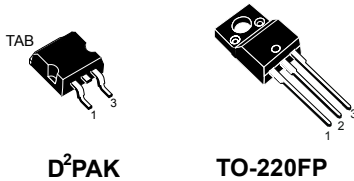
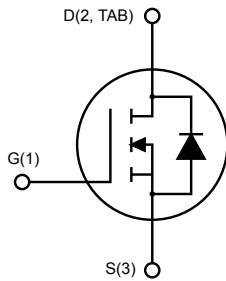


N-channel 550 V, 0.150 Ω typ., 16 A MDmesh™ M5 Power MOSFETs in a D²PAK and TO-220FP packages


D²PAK
TO-220FP


AM01475v1_noZen

Features

Order code	V _{DS} @ T _{jmax.}	R _{DS(on)} max.	Package
STB18N55M5	600 V	0.192 Ω	D ² PAK
STF18N55M5			TO-220FP

- Extremely low R_{DS(on)}
- Low gate charge and input capacitance
- Excellent switching performance
- 100% avalanche tested

Applications

- Switching applications

Description

These devices are N-channel Power MOSFETs based on the MDmesh™ M5 innovative vertical process technology combined with the well-known PowerMESH™ horizontal layout. The resulting products offer extremely low on-resistance, making them particularly suitable for applications requiring high power and superior efficiency.

Product status link

[STB18N55M5](#)
[STF18N55M5](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D ² PAK	TO-220FP	
V _{GS}	Gate-source voltage	±25		V
I _D	Drain current (continuous) at T _C = 25 °C	16		A
I _D	Drain current (continuous) at T _C = 100 °C	10		A
I _{DM} ⁽¹⁾	Drain current (pulsed)	64		A
P _{TOT}	Total dissipation at T _C = 25 °C	110	25	W
dv/dt ⁽²⁾	Peak diode recovery voltage slope	15		V/ns
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T _C = 25 °C)	2.5		kV
T _j	Operating junction temperature range	-55 to 150		°C
T _{stg}	Storage temperature range			

1. Pulse width limited by safe operating area.
2. I_{SD} ≤ 16 A, di/dt ≤ 400 A/μs; V_{DS peak} < V_{(BR)DSS}; V_{DD} = 340 V.

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		D ² PAK	TO-220FP	
R _{thj-case}	Thermal resistance junction-case	1.14	5	°C/W
R _{thj-amb}	Thermal resistance junction-ambient		62.5	°C/W
R _{thj-pcb} ⁽¹⁾	Thermal resistance junction-pcb	30		°C/W

1. When mounted on an 1-inch² FR-4, 2oz Cu board.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I _{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T _j Max)	4	A
E _{AS}	Single pulse avalanche energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	210	mJ

2 Electrical characteristics

($T_{CASE} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown voltage	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}$	550			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 550\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}, V_{DS} = 550\text{ V}, T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			100	μA
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}, I_D = 8\text{ A}$		0.150	0.192	Ω

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

Table 5. Dynamic

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	1260	-	μF
C_{oss}	Output capacitance			42		
C_{rss}	Reverse transfer capacitance			3.6		
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }440\text{ V}, V_{GS} = 0\text{ V}$	-	103	-	μF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related			35		
R_g	Gate input resistance	$f = 1\text{ MHz open drain}$	-	2.8	-	Ω
Q_g	Total gate charge	$V_{DD} = 440\text{ V}, I_D = 8\text{ A}, V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 18. Test circuit for gate charge behavior)	-	31	-	nC
Q_{gs}	Gate-source charge			8.3		
Q_{gd}	Gate-drain charge			14.2		

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 condition	Min.	Typ.	Max.	Unit
$t_{d(v)}$	Voltage delay time	$V_{DD} = 400\text{ V}$, $I_D = 10.5\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times and Figure 22. Switching time waveform)	-	37	-	ns
$t_{r(v)}$	Voltage rise time			7		
$t_{c(off)}$	Crossing time			10.3		
$t_{f(i)}$	Current fall time			8.3		

Table 7. Source drain diode

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit	
I_{SD}	Source-drain current		-		16	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				64		
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V	
t_{rr}	Reverse recovery time	$I_{SD} = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	244		ns	
Q_{rr}	Reverse recovery charge			2.8			A
I_{RRM}	Reverse recovery current			23			
t_{rr}	Reverse recovery time	$I_{SD} = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times)	-	295		ns	
Q_{rr}	Reverse recovery charge			3.7			A
I_{RRM}	Reverse recovery current			25			

