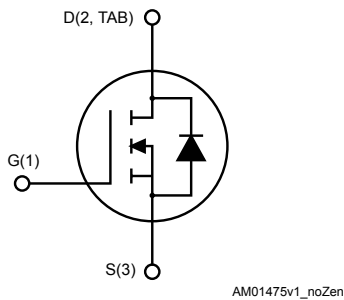


## N-channel 550 V, 0.150 $\Omega$ typ., 16 A MDmesh™ M5 Power MOSFETs in a DPAK and TO-220 packages



DPAK

TO-220



### Features

Order code	$V_{DS}$ @ $T_{jmax.}$	$R_{DS(on)max.}$	Package
STD18N55M5	600 V	0.192 $\Omega$	DPAK
STP18N55M5			TO-220

- 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

[STD18N55M5](#)
[STP18N55M5](#)

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{GS}$	Gate-source voltage	$\pm 25$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	16	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	10	A
$I_{DM}^{(1)}$	Drain current (pulsed)	64	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$T_j$	Operating junction temperature range	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		

1. Pulse width limited by safe operating area.

2.  $I_{SD} \leq 16\text{ A}$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ;  $V_{DS\ peak} < V_{(BR)DSS}$ ;  $V_{DD} = 340\text{ V}$ .

**Table 2. Thermal data**

Symbol	Parameter	Value		Unit
		DPAK	TO-220	
$R_{thj-case}$	Thermal resistance junction-case	1.14		$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient		62.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50		$^\circ\text{C}/\text{W}$

1. When mounted on an 1-inch<sup>2</sup> 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 $T_j\text{ Max}$ )	4	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	210	mJ

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  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	$\mu\text{A}$
		$V_{GS} = 0\text{ V}, V_{DS} = 550\text{ V}, T_C = 125\text{ °C}^{(1)}$			100	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 100$	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	$\Omega$

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	-	$\mu\text{F}$
$C_{oss}$	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	-	$\mu\text{F}$
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related			35		
$R_g$	Gate input resistance	$f = 1\text{ MHz}$ open drain	-	2.8	-	$\Omega$
$Q_g$	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**

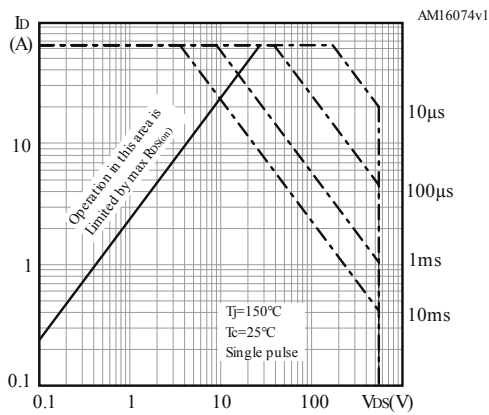
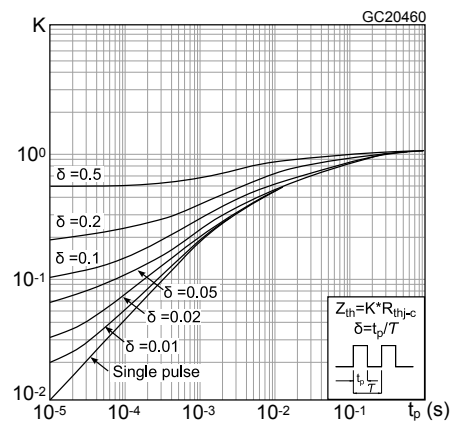
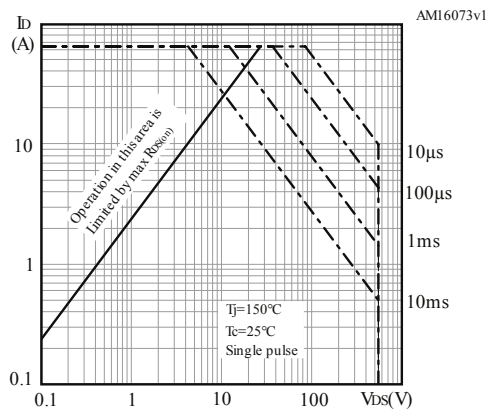
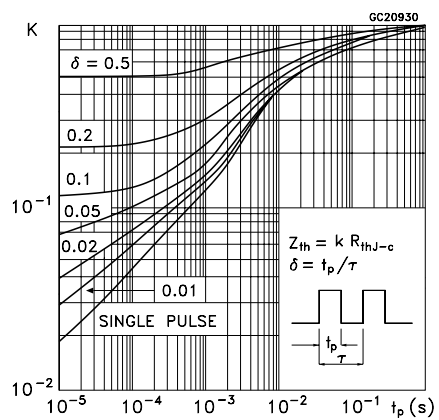
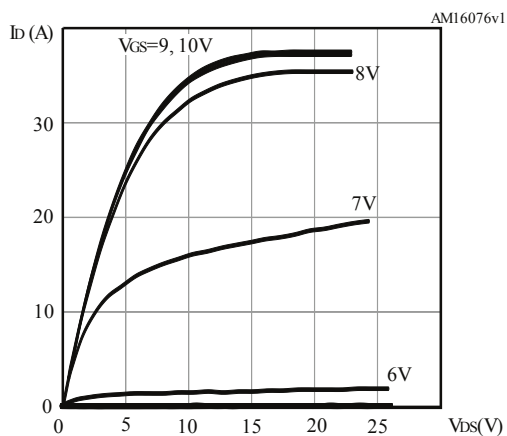
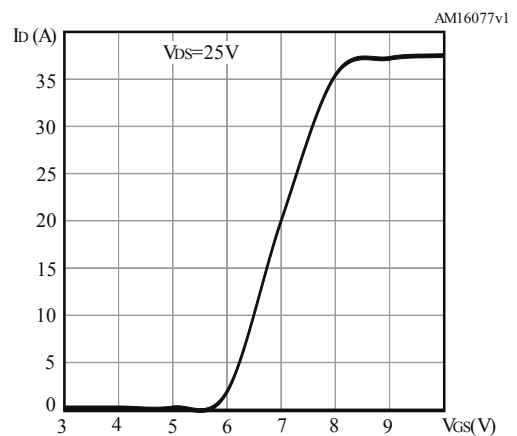
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$t_{d(v)}$	Voltage delay time	$V_{DD} = 400\text{ V}$ , $I_D = 10.5\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 19. Test circuit for inductive load switching and diode recovery times and Figure 22. Switching time waveform)	-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

