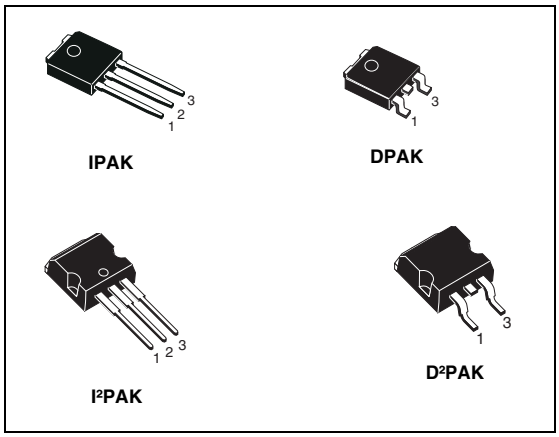
STGB18N40LZ
STGD18N40LZ

E_{AS} 180 mJ - 400 V - internally clamped IGBT

Features

- AEC Q101 compliant
- 180 mJ of avalanche energy @ T_C = 150 °C, L = 3 mH
- ESD gate-emitter protection
- Gate-collector high voltage clamping
- Logic level gate drive
- Low saturation voltage
- High pulsed current capability
- Gate and gate-emitter resistor



Application

- Pencil coil electronic ignition driver

Description

This IGBT utilizes the advanced PowerMESH™ process resulting in an excellent trade-off between switching performance and low on-state behavior.

Figure 1. Internal schematic diagram

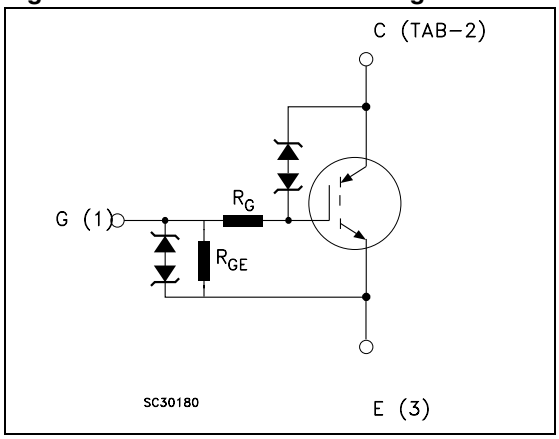


Table 1. Device summary

Order codes	Marking	Package	Packaging
STGD18N40LZT4	GD18N40LZ	DPAK	Tape and reel
STGD18N40LZ-1	GD18N40LZ	IPAK	Tube
STGB18N40LZT4	GB18N40LZ	D²PAK	Tape and reel
STGB18N40LZ-1	GB18N40LZ	I²PAK	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		DPAK IPAK	D²PAK I²PAK	
V_{CES}	Collector-emitter voltage (v_{GE} = 0)	$V_{CES(clamped)}$		V
V_{ECS}	Emitter collector voltage (V_{GE} = 0)	20		V
I_C (1)	Collector current (continuous) at T_C = 100 °C	25	30	A
I_{CP} (2)	Pulsed collector current	40		A
V_{GE}	Gate-emitter voltage	$V_{GE(clamped)}$		V
P_{TOT}	Total dissipation at T_C = 25 °C	125	150	W
E_{AS}	Single pulse energy T_C= 25 °C, L = 3 mH, R_G = 1 KΩ	300		mJ
E_{AS}	Single pulse energy T_C=150 °C, L = 3 mH, R_G = 1 KΩ	180		mJ
E_{SD}	Human body model, R= 1550 Ω, C = 100 pF	8		kV
	Machine model, R = 0, C = 100 pF	800		V
	Charged device model	2		kV
T_{stg}	Storage temperature	– 55 to 175		°C
T_j	Operating junction temperature			

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C, I_C)}$$

2. Pulse width limited by max. junction temperature allowed

Table 3. Thermal resistance

Symbol	Parameter	Value		Unit
		DPAK IPAK	D²PAK I²PAK	
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.2	1	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	65	62.5	°C/W