1. Pulse width limited by safe operating area.

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

2.1 Electrical characteristics curves

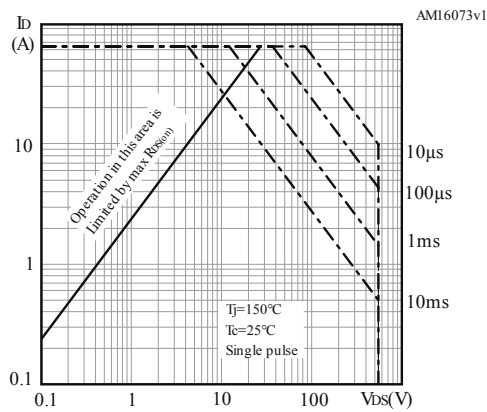
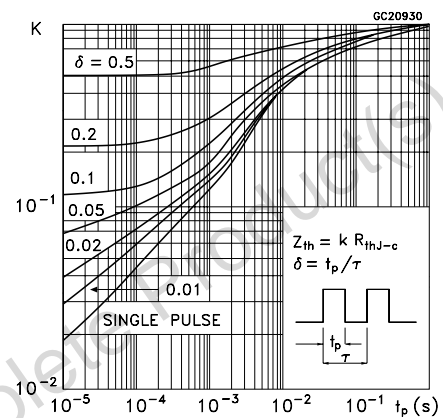
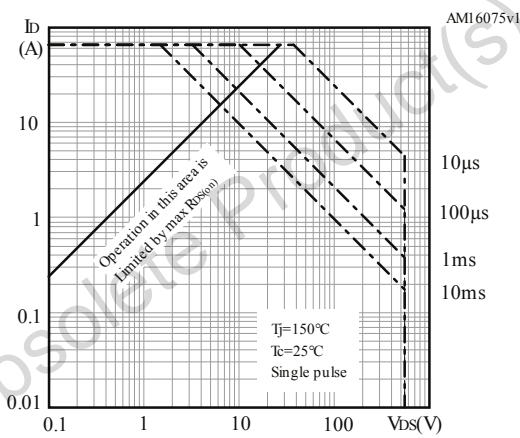
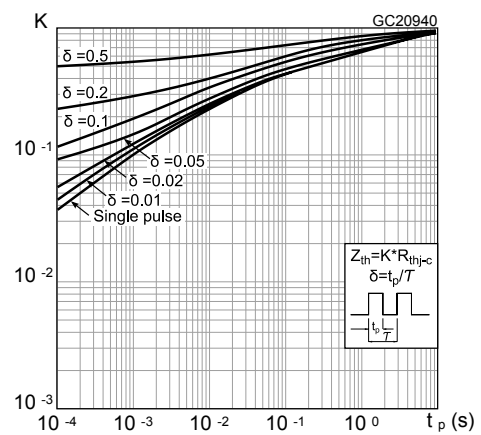
Figure 1. Safe operating area for D²PAK

