1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage (T_j = -40 °C to +175 °C)		1200	V
$I_{F(RMS)}$	Forward rms current		38	A
$I_{F(AV)}$	Average forward current	T_c = 155 °C, DC current	20	A
I_{FRM}	Repetitive peak forward current	T_c =155 °C, T_j = 175 °C, δ = 0.1	78	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C	140	A
		t_p = 10 ms sinusoidal, T_c = 150 °C	120	
		t_p = 10 µs square, T_c = 25 °C	700	
T_{stg}	Storage temperature range		-55 to +175	°C
T_j	Operating junction temperature(1)		-40 to +175	°C

1. *(dP_{tot}/dT_j) < ($1/R_{th(j-a)}$) condition to avoid thermal runaway for a diode on its own heatsink.*

Table 2. Thermal resistance parameters

Symbol	Parameter	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	0.30	0.45	°C/W

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	10	120	µA
		T_j = 150 °C		-	60	800	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 20 A	-	1.35	1.50	V
		T_j = 150 °C		-	1.75	2.25	

1. *Pulse test: t_p = 5 ms, δ < 2%*
2. *Pulse test: t_p = 500 µs, δ < 2%*

To evaluate the conduction losses, use the following equation: $P = 1.07 \times I_{F(AV)} + 0.059 \times I_F{}^2{}_{(RMS)}$

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Q_{Cj} (1)	Total capacitive charge	V_R = 800 V	-	129	-	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	-	1650	-	pF
		V_R = 800 V, T_c = 25 °C, F = 1 MHz	-	110	-	

1. *Most accurate value for the capacitive charge:* $Q_{cj}(V_R) = \int_0^{V_R} C_j(V)dV$

1.1 Characteristics (curves)

Figure 1. Forward voltage drop versus forward current (typical values)

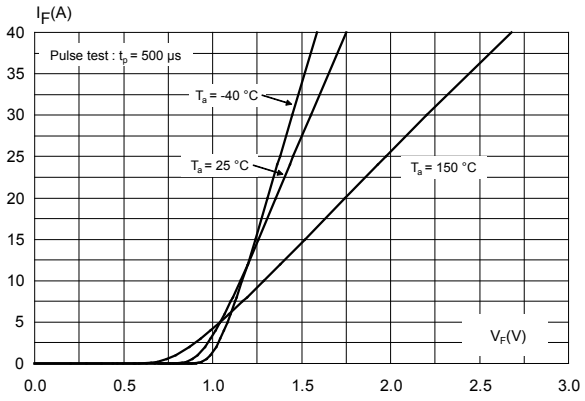


Figure 2. Reverse leakage current versus reverse voltage applied (typical values)

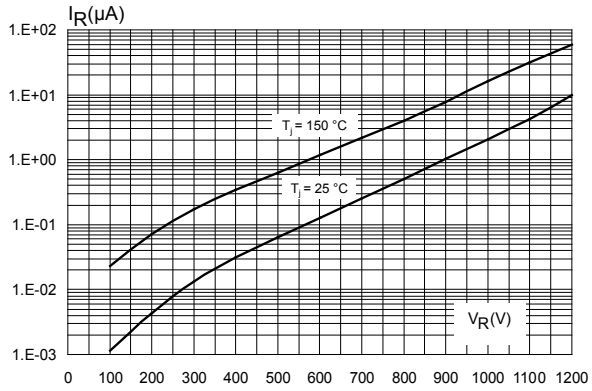


Figure 3. Peak forward current versus case temperature

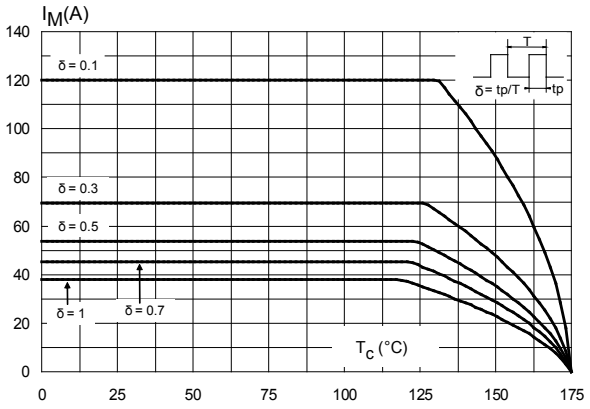


Figure 4. Junction capacitance versus reverse voltage applied (typical values)

