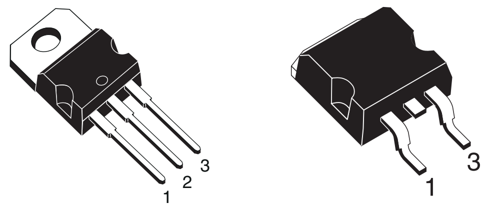
STGB30V60DF
STGP30V60DF

600 V, 30 A very high speed trench gate field-stop IGBT

Datasheet — preliminary data

Features

- Maximum junction temperature : T_J = 175 °C
- Very high speed switching
- Negligible tail current
- Low saturation voltage: $V_{CE(sat)}$ = 1.9 V (typ.) @ I_C = 30 A
- Tight parameters distribution
- Safe paralleling
- Low thermal resistance
- Very fast soft recovery antiparallel diode
- Lead free package



TO-220 D²PAK

Applications

- Photovoltaic inverters
- Uninterruptible power supply
- Welding
- Power factor correction
- Very high frequency converters

Description

This device is an IGBT developed using an advanced proprietary trench gate and field stop structure. This new IGBT "V" series offers the optimum compromise between conduction and switching losses, maximizing the efficiency of very high frequency converters. Furthermore, a positive VCE(sat) temperature coefficient and very tight parameter distribution result in easier paralleling operation.

Figure 1. Internal schematic diagram

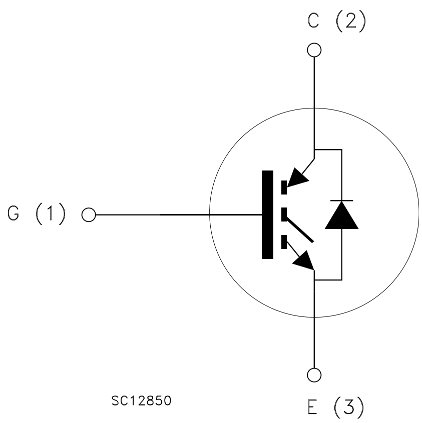


Table 1. Device summary

Order code	Marking	Package	Packaging
STGB30V60DF	GB30V60DF	D²PAK	Tape & reel
STGP30V60DF	GP30V60DF	TO-220	Tube

This is preliminary information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	600	V
I_C	Continuous collector current at T_C = 25 °C	60	A
I_C	Continuous collector current at T_C = 100 °C	30	A
I_{CP} (1)	Pulsed collector current	120	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous forward current at T_C = 25 °C	TBD	A
	Continuous forward current at T_C = 100 °C	TBD	
I_{FP}	Pulsed forward current	120	A
P_{TOT}	Total dissipation at T_C = 25 °C	TBD	W
T_{STG}	Storage temperature range	- 55 to 175	°C
T_J	Operating junction temperature		

1. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.83	°C/W
R_{thJC}	Thermal resistance junction-case diode	2.5	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage (V_{GE} = 0)	I_C = 2 mA	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A		1.9		V
		V_{GE} = 15 V, I_C = 30 A T_J = 125 °C		2.2		
		V_{GE} = 15 V, I_C = 30 A T_J = 175 °C		2.35		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		6.0		V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 600 V			25	µA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			250	nA

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0	-	4200 120 75	-	pF pF pF
Q_g	Total gate charge	V_{CC} = 480 V, I_C = 30 A, V_{GE} = 15 V	-	115	-	nC
Q_{ge}	Gate-emitter charge		-	TBD	-	nC
Q_{gc}	Gate-collector charge		-	TBD	-	nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V	-	TBD TBD TBD	-	ns ns A/µs
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V T_J = 175 °C	-	TBD TBD TBD	-	ns ns A/µs
$t_r(V_{off})$ $t_d(_{off})$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V	-	TBD TBD TBD	-	ns ns ns
$t_r(V_{off})$ $t_d(_{off})$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V T_J = 175 °C	-	TBD TBD TBD	-	ns ns ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V	-	TBD 0.37 TBD	-	mJ mJ mJ
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CE} = 400 V, I_C = 30 A, R_G = 10 Ω, V_{GE} = 15 V T_J = 175 °C	-	TBD 0.5 TBD	-	mJ mJ mJ

1. Energy losses include reverse recovery of the diode.
2. Turn-off losses include also the tail of the collector current.

