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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate-source voltage	± 25	V
I _D	Drain current (continuous) at T _C = 25 °C	11	Α
I _D	Drain current (continuous) at T _C = 100 °C	6.93	Α
I _{DM} ⁽¹⁾	Drain current (pulsed)	44	Α
P _{TOT}	Total dissipation at T _C = 25 °C	90	W
dv/dt (2)	Peak diode recovery voltage slope	15	V/ns
T _{stg}	Storage temperature	- 55 to 150	°C
T _j	Max. operating junction temperature	150	°C

^{1.} Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Val	Unit	
Cymbol	T di differen	D ² PAK	DPAK	
R _{thj-case}	Thermal resistance junction-case max	1.39		°C/W
R _{thj-pcb}	Thermal resistance junction-pcb max	30 50		°C/W

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I _{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	3.5	А
E _{AS}	Single pulse avalanche energy (starting T _J =25 °C, I _D =I _{AS} , V _{DD} =50 V)	200	mJ



^{2.} $I_{SD} \leq$ 11 A, di/dt \leq 400 A/ μ s, $V_{DS \; peak} \leq V_{(BR)DSS}$, V_{DD} = 80% $V_{(BR)DSS}$.

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	V _{GS} = 0, I _D = 1 mA	600			V
	Zero gate voltage	V _{GS} = 0, V _{DS} = 600 V			1	μA
I _{DSS}	drain current	V _{GS} = 0, V _{DS} = 600 V, T _C =125 °C			100	μΑ
I _{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = \pm 25 \text{ V}$			± 0.1	μΑ
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	2	3	4	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 5.5 A		0.28	0.36	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{iss}	Input capacitance		-	790	-	pF
C _{oss}	Output capacitance	$V_{GS} = 0, V_{DS} = 50 V,$	ı	60	-	pF
C _{rss}	Reverse transfer capacitance	f = 1 MHz	-	3.6	-	pF
C _{oss eq.} (1)	Equivalent output capacitance	$V_{GS} = 0$, $V_{DS} = 0$ to 480 V	-	135	-	pF
Qg	Total gate charge	V _{DD} = 480 V, I _D = 11 A,	-	27	-	nC
Q_{gs}	Gate-source charge	V _{GS} = 10 V,	-	4	-	nC
Q_{gd}	Gate-drain charge	(see Figure 16)	-	14	-	nC
R _G	Gate input resistance	f=1 MHz open drain	-	4.7	-	Ω

^{1.} $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DS}

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time		-	3	-	ns
t _r	Rise time	$V_{DD} = 300 \text{ V}, I_{D} = 5.5 \text{ A}$ $R_{G} = 4.7 \Omega V_{GS} = 10 \text{ V}$	-	8	-	ns
t _{d(off)}	Turn-off delay time	(see Figure 15)	-	30	-	ns
t _f	Fall time		-	10	-	ns



Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Тур.	Max.	Unit
I _{SD}	Source-drain current		-		11	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)		-		44	Α
V _{SD} (2)	Forward on voltage	I _{SD} = 11 A, V _{GS} = 0	-		1.5	V
t _{rr}	Reverse recovery time	$I_{SD} = 11 \text{ A, di/dt} = 100 \text{ A/}\mu\text{s}$	-	230		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 100 V	-	2		μC
I _{RRM}	Reverse recovery current	(see Figure 17)	-	18		Α
t _{rr}	Reverse recovery time	$I_{SD} = 11 \text{ A, di/dt} = 100 \text{ A/}\mu\text{s}$	-	290		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 100 V, T _j = 150 °C	-	2.5		μC
I _{RRM}	Reverse recovery current	(see Figure 17)	-	17		Α

^{1.} Pulse width limited by safe operating area

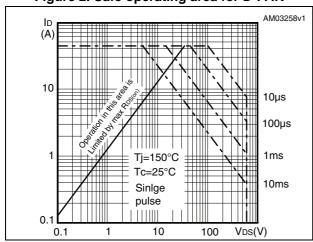


^{2.} Pulsed: pulse duration = 300 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for D²PAK

Figure 3. Thermal impedance for D²PAK



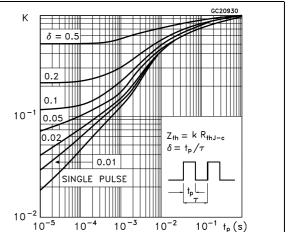
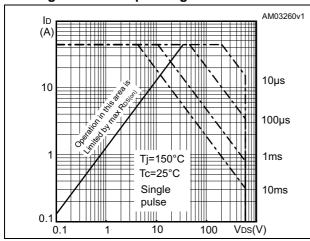


