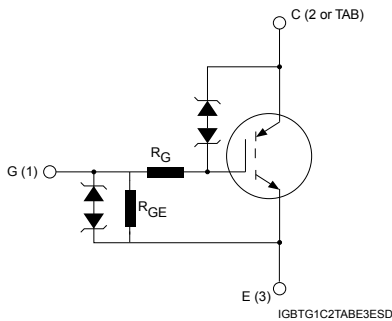
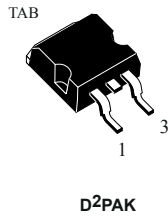



Automotive-grade 390 V internally clamped IGBT E<sub>SCIS</sub> 180 mJ


## Features

- AEC-Q101 qualified 
- SCIS energy of 180 mJ @ T<sub>C</sub> = 150 °C, L = 3 mH
- Parts are 100% tested in SCIS
- ESD gate-emitter protection
- Gate-collector high voltage clamping
- Logic level gate drive
- Very low saturation voltage
- High pulsed current capability
- Gate and gate-emitter resistor

## Applications

- Pencil coil electronic ignition driver

## Description

This application-specific IGBT utilizes the most advanced PowerMESH technology optimized for coil driving in the harsh environment of automotive ignition systems. The device shows very low on-state voltage and very high SCIS energy capability over a wide operating temperature range. Moreover, ESD-protected logic level gate input and an integrated gate resistor means no external protection circuitry is required.

## Product status link

[STGB18N40LZT4](#)

## Product summary

<b>Order code</b>	STGB18N40LZT4
<b>Marking</b>	GB18N40LZ
<b>Package</b>	D <sup>2</sup> PAK
<b>Packing</b>	Tape and reel

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0\text{ V}$ )	$V_{CES(\text{clamped})}$	V
$V_{ECS}$	Emitter-collector voltage ( $V_{GE} = 0\text{ V}$ )	20	V
$I_C$	Continuous collector current at $T_C = 100\text{ °C}$	30	A
$I_{CP}^{(1)}$	Pulsed collector current	40	A
$V_{GE}$	Gate-emitter voltage	$V_{GE(\text{clamped})}$	V
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	150	W
$E_{SCIS}^{(2)}$	Single pulse energy $T_C = 25\text{ °C}$ , $L = 3\text{ mH}$ , $V_{CC} = 50\text{ V}$	300	mJ
	Single pulse energy $T_C = 150\text{ °C}$ , $L = 3\text{ mH}$ , $V_{CC} = 50\text{ V}$	180	mJ
ESD	Human body model, $R = 1.5\text{ k}\Omega$ , $C = 100\text{ pF}$	8	kV
	Machine model, $R = 0$ , $C = 100\text{ pF}$	800	V
	Charged device model	2	kV
$T_{STG}$	Storage temperature range	-55 to 175	°C
$T_J$	Operating junction temperature range		°C

1. Pulse width limited by max. junction temperature.

2. For  $E_{SCIS}$  test circuit refer to Figure 14. Test circuit for inductive load switching with A and B not connected.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	1	°C/W
$R_{thJA}$	Thermal resistance, junction-to-ambient	62.5	°C/W