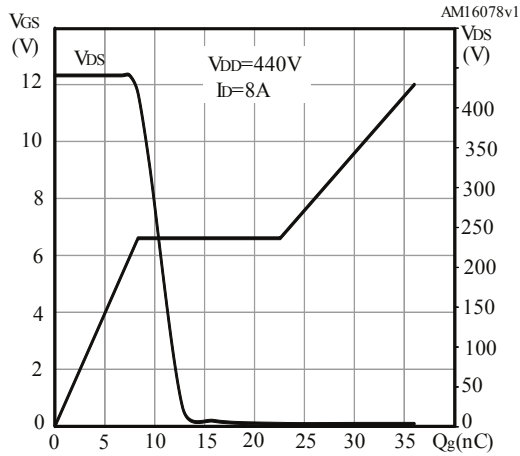
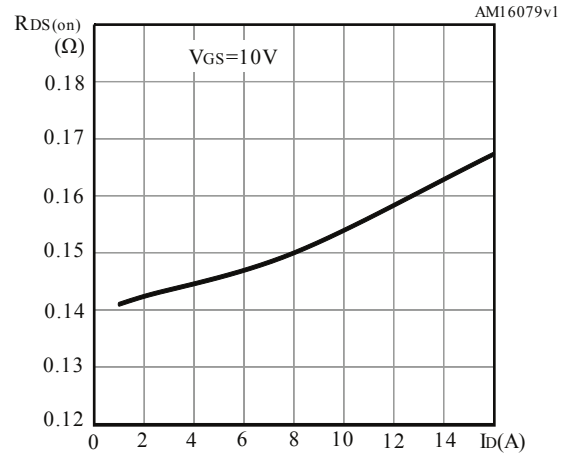
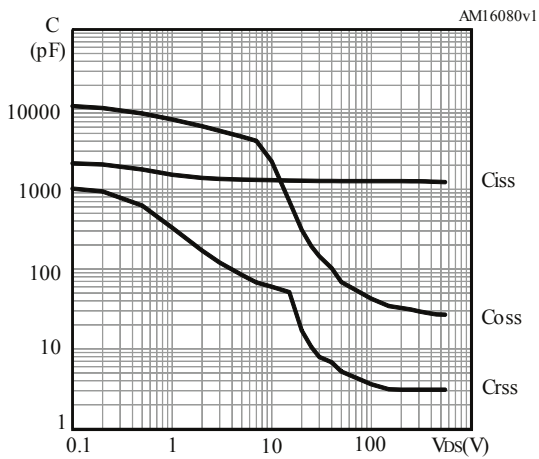
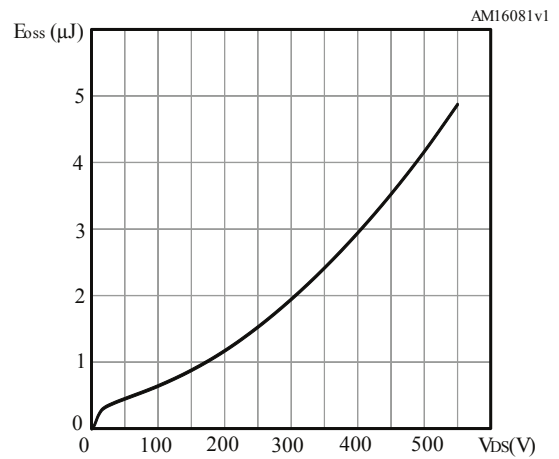
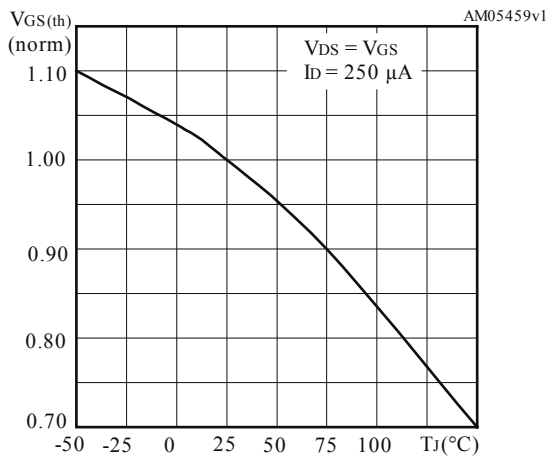
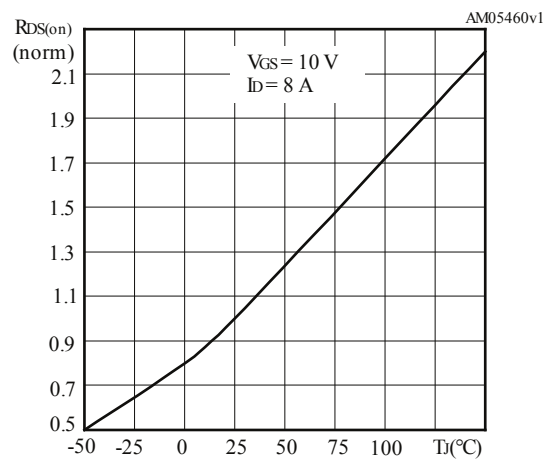
**Table 7. Source drain diode**