Figure 4. Safe operating area for DPAK

Figure 5. Thermal impedance for DPAK



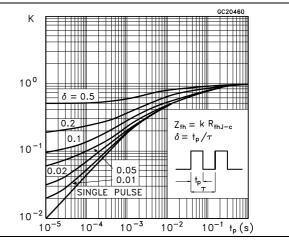
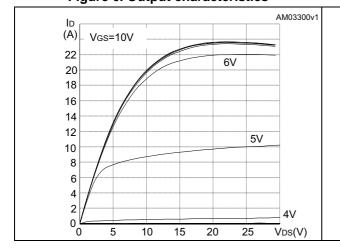


Figure 6. Output characteristics

Figure 7. Transfer characteristics



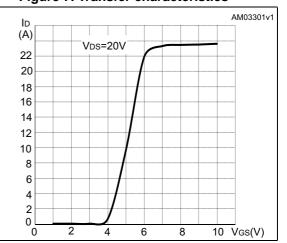
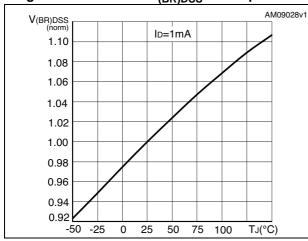


Figure 8. Normalized $V_{(BR)DSS}$ vs temperature

Figure 9. Static drain-source on-resistance



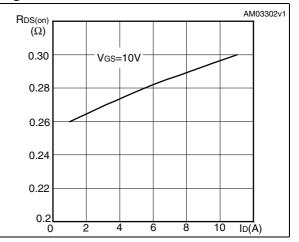
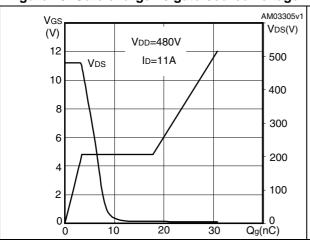


Figure 10. Gate charge vs gate-source voltage

Figure 11. Capacitance variations



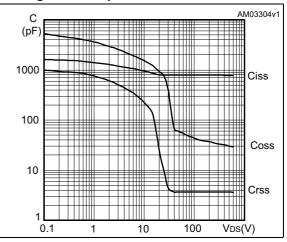
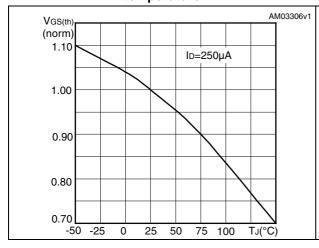


Figure 12. Normalized gate threshold voltage vs temperature

Figure 13. Normalized on-resistance vs temperature



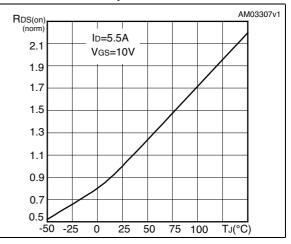
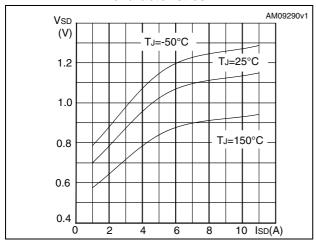


Figure 14. Source-drain diode forward characteristics



3 Test circuits

Figure 15. Switching times test circuit for resistive load

Figure 16. Gate charge test circuit

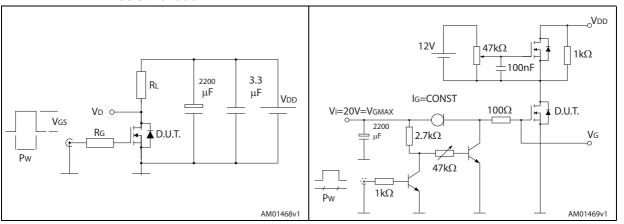


Figure 17. Test circuit for inductive load switching and diode recovery times

Figure 18. Unclamped inductive load test circuit

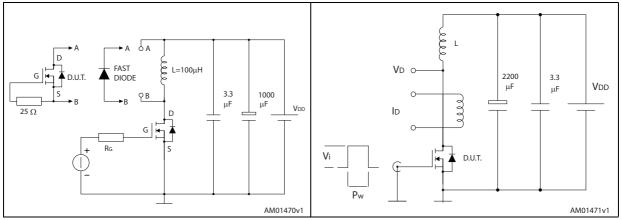
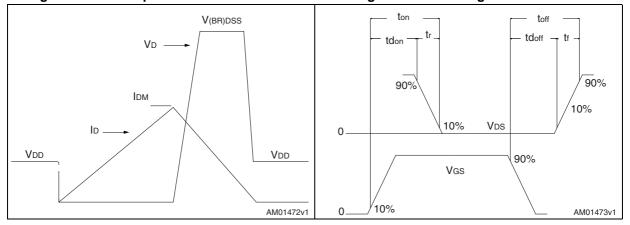


Figure 19. Unclamped inductive waveform

Figure 20. 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.

