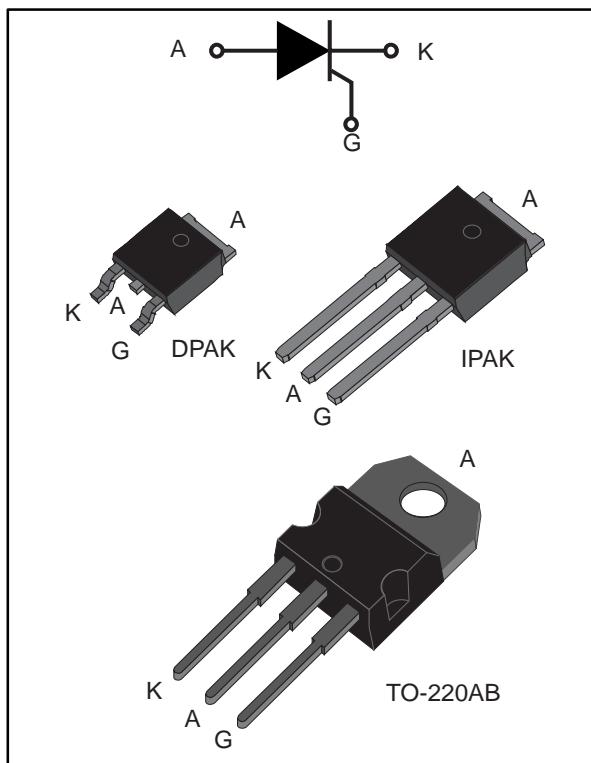


## Sensitive 12 A SCRs

Datasheet - production data



### Features

- On-state RMS current,  $I_{T(RMS)}$  12 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 V
- Triggering gate current,  $I_{GT}$  200  $\mu$ A
- ECOPACK®2 compliant component

### Applications

- Capacitive ignition circuit for motorcycle engine
- DC brush motor drive for power tool or kitchen appliance
- Gas ignitor circuit
- Regulator driver for battery charger

### Description

Thanks to highly sensitive triggering levels, the 12 A SCR series is suitable to fit all modes of control, found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

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

**Table 1: Device summary**

Order code	$V_{DRM}/V_{RRM}$	$I_{GT}$	Package
TS1220-600B	600 V	0.2 mA	DPAK
TS1220-600B-TR		0.2 mA	DPAK
TS1220-600H		0.2 mA	IPAK
TS1220-600T		0.2 mA	TO-220AB

# 1 Characteristics

Table 2: Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state RMS current (180° conduction angle)		$T_c = 105^\circ C$	12	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)		$T_c = 105^\circ C$	8	A
$I_{TSM}$	Non repetitive surge peak on-state current	$t_p = 8.3 \text{ ms}$	$T_j = 25^\circ C$	115	A
		$t_p = 10 \text{ ms}$		110	
$I^2t$	$I^2t$ value for fusing	$t_p = 10 \text{ ms}$	$T_j = 25^\circ C$	60	$A^2s$
$dI/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100 \text{ ns}$	$F = 60 \text{ Hz}$	$T_j = 125^\circ C$	50	$A/\mu s$
$I_{GM}$	Peak gate current	$t_p = 20 \mu s$	$T_j = 125^\circ C$	4	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125^\circ C$	1	W
$T_{stg}$	Storage junction temperature range			- 40 to + 150	$^\circ C$
$T_j$	Operating junction temperature range			- 40 to + 125	

Table 3: Sensitive electrical characteristics ( $T_j = 25^\circ C$ , unless otherwise specified)

Symbol	Test conditions			Unit
$I_{GT}$	$V_D = 12 \text{ V}$ , $R_L = 140 \Omega$		MAX.	200 $\mu A$
$V_{GT}$			MAX.	0.8 V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3 \text{ k}\Omega$ , $R_{GK} = 220 \Omega$	$T_j = 125^\circ C$	MIN.	0.1 V
$V_{RG}$	$I_{RG} = 10 \mu A$		MIN.	8 V
$I_H$	$I_T = 50 \text{ mA}$ , $R_{GK} = 1 \text{ k}\Omega$		MAX.	5 mA
$I_L$	$I_G = 1 \text{ mA}$ , $R_{GK} = 1 \text{ k}\Omega$		MAX.	6 mA
$dV/dt$	$V_D = 67\% V_{DRM}$ , $R_{GK} = 220 \Omega$	$T_j = 125^\circ C$	MIN.	5 $V/\mu s$
$V_{TM}$	$I_{TM} = 24 \text{ A}$ , $t_p = 380 \mu s$	$T_j = 25^\circ C$	MAX.	1.6 V
$V_{t0}$	Threshold voltage	$T_j = 125^\circ C$	MAX.	0.85 V
$R_d$	Dynamic resistance	$T_j = 125^\circ C$	MAX.	30 $m\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM}$ , $R_{GK} = 1 \text{ k}\Omega$	$T_j = 25^\circ C$	MAX.	5 $\mu A$
		$T_j = 125^\circ C$		2 mA

