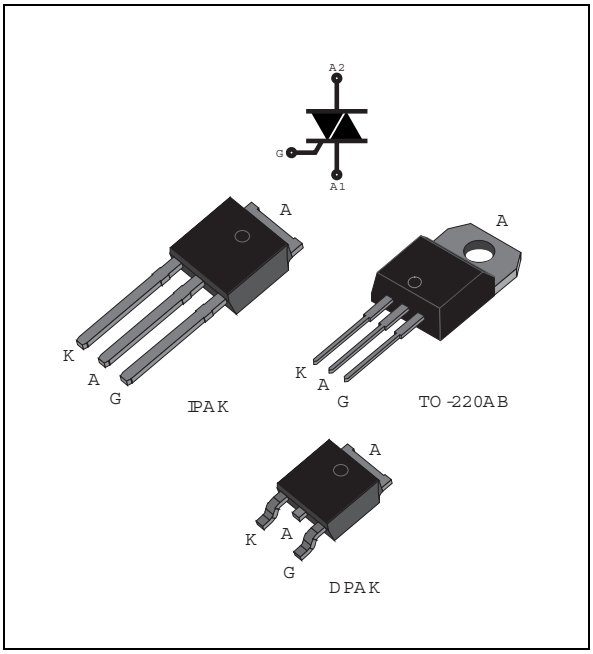
TS420

Sensitive gate 4 A SCRs

Datasheet – production data



Features

- On-state rms current, 4 A
- Repetitive peak off-state voltage (V_{DRM}, V_{RRM}) 600 V
- Triggering gate current, 0.2 mA

Description

Thanks to highly sensitive triggering levels, the TS420 is suitable for all applications where the available gate current is limited, such as motor control for hand tools, kitchen aids, overvoltage crowbar protection for low power supplies among others.

Available in through-hole and surface-mount packages, they provide an optimized performance in a limited space area.

Table 1. Device summary

Order code	Voltage 600 V	Sensitivity	Package
TS420-XXXB	X	0.2 mA	DPAK
TS420-XXXH	X		IPAK
TS420-XXXT	X		TO-220AB

1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state rms current (180° conduction angle)		T_c = 115°C	4	A
$IT_{(AV)}$	Average on-state current (180° conduction angle)		T_c = 115 °C	2.5	
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	$T_{jinitial}$ = 25 °C	33	
		t_p = 10 ms		30	
I^2t	I^2t value for fusing	t_p = 10 ms	T_j = 25 °C	4.5	A^2s
dI/dt	Critical rate of rise of on-state current, I_G = 10 mA, dI_G/dt = 0.1 A/µs	F = 60 Hz	T_j = 125 °C	50	A/µs
I_{GM}	Peak gate current	t_p = 20 µs		1.2	A
$P_{G(AV)}$	Average gate power dissipation			0.2	W
V_{RGM}	Maximum peak reverse gate voltage			5	
T_{stg}	Storage junction temperature range			- 40 to + 150	°C
T_j	Operating junction temperature range			- 40 to + 125	

Table 3. Device timings

Symbol	Parameter	Test conditions	Value	Unit
t_{GT}	Gate controlled turn on time	I_{TM} = 10 A, V_D = $V_{DRM(max)}$, I_{GT} = 10 mA, dI_G/dt = 0.2 A/µs, R_G = 1 k Ω , T_j = 25 °C	0.5 (Typ.)	µs
t_Q	Circuit controlled turn off time	V_D = 67% $V_{DRM(max)}$, T_j = 125 °C, I_{TM} = 8 A, V_R = 10 V, dI_T/dt = 10 A/µs, dV_D/dt = 2 V/µs, R_G = 1 kΩ	60 (Typ.)	