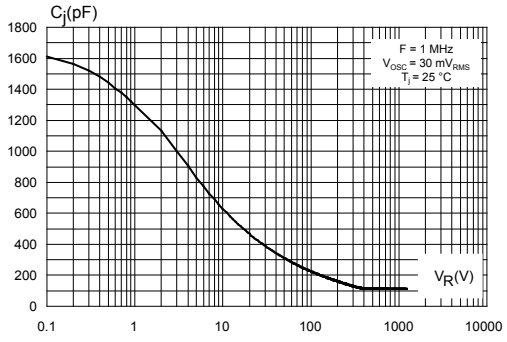


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

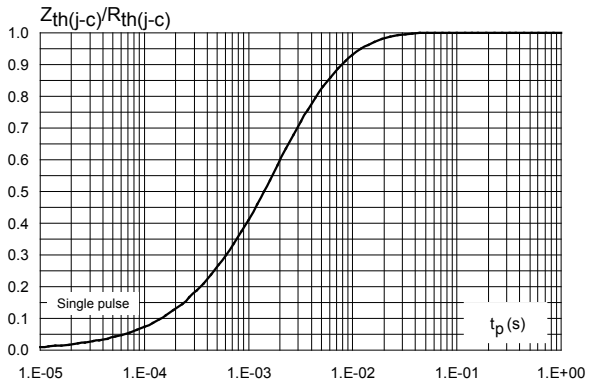


Figure 6. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

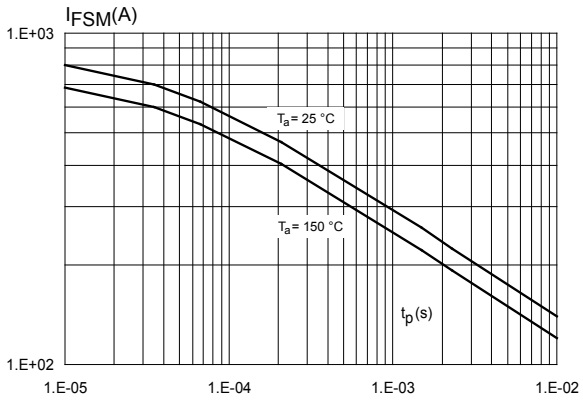


Figure 7. Total capacitive charges versus reverse voltage applied (typical values)

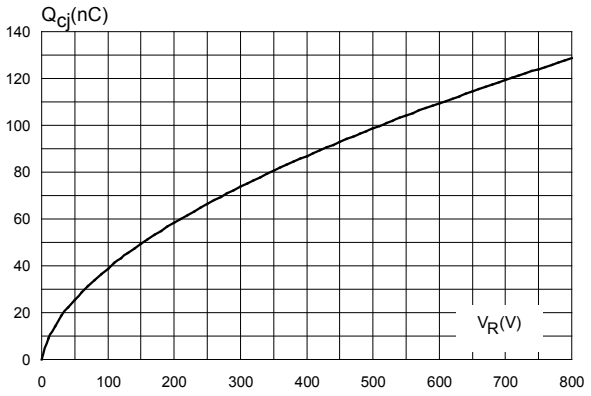
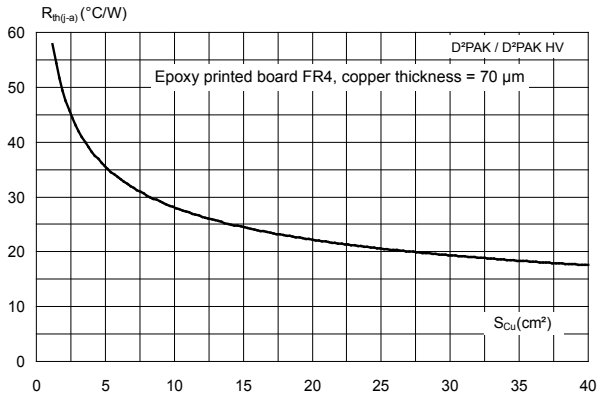


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu} = 70 µm)



2 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.

