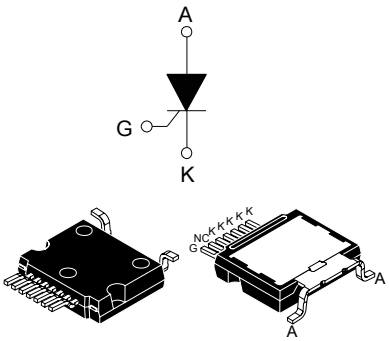
TN3050HP-12L2Y

Datasheet

30 A – 1200 V automotive grade SCR Thyristor



HU³PAK

Features

- AEC-Q101 qualified
- High junction temperature: T_j = 150 °C
- AC off state voltage: +/- 1200 V
- Nominal on-state current: 30 A_{RMS}
- High noise immunity: 1000 V/µs
- Max. gate triggering current: 50 mA
- ECOPACK1 compliant component

Applications

- Automotive applications: on board and off board battery charger
- Renewable energy inverters
- Solid state relay
- 3-Phase heating or motor soft start control
- UPS (uninterruptible power supply)
- Bypass SSR / hybrid relay
- Inrush current limiter in battery charger
- AC-DC voltage controlled rectifier
- Industrial welding systems

Product status link
TN3050HP-12L2Y

Product summary	
$I_{T(RMS)}$	30 A
V_{DRM}/V_{RRM}	1200 V
V_{DSM}/V_{RSM}	1400 V
I_{GT}	50 mA
T_j	150 °C

Description

This device is an automotive grade SCR Thyristor designed for applications such as automotive and stationary battery chargers.

Rated for 30 A_{RMS} power switching, this SCR Thyristor offers superior performance in terms of peak voltage robustness (up to 1400 V) and surge current handling (sine wave pulse up to 300 A). Its key features allow the design of functions such as a 42 A_{RMS} AC switch (dual back-to-back SCRs) and a 38 A av. AC-DC controlled rectifier bridge.

Available in HU³PAK package, it is ideal for compact SMD designs on surface mount boards or insulated metal substrate boards and and top-side cooling.

1 Characteristics

Table 1. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		T_C = 126 °C	30	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)			19	A
I_{TSM}[1]	Non repetitive surge peak on-state current, V_R = 0 V	t_p = 8.3 ms	T_j initial = 25 °C	330	A
		t_p = 10 ms		300	
V_{DRM} / V_{RRM}	Repetitive off-state voltage (50-60 Hz)		T_j = 150 °C	1200	V
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , tr ≤ 100 ns	f = 50 Hz	T_j = 150 °C	200	A/µs
V_{GM}	Peak forward gate voltage	t_p = 20 µs	T_j = 150 °C	10	V
I_{GM}	Peak forward gate current			8	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 150 °C	1	W
V_{RGM}	Peak reverse gate voltage		T_j = 25 °C	5	V
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature			-40 to +150	°C

1. *ST recommend I^2t value for fusing = 450 A^2s for T_j = 25 °C and t_P = 10 ms*

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		Min.	10	mA
			Max.	50	
V_{GT}	V_D = 12 V, R_L = 33 Ω		Max.	1.3	V
V_{GD}	V_D = 2/3 x V_{DRM}, R_L = 3.3 kΩ	T_j = 150 °C	Min.	0.2	V
I_H	I_T = 500 mA, gate open		Max.	100	mA
I_L	I_G = 1.2 x I_{GT}		Max.	125	mA
t_{gt}	I_T = 60 A , V_D = 2/3 x V_{DRM}, I_G = 100 mA, dI_G/dt = 0.2 A/µs		Typ.	1	µs
dV/dt	V_D = 2/3 x V_{DRM}, gate open	T_j = 150 °C	Min.	1000	V/µs
t_q	I_T = 20 A, dI_T/dt = 10 A/µs, V_R = 75 V, V_D = 2/3 x V_{DRM}, dV_D/dt = 20 V/µs, t_P = 100 µs	T_j = 150 °C	Typ.	150	µs
V_{TM}	I_{TM} = 60 A, t_P = 380 µs		Max.	1.65	V
V_{TO}	Threshold voltage	T_j = 150 °C	Max.	0.88	V
R_D	Dynamic resistance	T_j = 150 °C	Max.	14	mΩ
I_{DRM}/I_{RRM}	V_D = V_{DRM}, V_R = V_{RRM}	T_j = 25 °C	Max.	5	µA
		T_j = 125 °C	Max.	3	mA
		T_j = 150 °C	Max.	5	mA
I_{DSM}/I_{RSM}	V_D = V_{DSM}, V_R = V_{RSM}	T_j = 25 °C	Max.	10	µA