Figure 2. Thermal impedance for D²PAK

Figure 4. Safe operating area for TO-220FP

Figure 5. Thermal impedance for TO-220FP


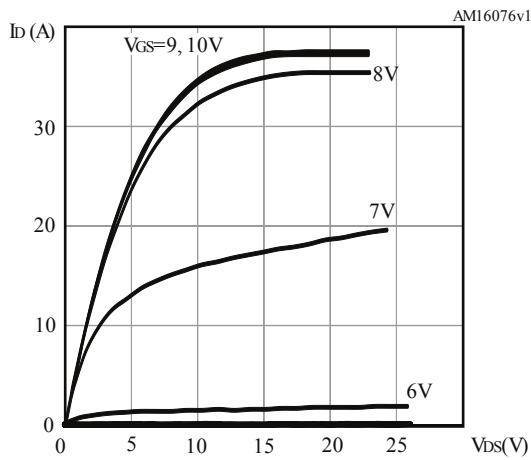
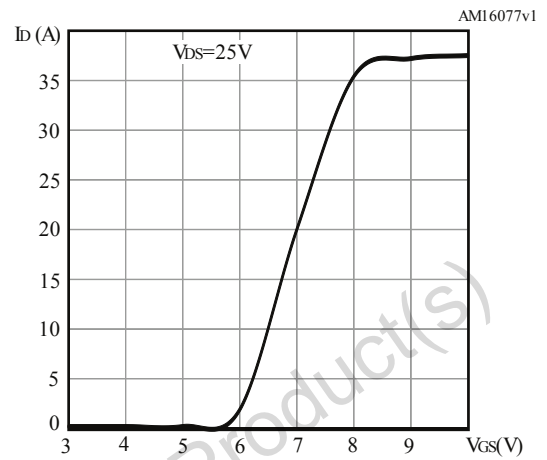
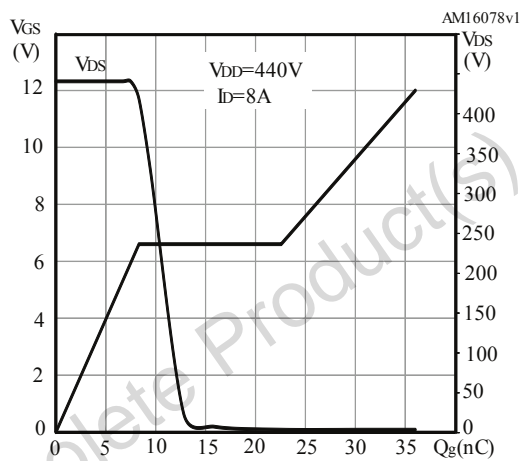
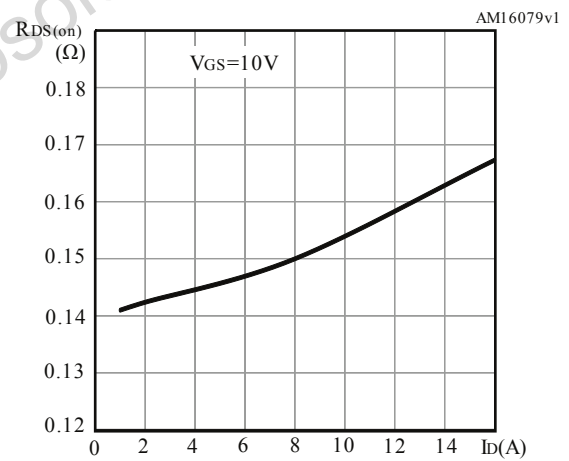
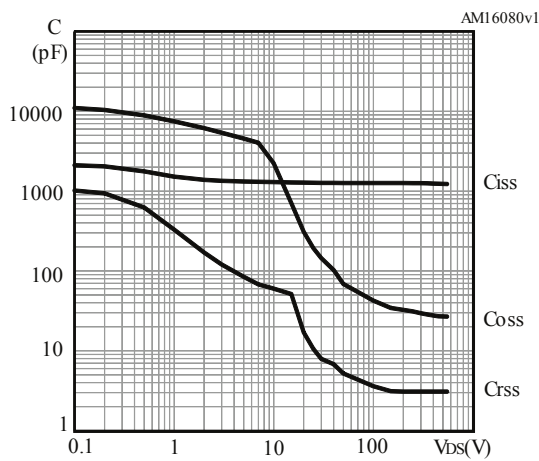
