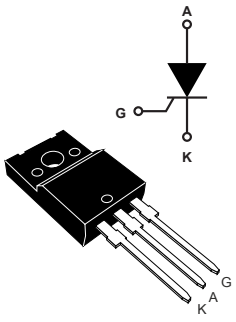
TN1610H-6FP

Datasheet

High temperature 16 A 600 V TO220FP thyristor SCRs



TO-220FPAB

Features

- High junction temperature: T_j = 150 °C
- High noise immunity dV/dt = 1000V/µs up to 150 °C
- Gate triggering current I_{GT} = 10 mA
- Peak off-state voltage V_{DRM}/V_{RRM} = 600 V
- High turn-on current rise dI/dt = 100 A/µs
- ECOPACK®2 compliant
- Complies with UL standards (File ref: E81734)
- Insulated package TO-220FPAB:
  - Insulated voltage: 2000 V_{RMS}

Applications

- Motorbike voltage regulator circuits
- Inrush current limiting circuits
- Motor control circuits and starters
- Light dimmers
- Solid state relays

Description

Thanks to a junction temperature T_j up to 150 °C and an isolated TO-220FPAB package, the TN1610H-6FP offers high thermal performance operation up to 16 A rms.

The trade-off between the device's noise immunity (dV/dt = 1 kV/µs), its gate triggering current (I_{GT} = 10 mA) and its turn-on current rise (dI/dt = 100 A/µs) allows the design of robust and compact control circuits for voltage regulators in motorbikes and industrial drives, overvoltage crowbar protection, motor control circuits in power tools and kitchen appliances and inrush current limiting circuits.

The insulated fullpack package allows a back-to-back configuration.

Product status
TN1610H-6FP

Product summary	
Order code	TN1610H-6FP
Package	TO-220FPAB
V_{DRM}/V_{RRM}	600 V
I_{GT}	10 mA

1 Characteristics

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

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		T_c = 83 °C	16	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)		T_c = 83 °C	10	A
			T_c = 102 °C	8	
			T_c = 117 °C	6	
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C)		t_p = 8.3 ms	153	A
			t_p = 10 ms	140	
I^2t	I^2t value for fusing, (T_j initial = 25 °C)		t_p = 10 ms	98	A^2s
dI/dt	I_G = 2 x I_{GT}, tr ≤ 100 ns Critical rate of rise of on-state current		f = 60 Hz	100	A/µs
V_{DRM}/V_{RRM}	Repetitive peak off-state voltage			600	V
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 150 °C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 150 °C	1	W
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Maximum operating junction temperature			-40 to +150	°C
T_l	Maximum lead temperature soldering during 10 s			260	°C
V_{ins}	Insulation rms voltage, 1 minute, TO-220FPAB			2000	V

Table 2. Electrical characteristics (T_j = 25 °C unless otherwise specified)

Symbol	Test conditions			Value	Unit
I_{GT}	V_D = 12 V, R_L = 33 Ω		Typ.	4.5	mA
			Max.	10	
V_{GT}			Max.	1.3	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ	T_j = 150 °C	Min.	0.2	V
I_H	I_T = 500 mA, gate open		Max.	30	mA
I_L	I_G = 1.2 x I_{GT}		Max.	60	mA
dV/dt	V_D = 402 V, gate open	T_j = 150 °C	Min.	1000	V/µs
t_{gt}	I_T = 32 A, V_D = 600 V, I_G = 100 mA, (dI_G/dt) max = 0.2 A/µs		Typ.	1.9	µs
t_q	I_T = 32 A, V_D = 402 V, (dI_T/dt)OFF = 30 A/µs, V_R = 25 V, dV_D/dt = 40 V/µs	T_j = 150 °C	Typ.	70	µs

Table 3. Static characteristics

Symbol	Test conditions			Value	Unit
V_{TM}	I_T = 32 A, t_p = 380 µs	T_j = 25 °C	Max.	1.60	V
V_{TO}	Threshold voltage	T_j = 150 °C	Max.	0.82	
R_D	Dynamic resistance	T_j = 150 °C	Max.	25	mΩ
I_{DRM}, I_{RRM}	$V_D = V_{DRM}$; $V_R = V_{RRM}$	T_j = 25 °C	Max.	5	µA
		T_j = 150 °C		1.5	mA

Table 4. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	4.5	°C/W
$R_{th(j-a)}$	Junction to ambient (DC)	Typ.	60	