## 2 Electrical characteristics

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

**Table 3. Static characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{CES(\text{clamped})}$	Collector-emitter clamped voltage	$I_C = 2\text{ mA}$ , $V_{GE} = 0\text{ V}$ , $T_J = -40\text{ °C}$ to $175\text{ °C}$	360	390	420	V
$V_{(BR)ECS}$	Emitter-collector break-down voltage	$V_{GE} = 0\text{ V}$ , $I_C = 75\text{ mA}$	20	28		V
$V_{GE(\text{clamped})}$	Gate-emitter clamped voltage	$I_G = \pm 2\text{ mA}$	12		16	V
$V_{CE(\text{sat})}$	Collector-emitter saturation voltage	$V_{GE} = 4.5\text{ V}$ , $I_C = 10\text{ A}$		1.35	1.7	V
		$V_{GE} = 4.5\text{ V}$ , $I_C = 10\text{ A}$ , $T_J = 150\text{ °C}$		1.30		V
		$V_{GE} = 3.8\text{ V}$ , $I_C = 6\text{ A}$		1.30		V
$V_{GE(\text{th})}$	Gate-threshold voltage	$V_{GE} = V_{CE}$ , $I_C = 1\text{ mA}$ , $T_J = -40\text{ °C}$	1.4			V
		$V_{GE} = V_{CE}$ , $I_C = 1\text{ mA}$	1.2	1.6	2.3	V
		$V_{GE} = V_{CE}$ , $I_C = 1\text{ mA}$ , $T_J = 150\text{ °C}$ <sup>(1)</sup>	0.7			V
$I_{CES}$	Collector cut-off current	$V_{CE} = 15\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_J = 150\text{ °C}$ <sup>(1)</sup>			10	$\mu\text{A}$
		$V_{CE} = 200\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_J = 150\text{ °C}$ <sup>(1)</sup>			100	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current	$V_{GE} = \pm 10\text{ V}$ , $V_{CE} = 0\text{ V}$	450	625	830	$\mu\text{A}$
$R_{GE}$	Gate emitter resistance		12	16	22	k $\Omega$
$R_G$	Gate resistance			1.6		k $\Omega$

1. Defined by design, not subject to production test.

**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GE} = 0\text{ V}$	-	490	-	pF
$C_{oes}$	Output capacitance		-	90	-	
$C_{res}$	Reverse transfer capacitance		-	5	-	
$Q_g$	Total gate charge	$V_{CE} = 280\text{ V}$ , $I_C = 10\text{ A}$ , $V_{GE} = 0$ to $5\text{ V}$	-	29	-	nC

**Table 5. Resistive load switching characteristics**

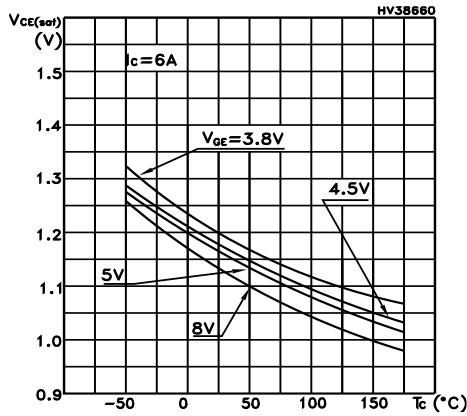
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 14\text{ V}$ , $V_{GE} = 5\text{ V}$ , $R_L = 1\ \Omega$	-	0.65	-	$\mu\text{s}$
$t_r$	Current rise time		-	3.5	-	$\mu\text{s}$
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 14\text{ V}$ , $V_{GE} = 5\text{ V}$ , $R_L = 1\ \Omega$ , $T_J = 150\text{ }^\circ\text{C}$	-	0.65	-	$\mu\text{s}$
$t_r$	Current rise time		-	3.8	-	$\mu\text{s}$

**Table 6. Inductive load switching characteristics**

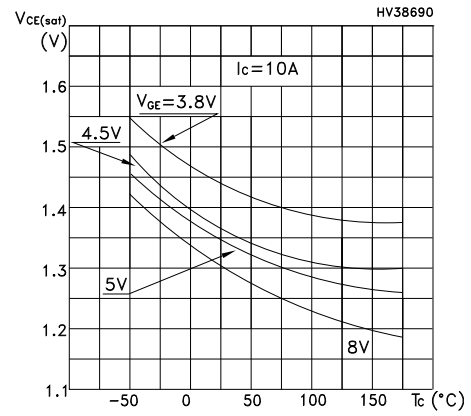
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 300\text{ V}$ , $L = 1\text{ mH}$ , $I_C = 10\text{ A}$ , $V_{GE} = 5\text{ V}$ ,	-	13.5	-	$\mu\text{s}$
$t_f$	Current fall time		-	5.5	-	$\mu\text{s}$
$dV/dt$	Turn-off voltage slope		-	105	-	$\text{V}/\mu\text{s}$
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 300\text{ V}$ , $L = 1\text{ mH}$ , $I_C = 10\text{ A}$ , $V_{GE} = 5\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	14.2	-	$\mu\text{s}$
$t_f$	Current fall time		-	8	-	$\mu\text{s}$
$dV/dt$	Turn-off voltage slope		-	97	-	$\text{V}/\mu\text{s}$