2 Electrical characteristics

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

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{CES(clamped)}$	Collector emitter clamped voltage (V_{GE} = 0)	I_C = 2 mA, R_G = 1 kΩ T_C = - 40 °C to 150 °C	370	400	430	V
$V_{(BR)ECS}$	Emitter collector break-down voltage (V_{GE} = 0)	I_C = 75 mA	20	28		V
$V_{GE(clamped)}$	Gate emitter clamped voltage	I_G = ±2 mA	12		16	V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 15 V, T_C = 150 °C			10	µA
		V_{CE} = 200 V,T_C = 150 °C			100	µA
I_{GES}	Gate cut-off current (V_{CE} = 0)	V_{GE} = ±10 V	450	625	830	µA
R_{GE}	Gate emitter resistance		12	16	22	KΩ
R_G	Gate resistance			1.6		KΩ
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = 12 V, I_C = 1 mA,T_C = -40 °C	1.4			V
		V_{CE} = 12 V, I_C = 1 mA	1.2	1.6	2.3	V
		V_{CE} = 12 V, I_C = 1 mA, T_C =150 °C	0.7			V
V_{GEP}	Gate emitter plateau voltage	V_{CE} = 12 V, I_C = 10 A		2.9		V
$V_{CE(sat)}$	Collector emitter saturation voltage	V_{GE} = 4.5 V, I_C = 10 A		1.35	1.7	V
		V_{GE} = 4.5 V, I_C = 10 A, T_C = 150 °C		1.30		V
		V_{GE} = 3.8 V, I_C = 6 A		1.30		V

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0		490		pF
C_{oes}	Output capacitance			90		pF
C_{res}	Reverse transfer capacitance			6.5		pF
Q_g	Gate charge	V_{CE} = 280 V, I_C = 10 A, V_{GE} = 5 V		23		nC

Table 6. Switching on/off

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
	Resistive load	V_{CC} = 14 V, I_C = 10 A				
$t_{d(on)}$	Turn-on delay time	R_G = 1 kΩ, V_{GE} = 5 V		1		µs
t_r	Rise time			5.8		µs
	Resistive load	V_{CC} = 14 V, I_C = 10 A				
$t_{d(on)}$	Turn-on delay time	R_G = 1 kΩ, V_{GE} = 5 V,		1		µs
t_r	Rise time	T_C = 150 °C		5.9		µs
	Inductive load					
$t_{d(off)}$	Turn-off delay time	V_{CC} = 300 V, L = 1 mH		14		µs
t_f	Fall time	R_G = 1 kΩ, V_{GE} = 5 V		6.7		µs
dv/dt	Turn-off voltage slope			90		V/µs
	Inductive load					
$t_{d(off)}$	Turn-off delay time	V_{CC} = 300 V, L = 1 mH		15		µs
t_f	Fall time	R_G = 1 kΩ, V_{GE} = 5 V		9.8		µs
dv/dt	Turn-off voltage slope	T_C = 150 °C		80		V/µs

