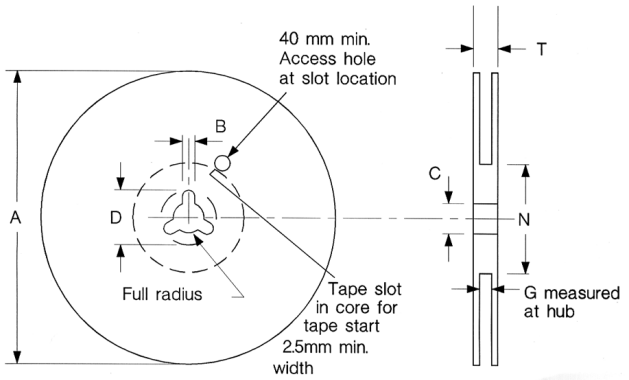
5 Packaging mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



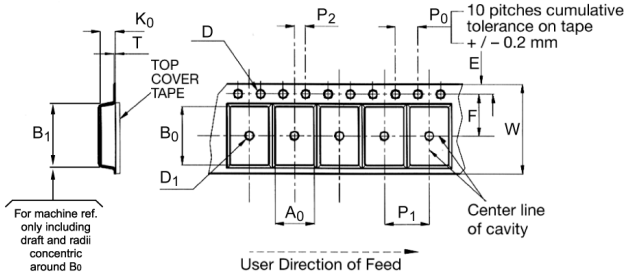
REEL MECHANICAL DATA

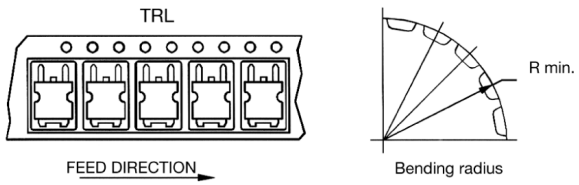
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641





6 Revision history

Table 9. Document revision history

Date	Revision	Changes
23-Oct-2009	1	First release

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