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC, max.)	HU^3PAK	0.8	°C/W

1.1 Characteristics (curves)

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

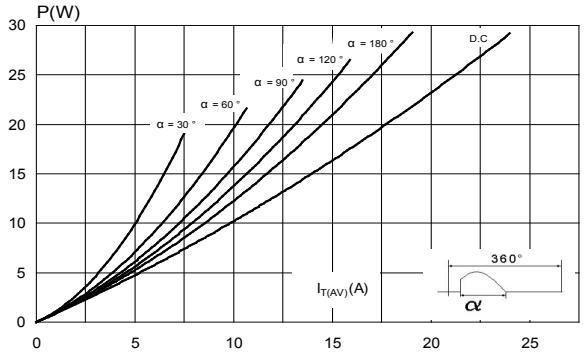


Figure 2. Average and DC on-state current versus case temperature

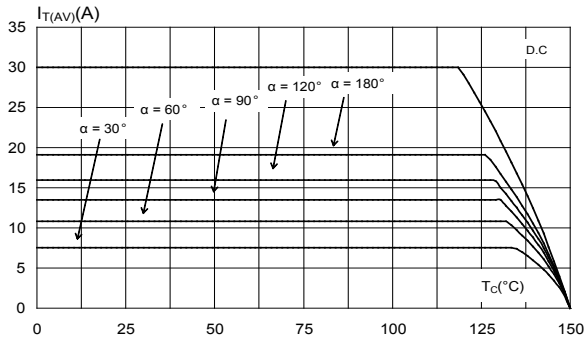


Figure 3. On-state characteristics (maximum values)

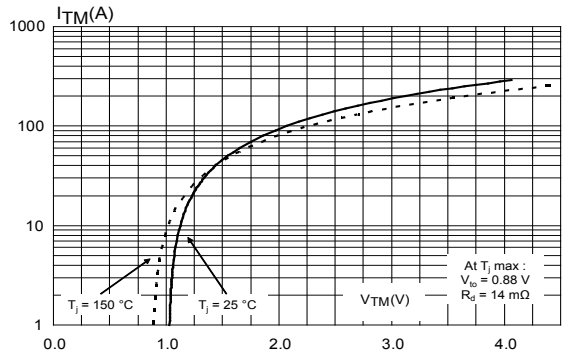


Figure 4. Average and D.C. on-state current versus ambient temperature

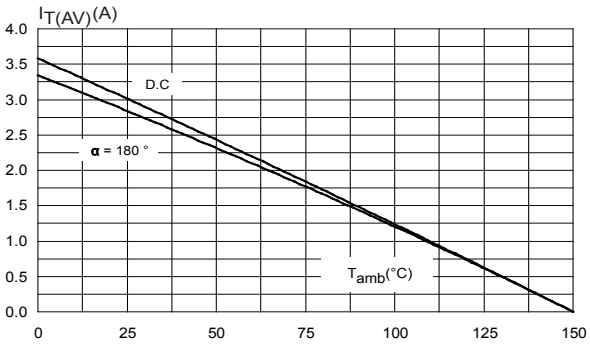


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

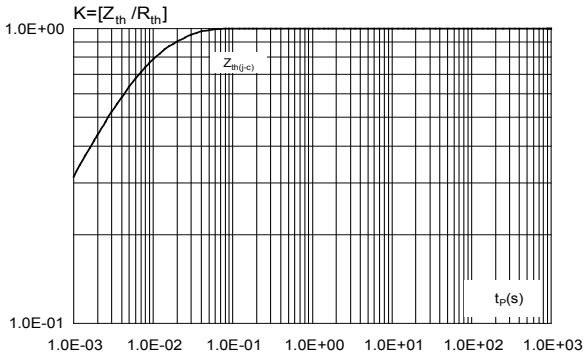


Figure 6. Surge peak on-state current versus number of cycles

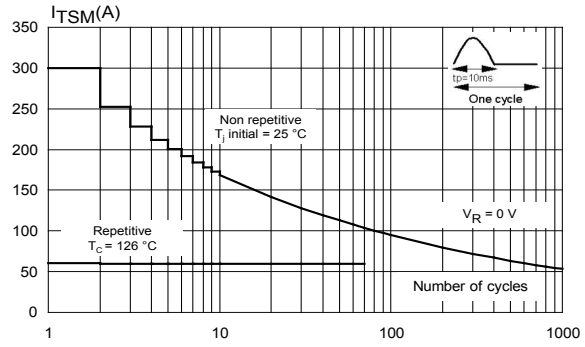


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse (t_p < 10 ms)