2.1 Electrical characteristics (curves)

Figure 2. Collector-emitter voltage vs temperature

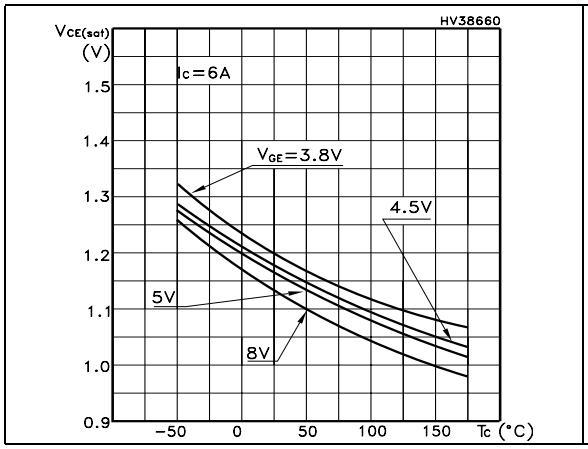


Figure 3. Collector-emitter voltage vs temperature

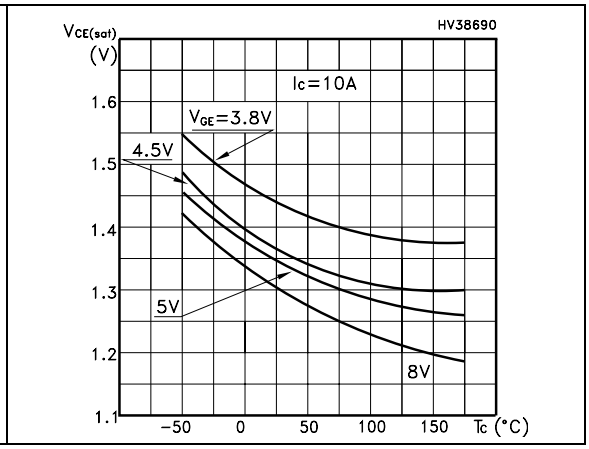


Figure 4. Collector-emitter voltage vs temperature

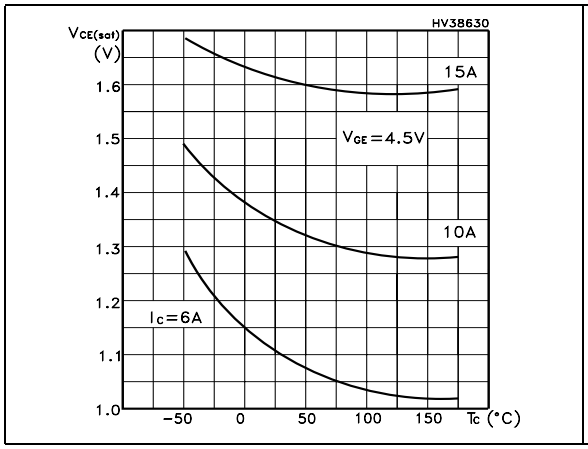


Figure 5. Self clamped inductive switch

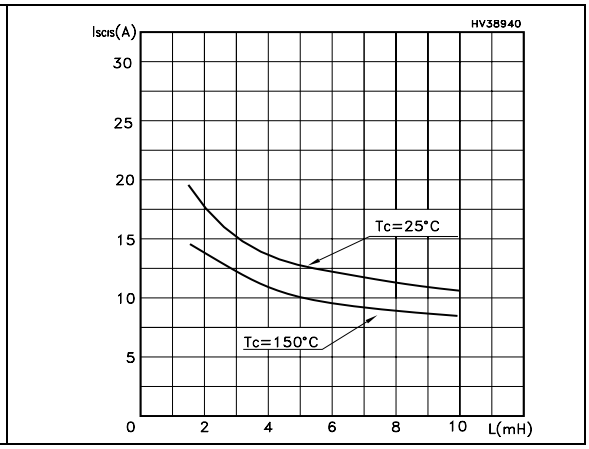


Figure 6. Collector current vs collector emitter voltage @ 25 °C

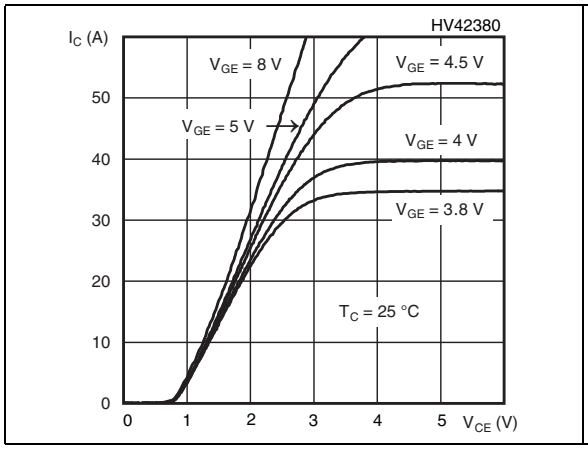


Figure 7. Collector current vs collector emitter voltage @ -40 °C

