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STGP7NC60H

N-channel PowerMESH™ 600 V, 14 A very fast IGBT

Datasheet - obsolete product

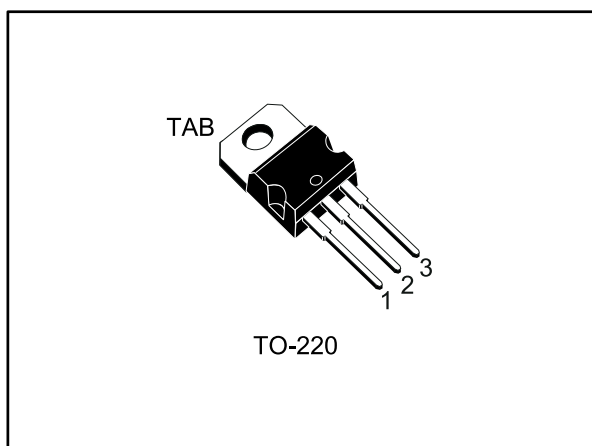
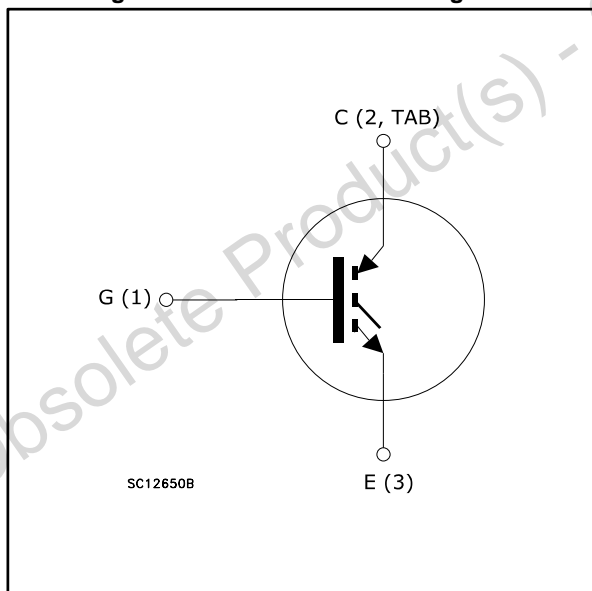


Figure 1: Internal schematic diagram



Features

Order code	V _{CEs}	V _{CE(sat)} max @ 25°C	I _c @ 100°C
STGP7NC60H	600 V	< 2.5 V	14 A

- Low on-voltage drop (V_{CE(sat)})
- High frequency operation up to 70 kHz

Applications

- High frequency inverters
- SMPS and PFC in both hard switch and resonant topologies
- Motor drivers

Description

This device is a very fast IGBT developed using advanced PowerMESH™ technology. This process guarantees an excellent trade-off between switching performance and low on-state behavior. This device is well-suited for resonant or soft-switching applications.

Table 1: Device summary

Order code	Marking	Package	Packing
STGP7NC60H	GP7NC60H	TO-220	Tube

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Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CES}	Collector-emitter voltage (V _{GE} = 0)	600	V
V _{GE}	Gate-emitter voltage	±20	V
I _C	Continuous collector current at T _C = 25 °C ⁽¹⁾	25	A
	Continuous collector current at T _C = 100 °C ⁽¹⁾	14	A
I _{CM} ⁽²⁾	Collector current (pulsed)	50	A
P _{TOT}	Continuous forward current at T _C = 25 °C	80	W
T _{stg}	Storage temperature range	- 55 to 150	°C
T _J	Operating junction temperature range		

Notes:

⁽¹⁾Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_{J(max)}) \times I_C(T_C)}$$

⁽²⁾Pulse width limited by maximum junction temperature.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R _{thj-case}	Thermal resistance junction-case max	1.56	°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5	°C/W

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2 Electrical characteristics

