1 Characteristics

Table 1. Absolute ratings (limiting values)

Symbol	Parameters			Value		Unit
				TN805 TN815 TS820	TYN608	
$I_{T(RMS)}$	RMS on-state current On-state rms current (180° conduction angle)		T_C = 110 °C	8		A
			TO-220FPAB, T_C = 91 °C			
$I_{T(AV)}$	Average on-state current (180° conduction angle)		T_C = 110 °C	5		A
			TO-220FPAB, T_C = 91 °C			
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	T_j = 25 °C	73	100	A
		t_p = 10 ms		70	95	
I^2t	I^2t value for fusing	t_p = 10 ms	T_j = 25 °C	24.5	45	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , t_r ≤ 100 ns	F = 60 Hz	T_j = 125 °C	50		A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	4		A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	1		W
T_{stg}	Storage junction temperature range			-40 to +150		°C
T_j	Operating junction temperature range			-40 to +125		°C
V_{RGM}	Maximum peak reverse gate voltage (for TN8x5 and TYN608 only)			5		V

Table 2. Sensitive electrical characteristics (T_j = 25 °C, unless otherwise specified)

Symbol	Parameter			TS820	Unit
I_{GT}	V_D = 12 V, R_L = 140 Ω		Max.	200	µA
V_{GT}			Max.	0.8	V
V_{RG}	I_{RG} = 10 µA		Min.	8	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ, R_{GK} = 220 Ω	T_j = 125 °C	Min.	0.1	V
I_H	I_T = 50 mA, R_{GK} = 1 kΩ		Max.	5	mA
I_L	I_G = 1mA, R_{GK} = 1 kΩ		Max.	6	mA
dV/dt	V_D = 65% V_{DRM}, R_{GK} = 220 Ω	T_j = 125 °C	Min.	5	V/µs
V_{TM}	I_{TM} = 16 A, 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.	46	mΩ
I_{DRM}	V_{DRM} = V_{RRM}, R_{GK} = 220 Ω	T_j = 25 °C	Max.	5	µA
I_{RRM}		T_j = 125 °C		1	mA

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Table 3. Standard electrical characteristics (T_j = 25 °C, unless otherwise specified)

Symbol	Parameter			TN805	TN815	TYN608	Unit
I_{GT}	V_D = 12 V, R_L = 140 Ω		Min.	0.5	2	2	mA
			Max.	5	15	15	
V_{GT}			Max.	1.3			V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ	T_j = 125 °C	Min.	0.2			V
I_H	I_T = 100 mA, gate open		Max.	25	40	30	mA
I_L	I_G = 1.2 I_{GT}		Max.	30	50	70	mA
dV/dt	V_D = 67% V_{DRM}, gate open	T_j = 125 °C	Min.	50	150	150	V/µs
V_{TM}	I_{TM} = 16 A, 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.	46			mΩ
I_{DRM}	V_{DRM} = V_{RRM}	T_j = 25 °C	Max.	5			µA
I_{RRM}		T_j = 125 °C		2			mA

Table 4. Thermal resistance (maximum values)

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (DC)		IPAK / DPAK / TO-220AB	1.3	°C/W
			TO-220FPAB	4.6	
$R_{th(j-a)}$	Junction to ambient	S[1] = 0.5 cm²	DPAK	70	°C/W
	Junction to ambient		TO-220AB / TO-220FPAB	60	
			IPAK	100	

