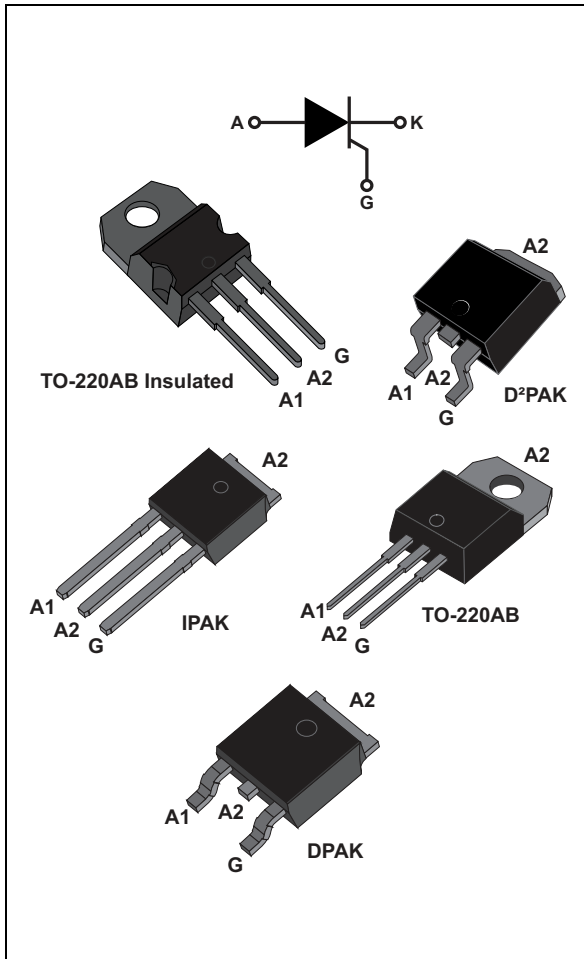


Sensitive and standard 12 A SCRs



Datasheet - production data

Features

- On-state rms current, $I_{T(RMS)}$ 12A
- Repetitive peak off-state voltage, V_{DRM}/V_{RRM} 600 and 1000 V
- Triggering gate current, I_{GT} 0.2 to 15 mA

Description

Available either in sensitive (TS1220) or standard (TN1215 / TYNX12) gate triggering levels, the 12A 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	Voltage (x00) V_{DRM}/V_{RRM}				I_{GT}	Package
	600	700	800	1000		
TN1215-xxxB	X		X		15 mA	DPAK
TN1215-xxxB	X		X		15 mA	D ² PAK
TN1215-xxxB	X		X		15 mA	IPAK
TS1220-xxxB	X	X			0.2 mA	DPAK
TS1220-xxxB	X				0.2 mA	IPAK
TS1220-xxxB	X				0.2 mA	TO-220AB
TYNx12RG	X		X	X	15 mA	TO-220AB
TYNx12TRG	X		X	X	5 mA	TO-220AB

1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter		Value		Unit
			TN121-G5 TYN12	TYN608	
$I_{T(RMS)}$	On-state rms current (180° conduction angle)		$T_c = 105\text{ °C}$		A
$I_{T(AV)}$	Average on-state current (180° conduction angle)		$T_c = 105\text{ °C}$		
I_{TSM}	Non repetitive surge peak on-state current	$t_p = 8.3\text{ ms}$	$T_j = 25\text{ °C}$		A
		$t_p = 10\text{ ms}$			
I^2t	I^2t value for fusing	$t_p = 10\text{ ms}$	$T_j = 25\text{ °C}$		A^2S
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$	$F = 60\text{ Hz}$	$T_j = 125\text{ °C}$		$A/\mu s$
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu s$	$T_j = 125\text{ °C}$		A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125\text{ °C}$		W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range		- 40 to + 150 - 40 to + 125		$^{\circ}C$
V_{RGM}	Maximum peak reverse gate voltage (for TN1215 and TYNx12608 only)			5	V

Table 3. Sensitive electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified)

Symbol	Test conditions			TS1220	Unit	
I_{GT}	$V_D = 12\text{ V}$, $R_L = 140\text{ }\Omega$		MAX.	200	μA	
V_{GT}			MAX.	0.8	V	
V_{GD}	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $R_{GK} = 220\text{ }\Omega$	$T_j = 125\text{ °C}$	MIN.	0.1	V	
V_{RG}	$I_{RG} = 10\text{ }\mu A$		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	$V_D = 65\% V_{DRM}$, $R_{GK} = 220\text{ }\Omega$	$T_j = 125\text{ °C}$	MIN.	5	$V/\mu s$	
V_{TM}	$I_{TM} = 24\text{ A}$, $t_p = 380\text{ }\mu s$		$T_j = 25\text{ °C}$	MAX.	1.6	V
V_{t0}	Threshold voltage		$T_j = 125\text{ °C}$	MAX.	0.85	V
R_d	Dynamic resistance		$T_j = 125\text{ °C}$	MAX.	30	$m\Omega$
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$, $R_{GK} = 220\text{ }\Omega$		$T_j = 25\text{ °C}$	MAX.	5	μA
			$T_j = 125\text{ °C}$		1	mA

Table 4. Standard electrical characteristics ($T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Test conditions			TN1215		TYN		Unit	
				B/G	G	x12T	x12		
I_{GT}	$V_D = 12\text{ V}, R_L = 33\ \Omega$		MIN.	2		0.5	2	mA	
			MAX.	15		5	15		
V_{GT}			MAX.	1.3				V	
V_{GD}	$V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega$	$T_j = 125\text{ }^\circ\text{C}$	MIN.	0.2				V	
I_H	$I_T = 500\text{ mA}$, gate open		MAX.	40	30	15	30	mA	
I_L	$I_G = 1.2\ I_{GT}$		MAX.	80	60	30	60	mA	
dV/dt	$V_D = 67\% V_{DRM}$, gate open	$T_j = 125\text{ }^\circ\text{C}$	MIN.	200		40	200	V/ μs	
V_{TM}	$I_{TM} = 24\text{ A}$ $t_p = 380\ \mu\text{s}$	$T_j = 25\text{ }^\circ\text{C}$	MAX.	1.6				V	
V_{t0}	Threshold voltage		MAX.	0.85				V	
R_d	Dynamic resistance		MAX.	30				m Ω	
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$		$T_j = 25\text{ }^\circ\text{C}$	MAX.				5	μA
			$T_j = 125\text{ }^\circ\text{C}$					2	mA