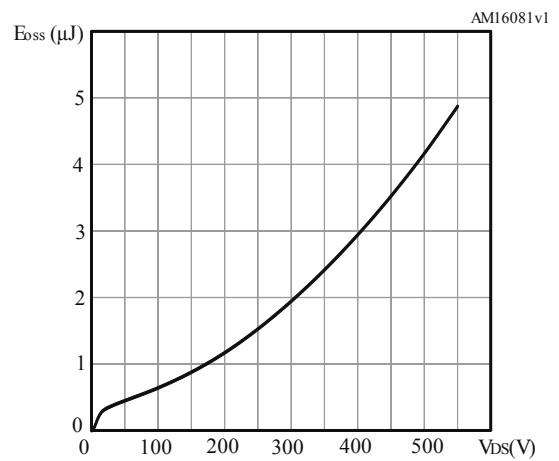
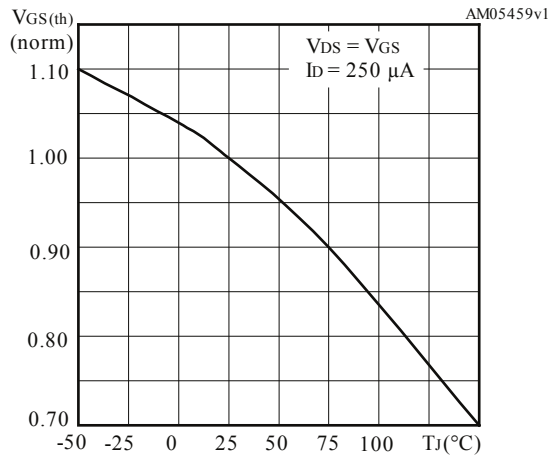
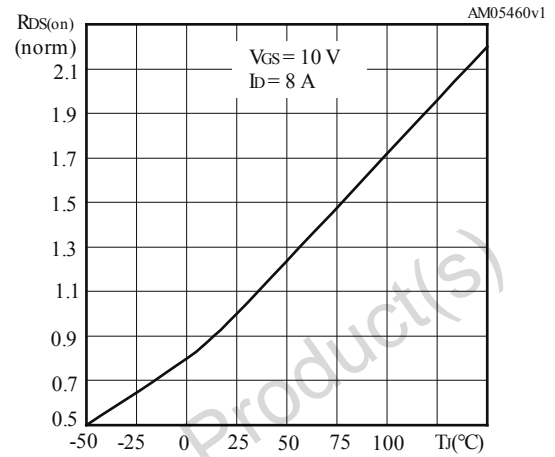
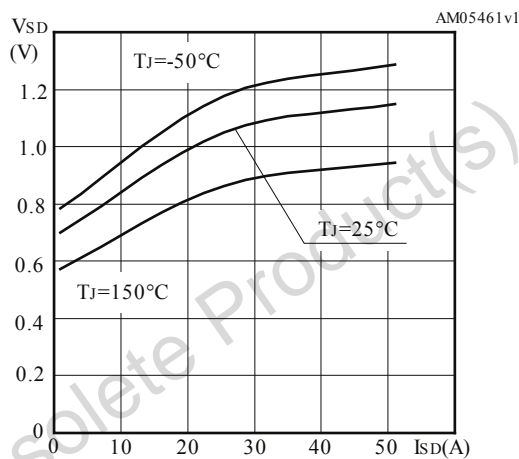
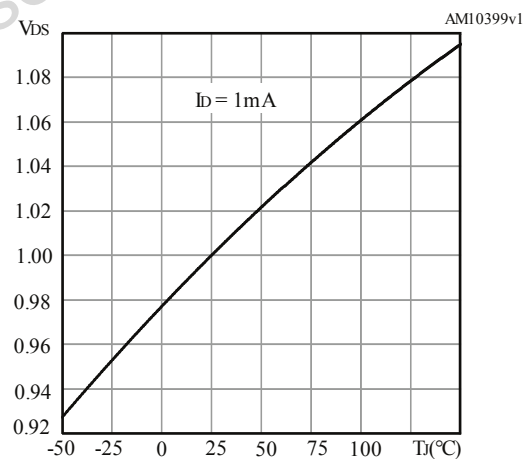
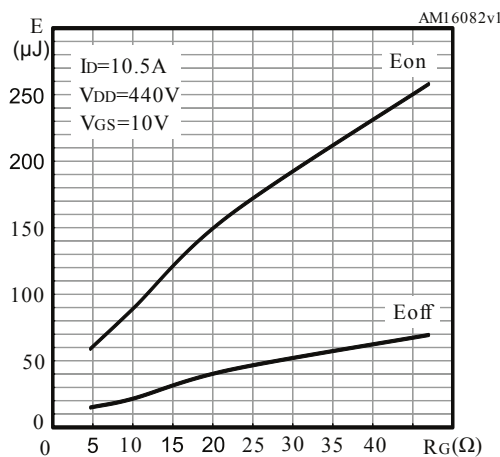
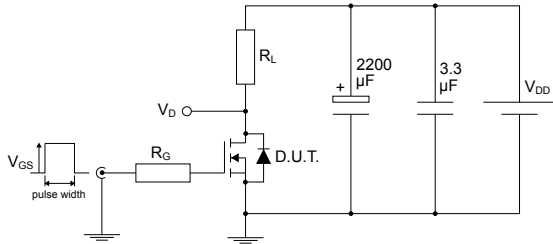
Figure 6. Output characteristics