1. *S = Copper surface under tab*

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1.1 Characteristics curves

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

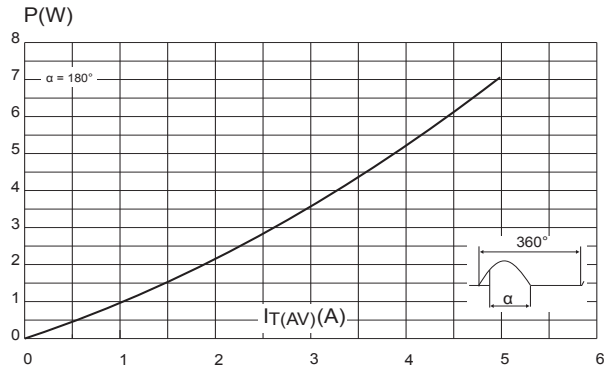

Figure 2. Average and DC on-state current versus case temperature

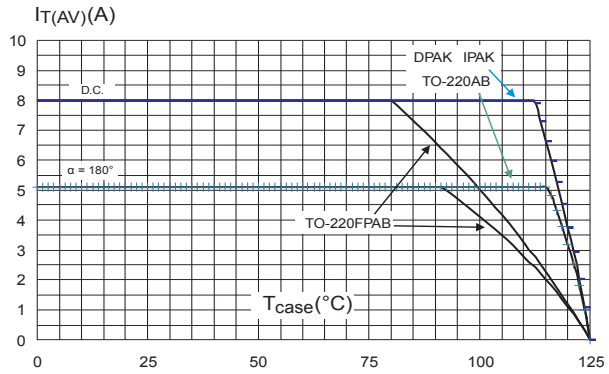

Figure 3. Average and DC on-state current versus ambient temperature

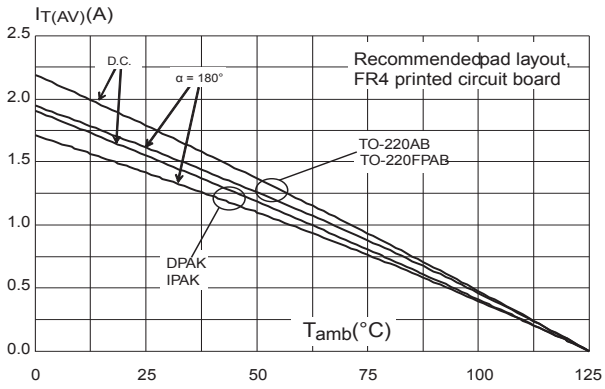

Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

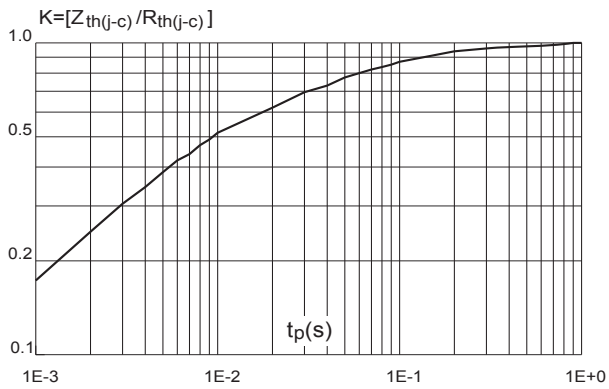

Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration

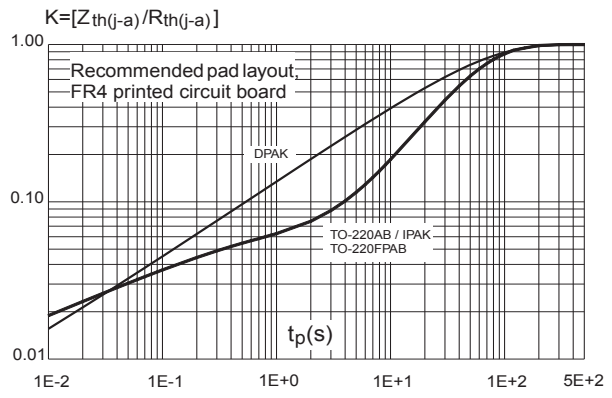

Figure 6. Relative variation of gate trigger current and holding current versus junction temperature for TS820

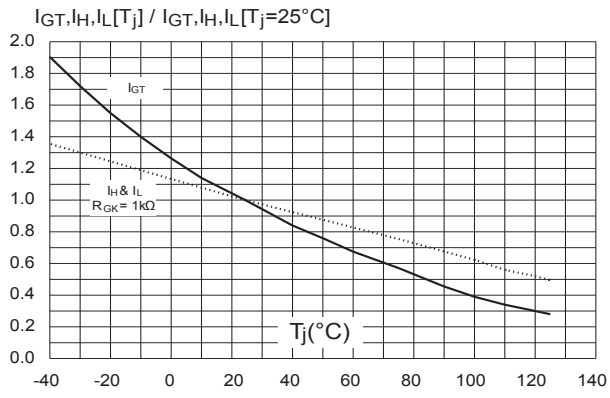

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Figure 7. Relative variation of gate trigger current and holding current versus junction temperature

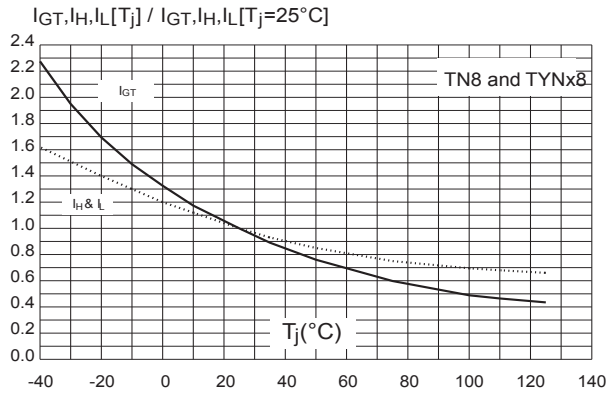

Figure 8. Relative variation of holding current versus gate-cathode resistance (typical values)