Table 5. Thermal resistance

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)		DPAK, IPAK, TO-220AB	1.3 $^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient (DC)	$S^{(1)} = 0.5\text{ cm}^2$	DPAK	70
		$S^{(1)} = 1.0\text{ cm}^2$	D ² PAK	450
			IPAK	100
			TO-220AB	60

1. S = Copper surface under tab

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

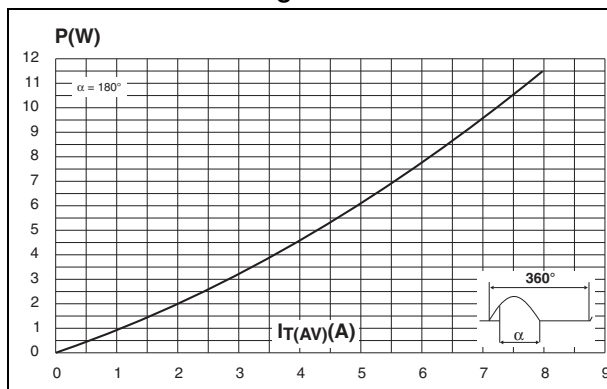


Figure 2. Average and DC on-state current versus case temperature

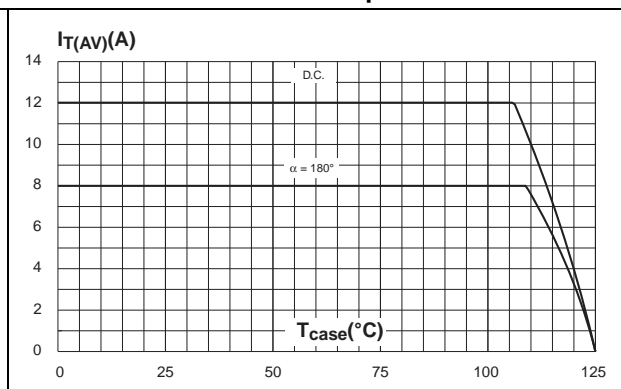


Figure 3. Average and DC on-state current versus ambient temperature (DPAK)

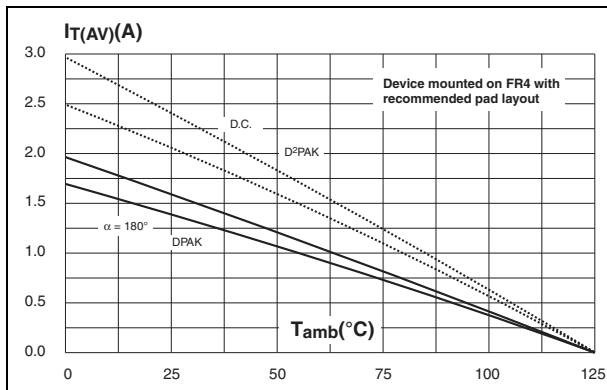


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

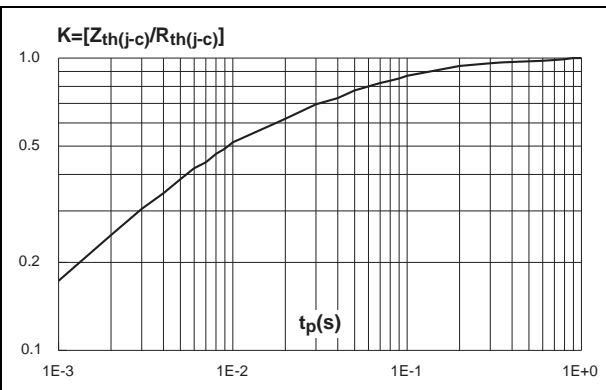


Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (DPAK)

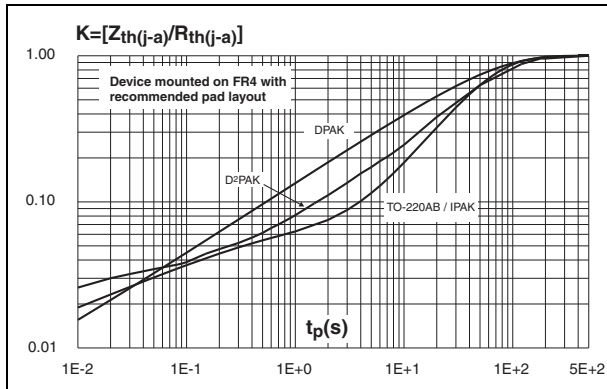


Figure 6. Relative variation of gate trigger and holding current versus junction temperature for TS1220 series

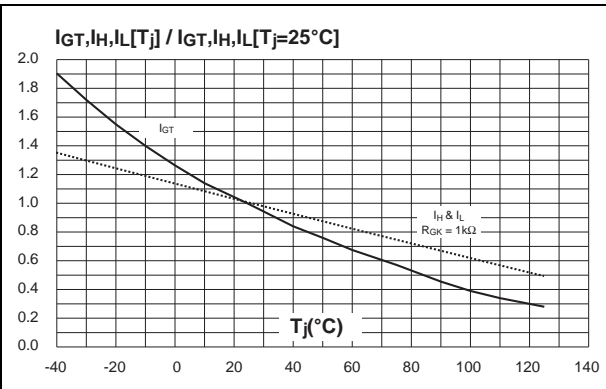


Figure 7. Relative variation of gate trigger and holding current versus junction temperature

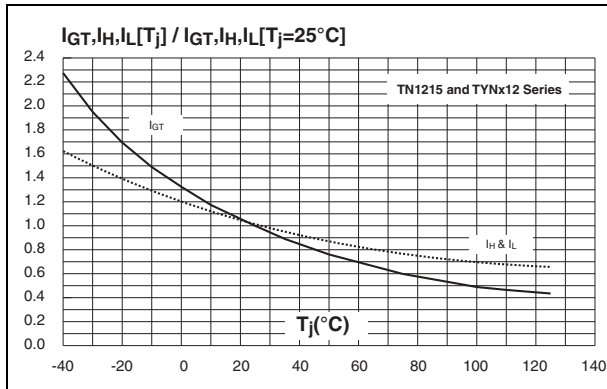


Figure 8. Relative variation of holding current versus gate-cathode resistance (typical values)