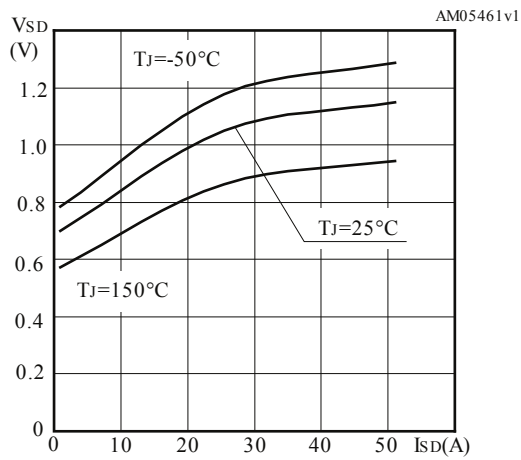
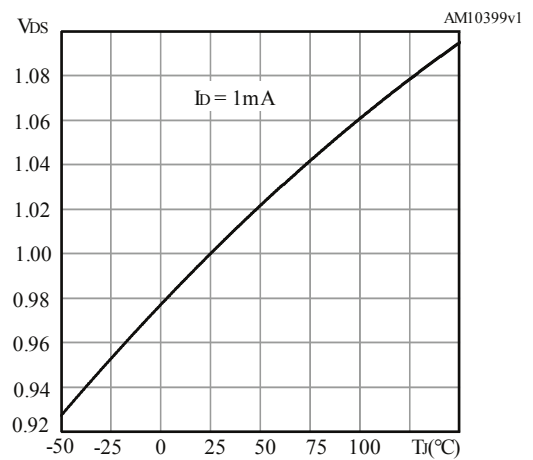
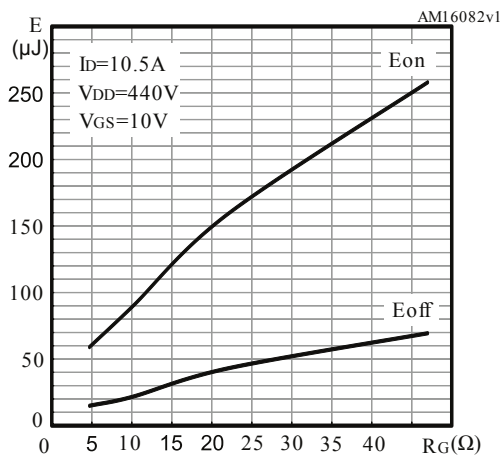
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		16	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				64	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 16\text{ A}$ , $di/dt = 100\text{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

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics curves

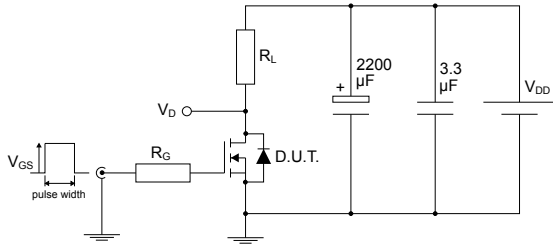
**Figure 1. Safe operating area for DPAK**

**Figure 2. Thermal impedance DPAK**

**Figure 3. Safe operating area for TO-220**

**Figure 4. Thermal impedance for TO-220**

**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**


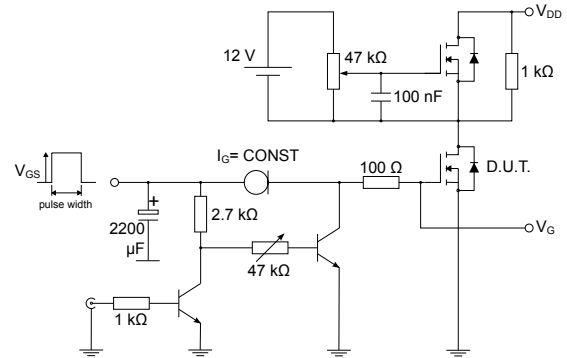
**Figure 14. Drain-source diode forward characteristics**