T_C = 25 °C unless otherwise specified

Table 4: Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)CES}	Collector-emitter breakdown voltage	V _{GE} = 0 V, I _C = 1 mA	600			V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15 V, I _C = 7 A		1.85	2.5	V
		V _{GE} = 15 V, I _C = 7 A, T _J = 125 °C		1.7		
V _{GE(th)}	Gate threshold voltage	V _{CE} = V _{GE} , I _C = 250 μA	3.75		5.75	V
I _{CES}	Collector cut-off current	V _{GE} = 0 V, V _{CE} = 600 V			10	μA
		V _{GE} = 0 V, V _{CE} = 600 V, T _C = 125 °C ⁽¹⁾			1	mA
I _{GES}	Gate-emitter leakage current	V _{CE} = 0 V, V _{GE} = ±20 V			±100	nA

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} ⁽¹⁾	Forward transconductance	V _{CE} = 15 V, I _C = 7 A		4.30		S
C _{ies}	Input capacitance	V _{CE} = 25 V, f = 1 MHz, V _{GE} = 0 V		720		pF
C _{oes}	Output capacitance			81		pF
C _{res}	Reverse transfer capacitance			17		pF
Q _g	Total gate charge	V _{CE} = 390 V, I _C = 7 A, V _{GE} = 15 V (see Figure 18: "Gate charge test circuit")		35	48	nC
Q _{ge}	Gate-emitter charge			7		
Q _{gc}	Gate-collector charge			16		
I _{CL}	Turn-off SOA minimum current	V _{clamp} = 480 V, T _J = 150 °C, R _G = 10 Ω, V _{GE} = 15 V	50			A

Notes:

⁽¹⁾Pulsed: Pulse duration= 300 μs, duty cycle 1.5%

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Table 6: IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$, $I_C = 7\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$ (see Figure 16: "Ic vs frequency" and Figure 17: "Test circuit for inductive load switching")	-	18.5		ns
$t_{r(on)}$	Turn-on rise time		-	8.5		ns
$di/dt_{(on)}$	Turn-on current slope		-	1060		A/ μ s
$t_{r(off)}$	Turn-off rise time		-	27		ns
$t_{d(off)}$	Turn-off delay time		-	72		ns
t_f	Fall time		-	60		ns
$E_{on}^{(1)}$	Turn-on switching energy		-	95	125	μ J
$E_{off}^{(2)}$	Turn-off switching energy		-	115	150	μ J
E_{ts}	Total switching energy		-	210	275	μ J
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 390\text{ V}$, $I_C = 7\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$ $T_J = 125\text{ }^\circ\text{C}$ (see Figure 17: "Test circuit for inductive load switching")	-	18.5		ns
$t_{r(on)}$	Turn-on rise time		-	7		ns
$di/dt_{(on)}$	Turn-on current slope		-	1000		A/ μ s
$t_{r(off)}$	Turn-off rise time		-	56		ns
$t_{d(off)}$	Turn-off delay time		-	116		ns
t_f	Fall time		-	105		ns
$E_{on}^{(1)}$	Turn-on switching energy		-	140		μ J
$E_{off}^{(2)}$	Turn-off switching energy		-	215		μ J
E_{ts}	Total switching energy		-	355		μ J