Table 4. Electrical characteristics (T_j = 25 °C, unless otherwise specified)

Symbol	Test conditions			Value	Unit
I_{GT}	V_D = 12 V, R_L = 33 Ω		Max.	100	µA
V_{GT}			Max.	0.8	V
V_{GD}	$V_D = V_{DRM}$, R_L = 33 kΩ, R_{GK} = 220 Ω	T_j = 125 °C	Min.	0.1	V
I_H	I_T = 50 mA, R_{GK} = 1 k Ω		Max.	5	mA
I_L	I_G = 2 mA, R_{GK} = 1 k Ω		Max.	6	mA
dV/dt	V_D = 67% V_{DRM}, R_{GK} = 220 Ω	T_j = 125 °C	Min.	5	V/µs
V_{TM}	I_{TM} = 8 mA, t_P = 380 µs	T_j = 25 °C	Max.	1.6	V
V_{t0}	Threshold voltage	T_j = 125 °C	Max.	0.85	V
R_d	Dynamic resistance	T_j = 125 °C	Max.	90	m Ω
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$, gate shorted	T_j = 25 °C	Max.	5	µA
		T_j = 125 °C		1	mA

Table 5. Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (DC)			3.0	°C/W
$R_{th(j-a)}$	Junction to ambient (DC)	$S^{(1)}$ = 0.5 cm^2	DPAK	70	°C/W
			IPAK	100	
			TO-220AB	60	

1. Copper surface under tab

Figure 1. Maximum average power dissipation versus average on-state current

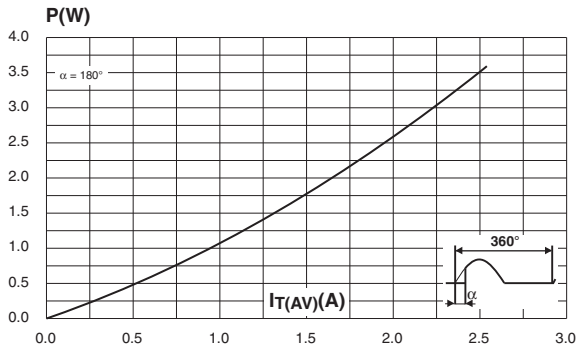


Figure 2. Average and DC on-state current versus case temperature

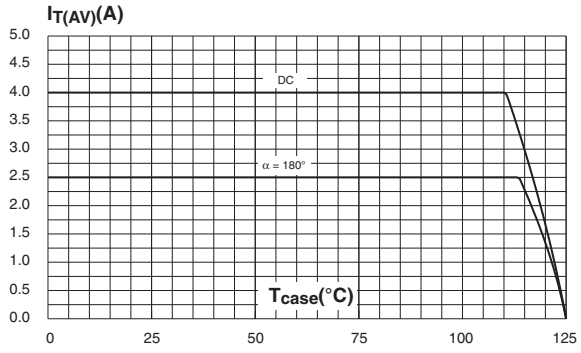


Figure 3. Average and DC on-state current versus ambient temperature (DPAK)

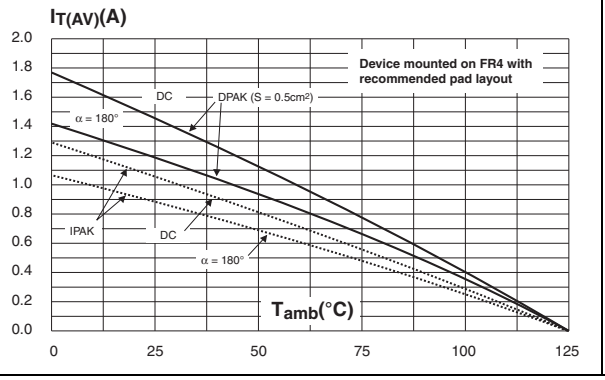


Figure 4. Relative variation of thermal impedance junction to ambient versus pulse duration (DPAK)