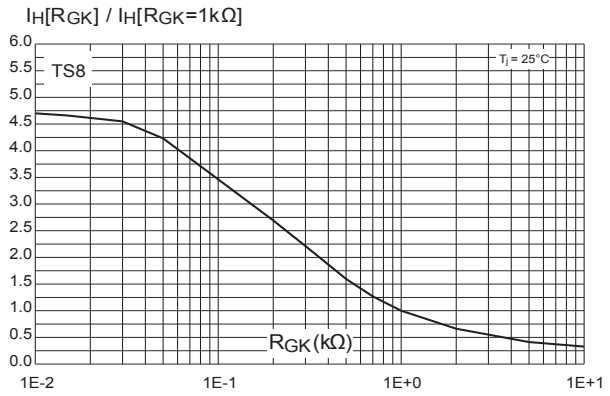

Figure 9. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values) for TS820

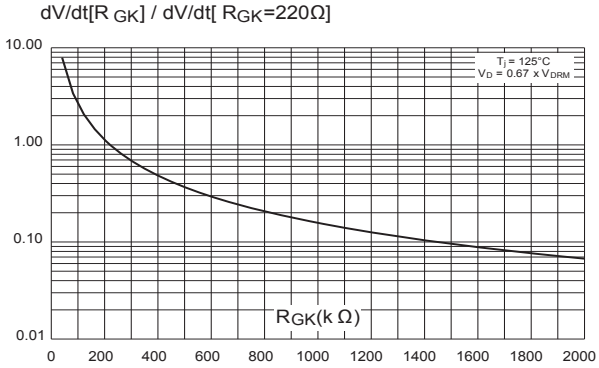

Figure 10. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values) for TS820

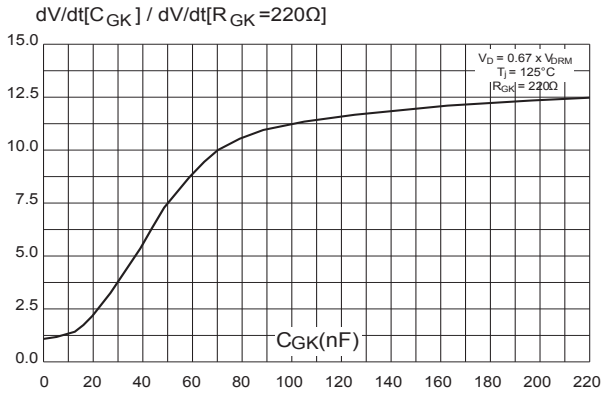

Figure 11. Surge peak on-state current versus number of cycles

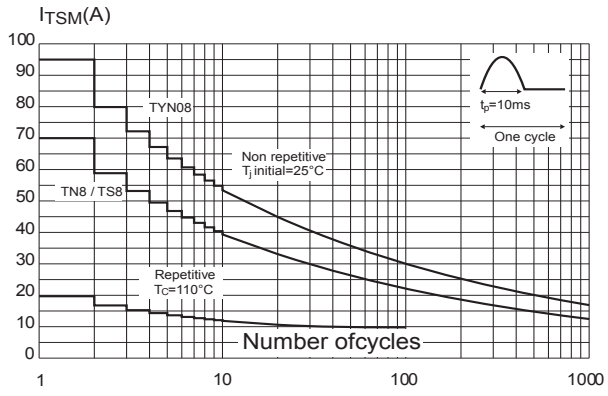

Figure 12. Non-repetitive surge peak on-state current and corresponding values of I2t

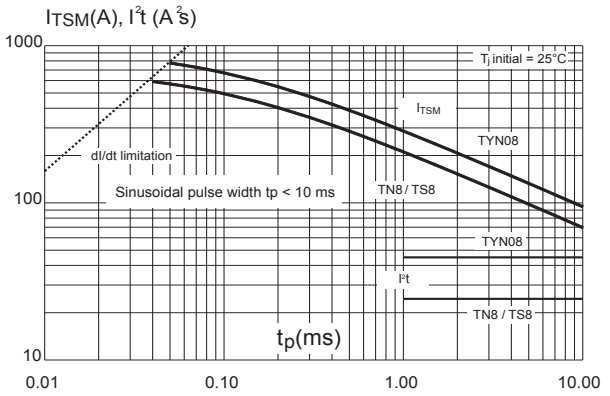

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Figure 13. On-state characteristics (maximum values)

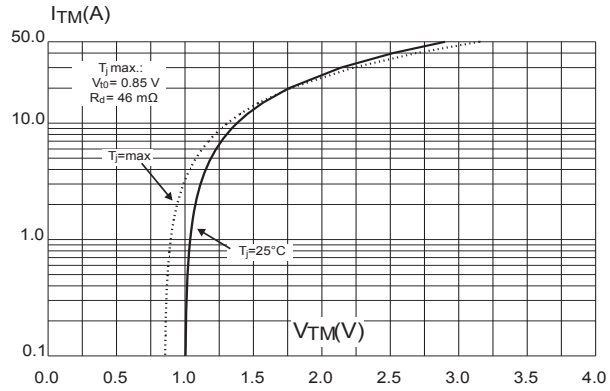
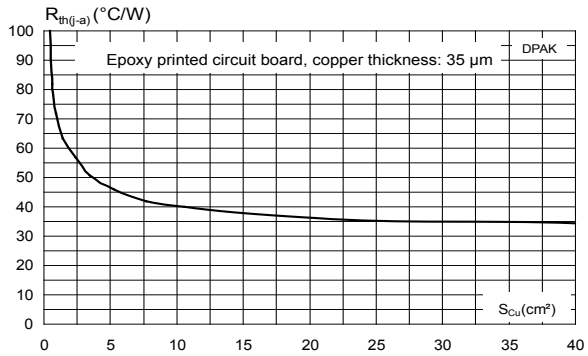