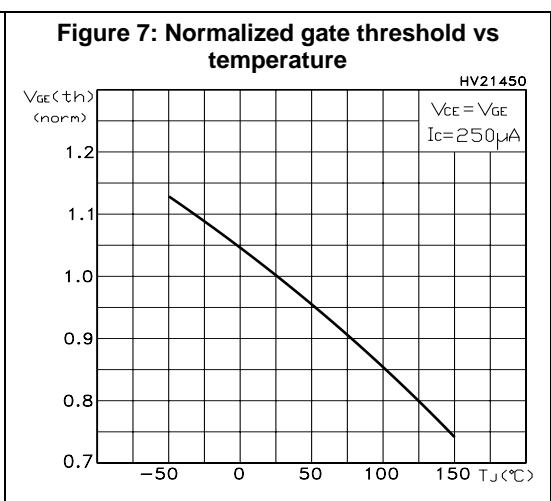
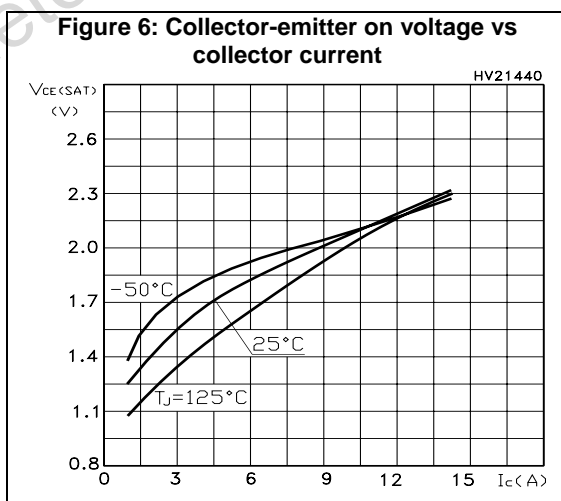
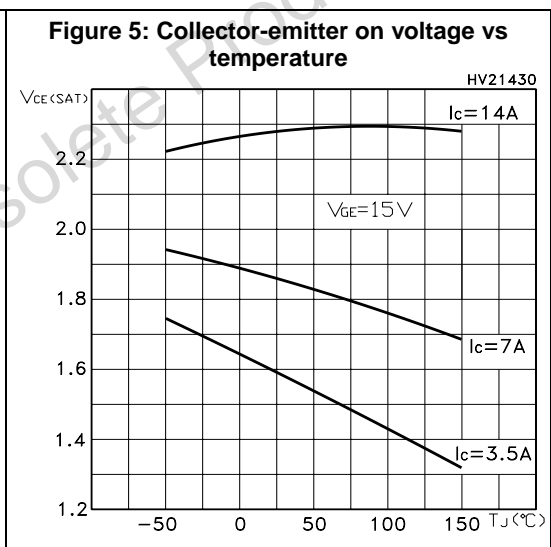
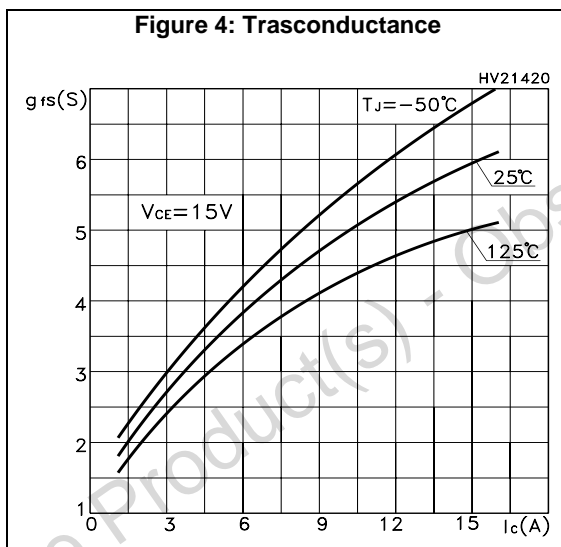
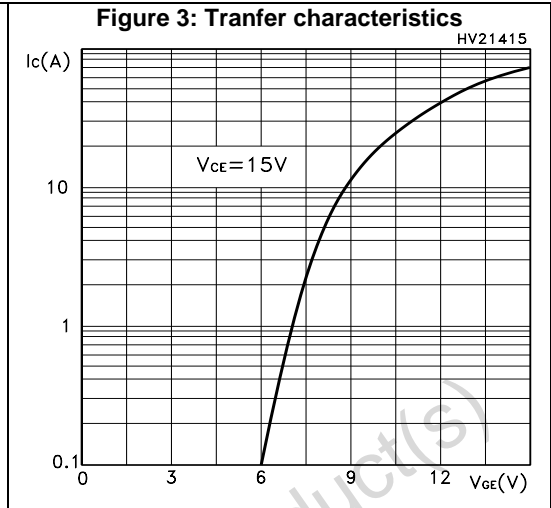
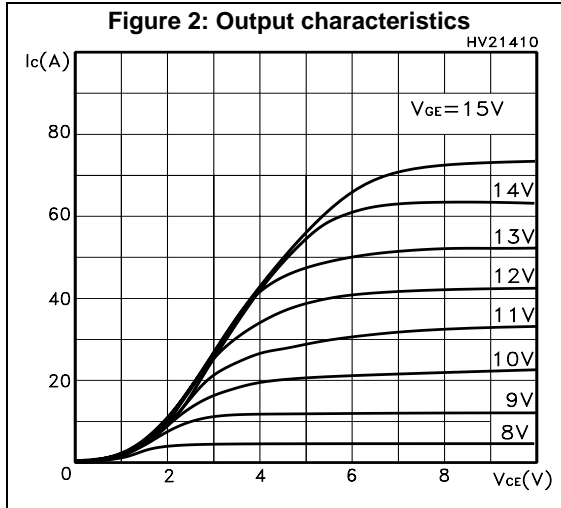
Notes:

- (1)Including the reverse recovery of the diode.
- (2)Including the tail of the collector current.

Electrical characteristics

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2.2 Electrical characteristics (curves)



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Electrical characteristics

Figure 8: Normalized breakdown voltage vs temperature

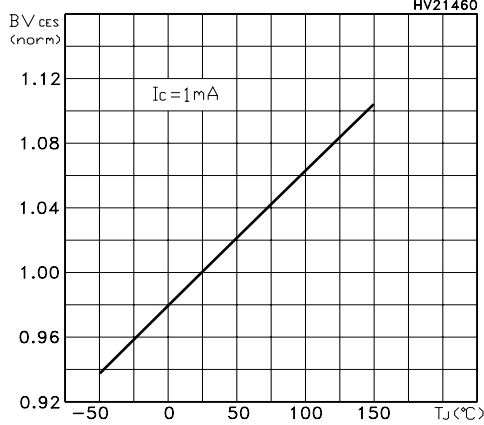


Figure 9: Gate charge vs gate-emitter voltage

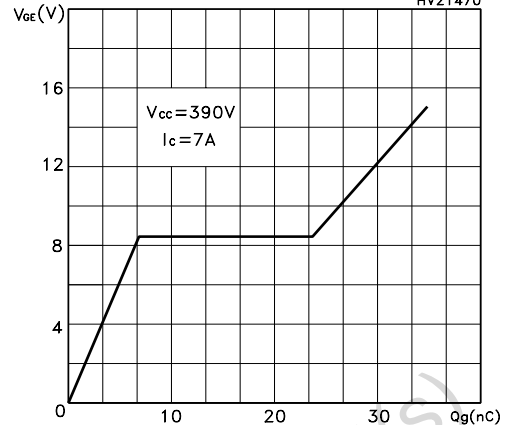


Figure 10: Capacitance variations

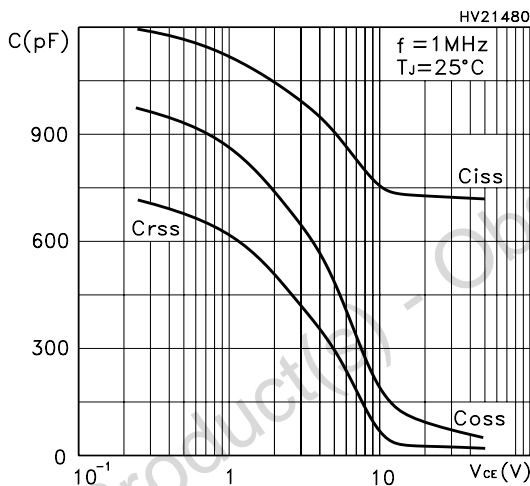


Figure 11: Total switching energy vs temperature