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

**Figure 16. Switching energy vs gate resistance**


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

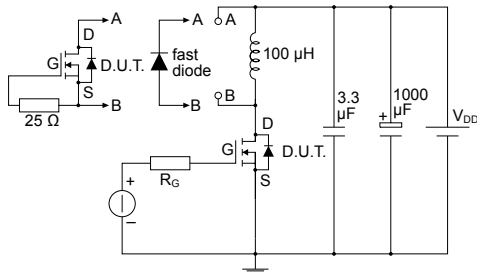
### 3 Test circuits

**Figure 17. Test circuit for resistive load switching times**


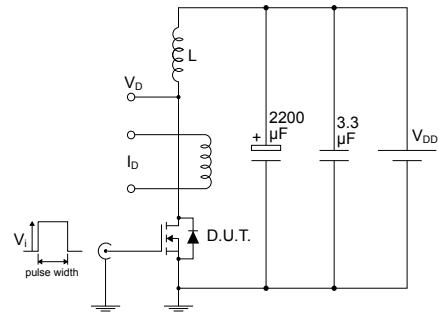
AM01488v1

**Figure 18. Test circuit for gate charge behavior**


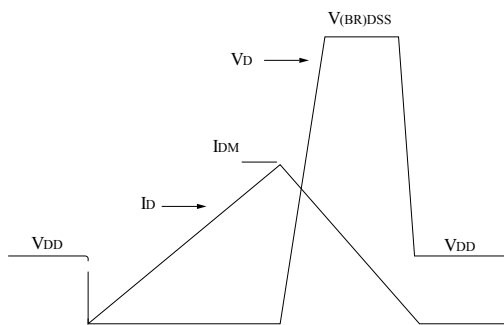
AM01469v1

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


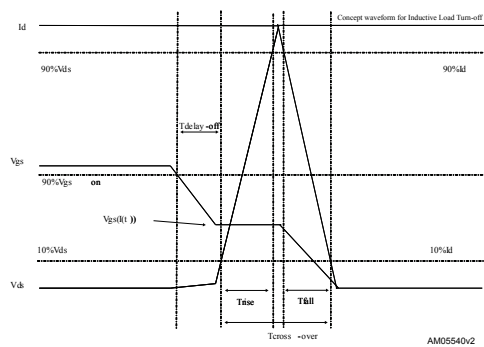
AM01470v1

**Figure 20. Unclamped inductive load test circuit**


AM01471v1

**Figure 21. Unclamped inductive waveform**


AM01472v1

**Figure 22. Switching time waveform**


AM05540v2



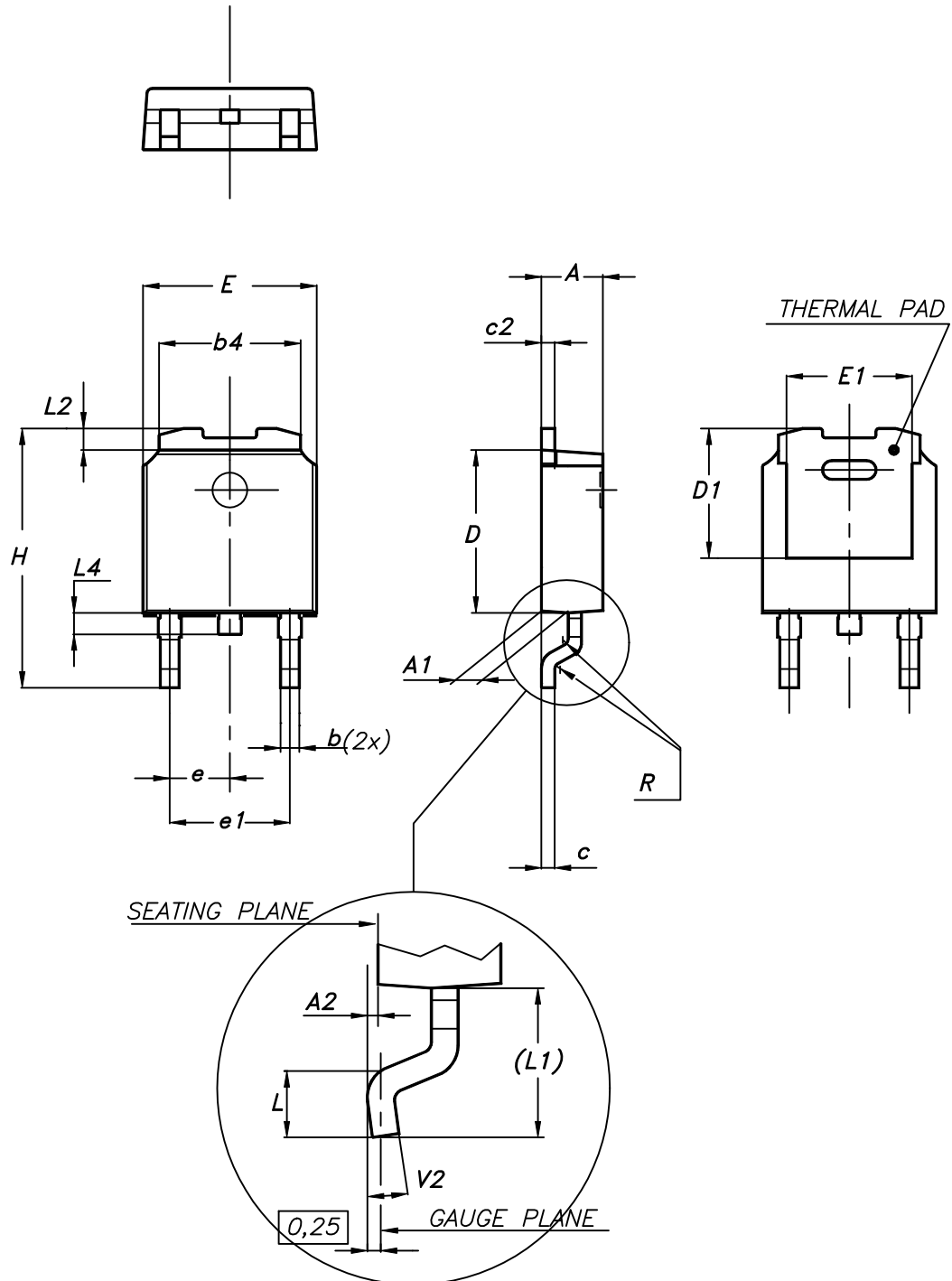
## 4 Package information

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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 DPAK (TO-252) type A2 package information