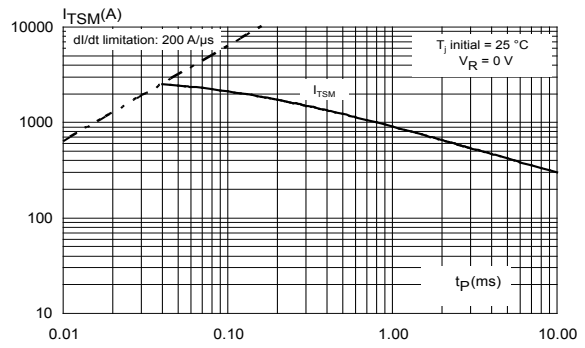


Figure 8. Relative variation of holding and latching current versus junction temperature (typical values)

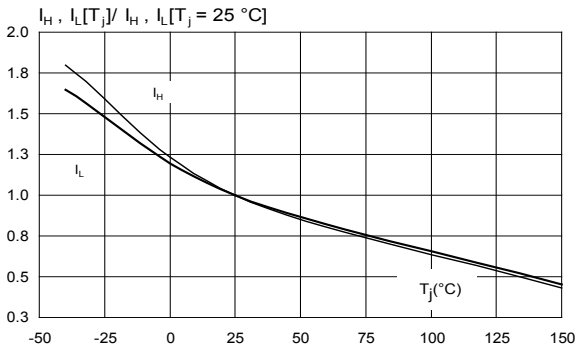


Figure 9. Relative variation of gate triggering current and voltage versus junction temperature

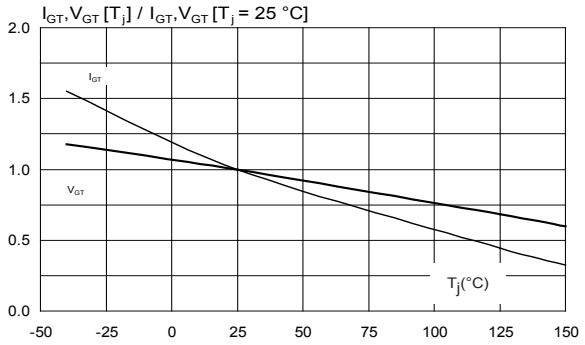


Figure 10. Relative variation of leakage current versus junction temperature for different values of blocking voltage

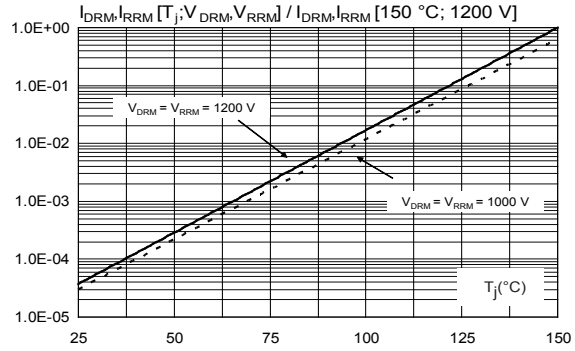
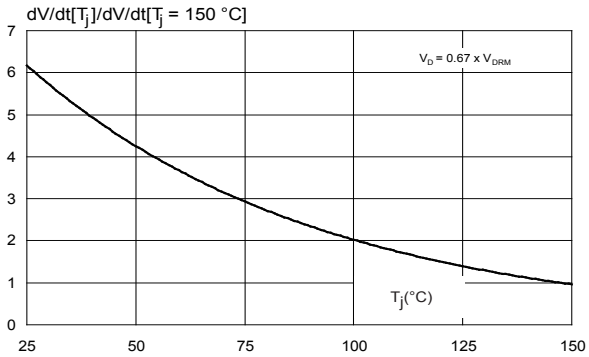


Figure 11. Relative variation of the static dV/dt immunity versus junction temperature (typical values)



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 HU^{3}PAK package information

- Epoxy moulding compound meets flammability standard UL94, V0
- Lead-free package leads
- Cooling method: by conduction (C)