1.1 Characteristics curves

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

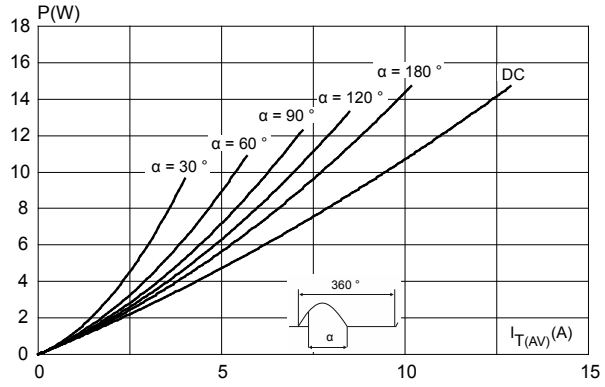


Figure 2. Average and DC on-state current versus case temperature

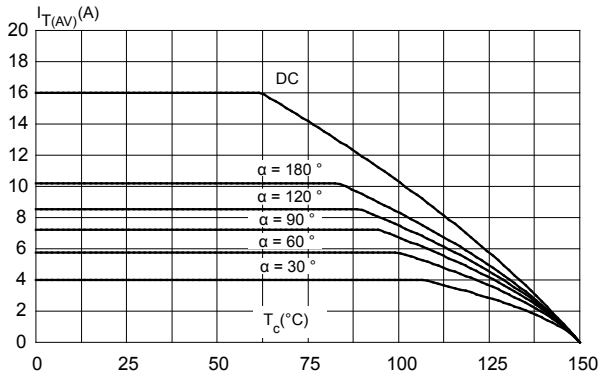


Figure 3. Average and D.C. on state current versus ambient temperature

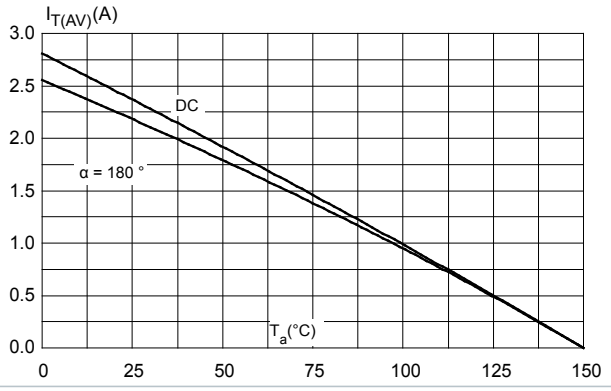


Figure 4. Relative variation of thermal impedance versus pulse duration

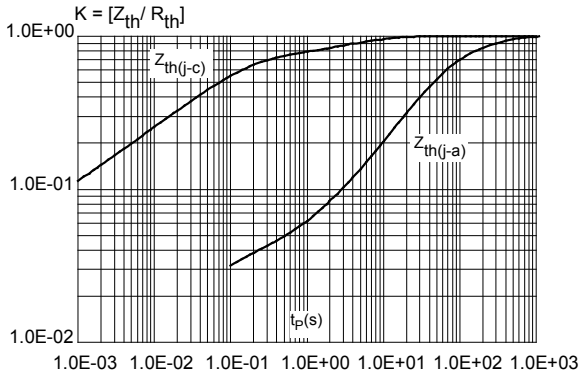


Figure 5. Relative variation of gate triggering current and gate voltage versus junction temperature (typical values)

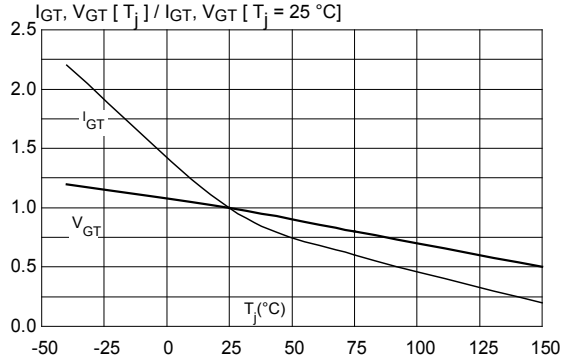


Figure 6. Relative variation of holding and latching current versus junction temperature (typical values)