Figure 23. DPAK (TO-252) type A2 package outline



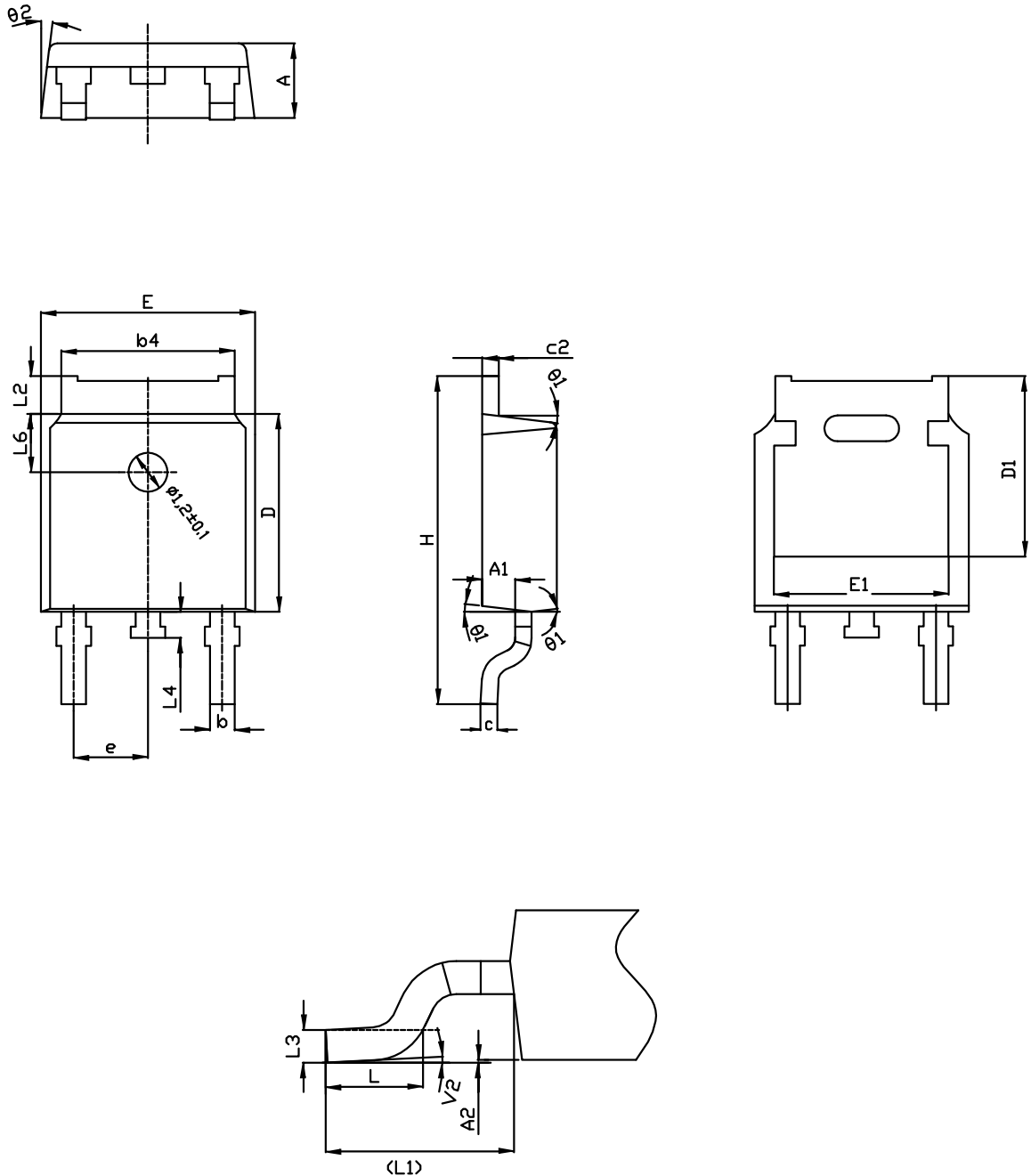
0068772\_type-A2\_rev25

**Table 8. DPAK (TO-252) type A2 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	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