Table 4: Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (DC)		DPAK, IPA, TO-220AB	1.3	$^\circ C/W$
$R_{th(j-a)}$	Junction to ambient (DC)	$S = 0.5 \text{ cm}^2$ <sup>(1)</sup>	DPAK	70	$^\circ C/W$
			IPA	100	
			TO-220AB	60	

## Notes:

<sup>(1)</sup>S = Copper surface under tab

## 1.1 Characteristics (curves)

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

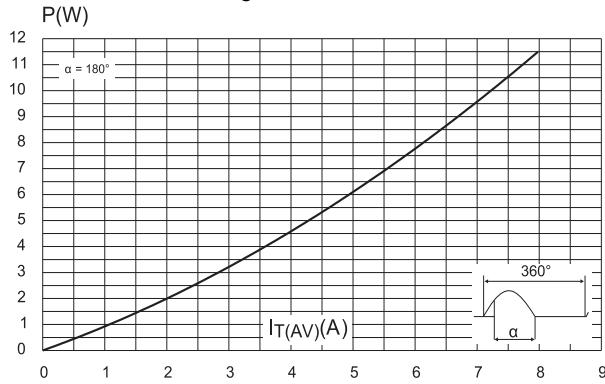


Figure 2: Average and DC on-state current versus case temperature

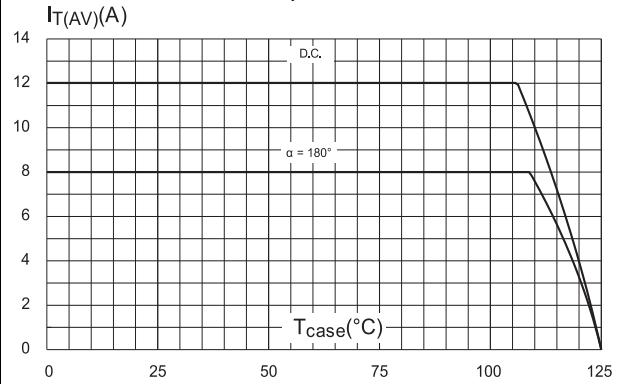


Figure 3: Average and DC on-state current versus ambient temperature (DPAK)

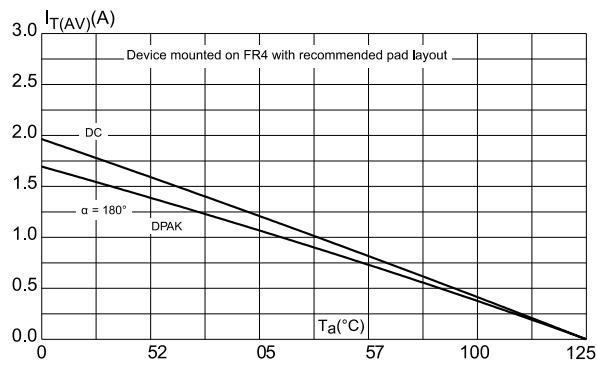


Figure 4: Relative variation of thermal impedance junction to case versus pulse duration

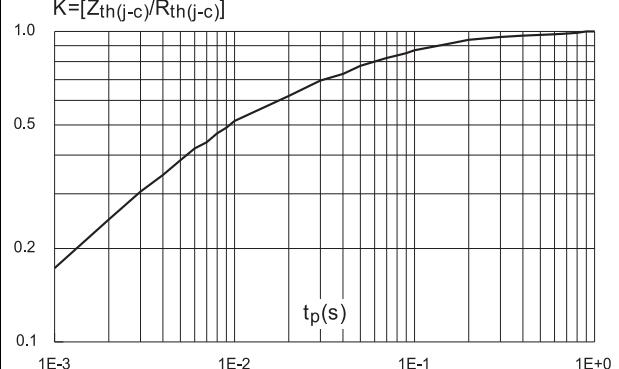


Figure 5: Relative variation of thermal impedance junction to ambient versus pulse duration