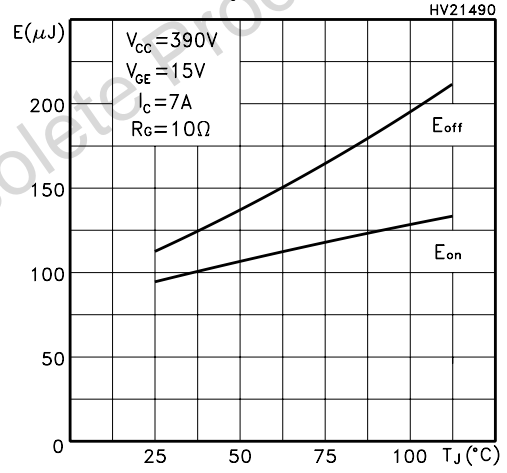


Figure 12: Total switching energy vs gate resistance

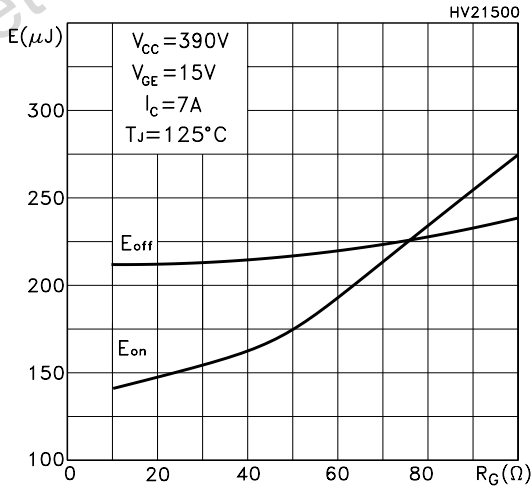
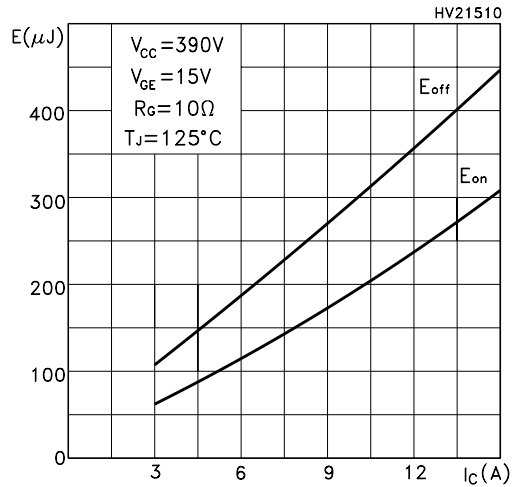
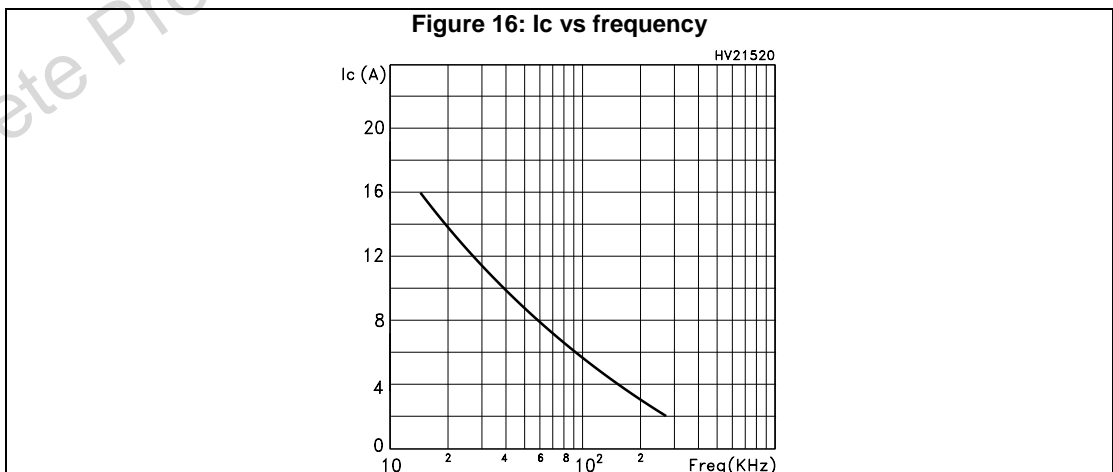
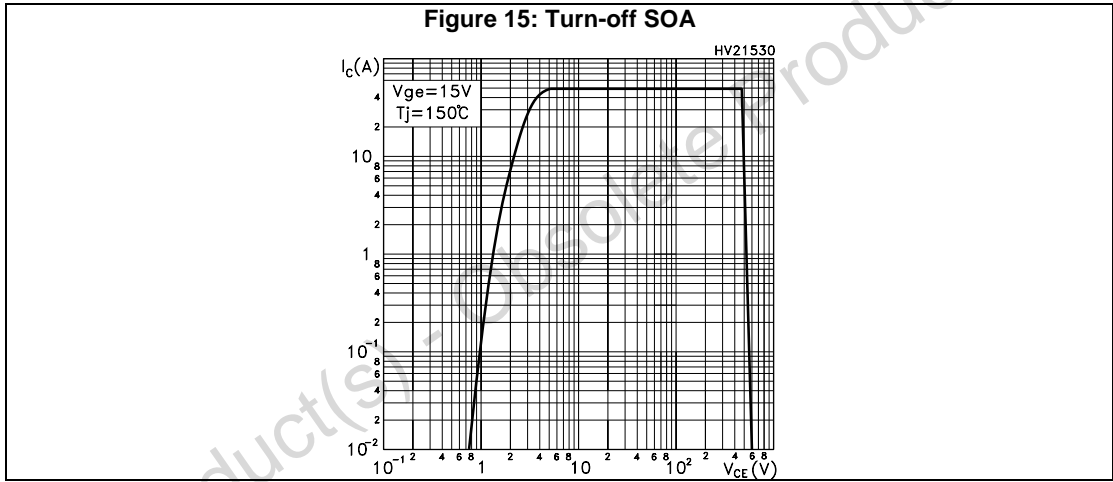
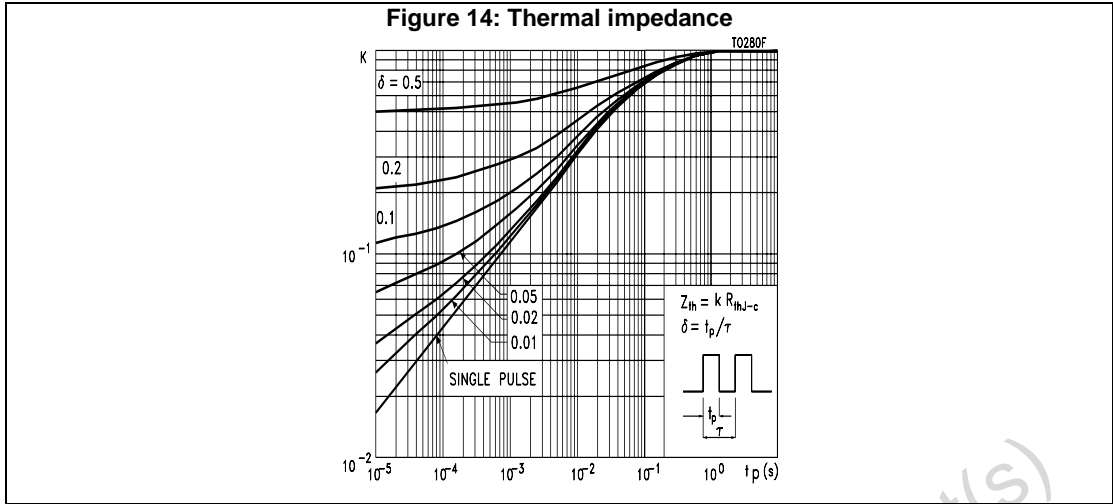