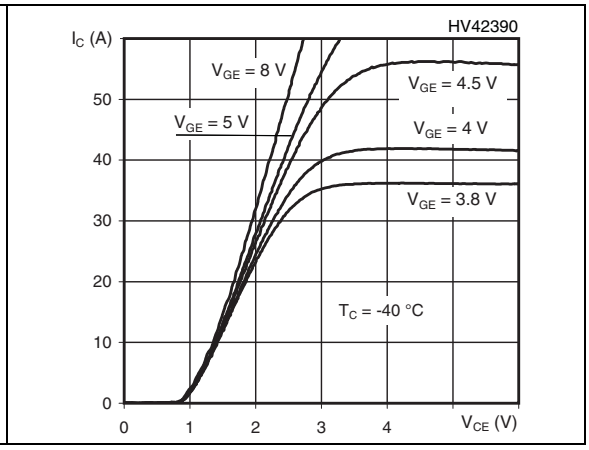


Figure 8. Collector current vs collector emitter voltage @ 175 °C

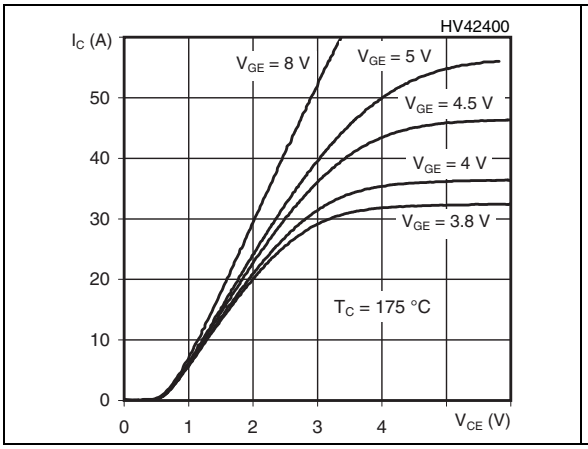


Figure 9. Transfer characteristics

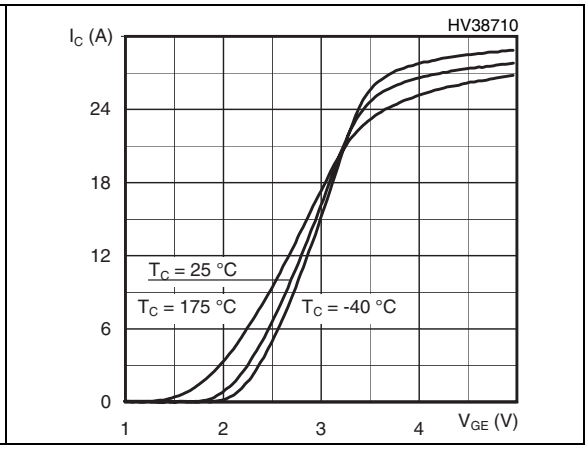


Figure 10. Collector emitter leakage current vs. temperature

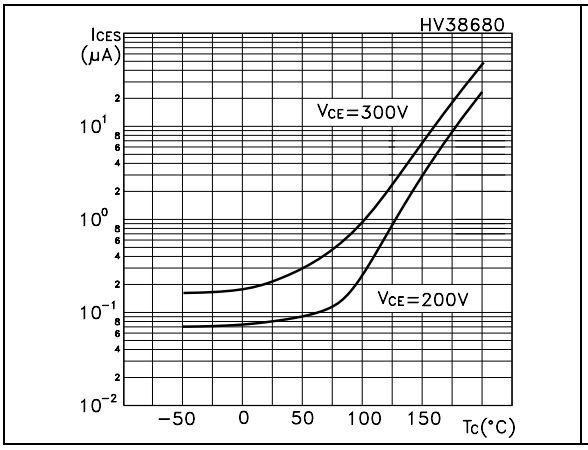


Figure 11. Normalized collector emitter breakdown voltage vs temperature

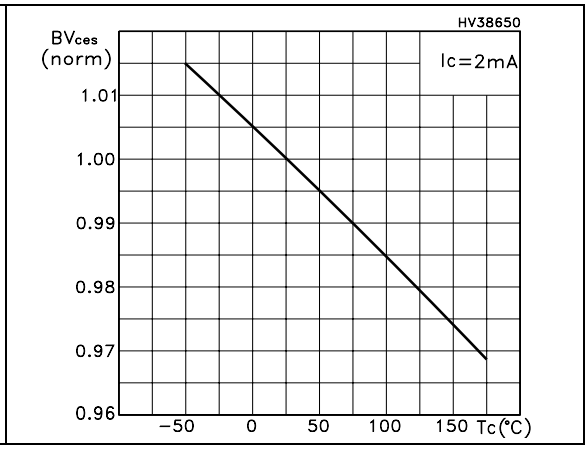


Figure 12. Normalized gate threshold voltage vs temperature

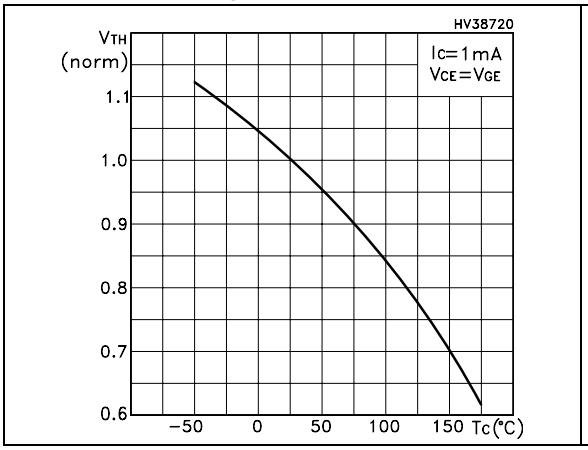