4.1 D²PAK package information

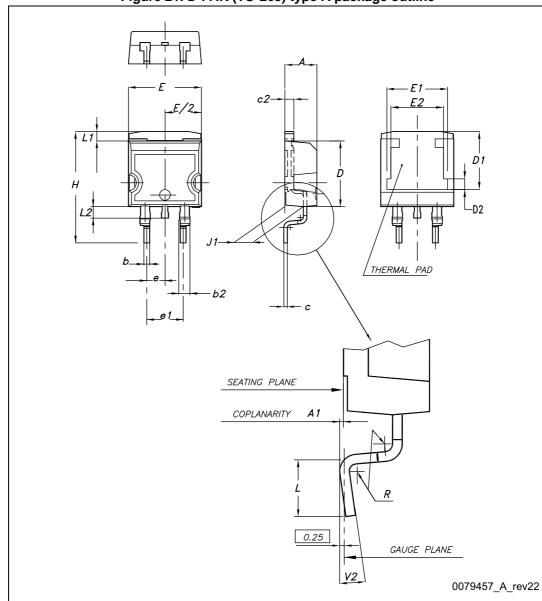


Figure 21. D²PAK (TO-263) type A package outline

Ay/

Table 9. D²PAK (TO-263) type A package mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
С	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		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
е		2.54	
e1	4.88		5.28
Н	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°

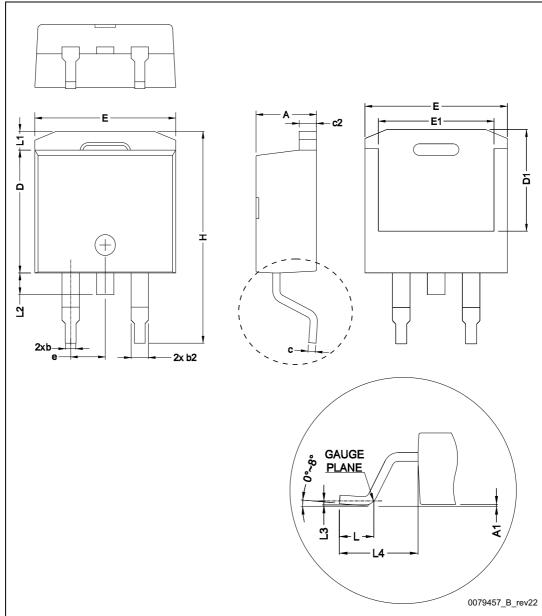


Figure 22. D²PAK (TO-263) type B package outline

Table 10. D²PAK (TO-263) type B package mechanical data

Dim	,	mm	
Dim.	Min.	Тур.	Max.
А	4.36		4.60
A1	0		0.25
b	0.70		0.93
b2	1.14		1.70
С	0.38		0.694
c1	0.38		0.534
c2	1.19		1.36
D	8.6		9.35
D1	6.9		
E	10		10.55
E1	8.1		
е		2.54	
Н	15		15.85
L	1.9		2.79
L1			1.65
L2			1.78
L3		0.25	
L4	4.78		5.28

9.75

16.9

1.6

2.54

5.08

Figure 23. D²PAK footprint^(a)

Footprint

a. All dimension are in millimeters

4.2 DPAK package information

Ε THERMAL PAD c2 E1 L2 A 1 <u>b(</u>2x) R С SEATING PLANE *V2* 0,25 0068772_type-A2_rev19

Figure 24. DPAK (TO-252) type A2 package outline

Table 11. DPAK (TO-252) type A2 package mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
С	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
Е	6.40		6.60
E1	5.10	5.20	5.30
е	2.16	2.28	2.40
e1	4.40		4.60
Н	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°