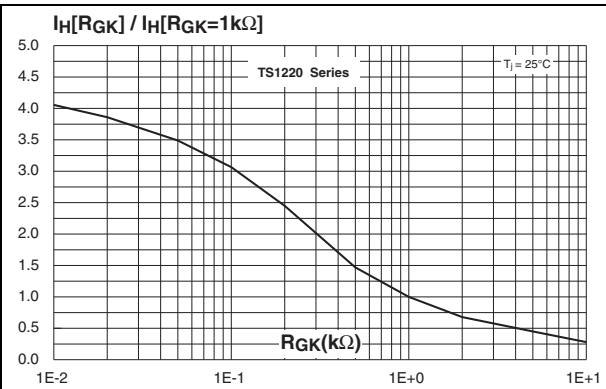


Figure 9. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values) for TS12 series

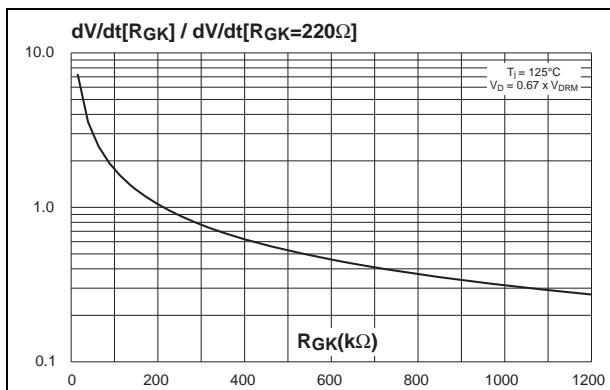


Figure 10. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values) for TS12 series

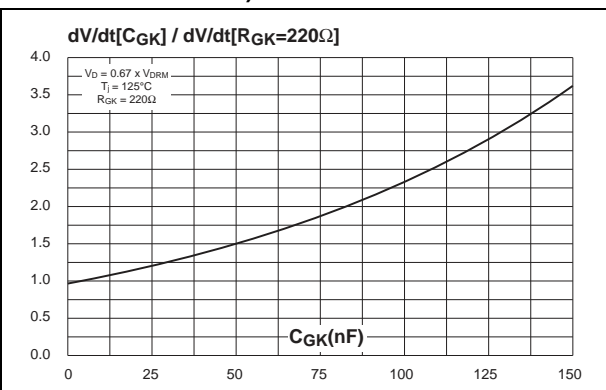


Figure 11. Surge peak on-state current versus number of cycles

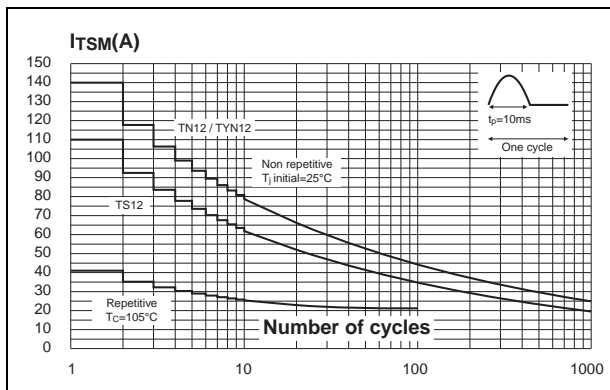


Figure 12. Non-repetitive surge peak on-state current and corresponding values of I^2t versus sinusoidal pulse width

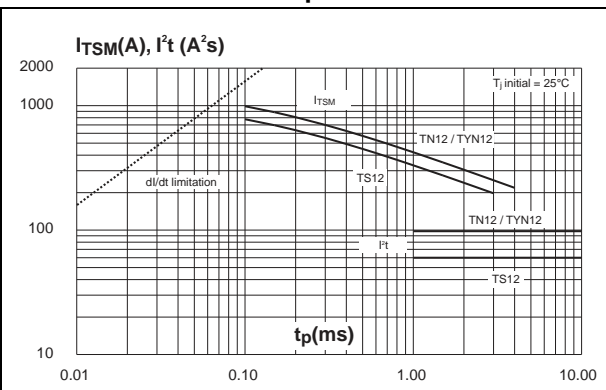


Figure 13. On-state characteristics (maximum values)

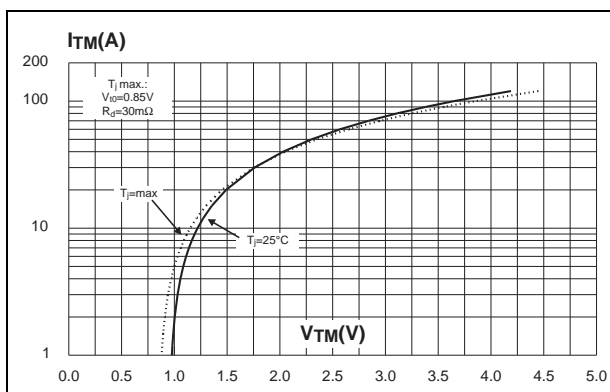
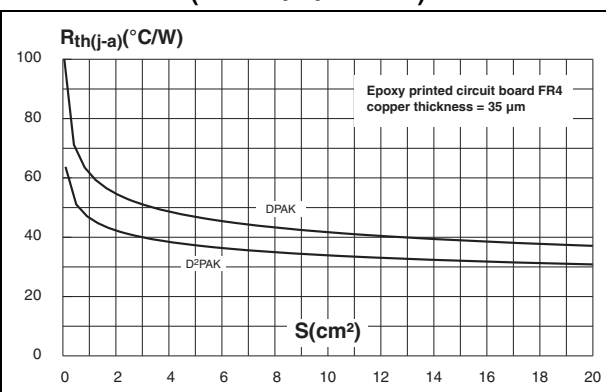