## 2.1 Electrical characteristics (curves)

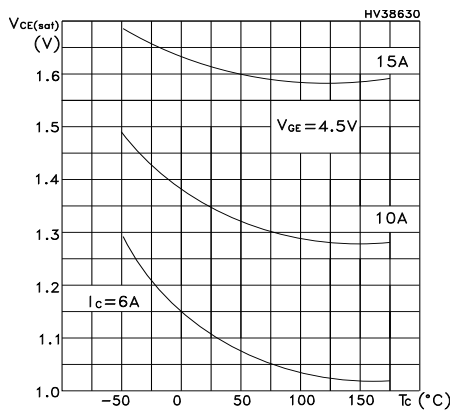
**Figure 1. Collector-emitter on voltage vs temperature**



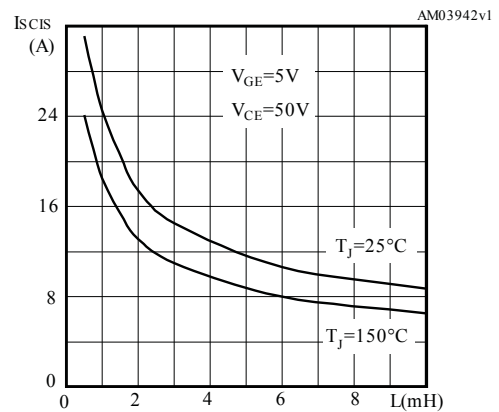
**Figure 2. Collector-emitter on voltage vs temperature**



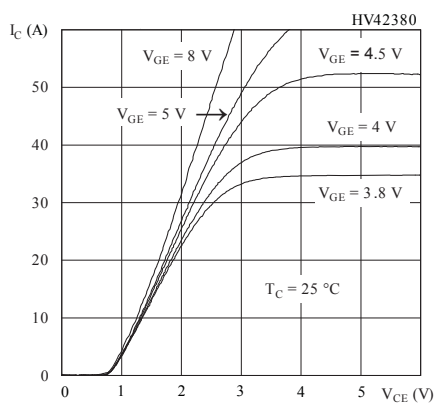
**Figure 3. Collector-emitter on voltage vs temperature**



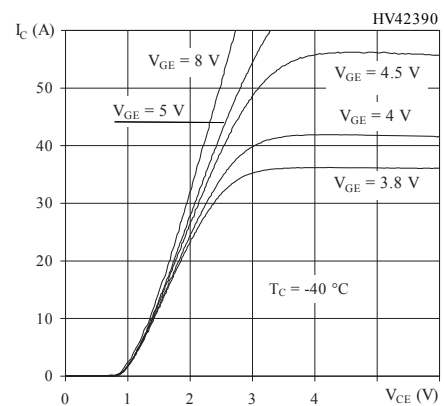
**Figure 4. Self clamped inductive switch**



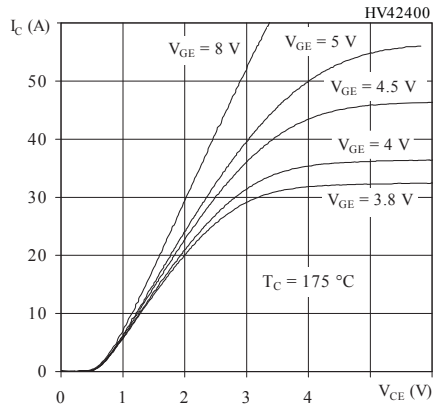
**Figure 5. Output characteristics at 25 °C**