Figure 13. Normalized collector emitter voltage vs temperature

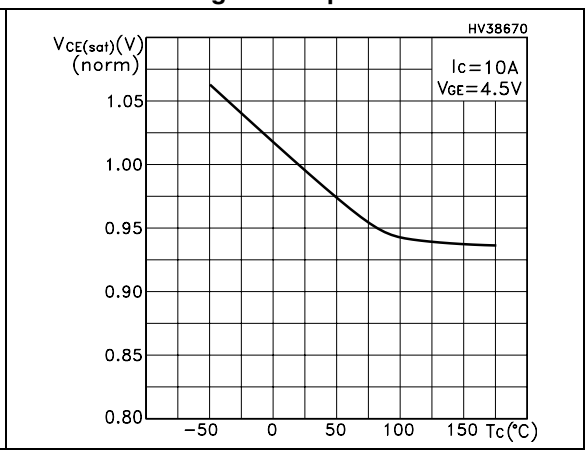


Figure 14. Thermal impedance for D²PAK / I²PAK

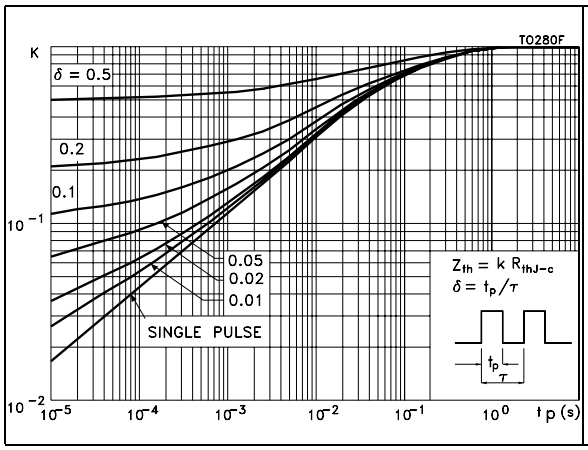
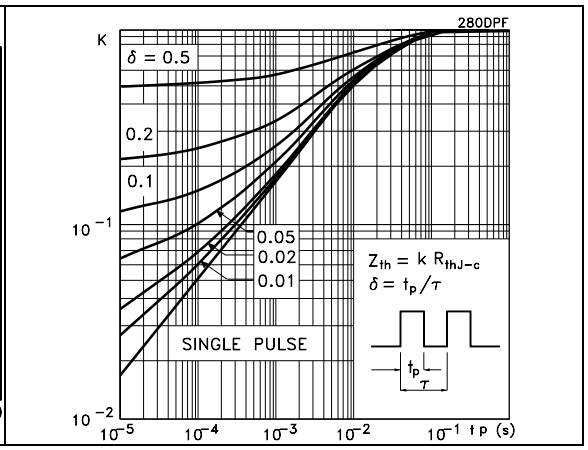


Figure 15. Thermal impedance for DPAK / IPAK



3 Test circuits

Figure 16. Test circuit for inductive load switching

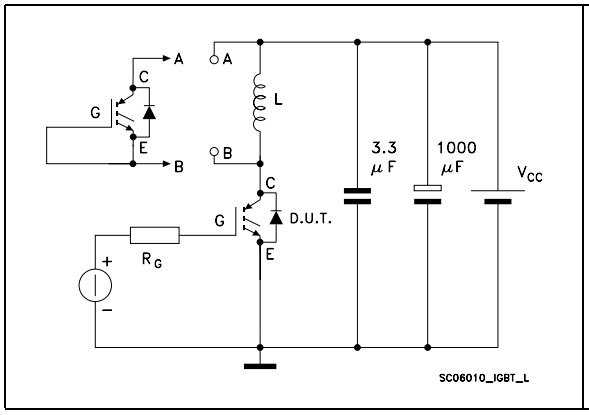


Figure 17. Gate charge test circuit

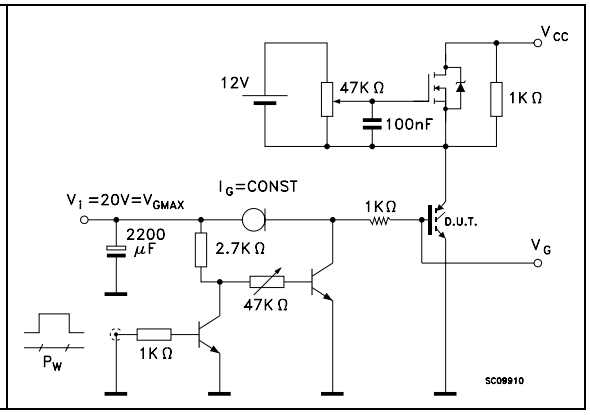


Figure 18. Switching waveform

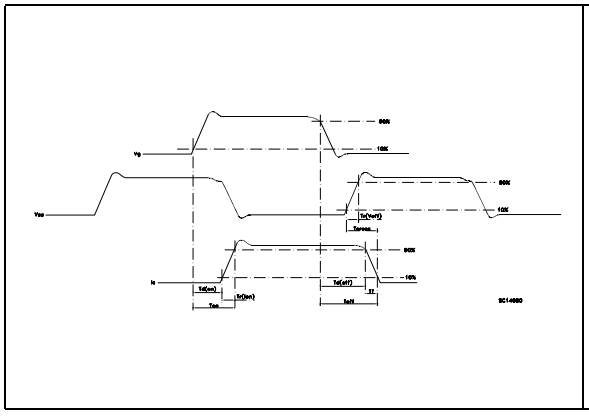
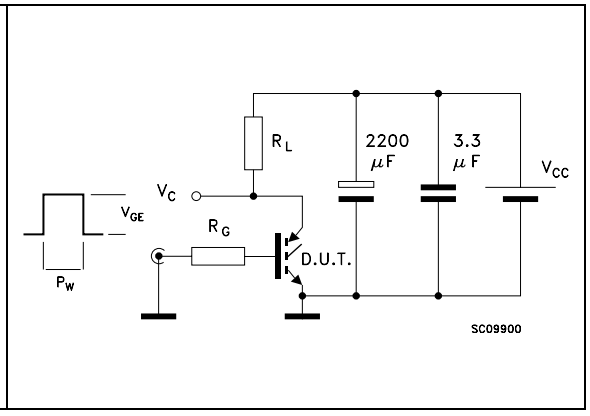