Figure 14. Thermal resistance junction to ambient versus copper surface under tab



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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 DPAK package information

- Molding compounded resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free package leads plating

Figure 15. DPAK package outline

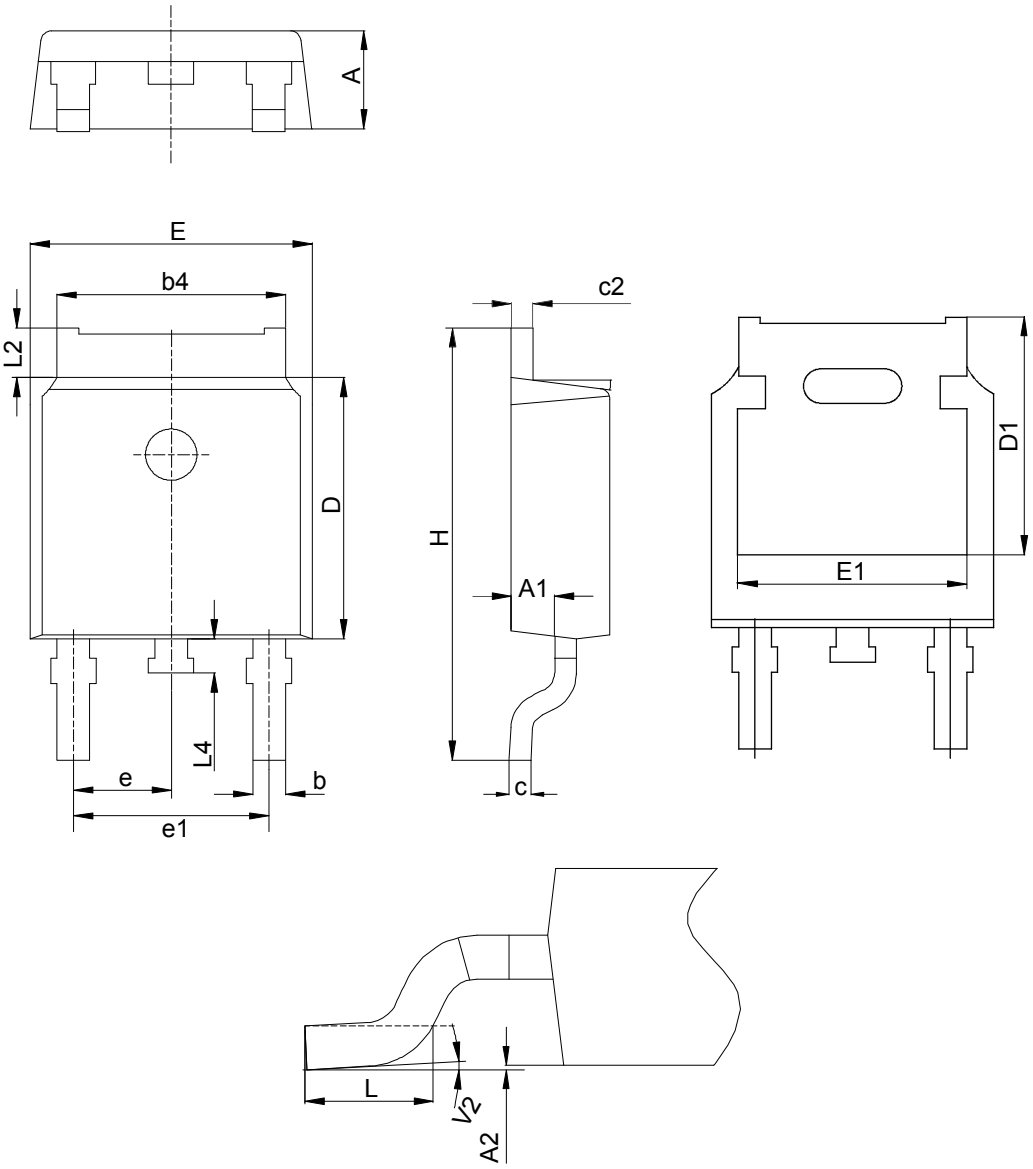

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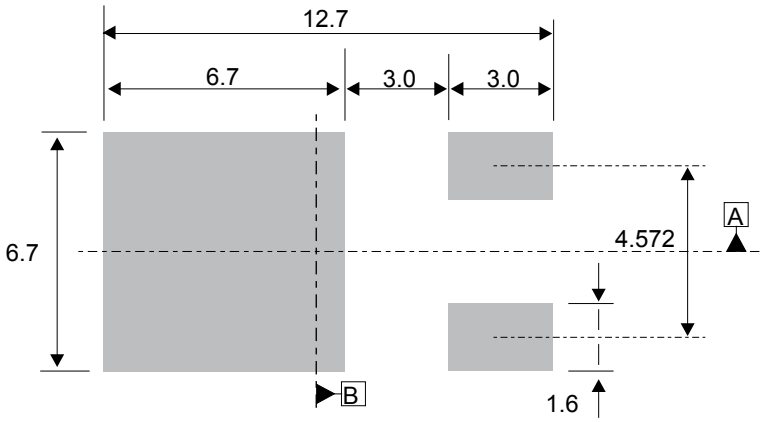
Table 5. DPAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	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		0.354
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		0.0236
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[2]	-8°		+8°	-8°		+8°

1. *Dimensions in inches are given for reference only*
2. *Degree*

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