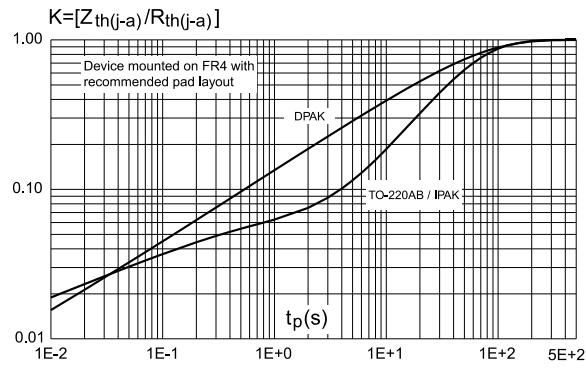
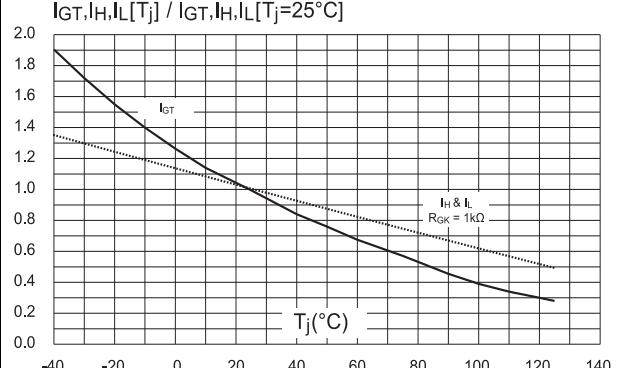


Figure 6: Relative variation of gate trigger and holding current versus junction temperature



## Characteristics

TS1220

Figure 7: Relative variation of holding current versus gate-cathode resistance (typical values)

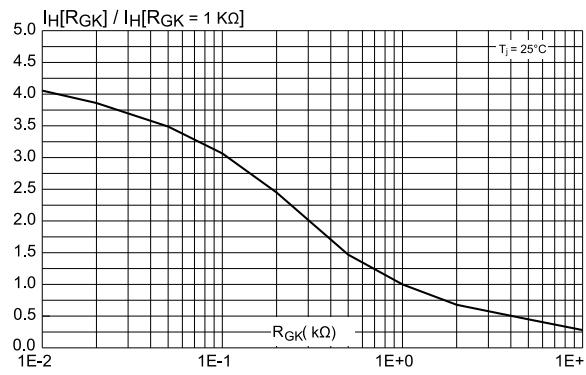


Figure 8: Relative variation of  $dV/dt$  immunity versus gate-cathode resistance (typical values)

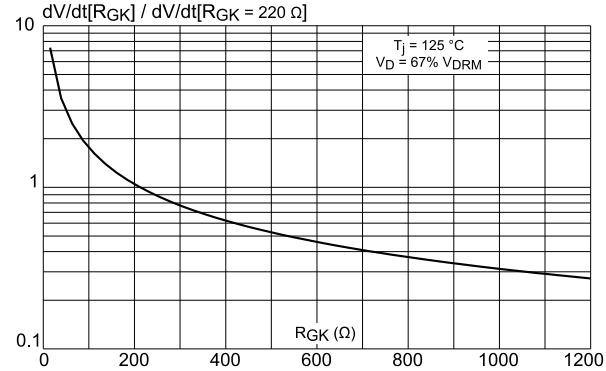


Figure 9: Relative variation of  $dV/dt$  immunity current versus gate-cathode capacitance (typical values)

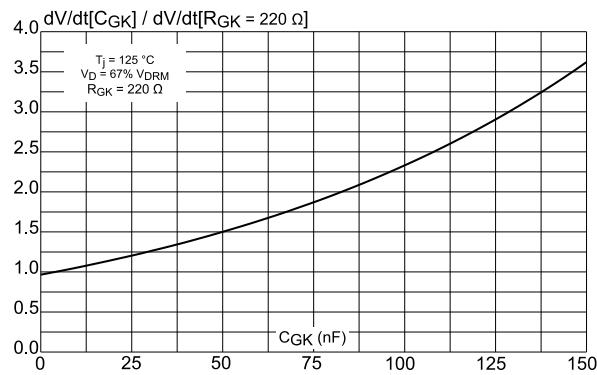


Figure 10: Surge peak on-state current versus number of cycles

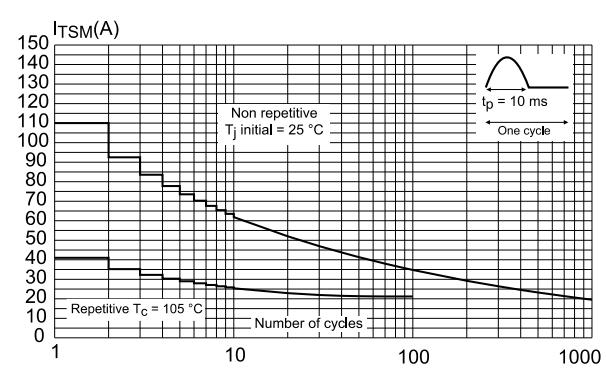


Figure 11: Non-repetitive surge peak on-state current and corresponding values versus sinusoidal pulse width