Figure 12. HU^{3}PAK package outline

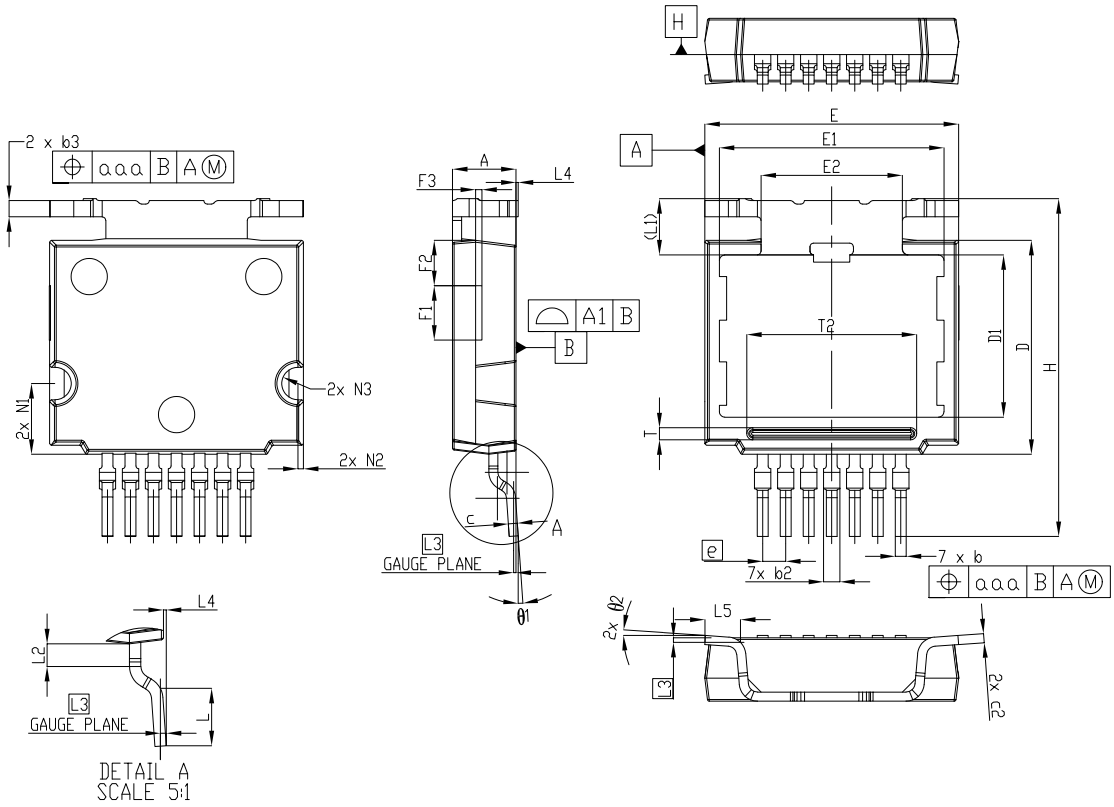


Figure 13. HU^{3}PAK recommended footprint (dimensions are in mm)