2.1 TO-220AC package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 9. TO-220AC package outline

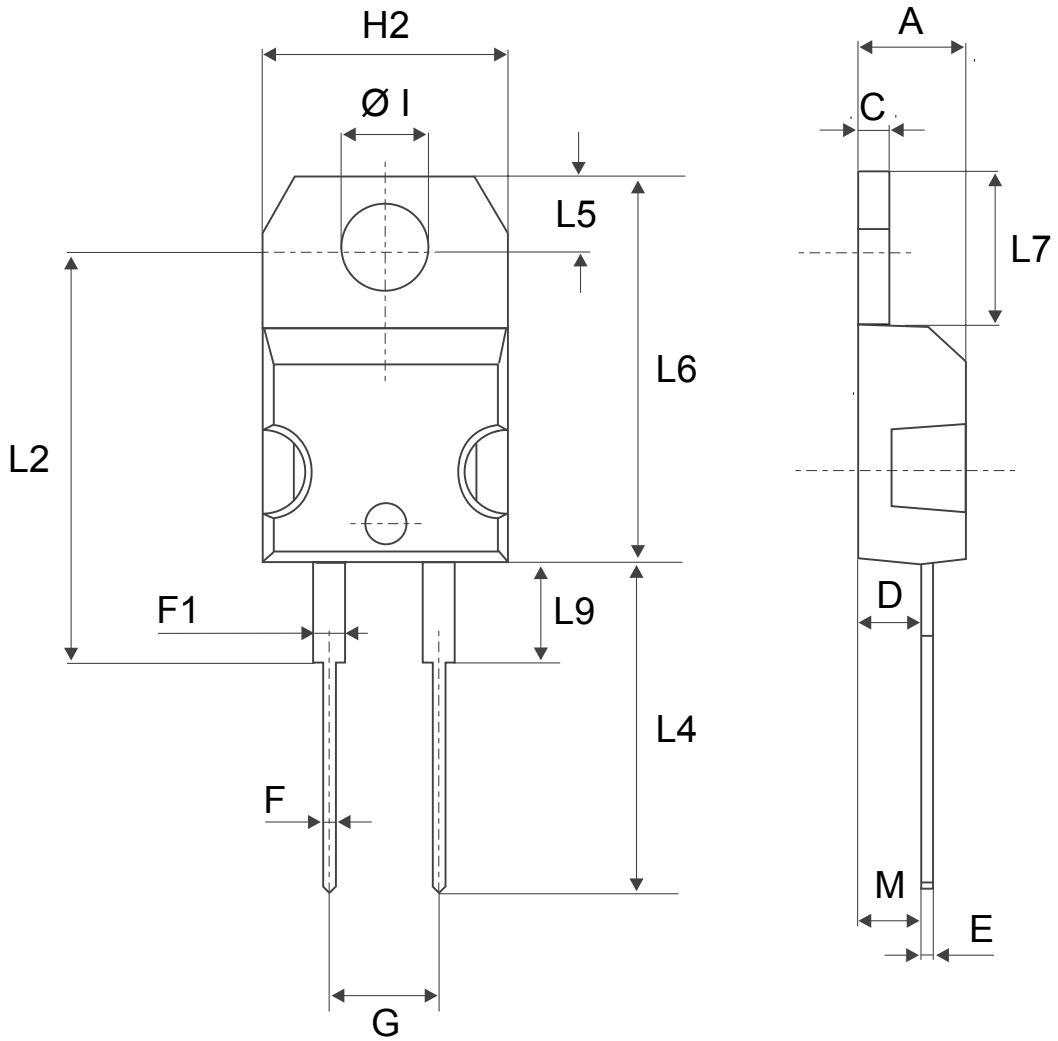


Table 5. **TO-220AC package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
ØI	3.75	3.85	0.147	0.151