Figure 19. Test circuit for resistive load switching

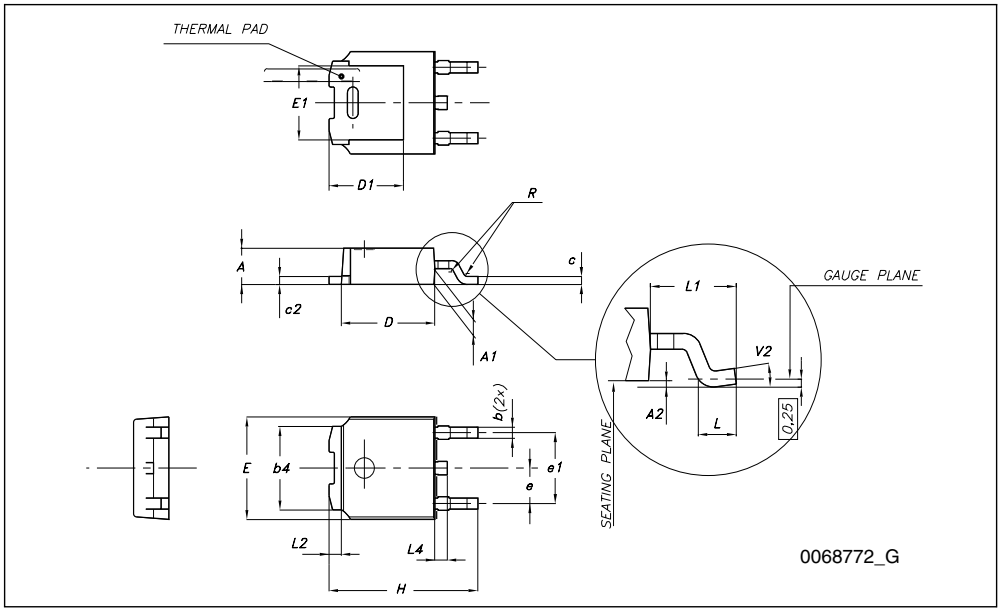


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: *www.st.com*

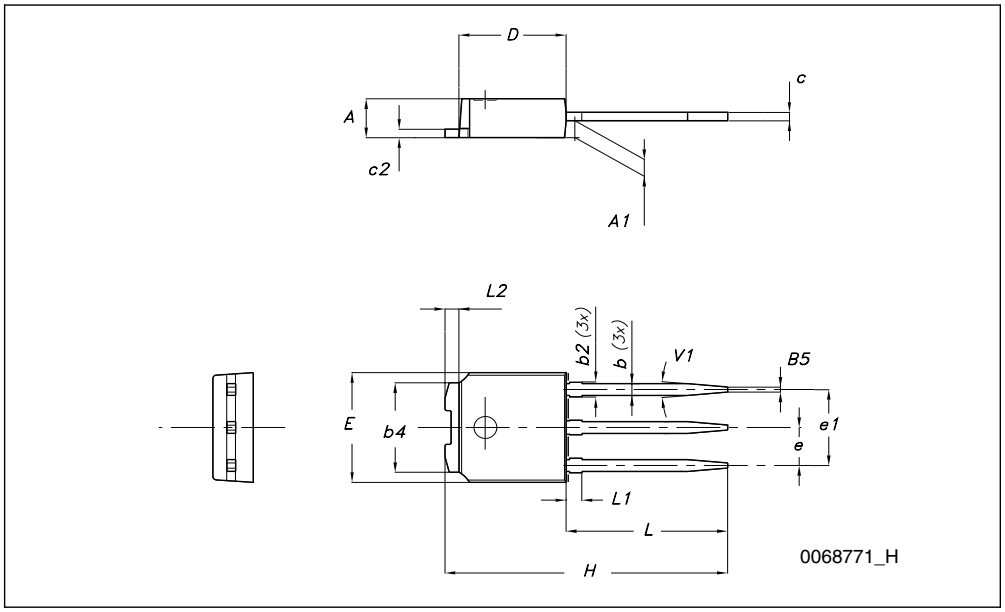
TO-252 (DPAK) mechanical data

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 °



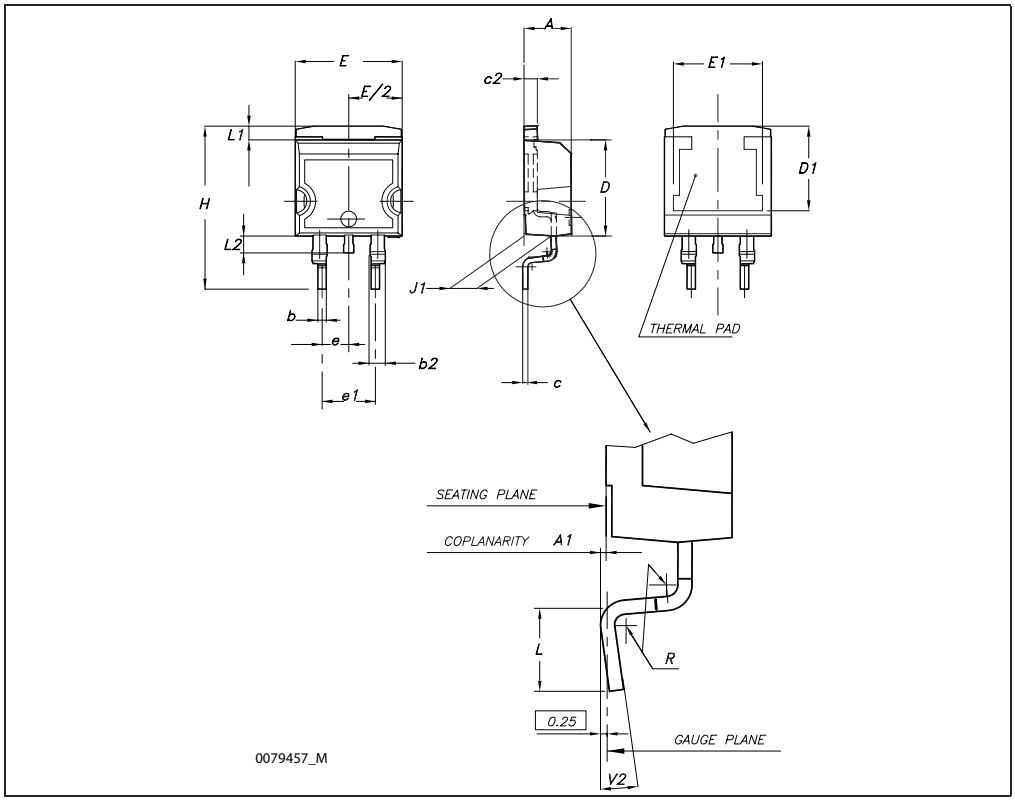
TO-251 (IPAK) mechanical data

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 ^{o}	