Figure 16. DPAK recommended footprint (dimensions are in mm)



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2.2 IPAK package information

- Molding compounded resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free package leads plating

Figure 17. **IPAK package outline**

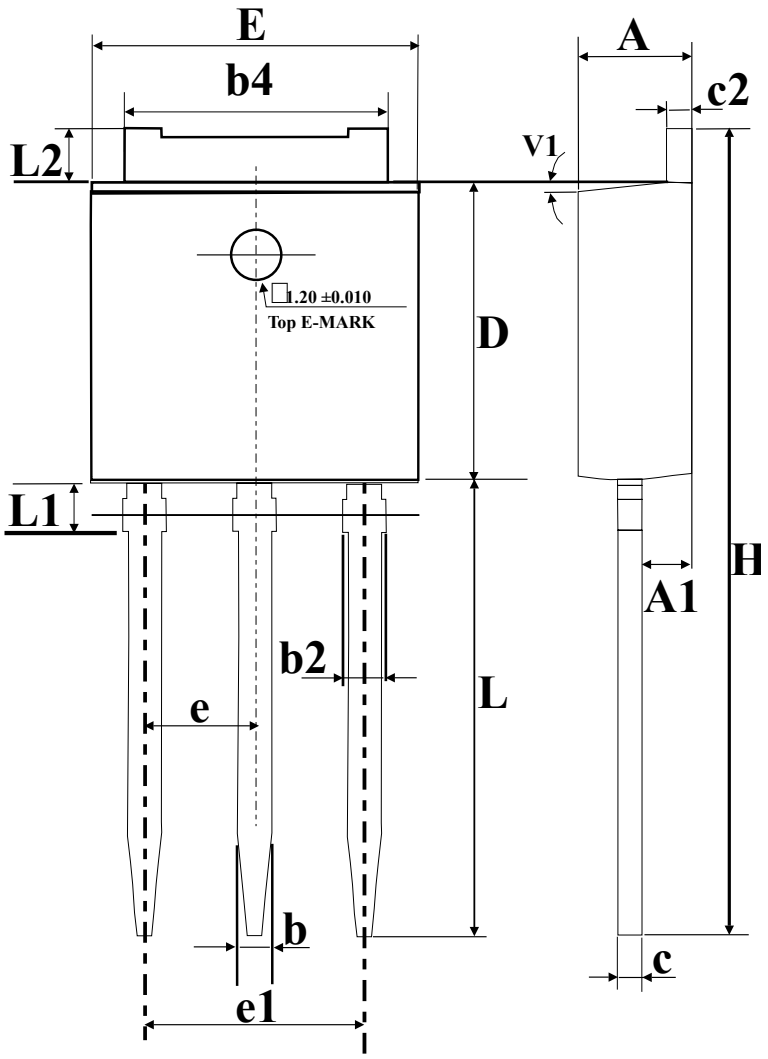

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Table 6. **IPAK package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.086		0.094
A1	0.90		1.10			0.035
b	0.64		0.90	0.025		0.035
b2			0.95			0.037
b4	5.20		5.43			
c	0.45		0.60			
c2	0.46		0.60			
D	6		6.20			
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°	

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2.3 TO-220AB package information

- Molding compouned resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free package leads plating
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 18. TO-220AB package outline