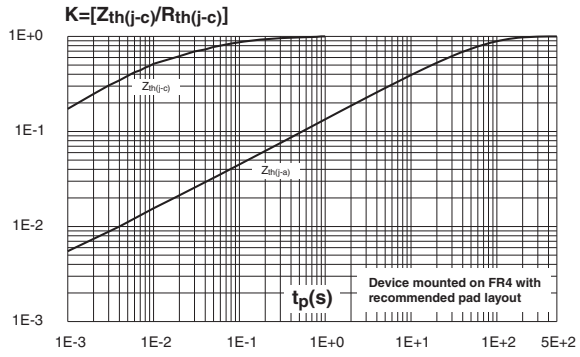


Figure 5. Relative variation of gate trigger current and holding current versus junction temperature

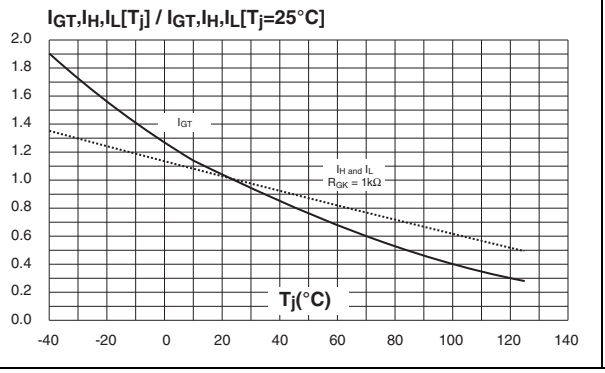


Figure 6. Relative variation of holding current versus gate-cathode resistance (typical values)

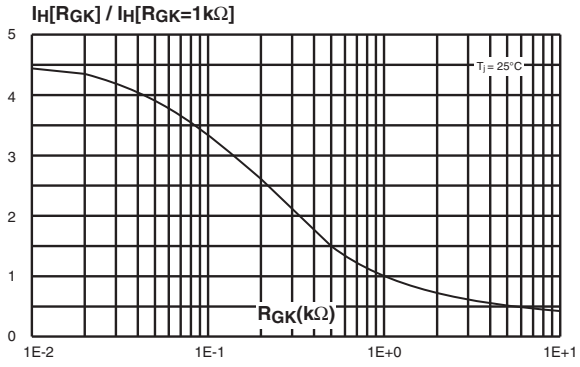


Figure 7. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values)

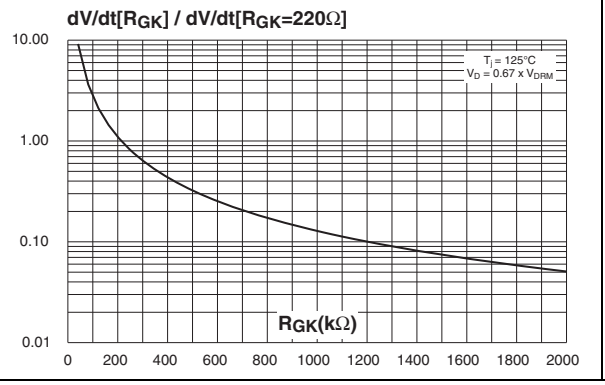


Figure 8. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values)