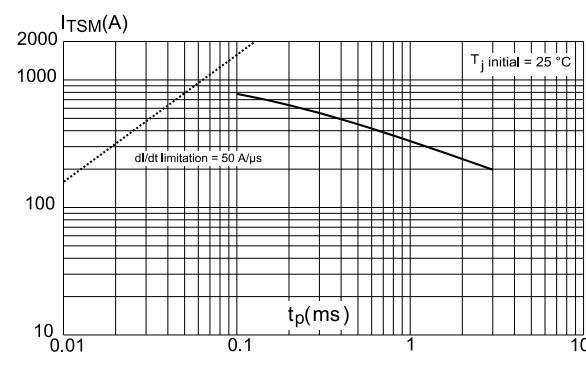


Figure 12: On-state characteristics (maximum values)

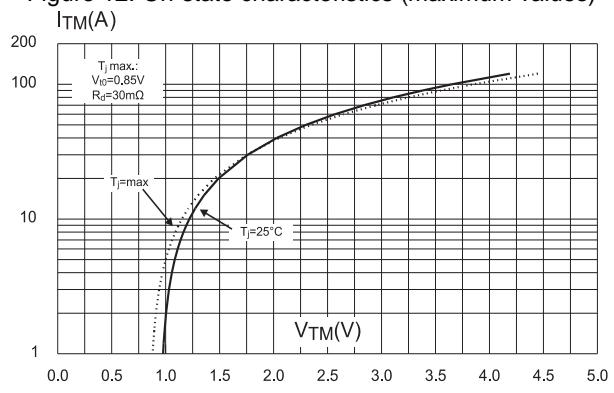
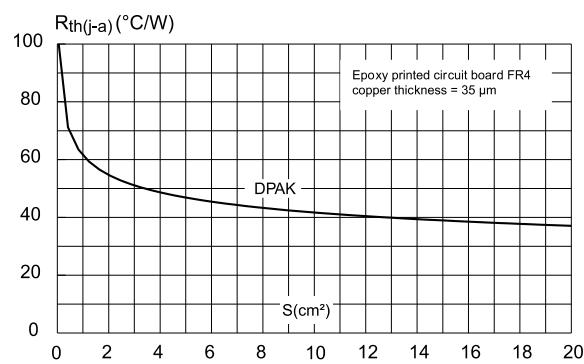


Figure 13: Thermal resistance junction to ambient versus copper surface under tab (DPAK)



## 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](http://www.st.com). ECOPACK® is an ST trademark.

Lead free lead plating; halogen free molding compound.