Figure 7. Transfer characteristics

Figure 8. Gate charge vs gate-source voltage

Figure 9. Static drain-source on resistance

Figure 10. Capacitance variations

Figure 11. Output capacitance stored energy


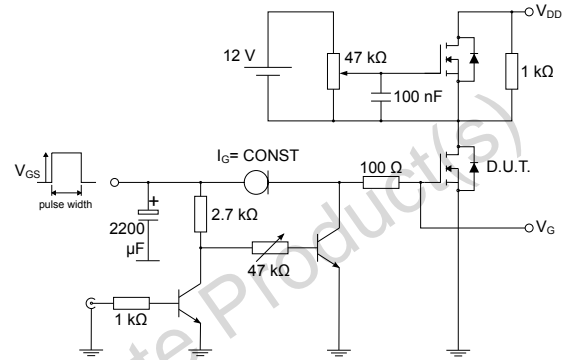
Figure 12. Normalized on-resistance vs temperature

Figure 13. Normalized gate threshold voltage vs temperature

Figure 14. Drain-source diode forward characteristics

Figure 15. Normalized $V_{(BR)DSS}$ vs temperature

Figure 16. Switching energy vs gate resistance


* E_{on} including reverse recovery of a SiC diode

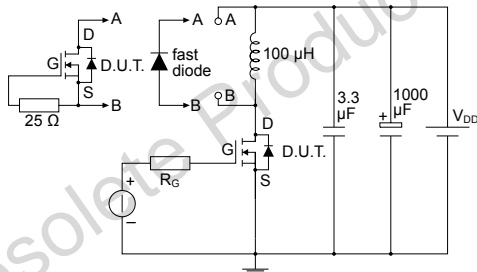
3 Test circuits

Figure 17. Test circuit for resistive load switching times


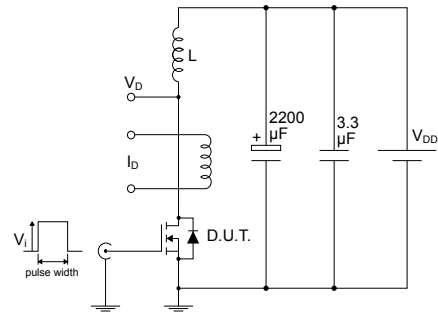
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Figure 18. Test circuit for gate charge behavior


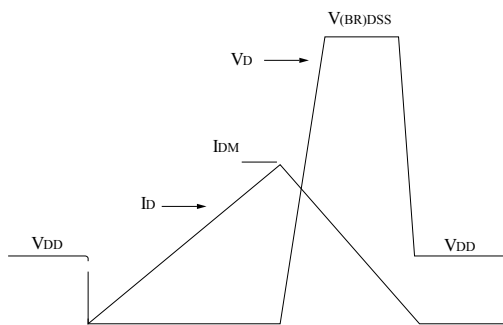
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Figure 19. Test circuit for inductive load switching and diode recovery times


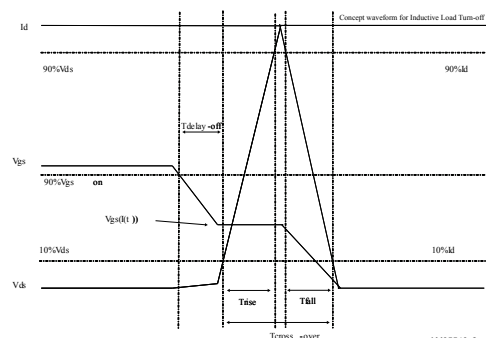
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Figure 20. Unclamped inductive load test circuit


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Figure 21. Unclamped inductive waveform


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Figure 22. Switching time waveform


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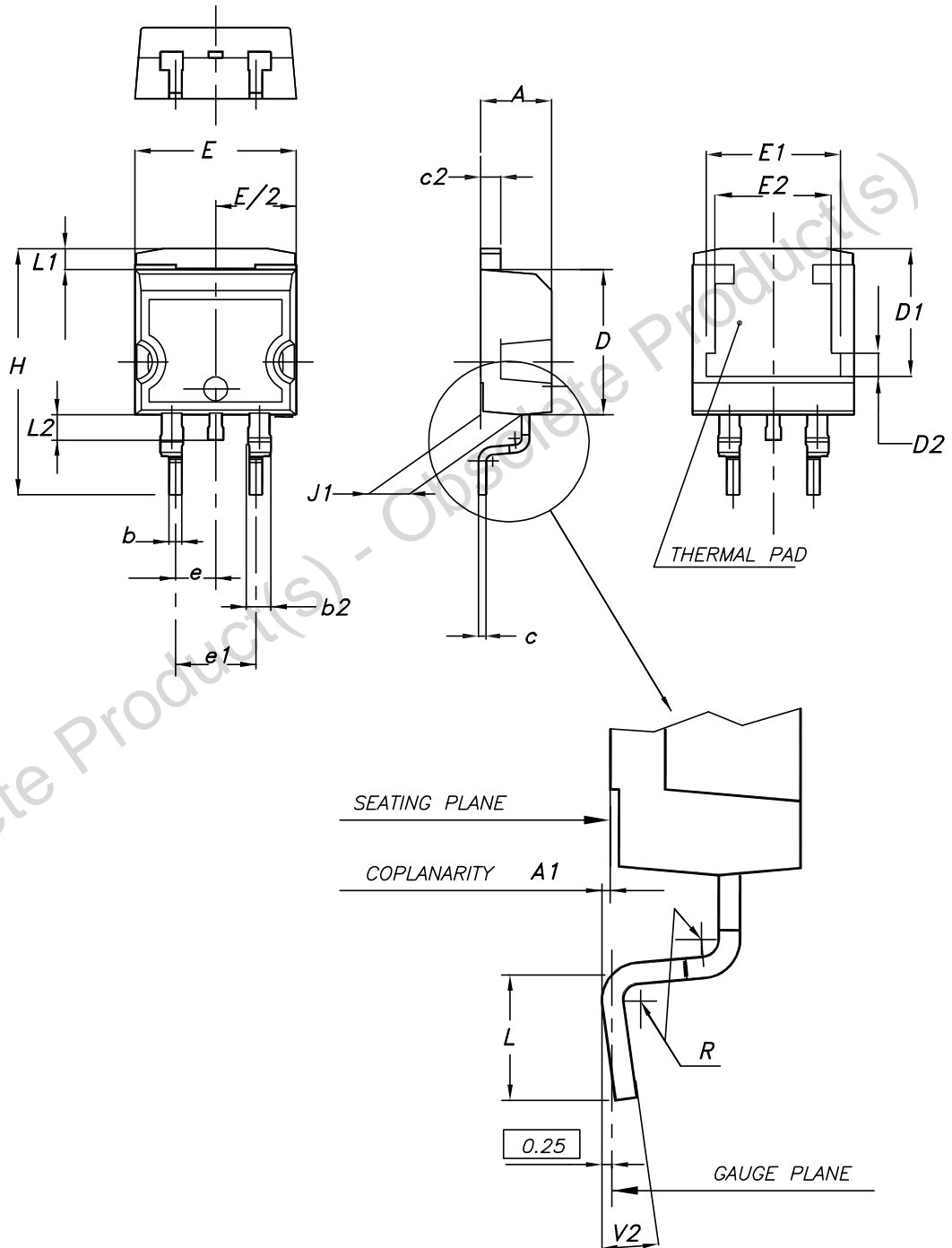
4 Package information