Figure 14. Thermal resistance junction to ambient versus copper surface under tab (DPAK and D²PAK)

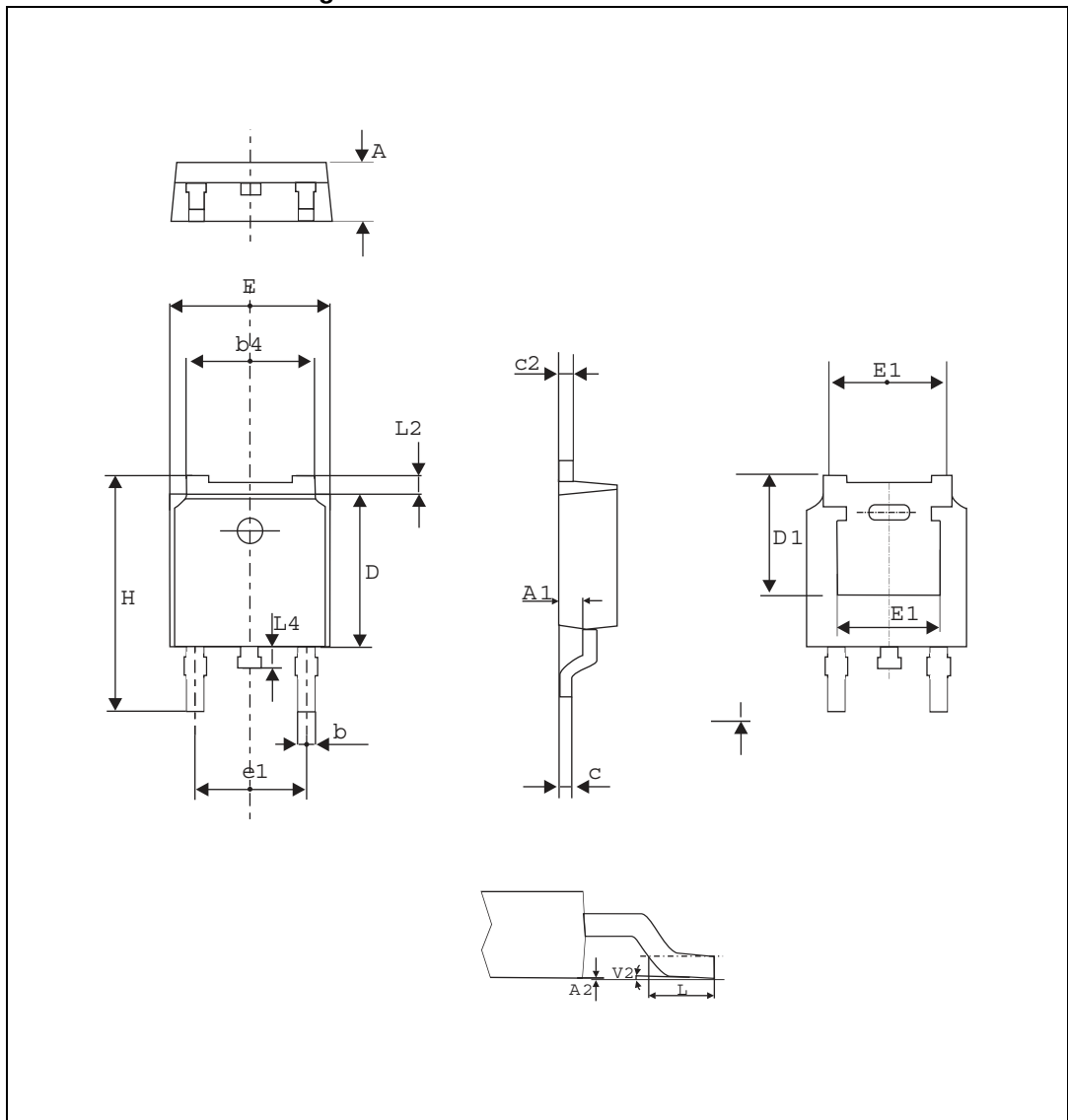


2 Package information

- 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 15. 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 16. Footprint (dimensions in mm)