### 2.1 DPAK package mechanical data

Figure 14: DPAK package outline

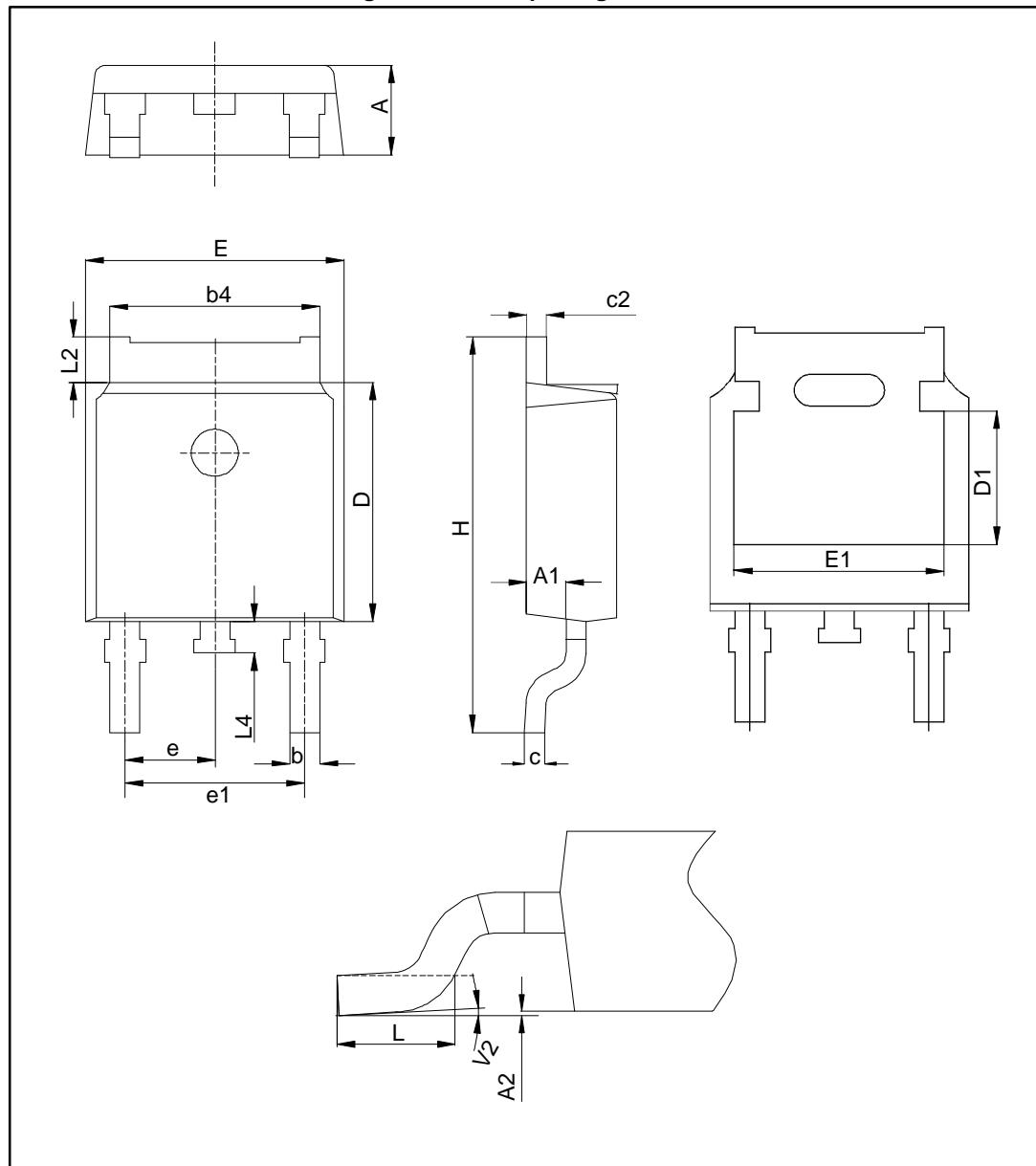


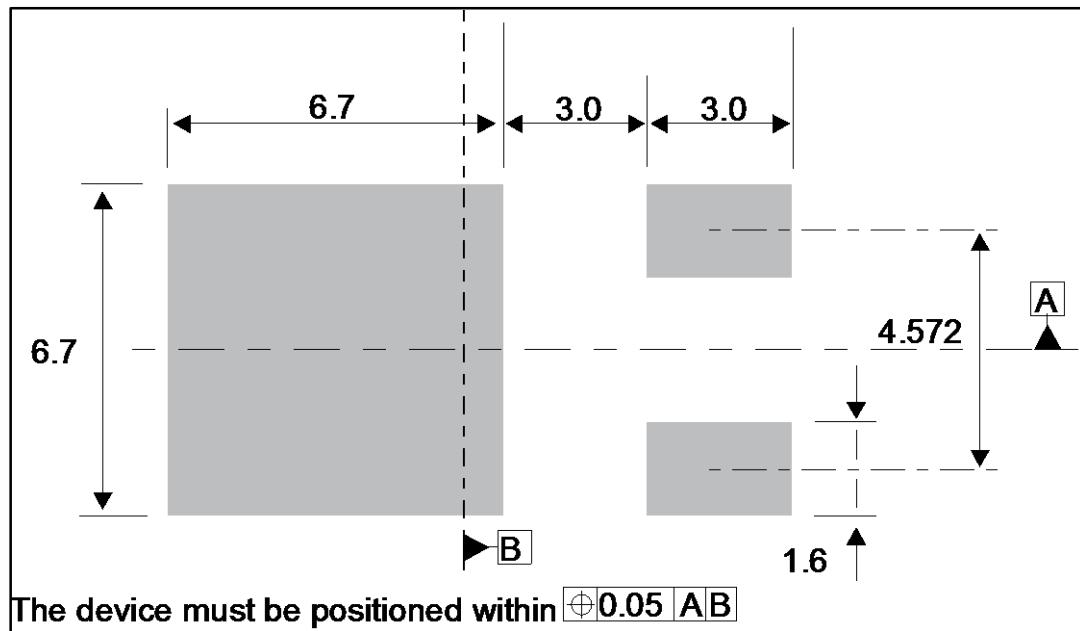
Table 5: DPAK mechanical data

Dim.	mm			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.0858		0.0945
A1	0.90		1.10	0.0354		0.0433
A2	0.03		0.23	0.0012		0.0091
b	0.64		0.90	0.0252		0.0354
b4	4.95		5.46	0.1949		0.2150
c	0.46		0.61	0.0181		0.0240
c2	0.46		0.60	0.0181		0.0240
D	5.97		6.22	0.2350		0.2449
D1	4.95		5.60	0.1949		0.2205
E	6.35		6.73	0.2500		0.2650
E1	4.32		5.50	0.1701		0.2165
e		2.286			0.0900	
e1	4.40		4.70	0.1732		0.1850
H	9.35		10.40	0.3681		0.4094
L	1.00		1.78	0.0394		0.0701
L2			1.27			0.0500
L4	0.60		1.02	0.0236		0.0402
V2	-8°		8°	-8°		8°