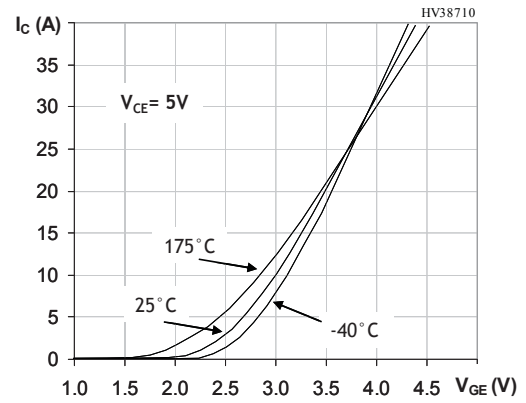
**Figure 6. Output characteristics at -40 °C**



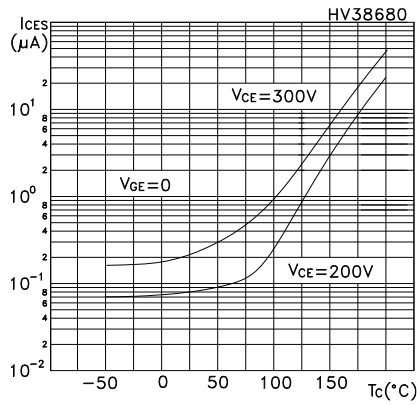
**Figure 7. Output characteristics at 175 °C**



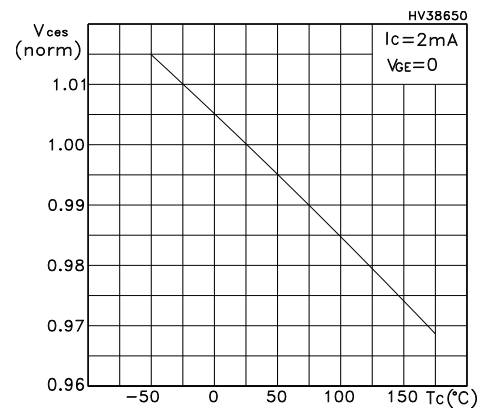
**Figure 8. Transfer characteristics**



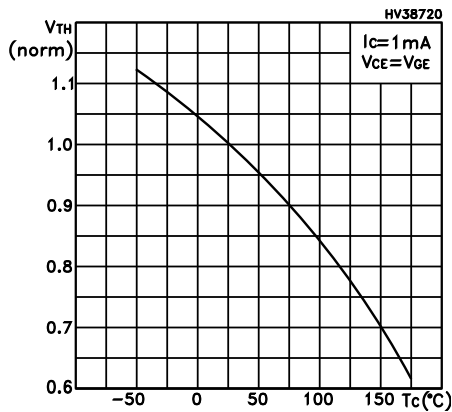
**Figure 9. Collector cut-off current vs temperature**



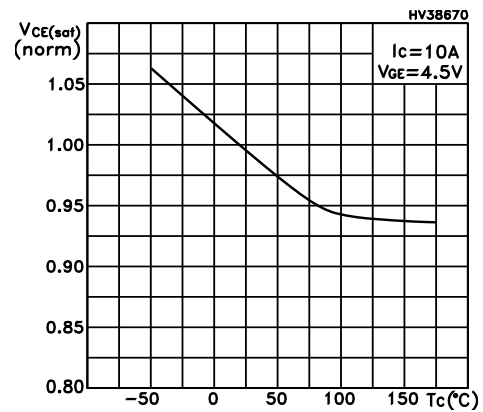
**Figure 10. Normalized collector emitter voltage vs temperature**



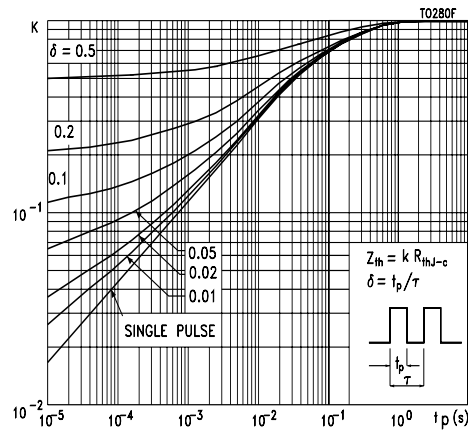
**Figure 11. Normalized gate threshold voltage vs temperature**