Table 8. Collector-emitter diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_F	Forward on-voltage	I_F = 16 A I_F = 16 A, T_J = 175 °C	-	TBD 1.3	2.2	V V
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 16 A,V_R = 400 V, R_G = 10 Ω	-	TBD TBD TBD	-	ns nC A
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 16 A,V_R = 400 V, R_G = 10 Ω, T_J = 175 °C	-	150 330 5	-	ns nC A

3 Test circuits

Figure 2. Test circuit for inductive load switching

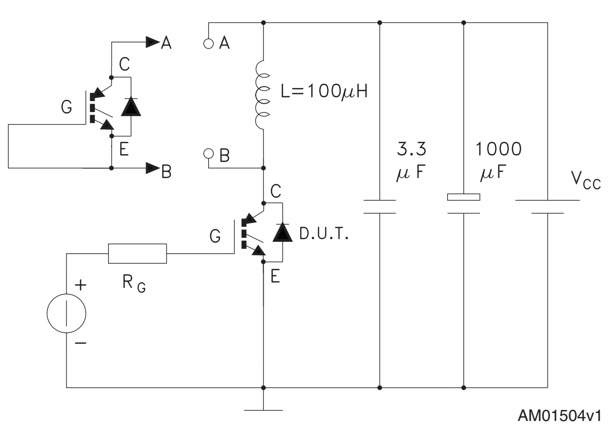


Figure 3. Gate charge test circuit

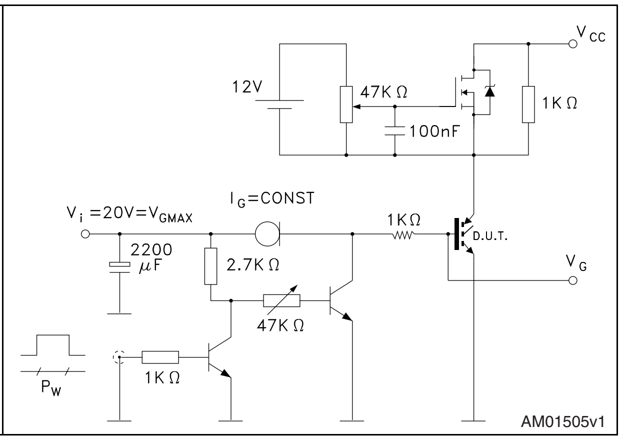


Figure 4. Switching waveform

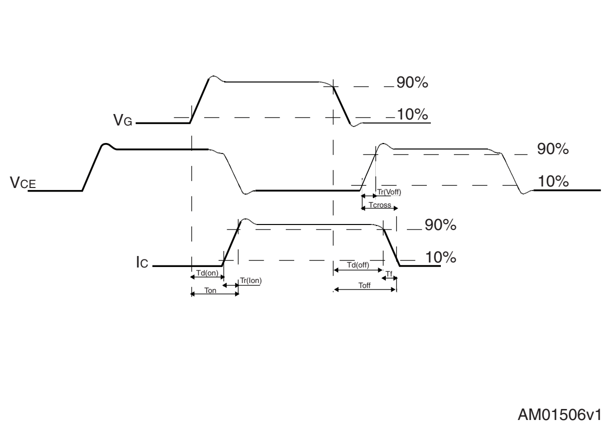
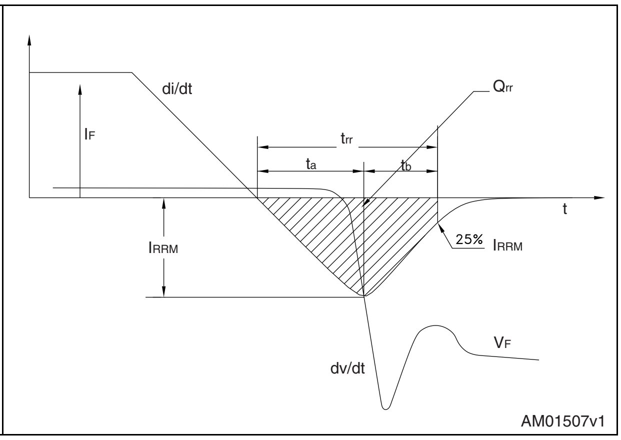