2.2 D²PAK package information

- Epoxy meets UL94, V0.
- Cooling method: by conduction (C)

Figure 10. D²PAK package outline

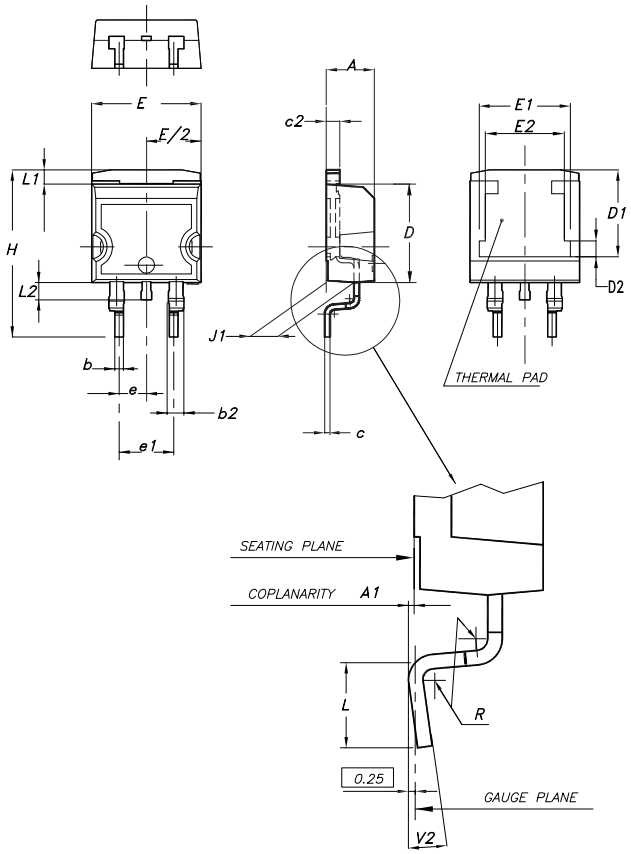
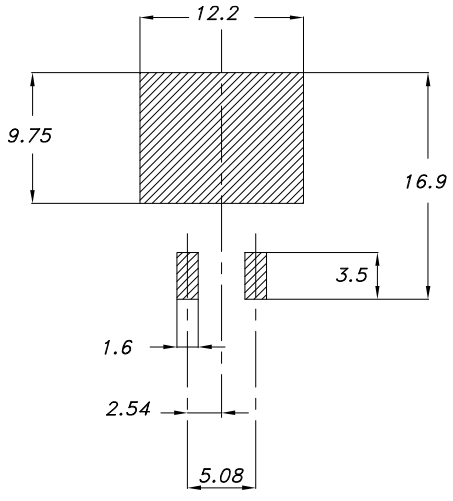


Table 6. D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.028		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.018		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50	7.75	8.00	0.295	0.305	0.315
D2	1.10	1.30	1.50	0.043	0.051	0.060
E	10		10.40	0.394		0.409

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
E1	8.30	8.50	8.70	0.326	0.335	0.343
E2	6.85	7.05	7.25	0.266	0.278	0.282
e		2.54			0.100	
e1	4.88		5.28	0.190		0.205
H	15		15.85	0.591		0.624
J1	2.49		2.69	0.097		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.049		0.055
L2	1.30		1.75	0.050		0.069
R		0.4			0.015	
V2	0°		8°	0°		8°

Figure 11. D²PAK recommended footprint (dimensions are in mm)