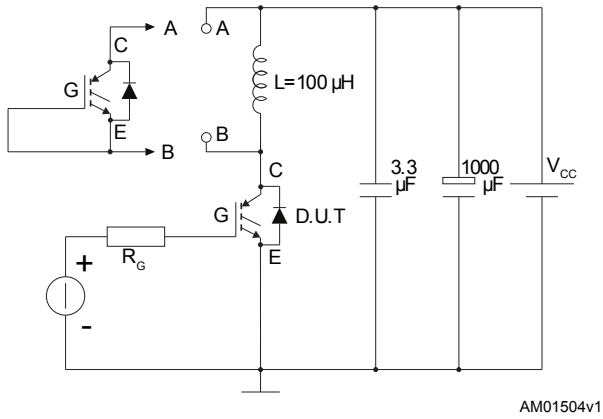
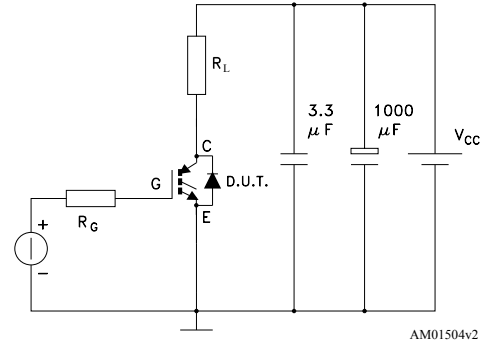
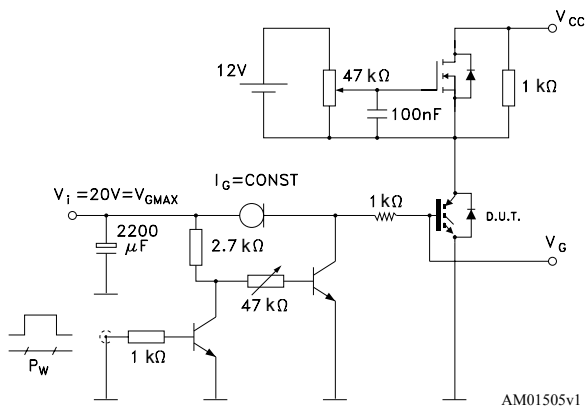
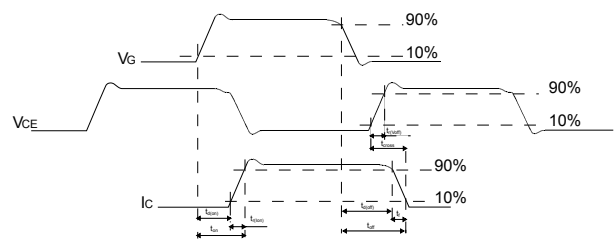
**Figure 12. Normalized collector emitter on voltage vs temperature**