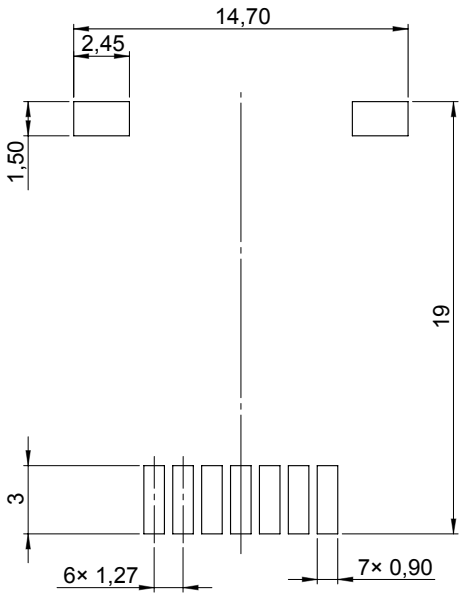


Table 4. HU^{3}PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	3.40	3.50	3.60	0.1339	0.1378	0.1417
A1			0.05			0.0019
b	0.50	0.60	0.70	0.0197	0.0236	0.0275
b2	0.50	0.70	1.00	0.0197	0.0276	0.0393
b3	0.80	0.90	1.00	0.0315	0.0354	0.0393
c	0.40	0.50	0.60	0.0158	0.0197	0.0236
c2	0.40	0.50	0.60	0.0158	0.0197	0.0236
D	11.70	11.80	11.90	0.4607	0.4646	0.4685
D1	8.80	8.96	9.10	0.3465	0.3528	0.3582
E	13.90	14.00	14.10	0.5473	0.5512	0.5551
E1	12.30	12.40	12.50	0.4843	0.4882	0.4921
E2	7.75	7.80	7.85	0.3052	0.3071	0.3090
e		BSC 1.27			0.0500	
H	18.00	18.58	19.00	0.7087	0.7315	0.7480
L	2.40	2.52	2.60	0.0945	0.0992	0.1023
L1		3.05			0.1201	
L2	0.90	1.00	1.10	0.0355	0.0394	0.0433
L3		BSC 0.26			0.0103	
L4	0.075	0.125	0.175	0.0030	0.0049	0.0068
L5	1.83	1.93	2.03	0.0721	0.0760	0.0799
aaa			0.10			0.0039
θ1	0°		8°			
θ2	0°		8°			
F1	2.90	3.00	3.10	0.1142	0.1181	0.1220
F2	2.40	2.50	2.60	0.0945	0.0984	0.1023
F3	0.25	0.35	0.45	0.0099	0.0138	0.0177
N1	3.80	3.90	4.0	0.1497	0.1535	0.1574
N2	0.25	0.30	0.45	0.0099	0.0118	0.0177
N3	0.80	0.90	1.00	0.0315	0.0354	0.0393
T	0.50	0.67	0.70	0.0197	0.0264	0.0275
T2	9.33	9.38	9.43	0.3674	0.3693	0.3712

1. *Inches are given for reference only*

2.2 HU^{3}PAK packing information

Figure 14. **HU^{3}PAK carrier tape outline**

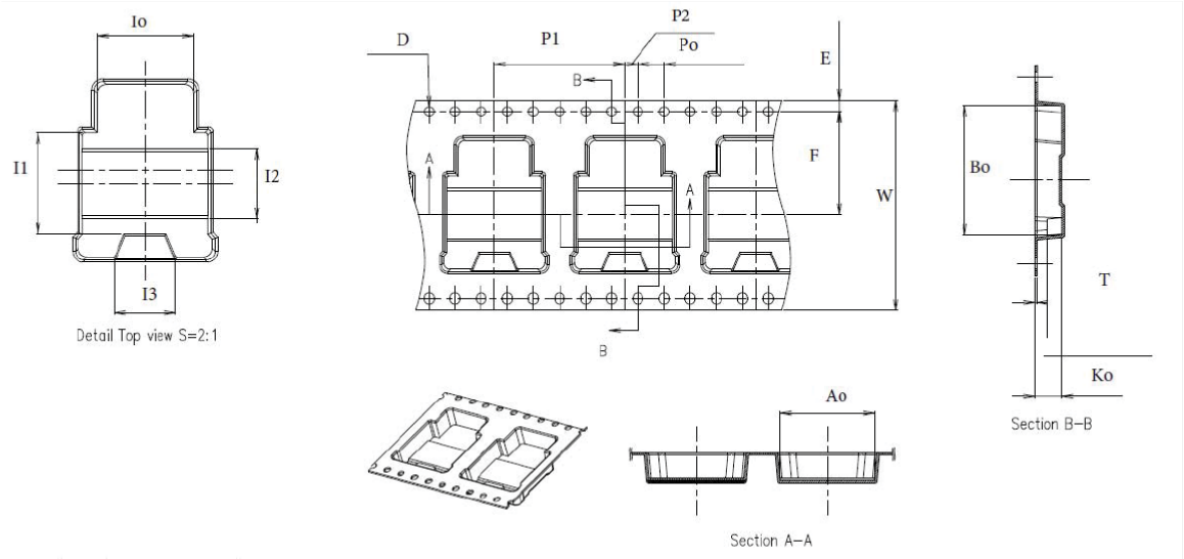


Table 5. **HU^{3}PAK tape and reel mechanical data**

Tape	
Dim.	mm
	Value
A0	14.40 ±0.1
B0	19.70
D	1.50 ±0.1
E	1.75 ±0.1
F	15.65 ±0.1
I0	11.00
I1	11.60 ±0.1
I2	8.0
I3	7.0
K0	4.20
P0	4.00 ±0.1
P1	20.00 ±0.1
P2	2.00 ±0.1
T	0.40 ±0.5
W	32.00 ±0.3

3 Ordering information

Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN3050HP-12L2Y	TN3050HP12Y	HU^{3}PAK	2.32 g	600	Tape and reel

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
07-Apr-2020	1	Initial release.
15-Jul-2022	2	Updated Section Description.