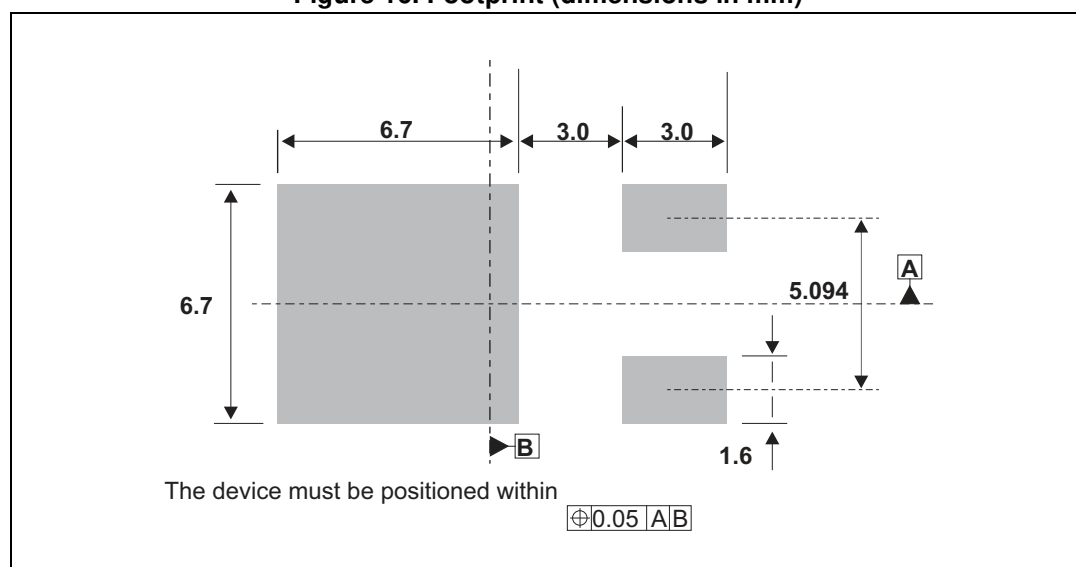
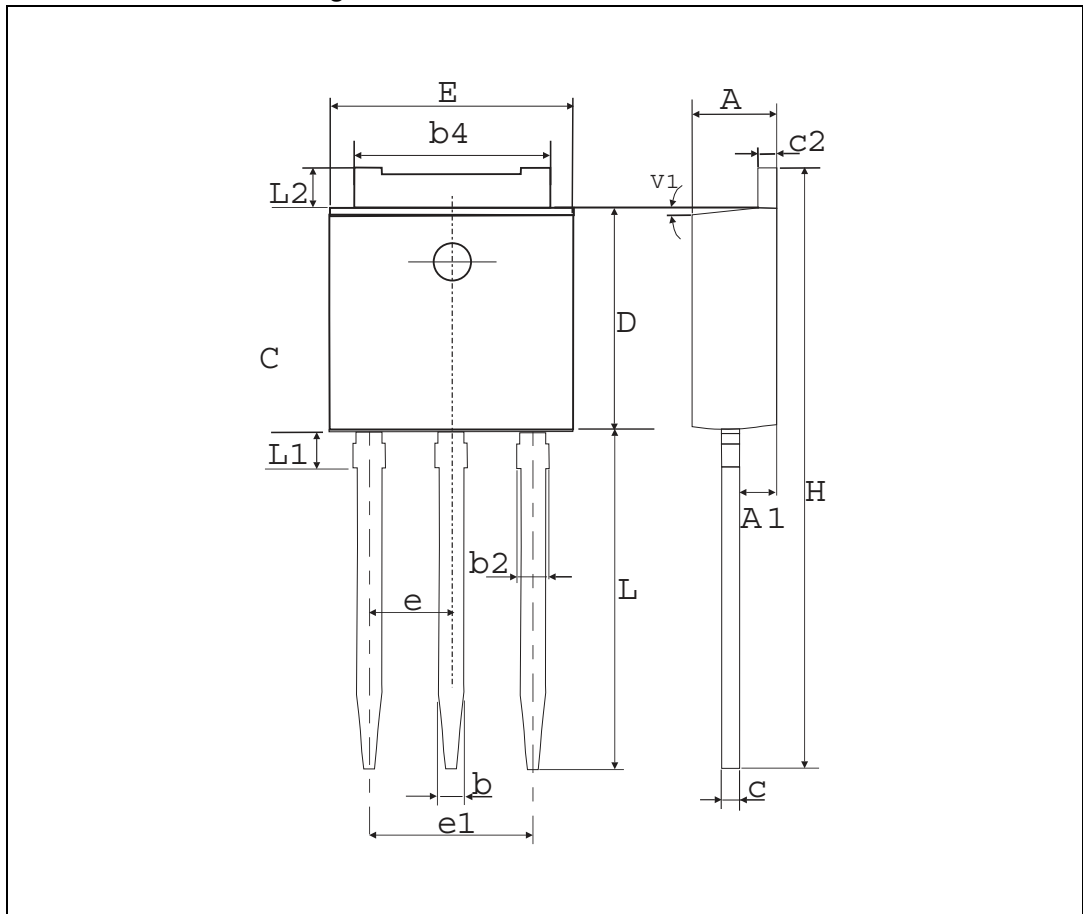


Figure 17. IPAK dimension definitions



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 18. TO-220AB dimension definitions