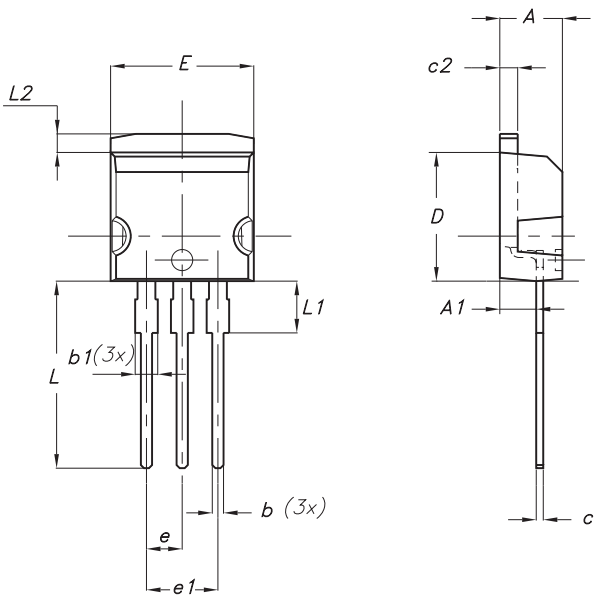
D²PAK (TO-263) mechanical data

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°



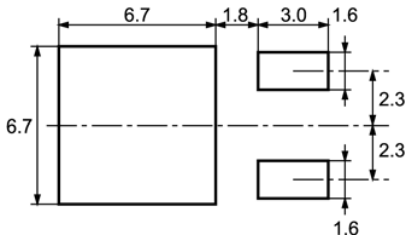
I²PAK (TO-262) mechanical data

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



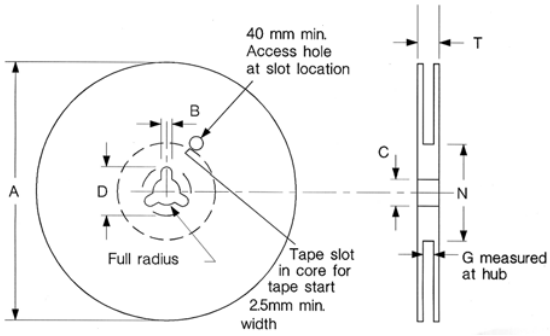
5 Packaging mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