2.3 D²PAK high voltage package information

Figure 12. D²PAK high voltage package outline

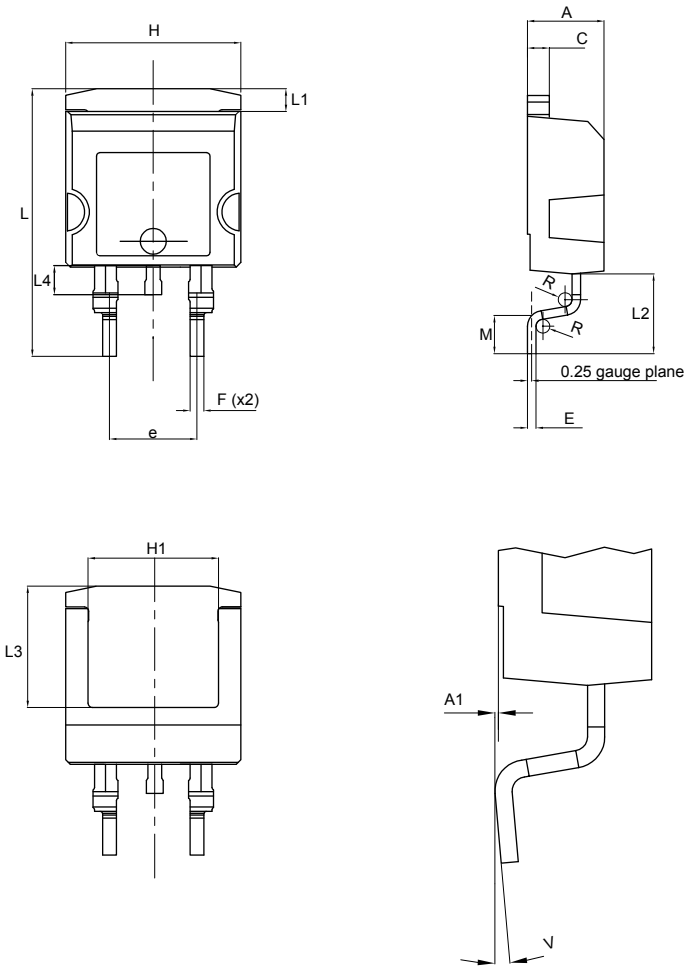
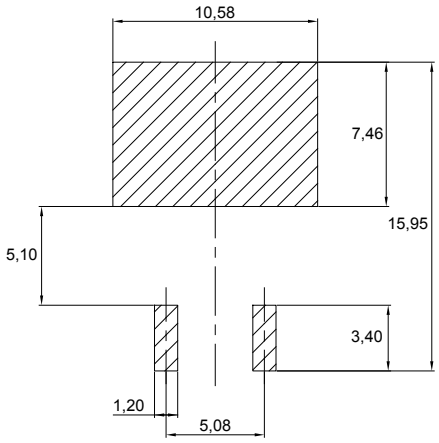


Table 7. D²PAK high voltage package mechanical data

Ref.	Dimensions		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 13. D²PAK High Voltage footprint in mm



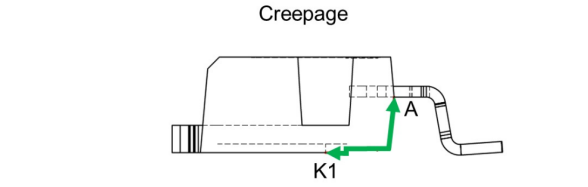
2.3.1 Creepage distance between Anode and Cathode

Table 8. Creepage distance between anode and cathode

Symbol	Parameter		Value	Unit
Cd_{A-K1}	Minimum creepage distance between A and K1 (with top coating)	D²PAK HV	5.38	mm
Cd_{A-K2}	Minimum creepage distance between A and K2 (without top coating)		3.48	

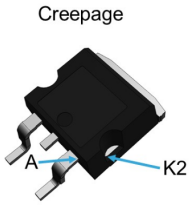
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 14. Creepage with top coating



Minimum distance between A & K1 = 5.38 mm (with top coating)

Figure 15. Creepage without top coating



Minimum distance between A & K2 = 3.48 mm (without top coating)

3 Ordering information

Table 9. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC20H12DY	STPSC20H12DY	TO-220AC	1.86 g	50	Tube
STPSC20H12GY-TR	STPSC20H12GY	D²PAK	1.48 g	1000	Tape and reel
STPSC20H12G2Y-TR	SC20H12G2Y	D²PAK HV	1.48 g	1000	Tape and reel

Revision history

Table 10. **Document revision history**

Date	Revision	Changes
05-Jan-2017	1	Initial release.
23-Jan-2017	2	Added D²PAK package.
18-Dec-2017	3	Updated cover image.
02-May-2019	4	Added D²PAK HV package.