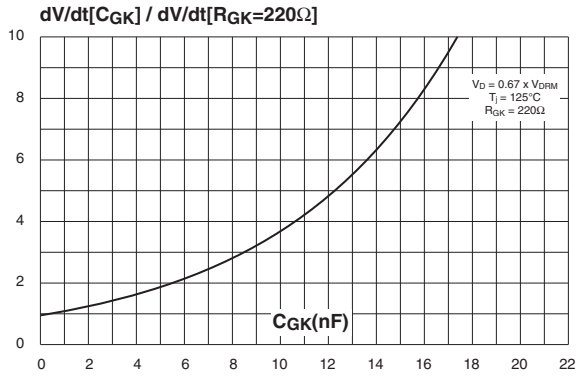


Figure 9. Surge peak on-state current versus number of cycles

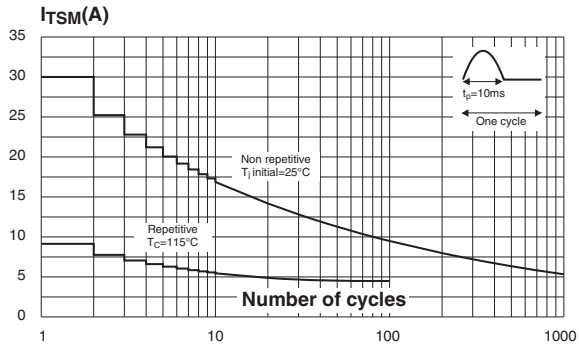


Figure 10. Non-repetitive surge peak on-state current, and corresponding values of I^2t

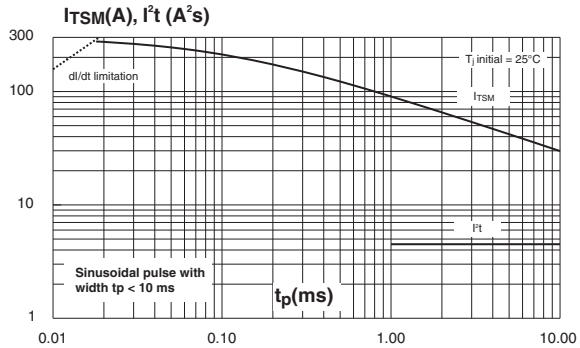


Figure 11. On-state characteristics (maximum values)

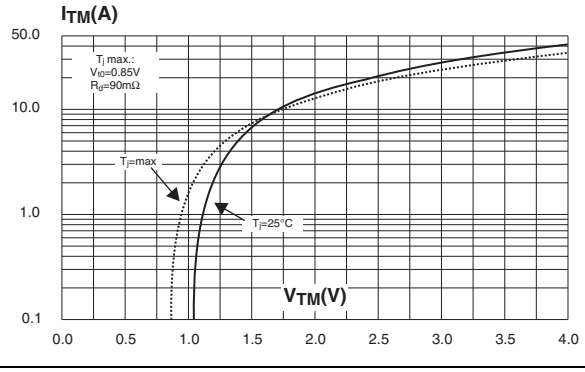
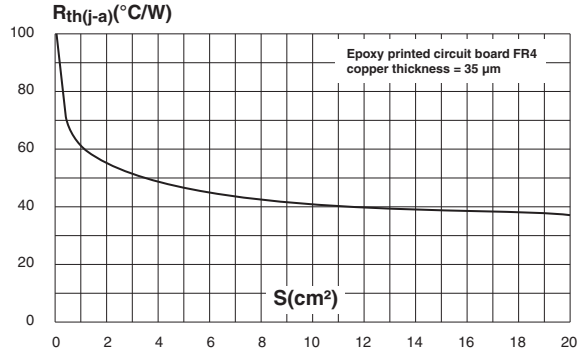


Figure 12. Thermal resistance junction to ambient versus copper surface under tab