Figure 5. Diode recovery time waveform



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-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

Figure 6. TO-220 type A drawing

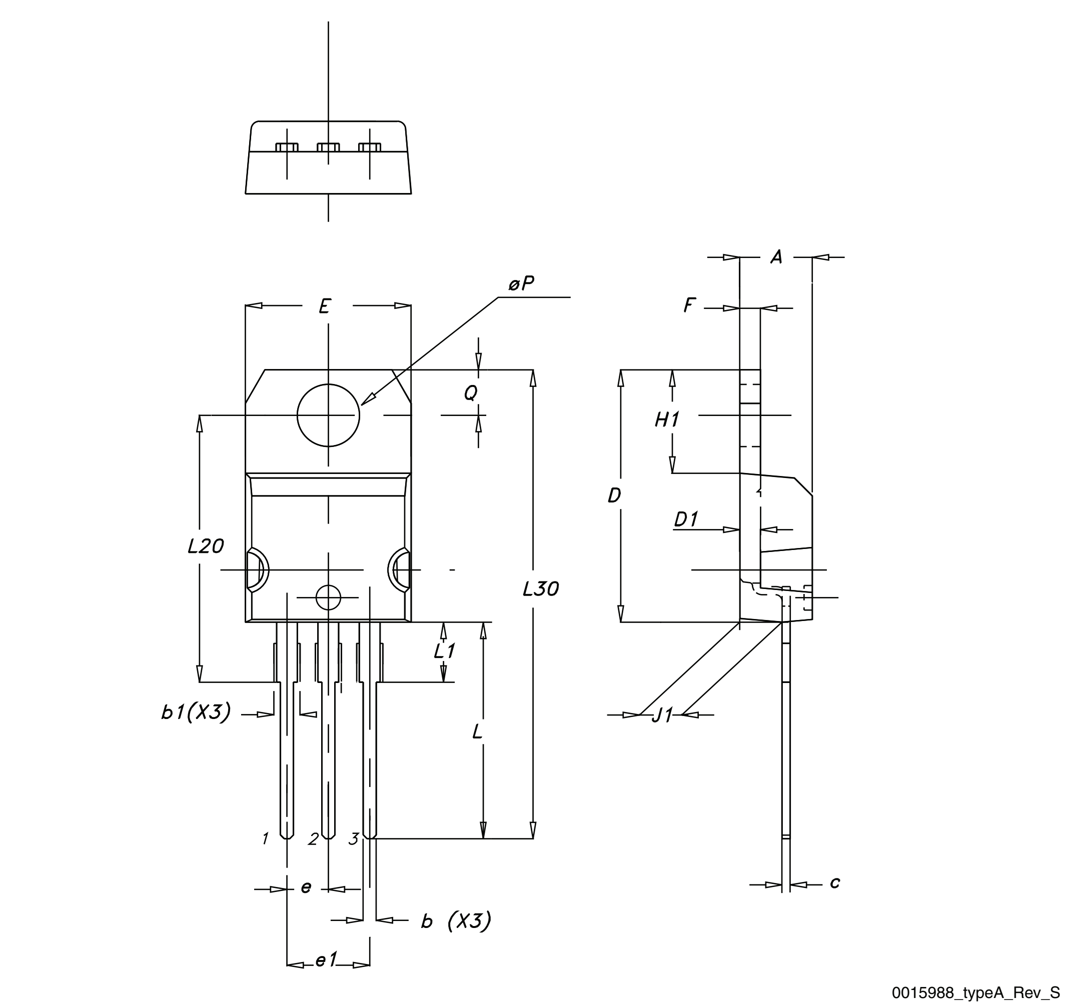


Table 10. D²PAK mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		

Table 10. D²PAK mechanical data

Dim.	mm		
	Min.	Typ.	Max.
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 7. D²PAK drawing