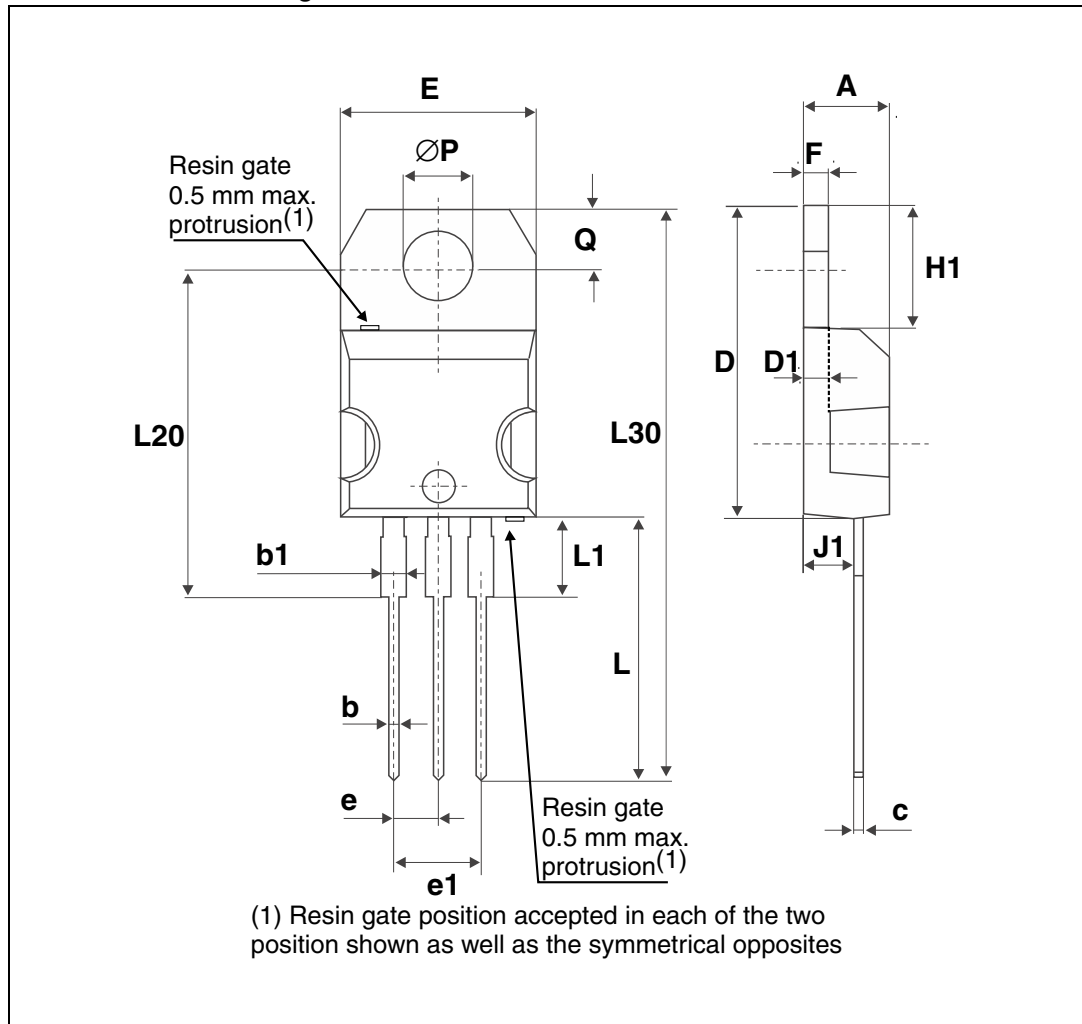


Table 8. TO-220AB dimension values

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.17	0.18
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.045	0.067
c	0.48	0.70	0.019	0.027
D	15.25	15.75	0.60	0.62
D1	1.27 typ.		0.05 typ.	
E	10	10.40	0.39	0.41
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.19	0.20
F	1.23	1.32	0.048	0.052
H1	6.20	6.60	0.24	0.26
J1	2.40	2.72	0.094	0.107
L	13	14	0.51	0.55
L1	3.50	3.93	0.137	0.154
L20	16.40 typ.		0.64 typ.	
L30	28.90 typ.		1.13 typ.	
ØP	3.75	3.85	0.147	0.151
Q	2.65	2.95	0.104	0.116

Figure 19. TO-220AB (Nlns. & Ins. 20-up) dimension definitions

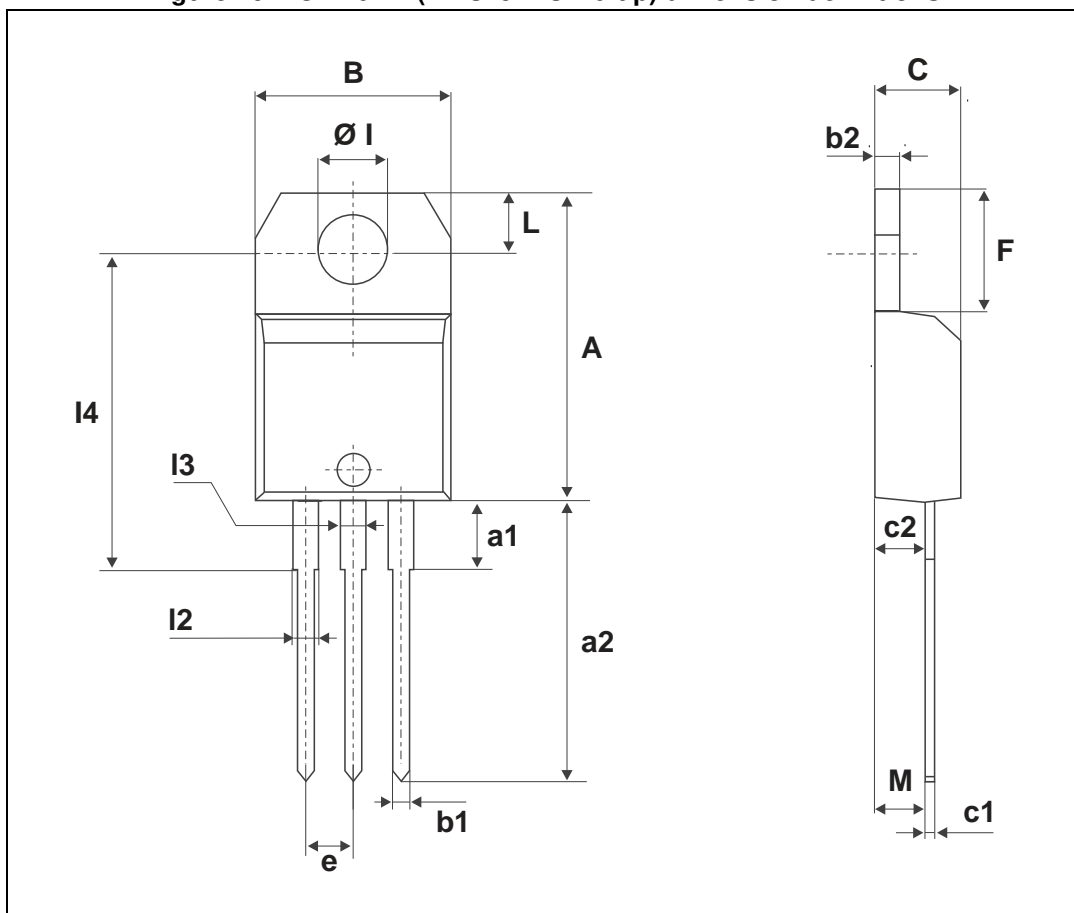


Table 9. TO-220AB (Nlns. & Ins. 20-up) dimension values

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
Øl	3.75		3.85	0.147		0.151
l4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
l2	1.14		1.70	0.044		0.066
l3	1.14		1.70	0.044		0.066
M		2.60			0.102	