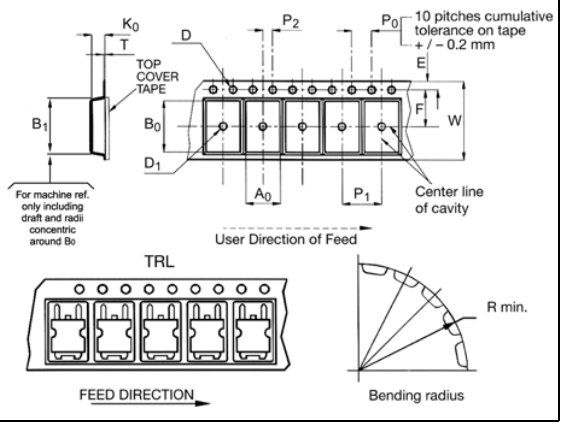
REEL MECHANICAL DATA

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

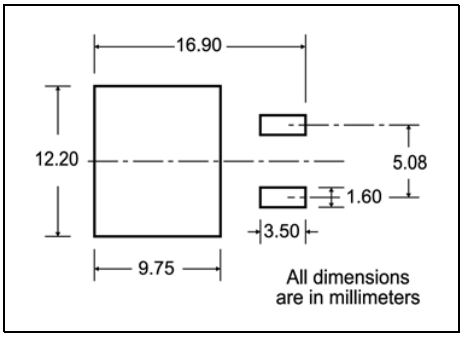
BASE QTY	BULK QTY
2500	2500

TAPE MECHANICAL DATA

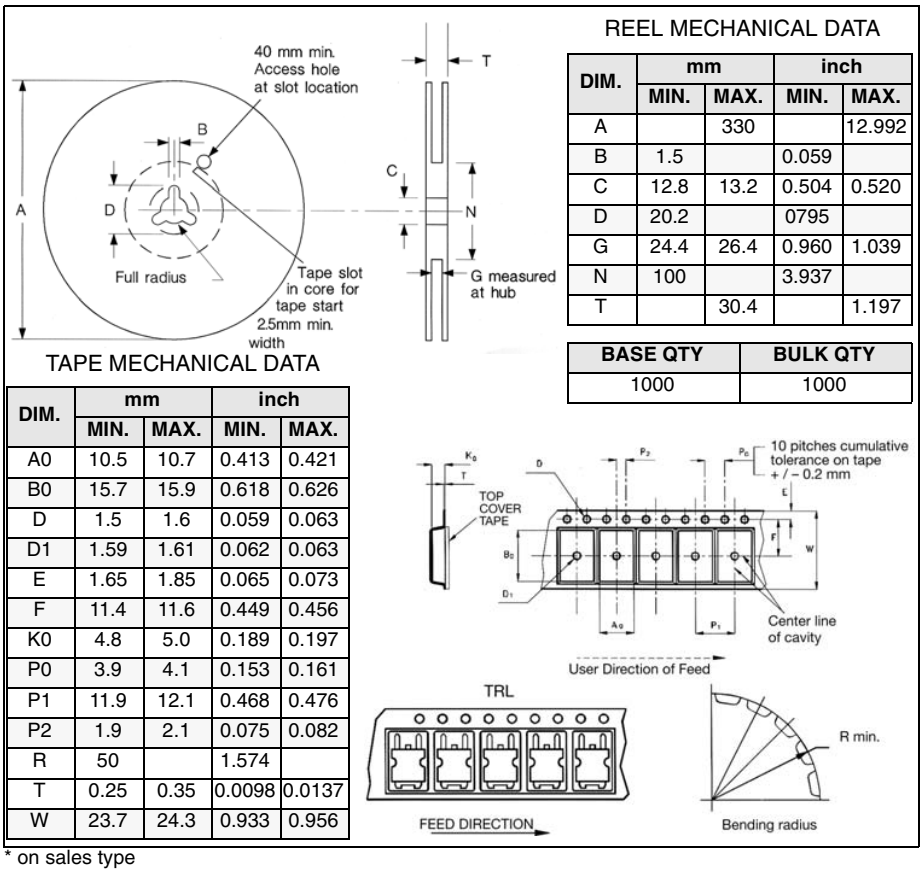
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618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



D²PAK FOOTPRINT



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		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

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

* on sales type

6 Revision history

Table 7. Document revision history

Date	Revision	Changes
18-Jan-2008	1	Initial release.
07-Mar-2008	2	Modified *Figure 7*, *Figure 8*, *Figure 10*.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com