**Figure 13. Thermal impedance**



### 3 Test circuits

**Figure 14. Test circuit for inductive load switching**

**Figure 15. Test circuit for resistive load switching**

**Figure 16. Gate charge test circuit**

**Figure 17. Switching waveform**


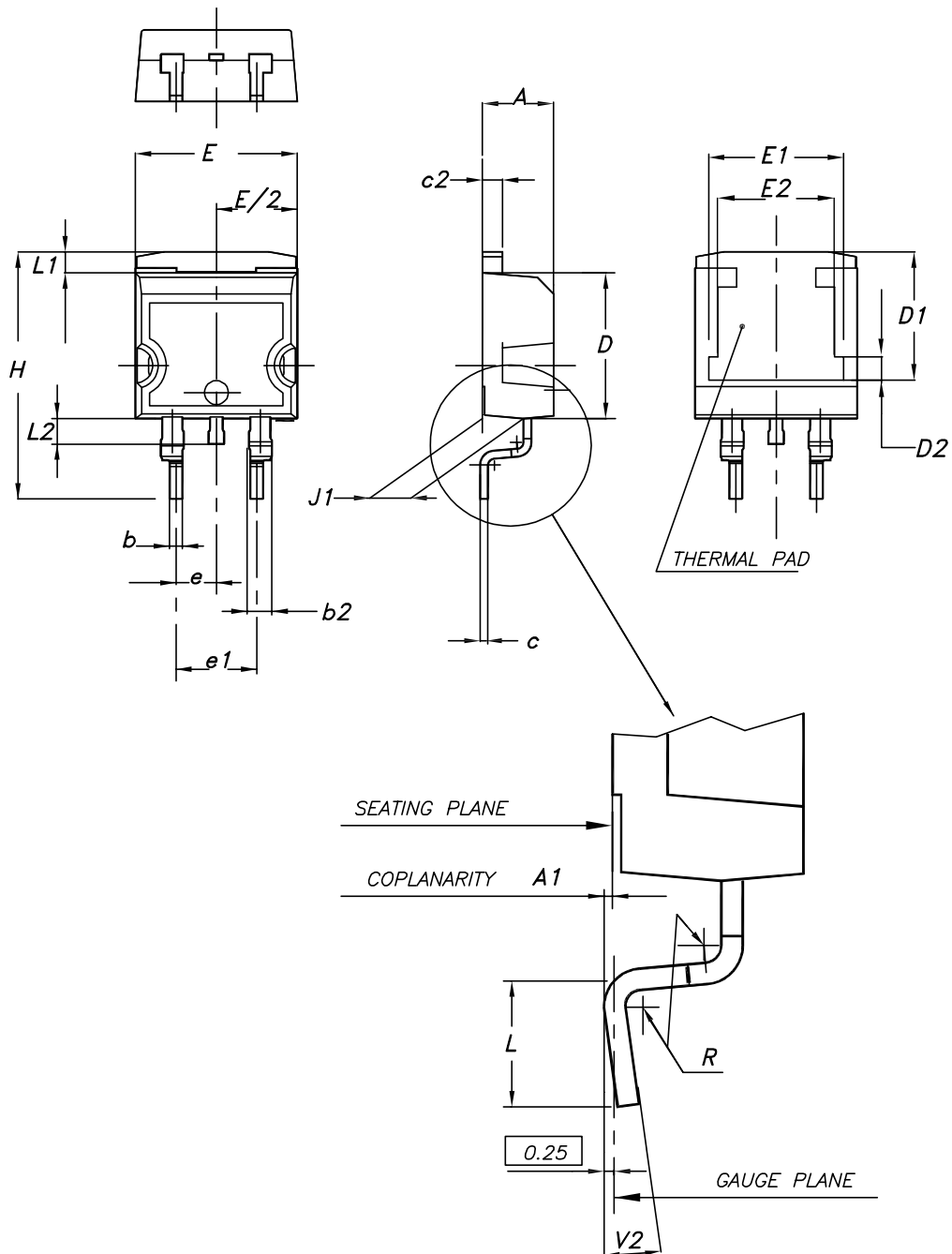


## 4 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 4.1 D<sup>2</sup>PAK (TO-263) type A package information