## 4.2 DPAK (TO-252) type C2 package information

Figure 24. DPAK (TO-252) type C2 package outline



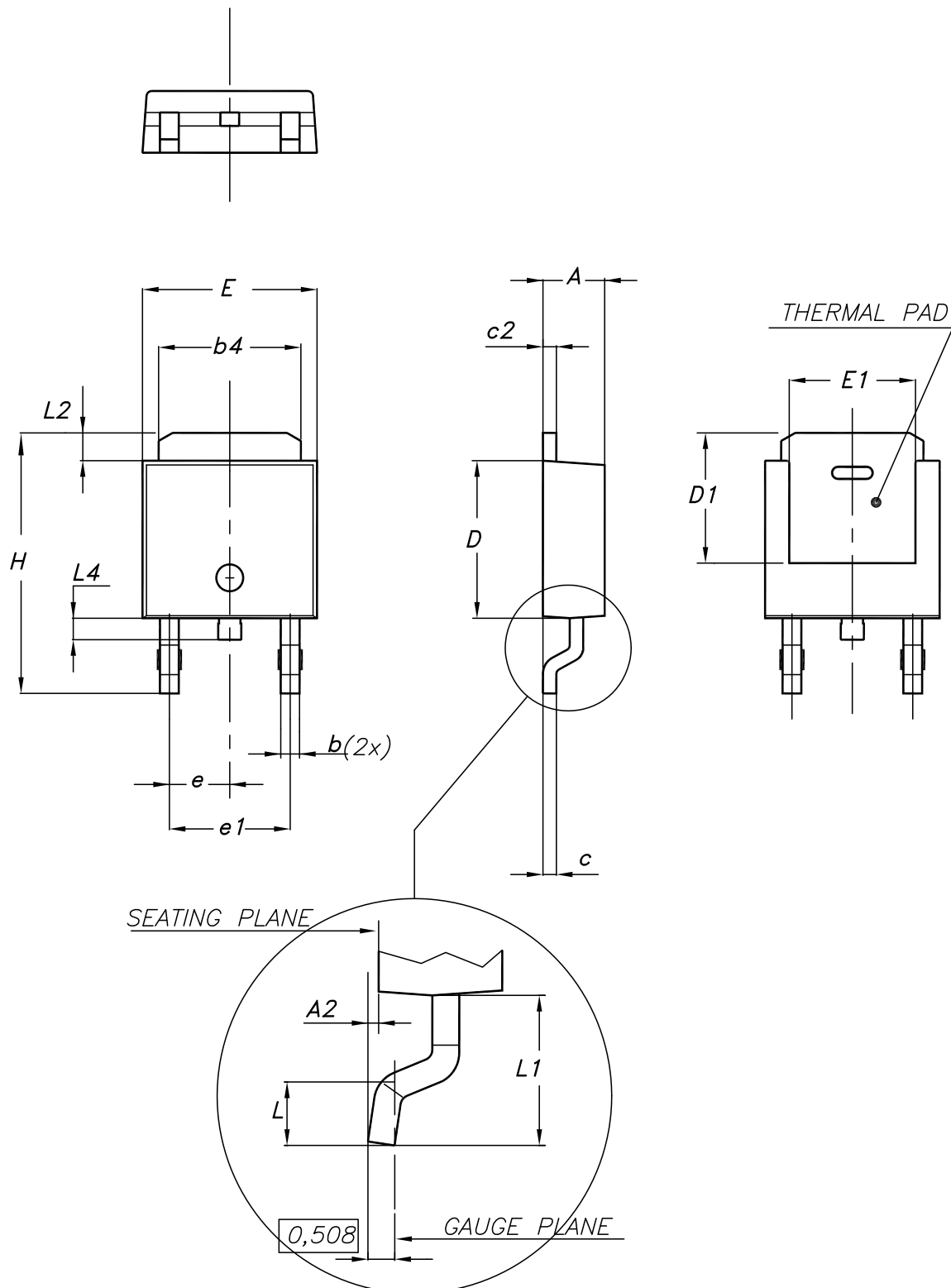
0068772\_C2\_25

**Table 9. DPAK (TO-252) type C2 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

### 4.3 DPAK (TO-252) type E package information

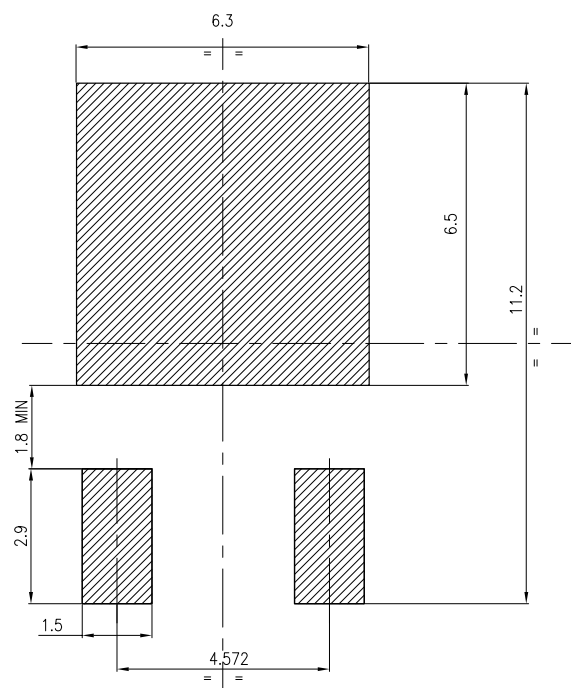
Figure 25. DPAK (TO-252) type E package outline