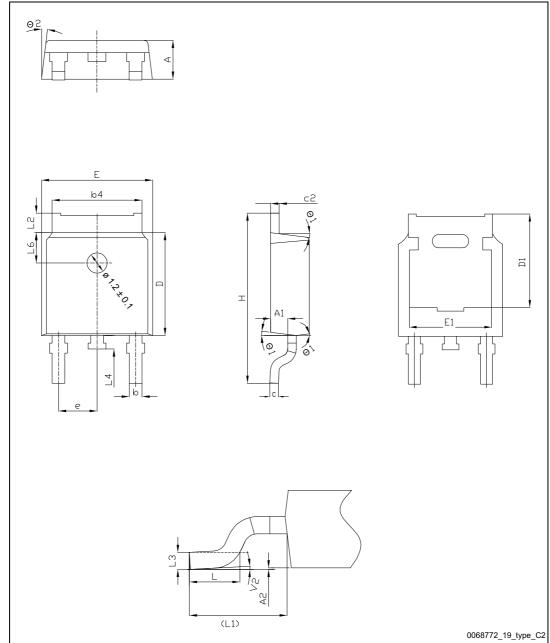


Figure 25. DPAK (TO-252) type C2 outline

Table 12. DPAK (TO-252) type C2 package mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А	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
С	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.25	-	-
Е	6.50	6.60	6.70
E1	5.20	-	-
е	2.186	2.286	2.386
Н	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°

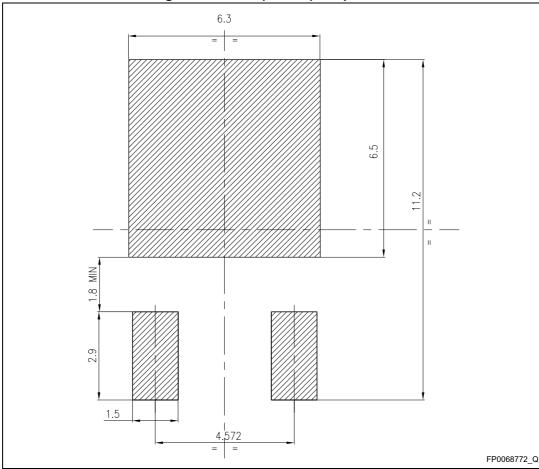
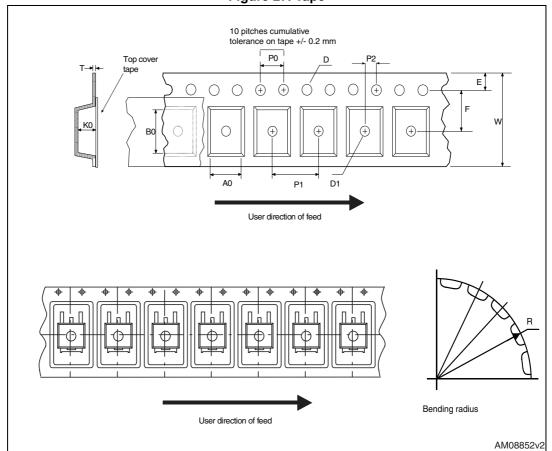


Figure 26. DPAK (TO-252) footprint ^(b)

b. All dimensions are in millimeters

5 Packing information

Figure 27. Tape



REEL DIMENSIONS 40mm min. Access hole At sl ot location В D С Tape slot in core for tape start 25 mm min. width G measured at hub Full radius AM08851v2

Figure 28. Reel

Table 13. D²PAK (TO-263) tape and reel mechanical data

Таре				Reel		
Dim.	mm		Dim.	mm		
	Min.	Max.	Dim.	Min.	Max.	
A0	10.5	10.7	Α		330	
В0	15.7	15.9	В	1.5		
D	1.5	1.6	С	12.8	13.2	
D1	1.59	1.61	D	20.2		
Е	1.65	1.85	G	24.4	26.4	
F	11.4	11.6	N	100		
K0	4.8	5.0	Т		30.4	
P0	3.9	4.1				
P1	11.9	12.1	Base qty 1000		1000	
P2	1.9	2.1	Bulk qty 1000			
R	50					
Т	0.25	0.35				
W	23.7	24.3				

Table 14. DPAK (TO-252) tape and reel mechanical data

Таре				Reel		
Dim.	n	nm	Dim.	mm		
	Min.	Max.		Min.	Max.	
A0	6.8	7	А		330	
В0	10.4	10.6	В	1.5		
B1		12.1	С	12.8	13.2	
D	1.5	1.6	D	20.2		
D1	1.5		G	16.4	18.4	
Е	1.65	1.85	N	50		
F	7.4	7.6	Т		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				

6 Revision history

Table 15. Document revision history

Date	Revision	Changes
18-Dec-2012	1	First release
10-Jul-2014	2	 Updated: Section 3: Test circuits Updated: Section 4: Package information Minor text changes
19-Jun-2015	3	Updated 4: Package informationMinor text changes



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