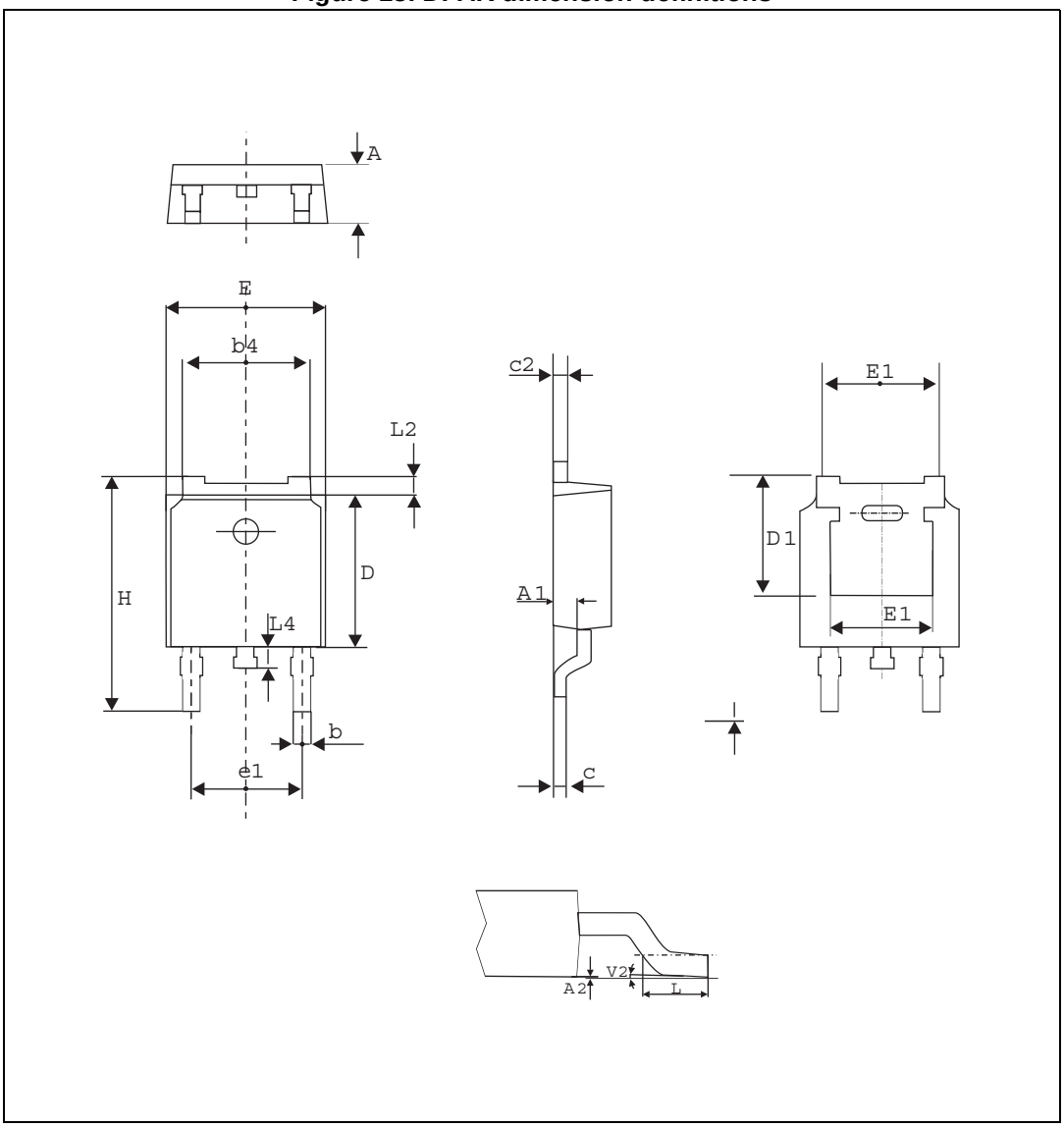


2 Package information

- Epoxy meets UL94, V0
- Lead-free packages
- Recommended torque: 0.4 to 0.6 N·m

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.

Figure 13. DPAK dimension definitions



Note: this package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.086		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	4.95		5.46	0.195		0.215
c	0.46		0.61	0.018		0.024
c2	0.46		0.60	0.018		0.023
D	5.97		6.22	0.235		0.244
D1	5.10			0.201		
E	6.35		6.73	0.250		0.264
E1		4.32			0.170	
e1	4.40		4.70	0.173		0.185
H	9.35		10.40	0.368		0.409
L	1.00		1.78	0.039		0.070
L2			1.27			0.05
L4	0.60		1.02	0.023		0.040
V2	0°		8°	0°		8°