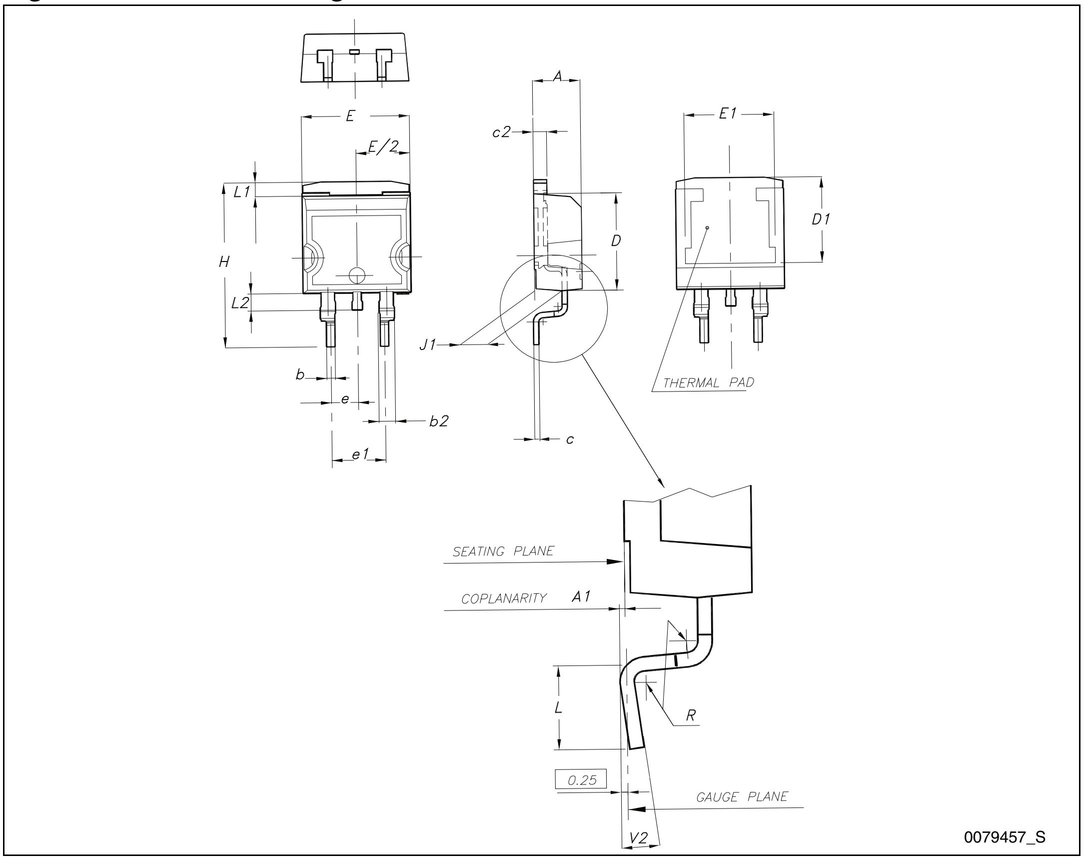
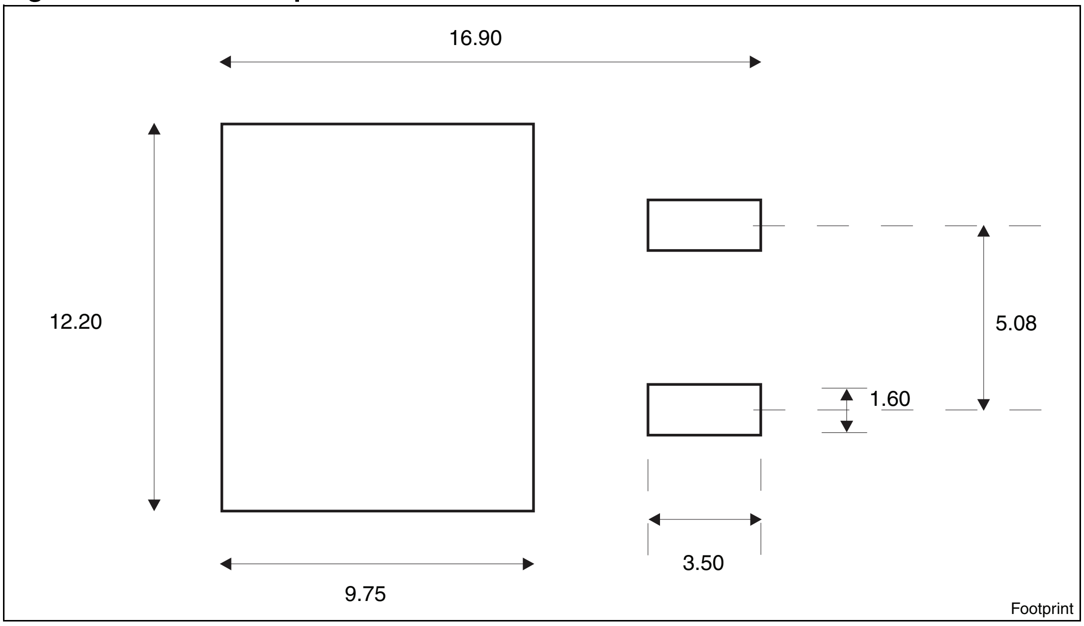