**Notes:**

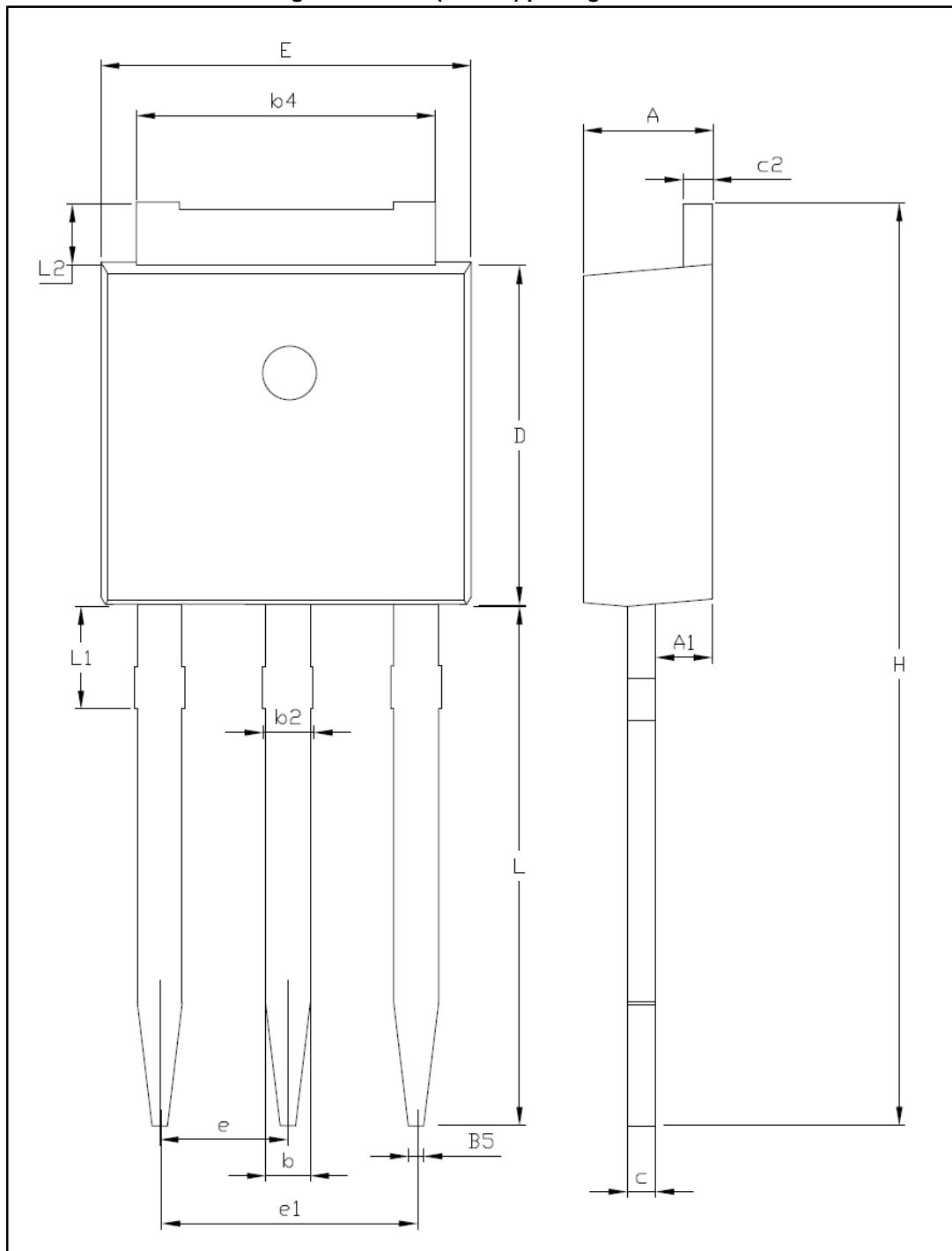
(1)Inch dimensions are for reference only.