Figure 14. Footprint (dimensions in mm)

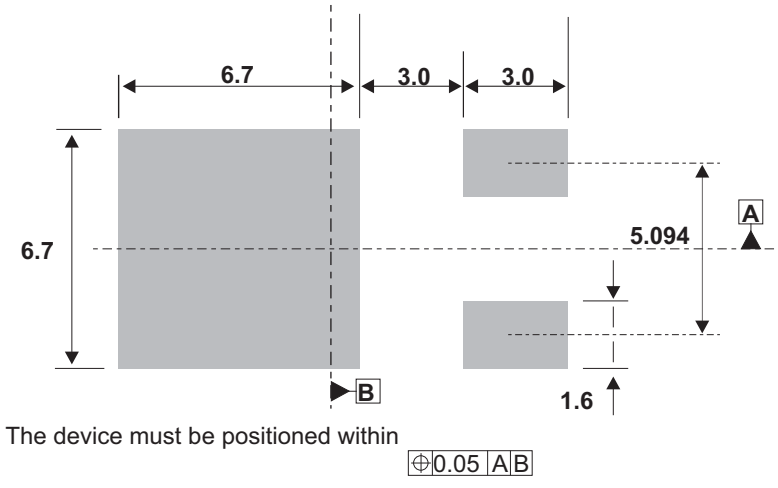
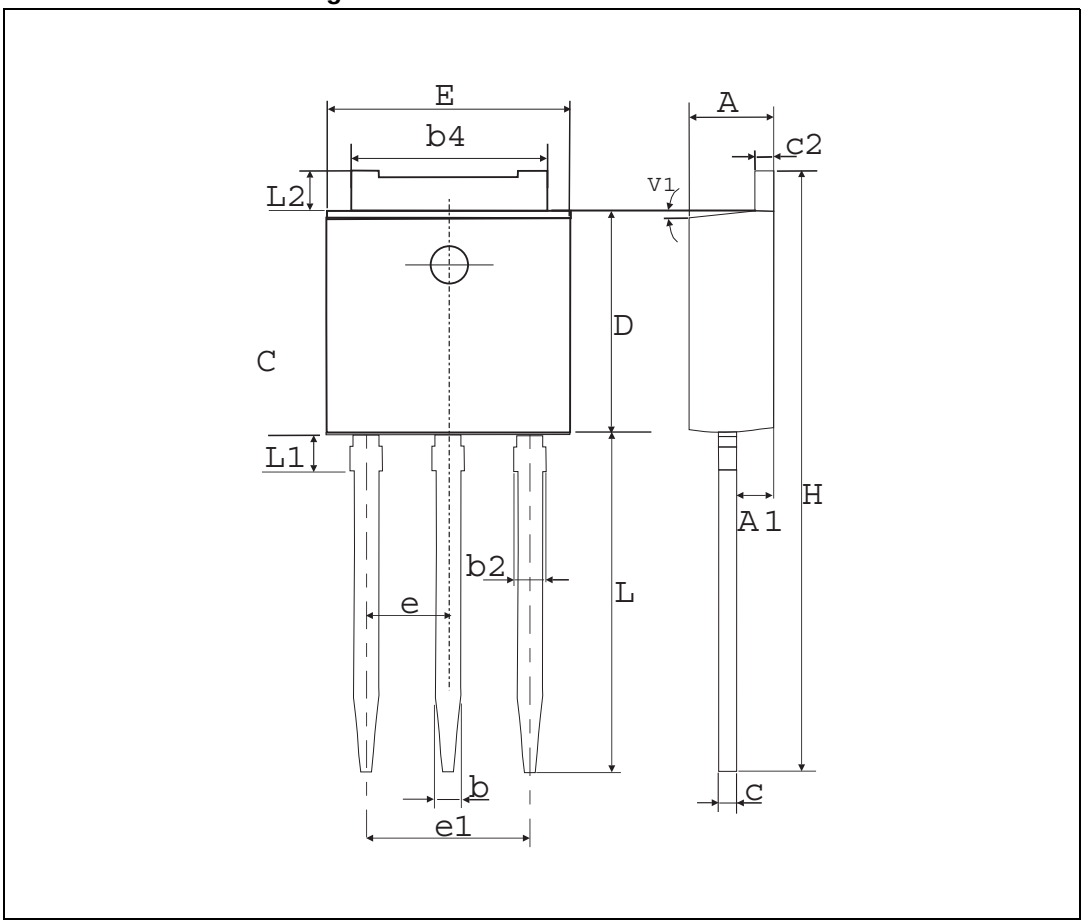