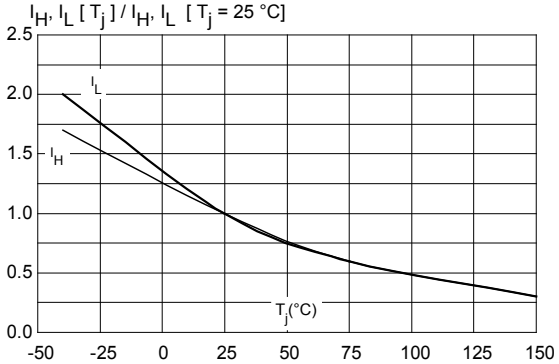


Figure 7. Relative variation of static dV/dt immunity versus junction temperature (typical values)

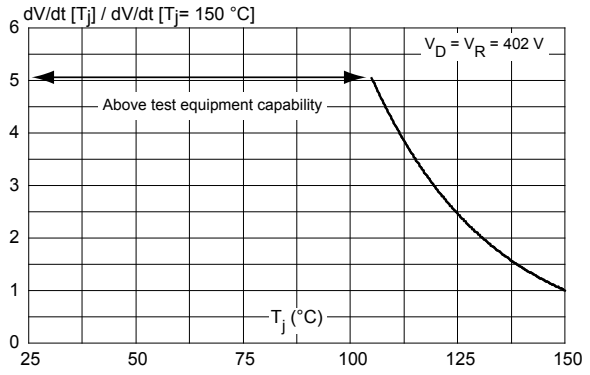


Figure 8. Surge peak on-state current versus number of cycles

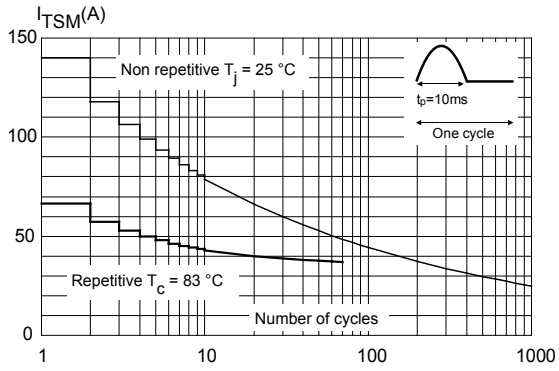


Figure 9. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

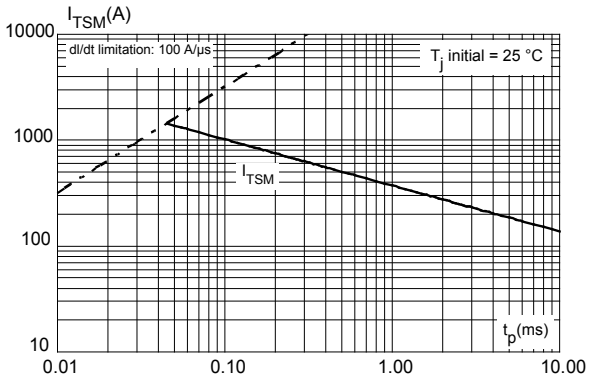


Figure 10. On-state characteristics (maximum values)

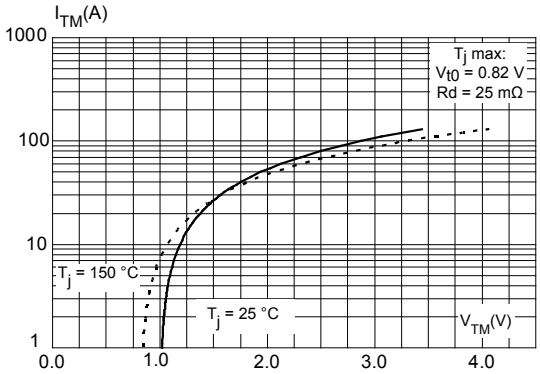
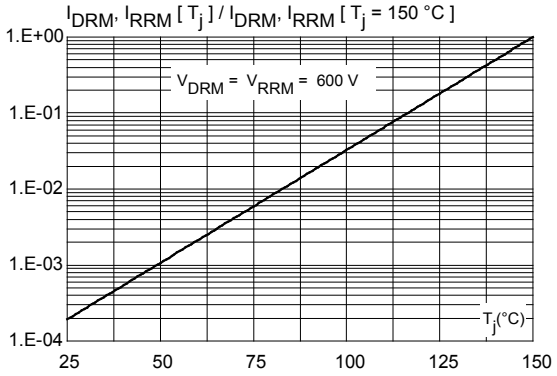


Figure 11. Relative variation of leakage current versus junction temperature (t_p < 10 ms)



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-220FPAB package information