Figure 20. D²PAK dimension definitions

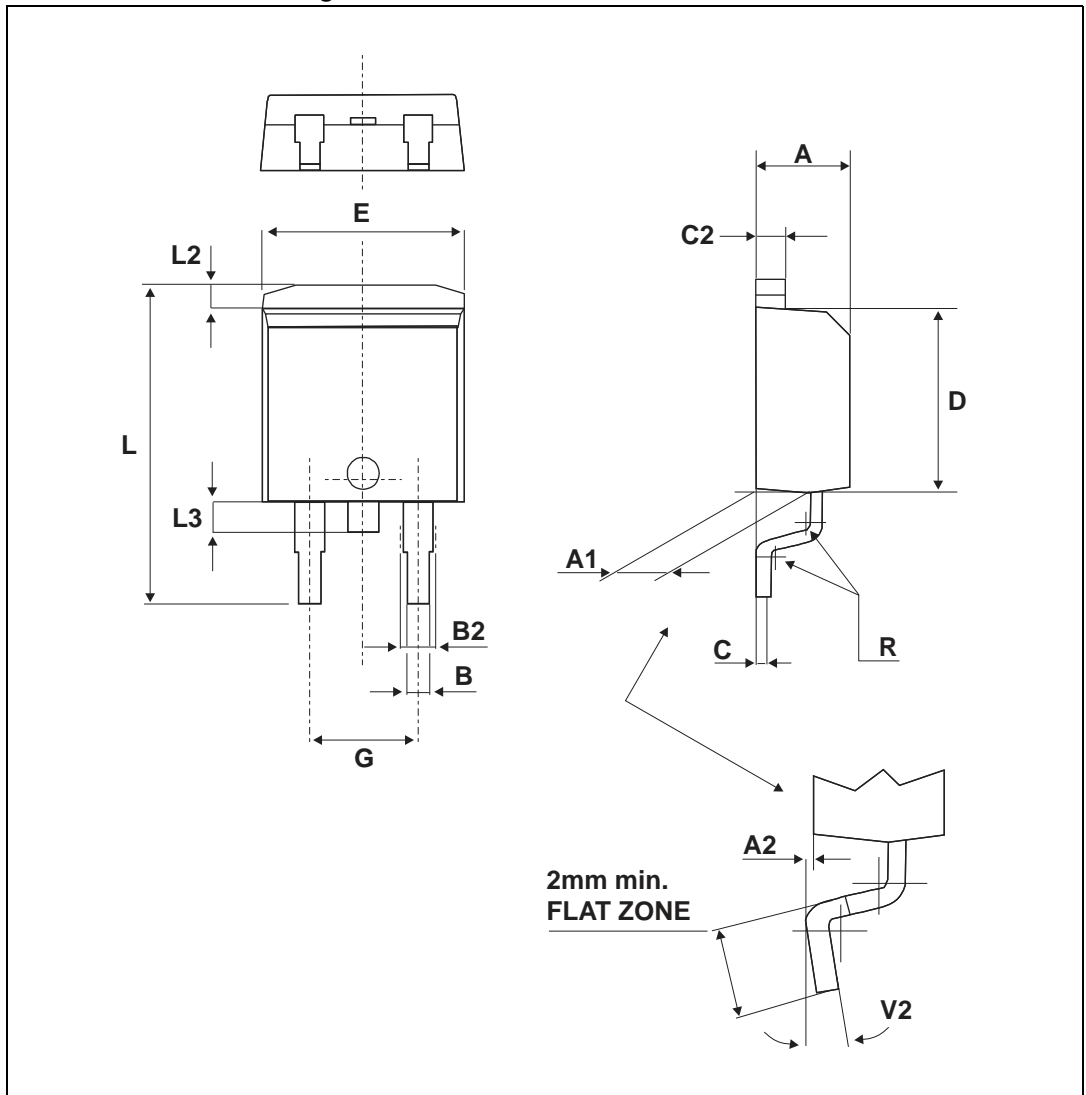
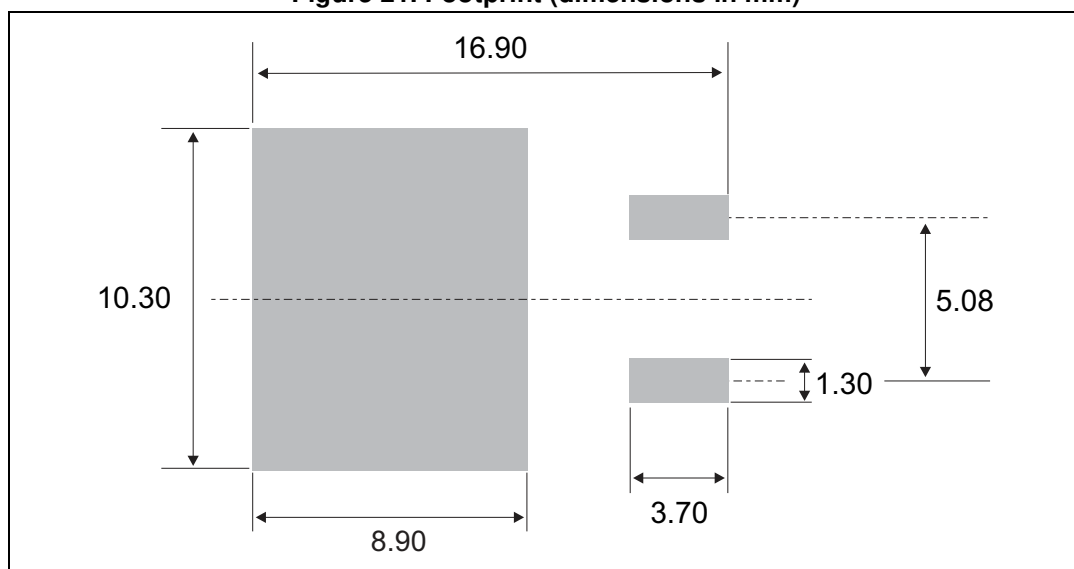


Table 10. D²PAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.169		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.70		0.93	0.027		0.037
B2	1.25	1.40		0.048	0.055	
C	0.45		0.60	0.017		0.024
C2	1.21		1.36	0.047		0.054
D	8.95		9.35	0.352		0.368
E	10.00		10.28	0.393		0.405
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.40	0.050		0.055
L3	1.40		1.75	0.055		0.069
R	0.40			0.016		
V2	0°		8°	0°		8°

Figure 21. Footprint (dimensions in mm)