Figure 18. D<sup>2</sup>PAK (TO-263) type A package outline

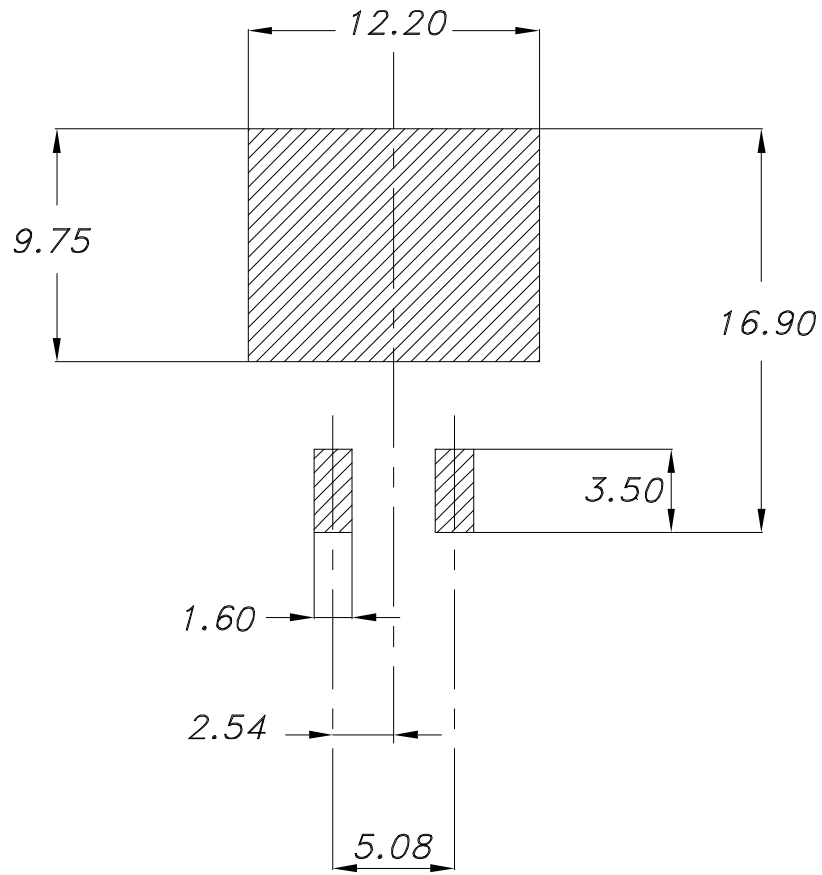


0079457\_26

**Table 7. D<sup>2</sup>PAK (TO-263) type A package 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	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

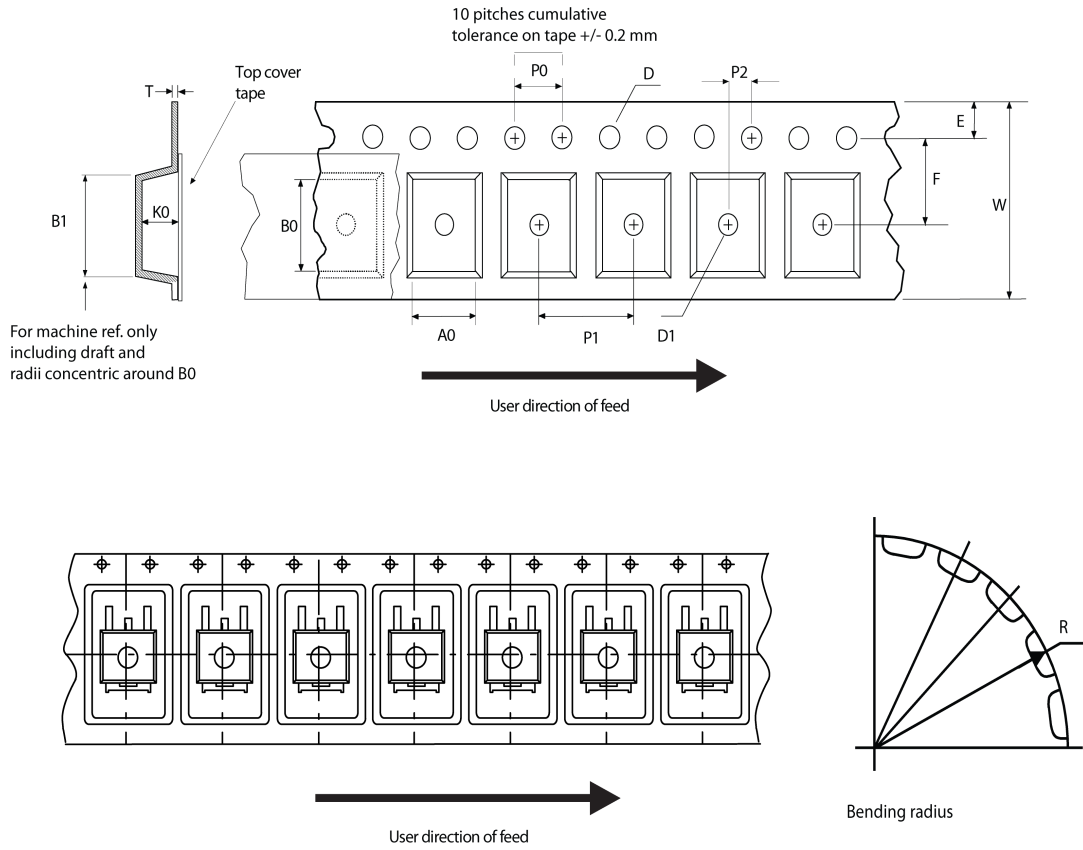
**Figure 19. D<sup>2</sup>PAK (TO-263) recommended footprint (dimensions are in mm)**