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. ECOPACK® is an ST trademark.

Obsolete Product(s) - Obsolete Product(s)

4.1 D²PAK (TO-263) type A package information

Figure 23. D²PAK (TO-263) type A package outline

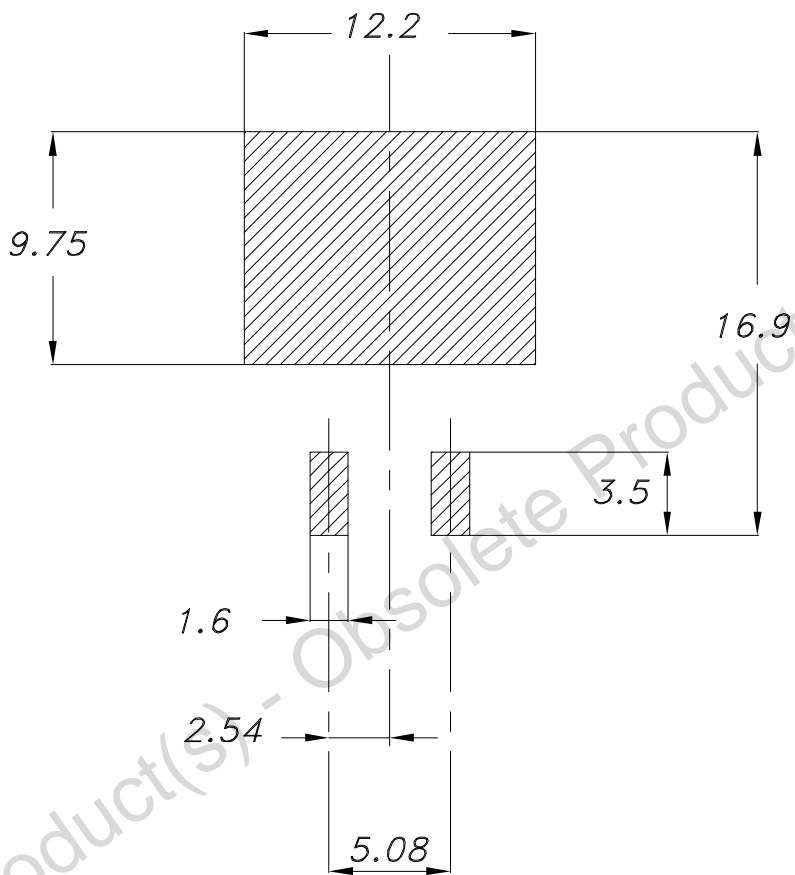


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Table 8. D²PAK (TO-263) type A package mechanical data