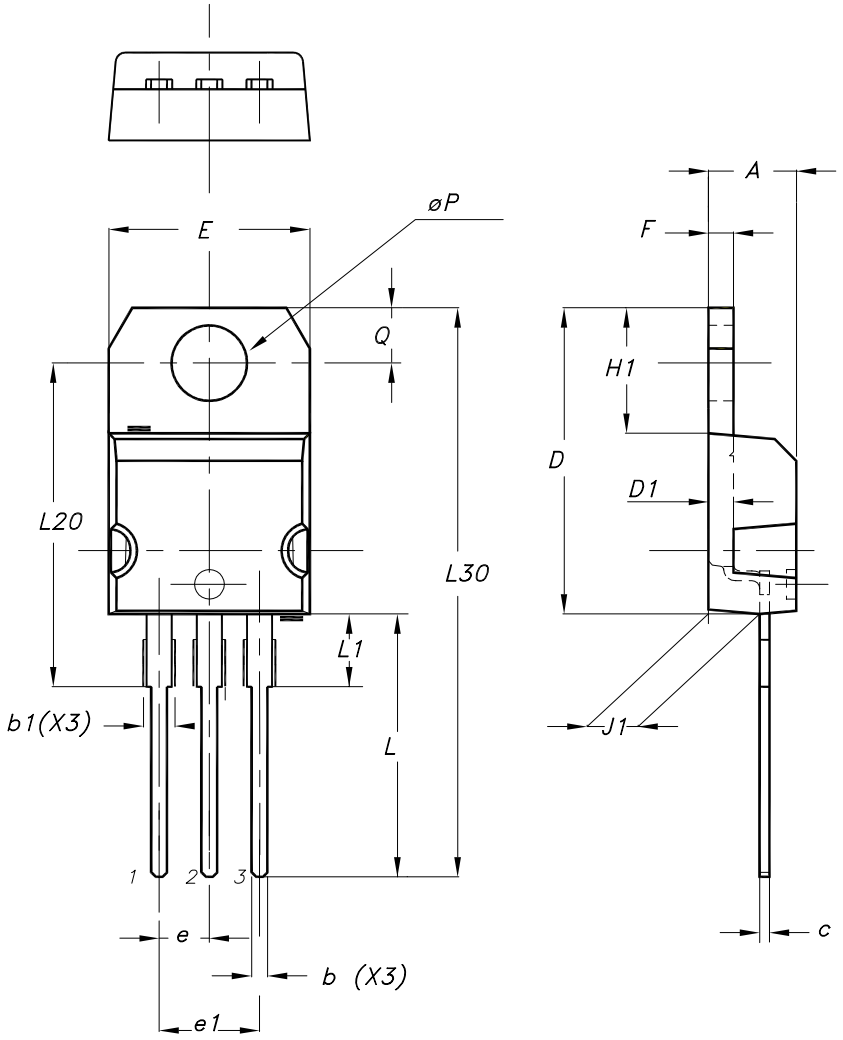

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Table 7. **TO-220AB package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	0.61	0.88	0.240	0.035
b1	1.14	1.55	0.045	0.061
c	0.48	0.70	0.019	0.028
D	15.25	15.75	0.600	0.620
D1	1.27 typ.		0.050 typ.	
E	10.00	10.40	0.394	0.409
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.195	0.203
F	1.23	1.32	0.048	0.052
H1	6.20	6.60	0.244	0.260
J1	2.40	2.72	0.094	0.107
L	13.00	14.00	0.512	0.551
L1	3.50	3.93	0.138	0.155
L20	16.40 typ.		0.646 typ.	
L30	28.90 typ.		1.138 typ.	
θP	3.75	3.85	0.148	0.152
Q	2.65	2.95	0.104	0.116

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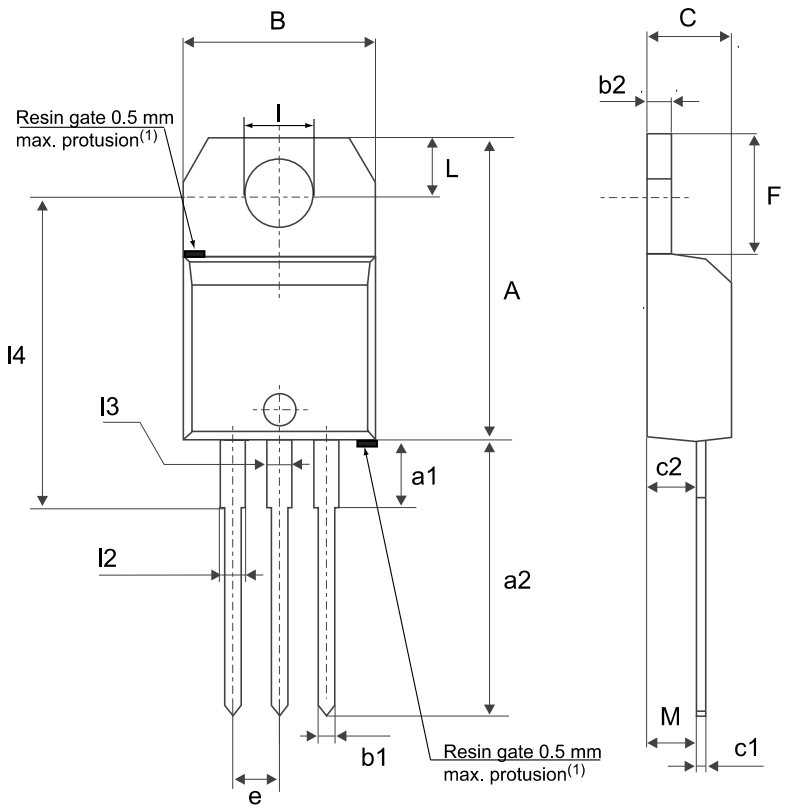
2.4 TO-220AB package information