Figure 15: DPAK recommended footprint (dimensions are in mm)



## 2.2 IPAK package information

Figure 16: IPAK (TO-251) package outline



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

Table 6: IPAK (TO-251) package mechanical data

Ref.	Dimensions					
	Millimiters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.0866		0.0945
A1	0.90		1.10	0.0354		0.0433
b	0.64		0.90	0.0252		0.0354
b2			0.95			0.0374
b4	5.20		5.43	0.2047		0.2138
B5		0.30			0.0125	
c	0.45		0.60	0.0177		0.0236
c2	0.46		0.60	0.0181		0.0236
D	6.00		6.20	0.2362		0.2441
E	6.40		6.65	0.2520		0.2618
e		2.28			0.0898	
e1	4.40		4.60	0.1732		0.1811
H		16.10			0.6339	
L	9.00		9.60	0.3545		0.3780
L1	0.80		1.20	0.0315		0.0472
L2		0.80	1.25		0.0315	0.0492
V1		10°			10°	

**Notes:**

(1)Inch dimensions are for reference only.

## 2.3 TO-220AB package information

Figure 17: TO-220AB package outline

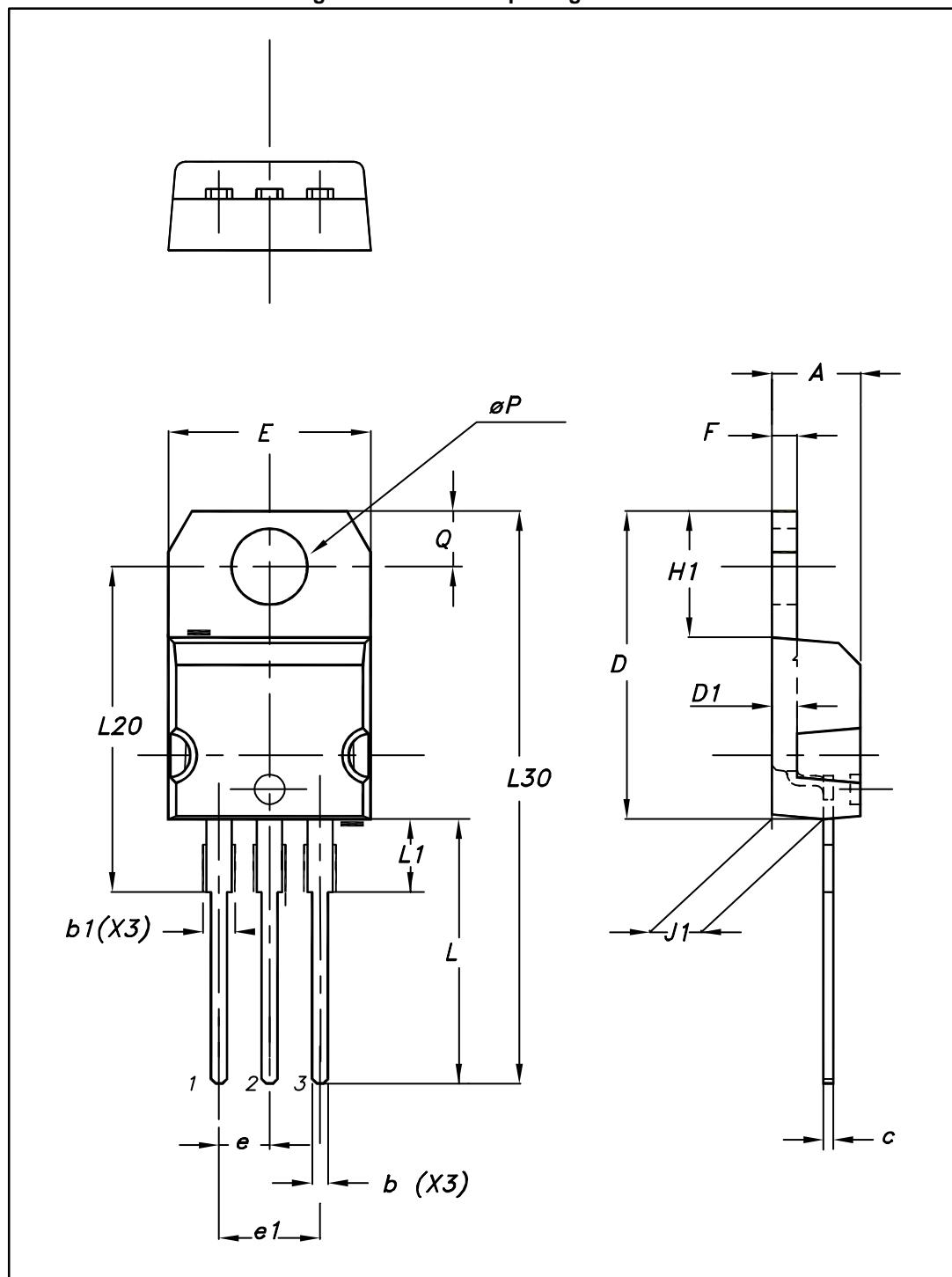


Table 7: TO-220AB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches <sup>(1)</sup>	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.1732	0.1811
b	0.61	0.88	0.0240	0.0346
b1	1.14	1.70	0.0449	0.0669
c	0.48	0.70	0.0189	0.0276