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°

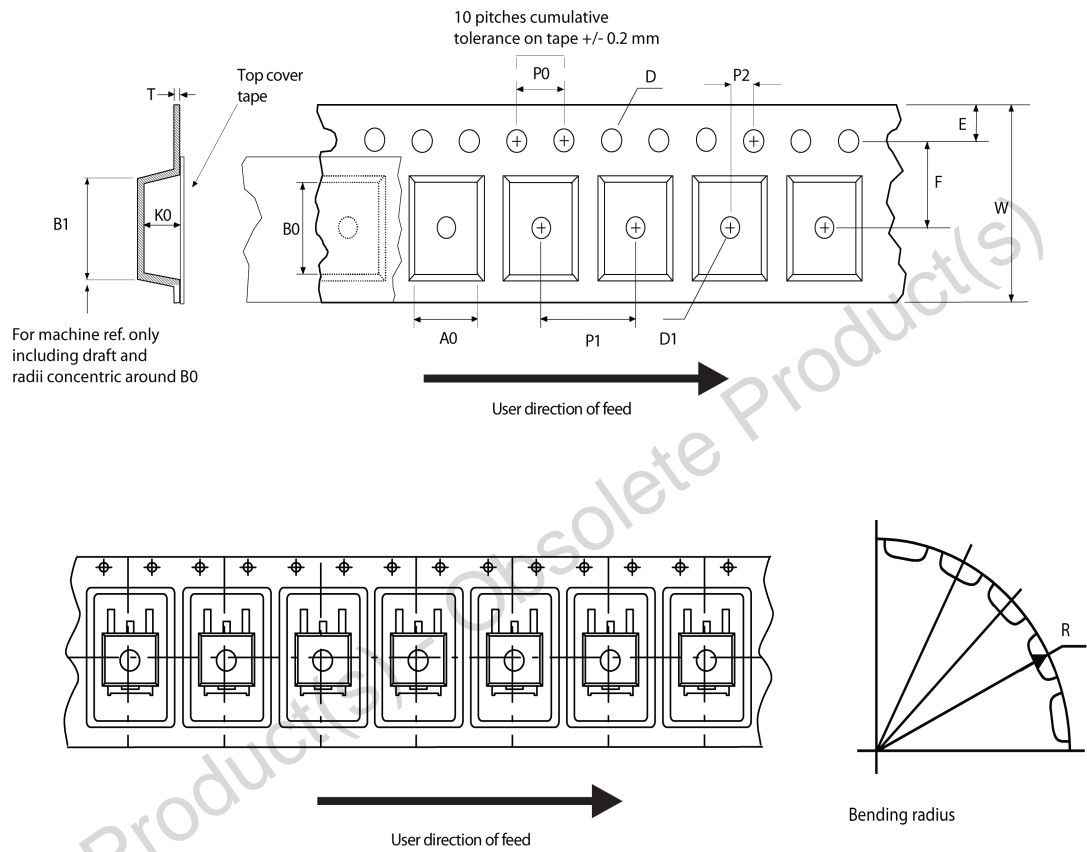
Figure 24. D²PAK (TO-263) recommended footprint (dimensions are in mm)



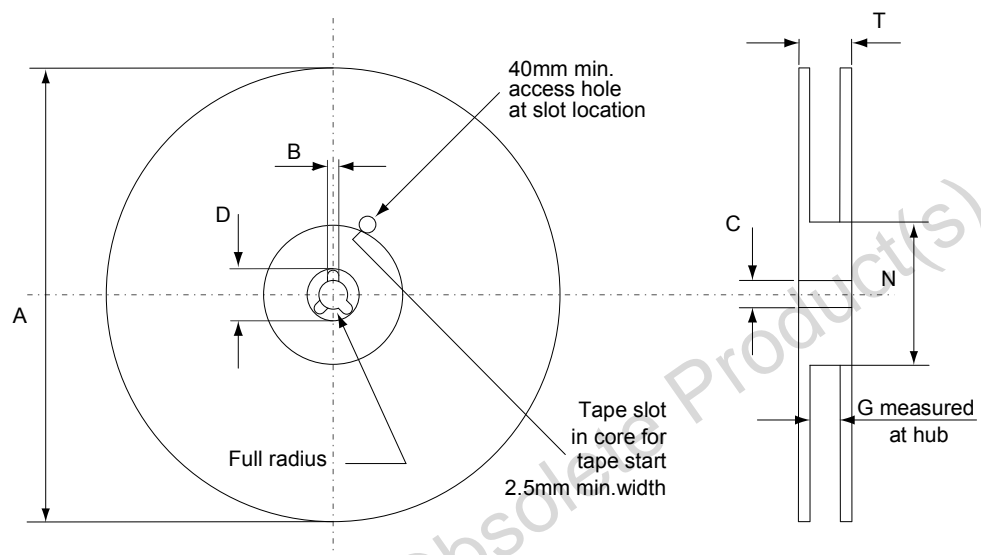
Footprint

4.2 D²PAK packing information

Figure 25. D²PAK tape outline



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Figure 26. D²PAK reel outline