- Molding compound resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free plating package leads
- Recommended torque: 0.4 to 0.6 N·m

Figure 19. TO-220AB package outline



(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

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Table 8. **TO-220AB package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.5984		0.6260
a1		3.75			0.1476	
a2	13.00		14.00	0.5118		0.5512
B	10.00		10.40	0.3937		0.4094
b1	0.61		0.88	0.0240		0.0346
b2	1.23		1.32	0.0484		0.0520
C	4.40		4.60	0.1732		0.1811
c1	0.49		0.70	0.0193		0.0276
c2	2.40		2.72	0.0945		0.1071
e	2.40		2.70	0.0945		0.1063
F	6.20		6.60	0.2441		0.2598
I	3.73		3.88	0.1469		0.1528
L	2.65		2.95	0.1043		0.1161
l2	1.14		1.70	0.0449		0.0669
l3	1.14		1.70	0.0449		0.0669
l4	15.80	16.40	16.80	0.6220	0.6457	0.6614
M		2.6			0.1024	

1. *Inch dimensions are for reference only.*

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2.5 TO-220FPAB package information

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

Figure 20. **TO-220FPAB package outline**

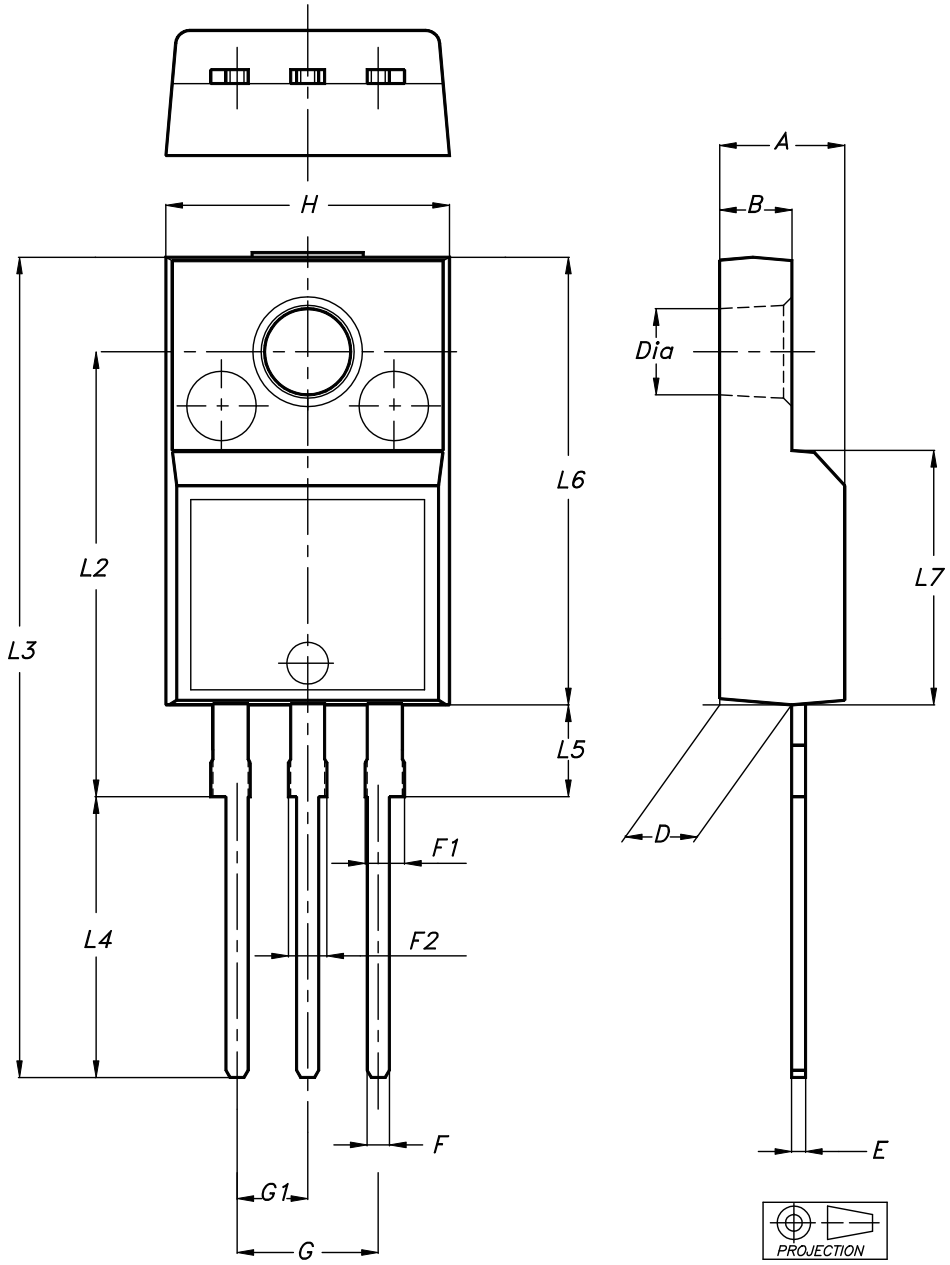

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Table 9. **TO-220FPAB package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.1739	0.1818
B	2.5	2.7	0.0988	0.1067
D	2.50	2.75	0.0988	0.1087
E	0.45	0.70	0.0178	0.0277
F	0.75	1.0	0.0296	0.0395
F1	1.15	1.70	0.0455	0.0672
F2	1.15	1.70	0.0455	0.0672
G	4.95	5.20	0.1957	0.2055
G1	2.40	2.70	0.0949	0.1067
H	10.00	10.40	0.3953	0.4111
L2	16.00 typ.		0.6324 typ.	
L3	28.60	30.60	1.1304	1.2095
L4	9.80	10.6	0.3874	0.4190