- ECOPACK®2 compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL94 level V0
- Recommended torque: 0.4 to 0.6 N·m

Figure 12. TO-220FPAB package outline

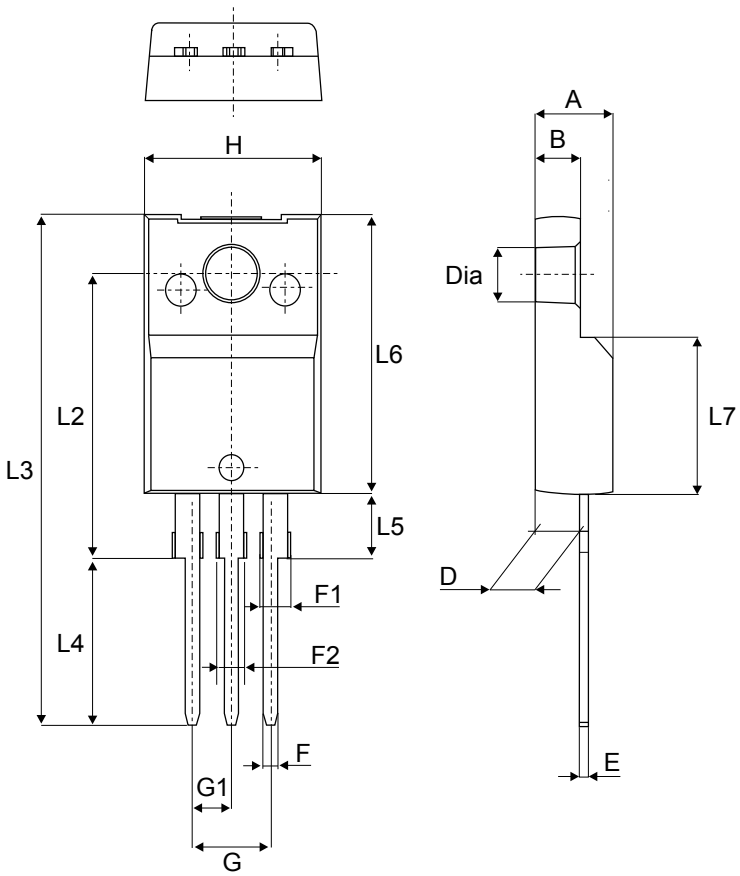


Table 5. TO-220FPAB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches[1]	
	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
Diam	3.0	3.20	0.1186	0.1265

1. *Inch dimensions are for reference only.*

3 Ordering information

Figure 13. **Ordering information scheme**

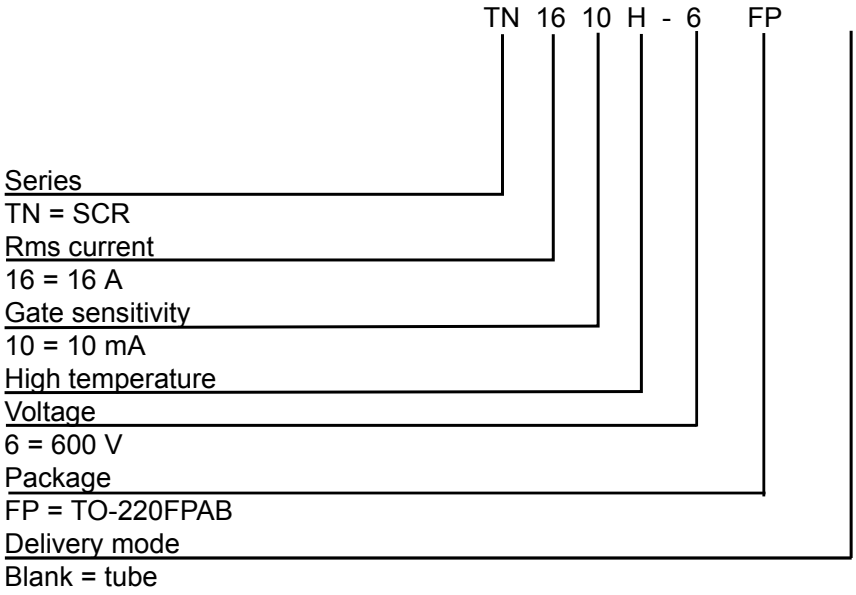


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN1610H-6FP	TN1610H6	TO-220FPAB	2.0 g	50	Tube

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
24-Feb-2015	1	Initial release.
22-Feb-2019	2	Updated Table 4. Thermal parameters.