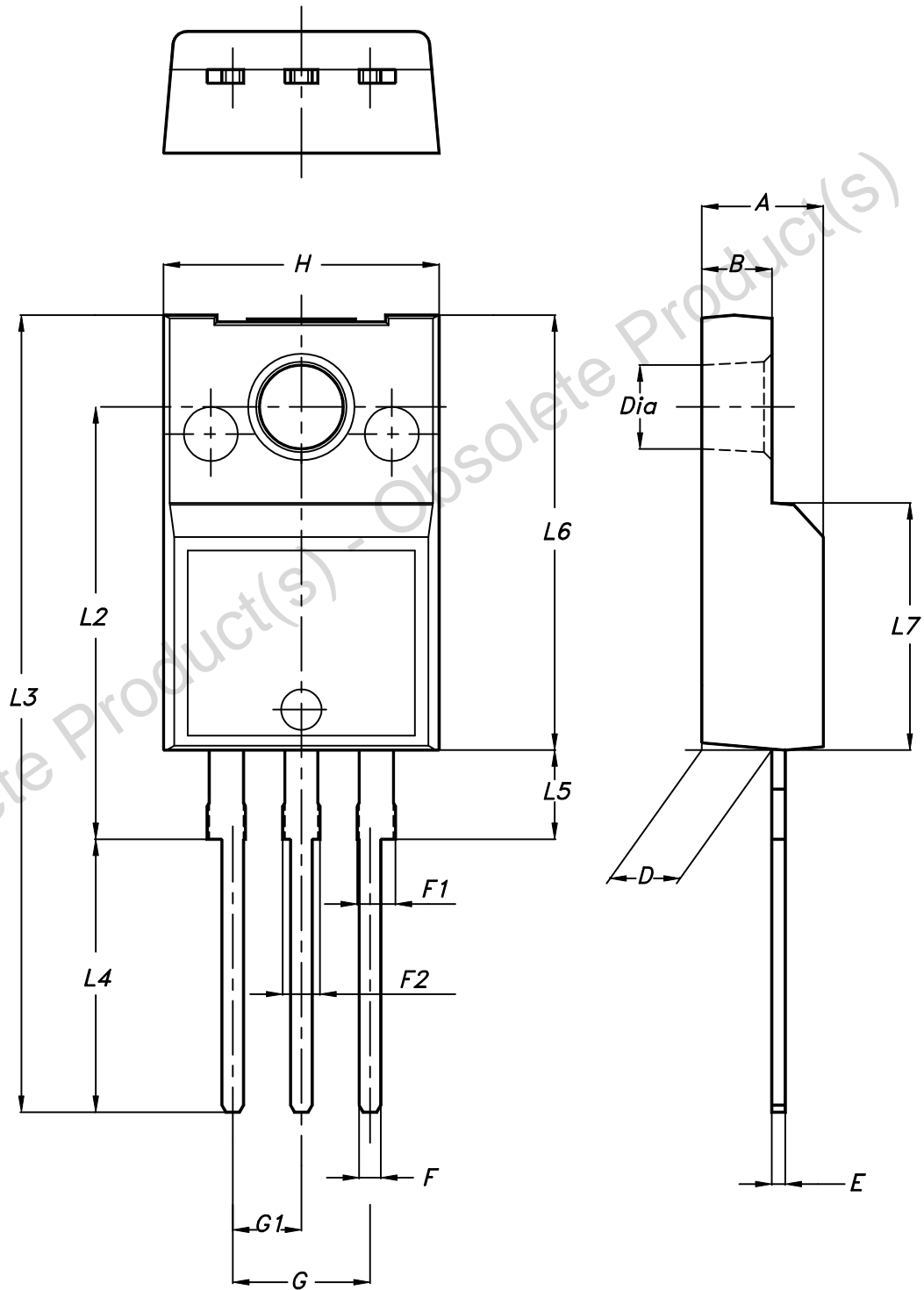
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Table 9. D²PAK tape and reel mechanical data

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 quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

4.3 TO-220FP package information

Figure 27. TO-220FP package outline



7012510_Rev_12_B

Table 10. TO-220FP package 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

5 Ordering information

Table 11. Order codes

Order code	Marking	Package	Packing
STB18N55M5	18N55M5	D ² PAK	Tape and reel
STF18N55M5		TO-220FP	Tube

Obsolete Product(s) - Obsolete Product(s)

Revision history

Table 12. Document revision history

Date	Version	Changes
27-Aug-2018	1	First release. Part numbers previously included in datasheet DocID17078.

Obsolete Product(s) - Obsolete Product(s)

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