Table 11. D²PAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 8. D²PAK footprint[a]



a. All dimension are in millimeters

Figure 9. Tape

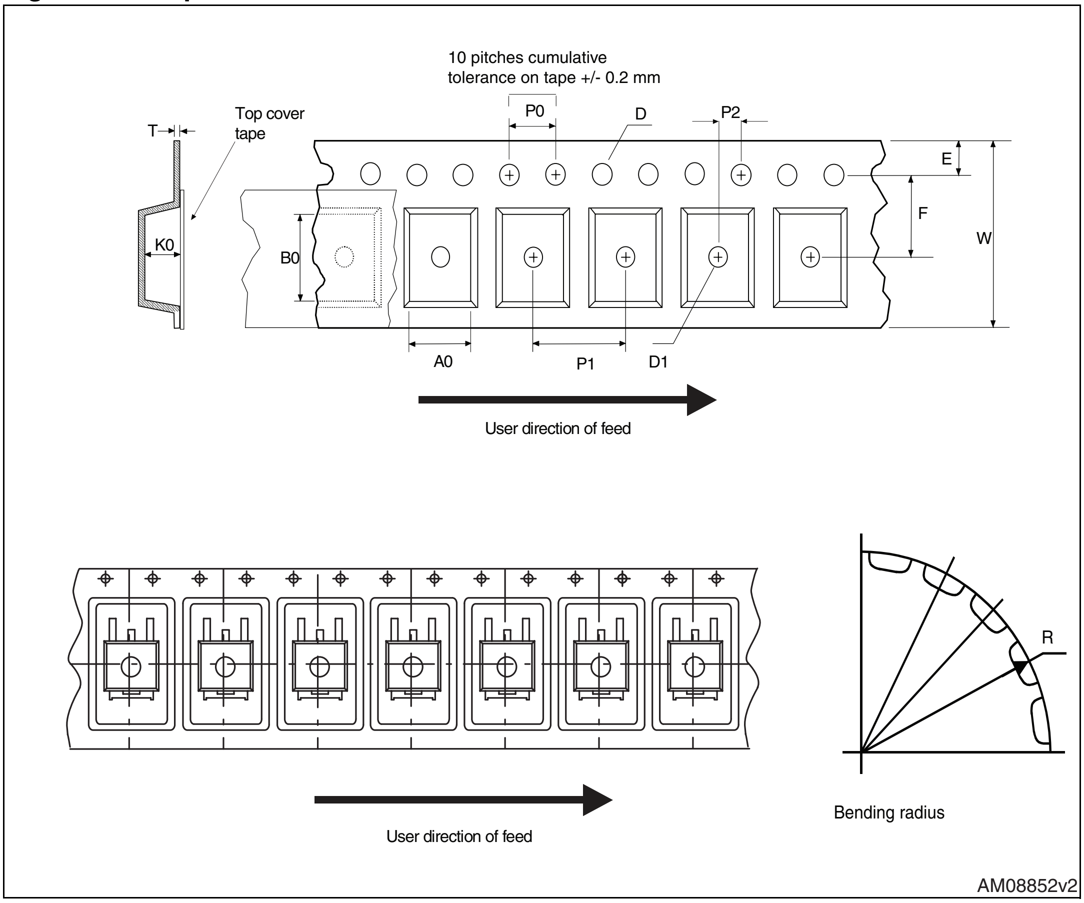