D	15.25	15.75	0.6004	0.6201
D1	1.27 typ.		0.0500 typ.	
E	10.00	10.40	0.3937	0.4094
e	2.40	2.70	0.0945	0.1063
e1	4.95	5.15	0.1949	0.2028
F	1.23	1.32	0.0484	0.0520
H1	6.20	6.60	0.2441	0.2598
J1	2.40	2.72	0.0945	0.1071
L	13.00	14.00	0.5118	0.5512
L1	3.50	3.93	0.1378	0.1547
L20	16.40 typ.		0.6457 typ.	
L30	28.90 typ.		1.1378 typ.	
ØP	3.75	3.85	0.1476	0.1516
Q	2.65	2.95	0.1043	0.1161

**Notes:**

(1)Inch dimensions are for reference only.

### 3 Ordering information

Figure 18: TS1220 series

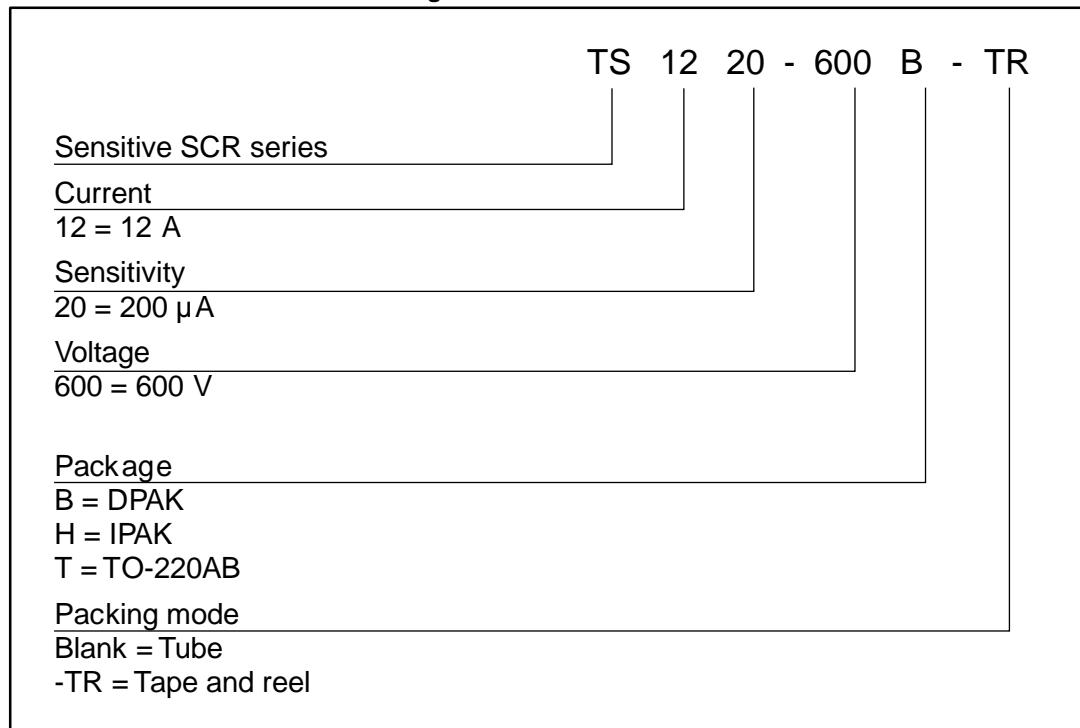


Table 8: Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
TS1220-600B	TS12 20600	DPAK	0.3 g	75	Tube
TS1220-600B-TR	TS12 20600	DPAK	0.3 g	2500	Tape and reel
TS1220-600H	TS12 20600	IPAK	0.3 g	75	Tube
TS1220-600T	TS1220600T	TO-220AB	2.3 g	50	Tube

## 4 Revision history

Table 9: Document revision history

Date	Revision	Changes
08-Apr-2015	1	First issue.
03-Aug-2016	2	Added section Applications and updated Features and in <a href="#">Table 1: "Device summary"</a> in cover page. Updated <a href="#">Section 3: "Package information"</a> . Minor text changes.

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