3 Ordering information

Figure 22. TN1215 series

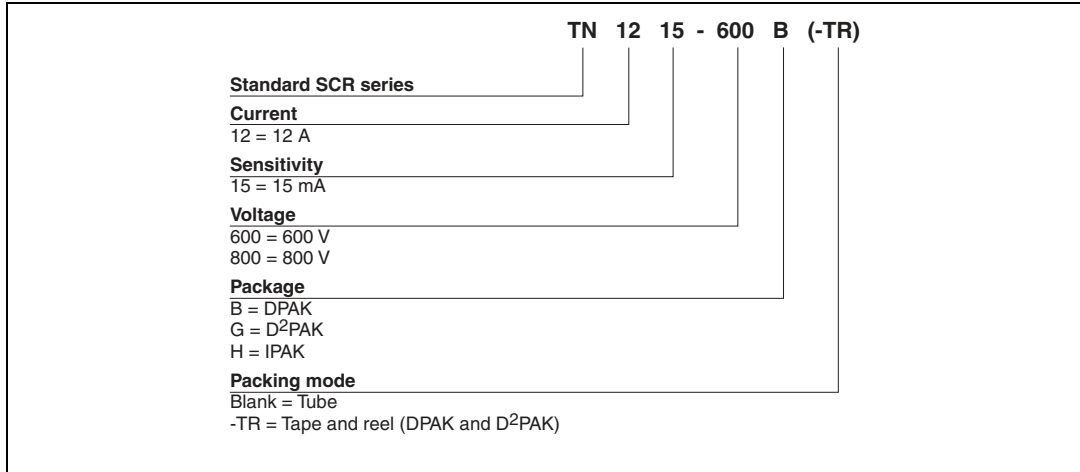


Figure 23. TS1220 series

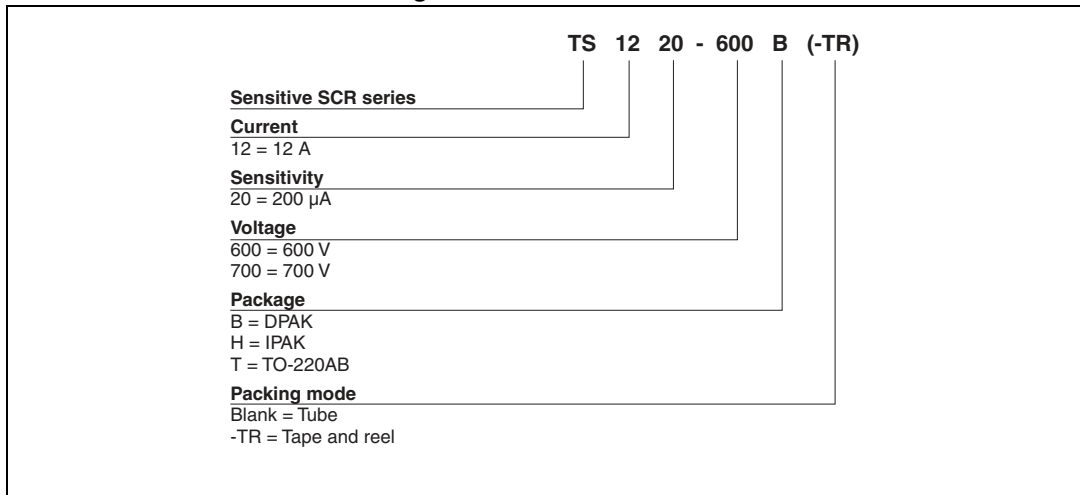


Figure 24. TYNx12 series

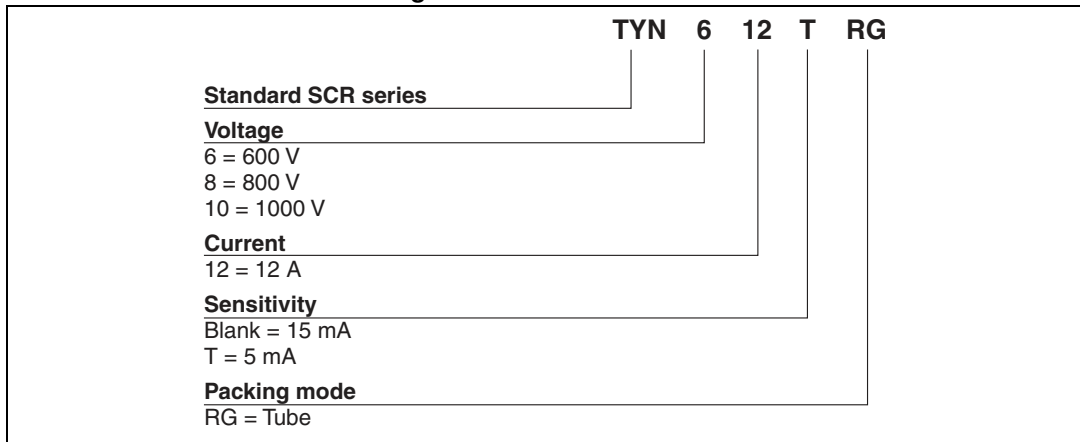


Table 11. Ordering information

Order code ⁽¹⁾	Marking ⁽¹⁾	Package	Weight	Base qty	Delivery mode
TN1215-x00B	TN12 15x00	DPAK	0.3 g	75	Tube
TN1215-x00B-TR	TN12 15x00	DPAK	0.3 g	2500	Tape and reel
TN1215-x00G	TN1215x00G	D ² PAK	1.5 g	50	Tube
TN1215-x00G-TR	TN1215x00G	D ² PAK	1.5 g	1000	Tape and reel
TN1215-x00H	TN12 15x00	IPAK	0.3 g	75	Tube
TS1220-x00B	TS12 20x00	DPAK	0.3 g	75	Tube
TS1220-x00B-TR	TS12 20x00	DPAK	0.3 g	2500	Tape and reel
TS1220-x00H	TS12 20x00	IPAK	0.3 g	75	Tube
TS1220-x00T	TS1220600T	TO-220AB	2.3 g	50	Tube
TYNx12RG	TYNx12	TO-220AB	2.3 g	50	Tube
TYNx12TRG	TYNx12T	TO-220AB	2.3 g	50	Tube

1. x (6, 7, 8, 10) depends upon voltage

4 Revision history

Table 12. Document revision history

Date	Revision	Changes
Sep-2000	3	Last update.
25-Mar-2005	4	TO-220AB delivery mode changed from bulk to tube.
14-Oct-2005	5	Changed sensitivity values in Table 1 for TYNx12 (30 to 15 mA) and TYNx12T (15 to 5 mA). Added ECOPACK statement.
08-Mar-2007	6	Reformatted to current standard. Figure 22: TN1215 series product name corrected. Figure 23: TS1220 series product name corrected.
23-Oct-2009	7	Added TS1220-xxxT device.
03-Jun-2014	8	Updated DPAK and IPAK package information and reformatted to current standard.

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