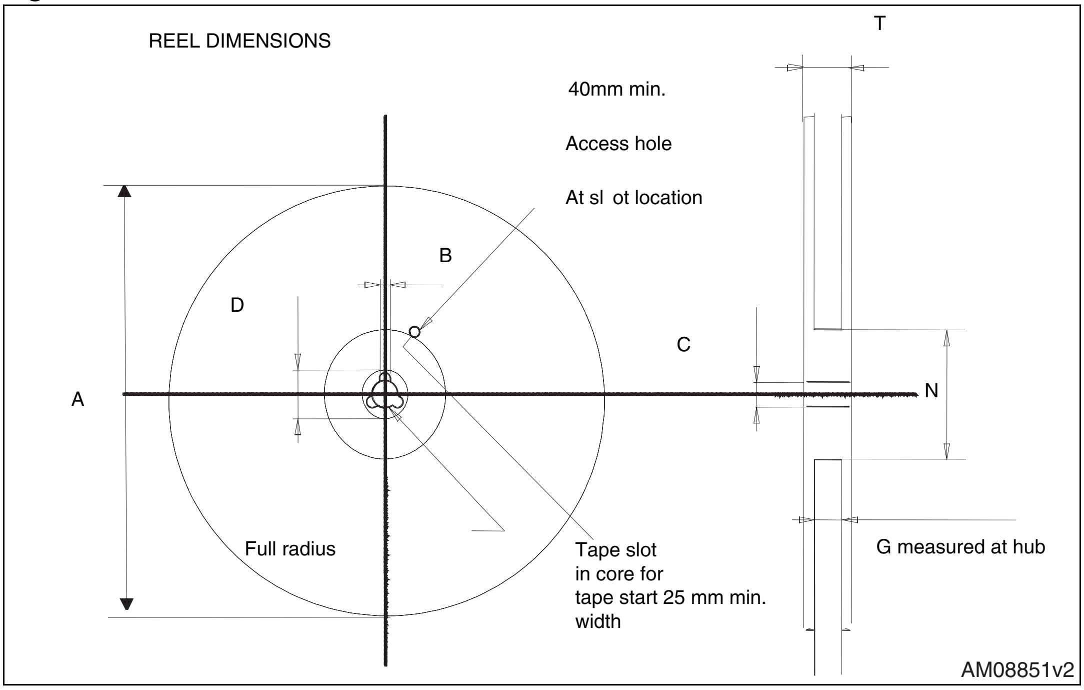


Figure 10. Reel



5 Revision history

Table 12. Document revision history

Date	Revision	Changes
20-Sep-2012	1	Initial release.