**Table 10. DPAK (TO-252) type E mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.18		2.39
A2			0.13
b	0.65		0.884
b4	4.95		5.46
c	0.46		0.61
c2	0.46		0.60
D	5.97		6.22
D1	5.21		
E	6.35		6.73
E1	4.32		
e		2.286	
e1		4.572	
H	9.94		10.34
L	1.50		1.78
L1		2.74	
L2	0.89		1.27
L4			1.02

**Figure 26. DPAK (TO-252) recommended footprint (dimensions are in mm)**



FP\_0068772\_25

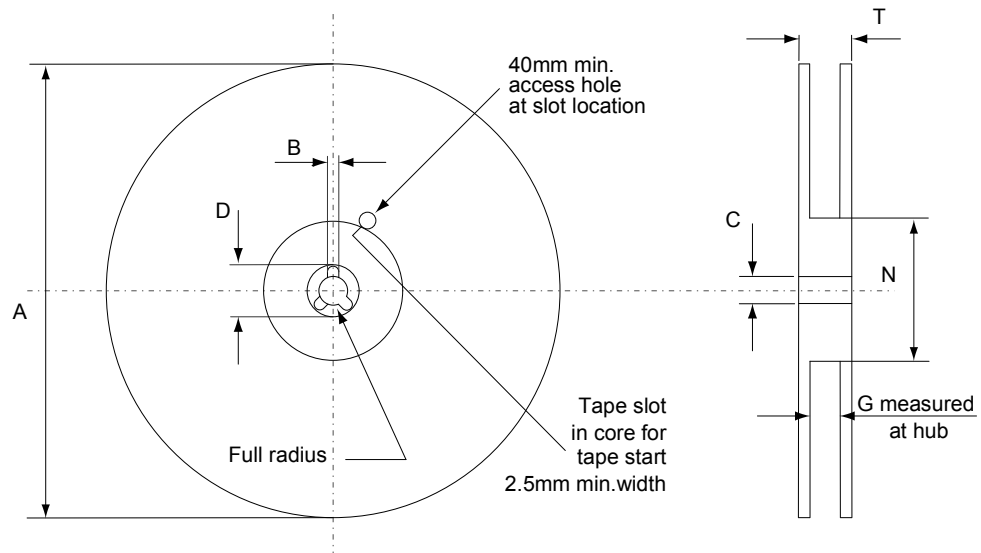
### 4.4 DPAK (TO-252) packing information