L5	2.90	3.60	0.1146	0.1423
L6	15.90	16.40	0.6285	0.6482
L7	9.00	9.30	0.3557	0.3676
Dia	3.0	3.20	0.1186	0.1265

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3 Ordering information

Figure 21. TN8 series

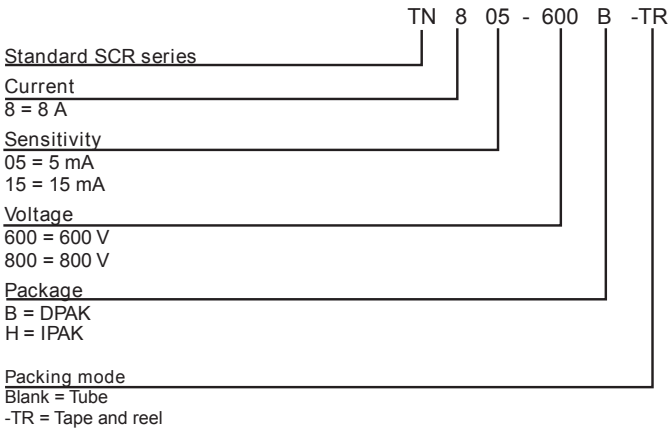

Figure 22. TS8 series

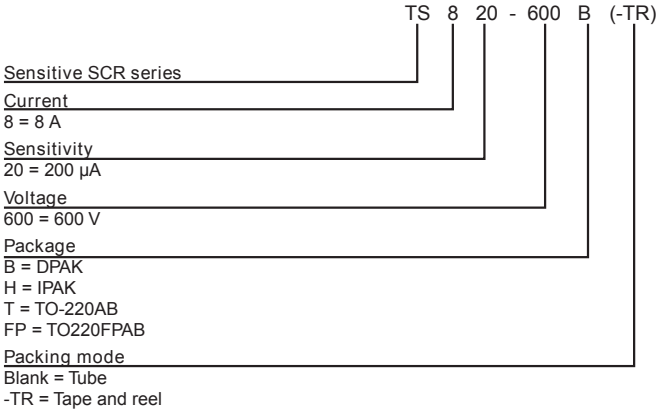

Figure 23. TYNx08 series

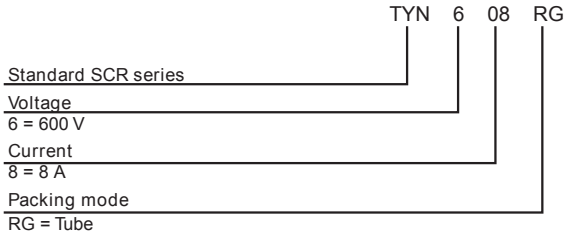

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Table 10. **Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
TN805-600B-TR	TN805600	DPAK	0.3 g	2500	Tape and reel
TN815-600B-TR	TN815600	DPAK	0.3 g	2500	Tape and reel
TN815-800B-TR	TN815800	DPAK	0.3 g	2500	Tape and reel
TN815-800H	TN815800	IPAK	0.4 g	75	Tube
TS820-600B	TS820600	DPAK	0.3 g	75	Tube
TS820-600B-TR	TS820600	DPAK	0.3 g	2500	Tape and reel
TS820-600H	TS820600	IPAK	0.4 g	75	Tube
TS820-600T	TS820600T	TO-220AB	2.3 g	50	Tube
TS820-600FP	TS820600	TO-220FPAB	2.0 g	50	Tube
TYN608RG	TYN608	TO-220AB	2.3 g	50	Tube

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Revision history

Table 11. **Document revision history**

Date	Revision	Changes
Apr-2002	4A	Last update.
13-Feb-2006	5	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.
22-Jan-2010	6	Alpha definition updated in Figure 1. Thermal resistance, junction to case, updated in Table 5.
10-Oct-2011	7	Added TO-220FPAB package. Removed 700 V and 1000 V products.
14-May-2014	8	Updated DPAK and IPAK package information and reformatted to current standard.
03-Nov-2021	9	Added TN815-800H product information. Minor text changes.

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