Figure 15. IPAK dimension definitions

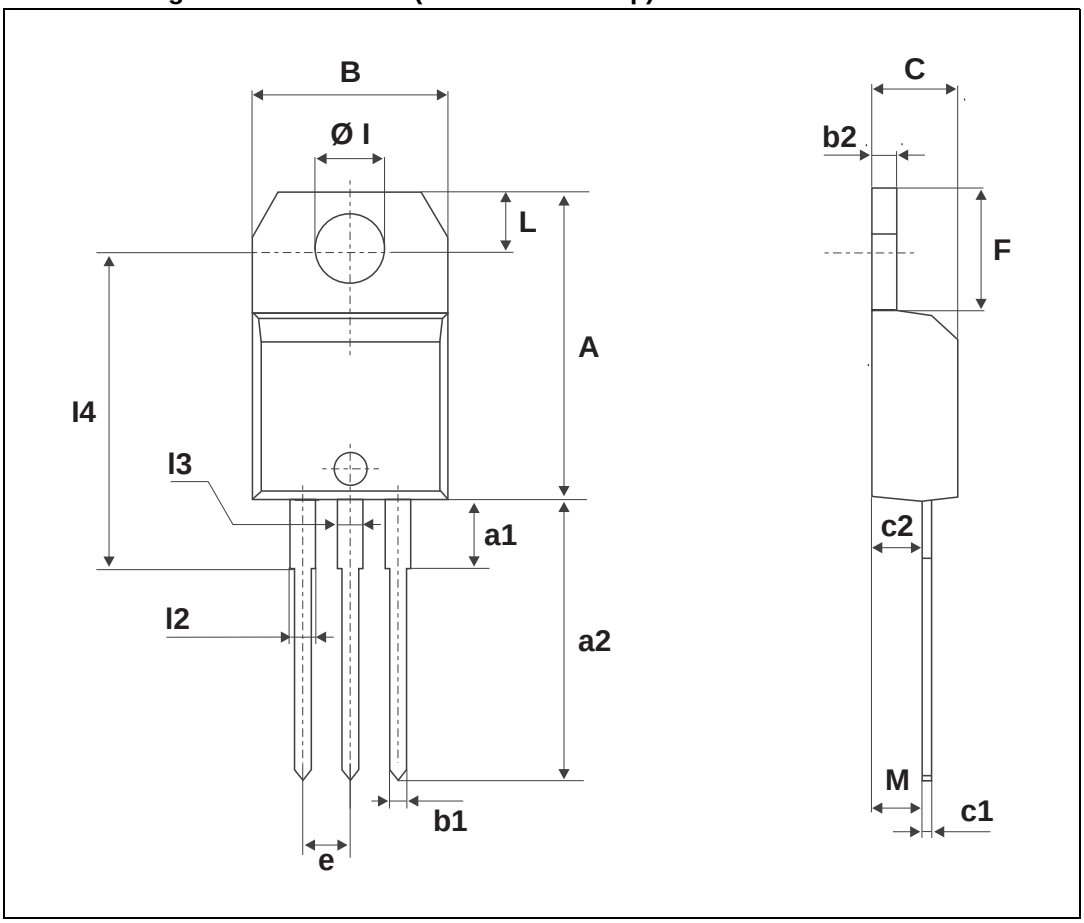


Note: this package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 7. IPAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.086		0.094
A1	0.90		1.10	0.035		0.043
b	0.64		0.90	0.025		0.035
b2			0.95			0.037
b4	5.20		5.43	0.204		0.213
c	0.45		0.60	0.017		0.023
c2	0.46		0.60	0.018		0.023
D	6		6.20	0.236		0.244
E	6.40		6.70	0.252		0.263
e		2.28			0.090	
e1	4.40		4.60	0.173		0.181
H		16.10			0.634	
L	9		9.60	0.354		0.377
L1	0.8		1.20	0.031		0.047
L2		0.80	1.25		0.031	0.049
V1		10°			10°	

Figure 16. TO-220AB (NIns. & Ins. 20-up) dimension definitions



Note: this package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 8. TO-220AB (NIns. & Ins. 20-up) dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	