Figure 27. DPAK (TO-252) tape outline



AM08852v1

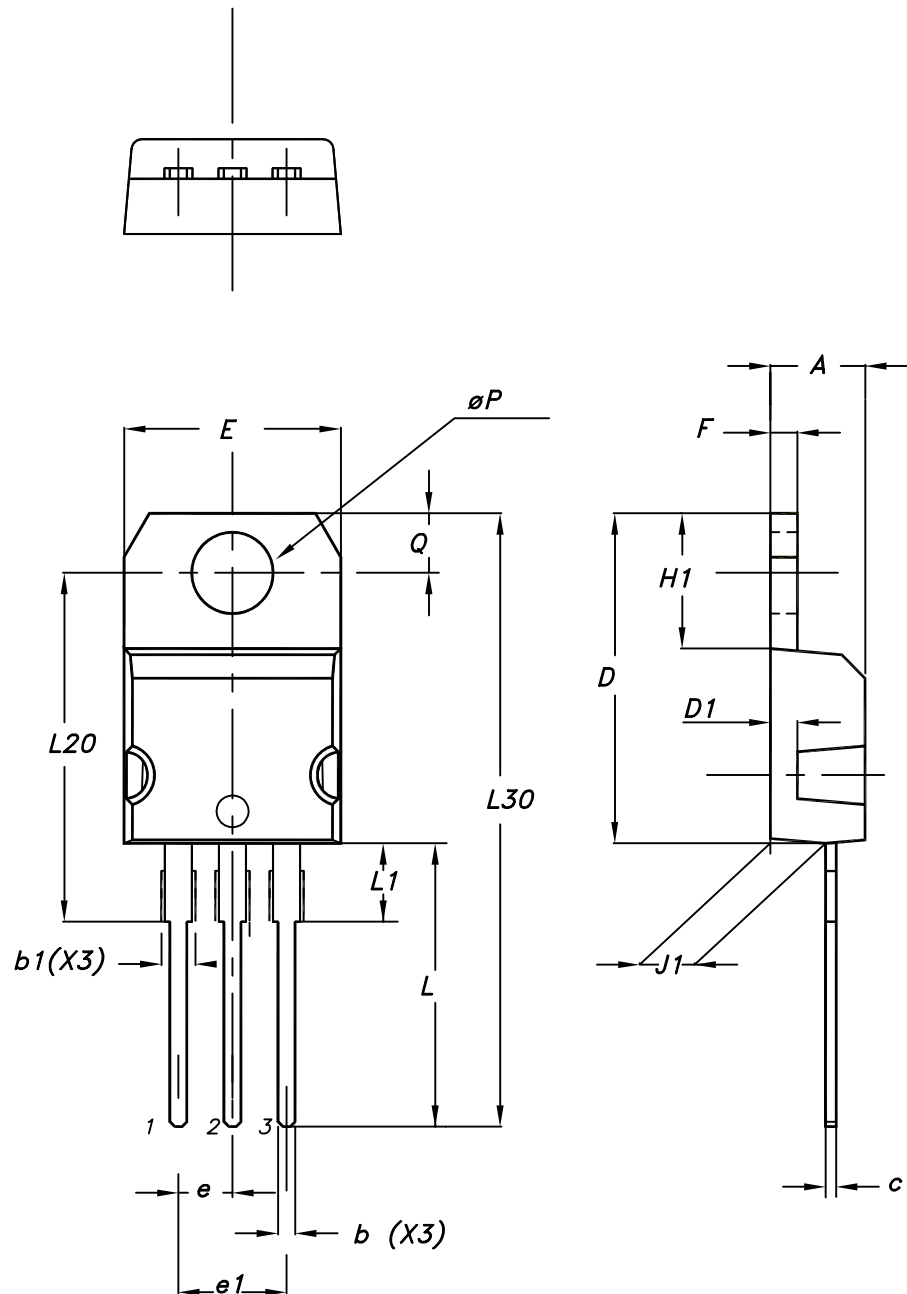


**Figure 28. DPAK (TO-252) reel outline**


AM06038v1

**Table 11. DPAK (TO-252) tape and reel mechanical data**

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

**4.5 TO-220 type A package information**
**Figure 29. TO-220 type A package outline**


0015988\_typeA\_Rev\_21

**Table 12. TO-220 type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		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	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

## 5 Ordering information

**Table 13. Order codes**

Order code	Marking	Package	Packing
STD18N55M5	18N55M5	DPAK	Tape and reel
STP18N55M5		TO-220	Tube

## Revision history

**Table 14. Document revision history**

Date	Version	Changes
09-Feb-2010	1	First release.
04-Mar-2011	2	<ul style="list-style-type: none"> <li>– Document status promoted from preliminary data to datasheet;</li> <li>– Added new package, mechanical data: D<sup>2</sup>PAK.</li> </ul>
22-Nov-2013	3	<ul style="list-style-type: none"> <li>– Updated: title on the cover page and RDS(on) values.</li> <li>– Modified: EAS value and note 3 in Table 2</li> <li>– Modified: RDS(on) value in Table 4, typical values in Table 5 and 7</li> <li>– Updated: the entire Table 5</li> <li>– Added: Section 2.1: Electrical characteristics (curves)</li> <li>– Updated: Section 4: Package mechanical data and Section 5: Packaging mechanical data</li> <li>– Updated: Figure 11 and 18</li> <li>– Minor text changes.</li> </ul>
03-Aug-2018	4	<p>The part numbers STB18N55M5 and STF18N55M5 have been moved to a separate datasheet.</p> <p>Removed maturity status indication from cover page. The document status is production data.</p> <p>Updated title in cover page, <a href="#">Section 1 Electrical ratings</a>, <a href="#">Section 2 Electrical characteristics</a> and <a href="#">Section 4 Package information</a>.</p> <p>Minor text changes.</p>

## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>2</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>3</b>
<b>2.1</b>	Electrical characteristics curves .....	5
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package information</b> .....	<b>9</b>
<b>4.1</b>	DPAK (TO-252) type A2 package information .....	9
<b>4.2</b>	DPAK (TO-252) type C2 package information .....	11
<b>4.3</b>	DPAK (TO-252) type E package information .....	13
<b>4.4</b>	DPAK (TO-252) packing information .....	15
<b>4.5</b>	TO-220 type A package information .....	17
<b>5</b>	<b>Ordering information</b> .....	<b>20</b>
	<b>Revision history</b> .....	<b>21</b>

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