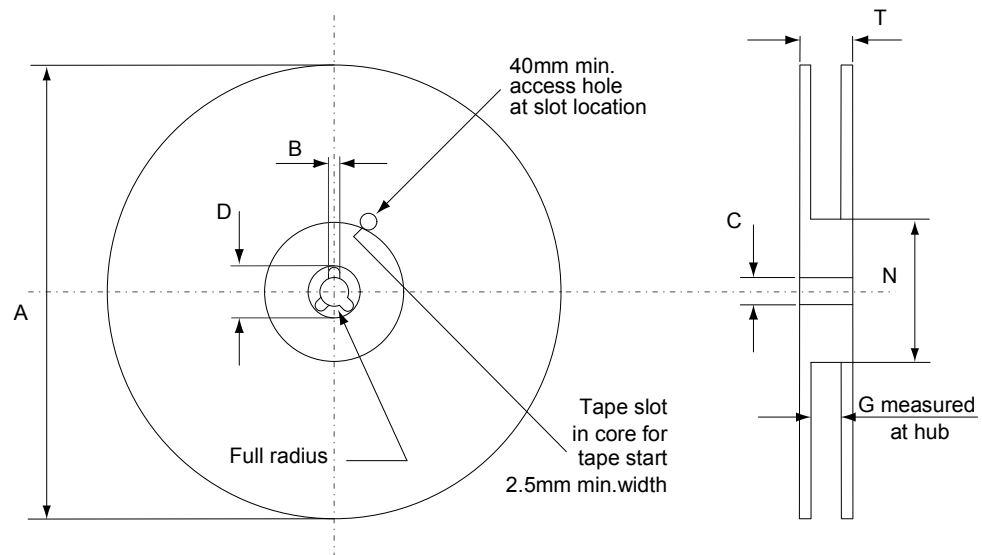
Footprint\_26

## 4.2 D<sup>2</sup>PAK packing information

Figure 20. D<sup>2</sup>PAK tape outline



AM08852v1

**Figure 21. D<sup>2</sup>PAK reel outline**


AM06038v1

**Table 8. D<sup>2</sup>PAK tape and reel mechanical data**

Dim.	Tape		Dim.	Reel	
	mm			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 quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

## Revision history

**Table 9. Document revision history**

Date	Revision	Changes
18-Jan-2008	1	Initial release.
07-Mar-2008	2	Modified <i>Figure 7</i> , <i>Figure 8</i> , <i>Figure 10</i> .
07-May-2008	3	Modified <i>Figure 9</i>
31-Mar-2009	4	Added new package, mechanical data: TO-220
18-May-2009	5	Modified <i>Figure 5</i>
12-Nov-2014	6	Updated <i>Table 1: Device summary</i> , <i>Table 2: Absolute maximum ratings</i> and <i>Table 3: Thermal data</i> Updated <i>3: Test circuits</i> Updated <i>Section 4: Package mechanical data</i> Updated <i>Section 5: Packaging mechanical data</i> Minor text changes
11-Jan-2021	7	The part numbers STGD18N40LZ and STGP18N40LZT4 have been removed. Minor text changes

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