3 Ordering information

Figure 17. Ordering information scheme

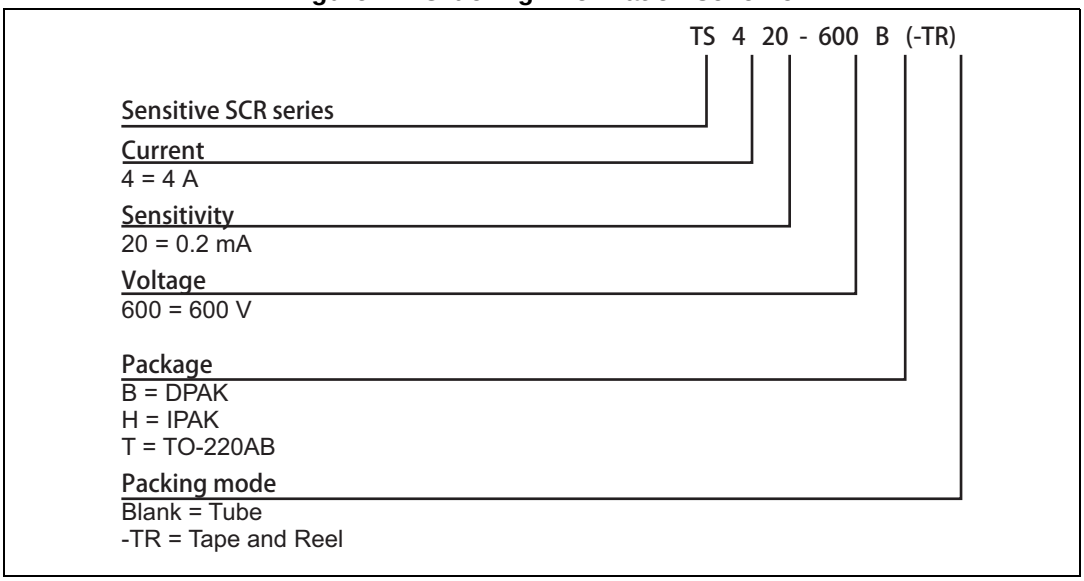


Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
TS420-600B	TS420600	DPAK	0.3 g	75	Tube
TS420-600B-TR	TS420600			2500	Tape and reel
TS420-600H	TS420600	IPAK	0.4 g	75	Tube
TS420-600T	TS420600T	TO-220AB	2.3 g	50	Tube
TS420-700B	TS420700	DPAK	0.3 g	75	Tube
TS420-700B-TR	TS420700			2500	Tape and reel
TS420-700H	TS420700	IPAK	0.4 g	75	Tube
TS420-700T	TS420700T	TO-220AB	2.3 g	50	Tube

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
Sep-2000	3	Previous release.
26-Jan-2010	4	Updated package illustration for TO-220AB on front page and *Table 8*. Added *Table 5*.
28-May-2014	5	Updated DPAK package information and reformatted to current standard.

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