Figure 13: Total switching energy vs collector current

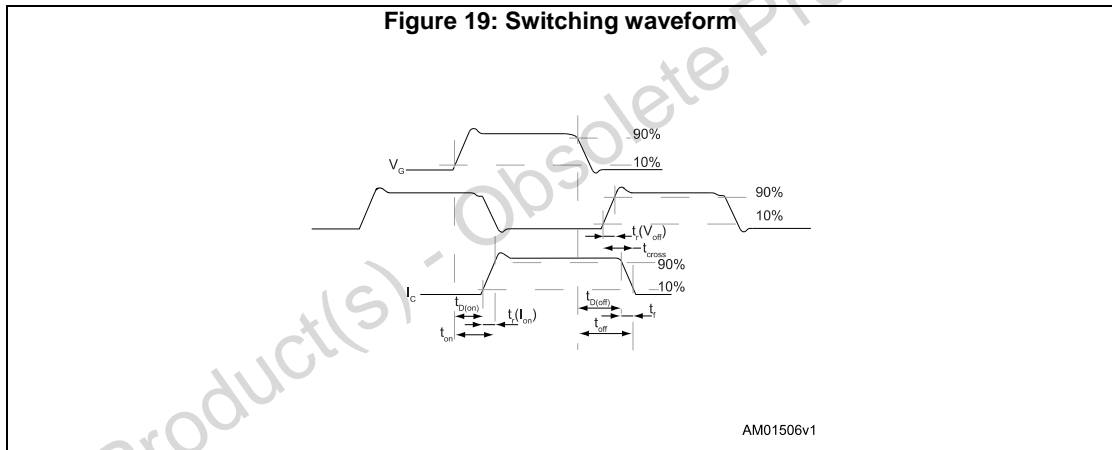
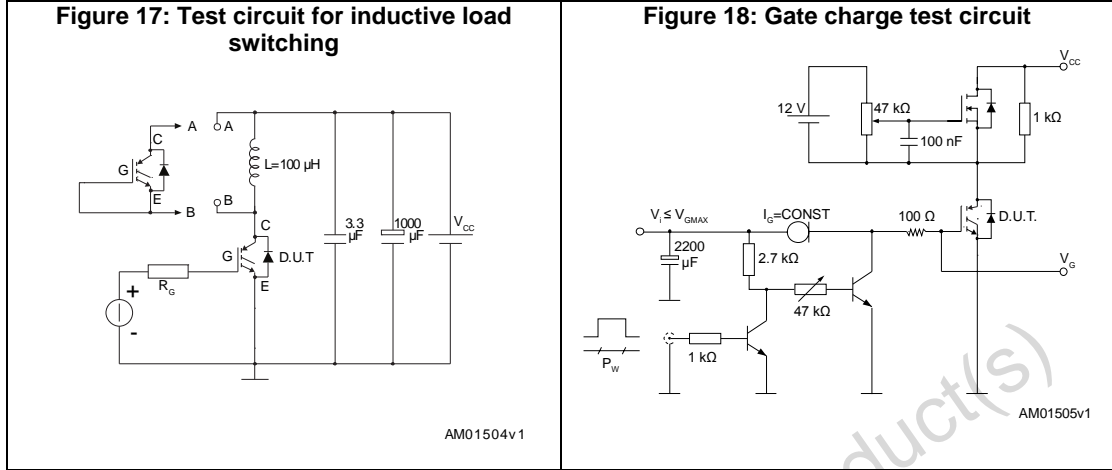


Electrical characteristics

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3 Test circuits



Obsolete Product(s) - Obsolete Product(s)

4 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.

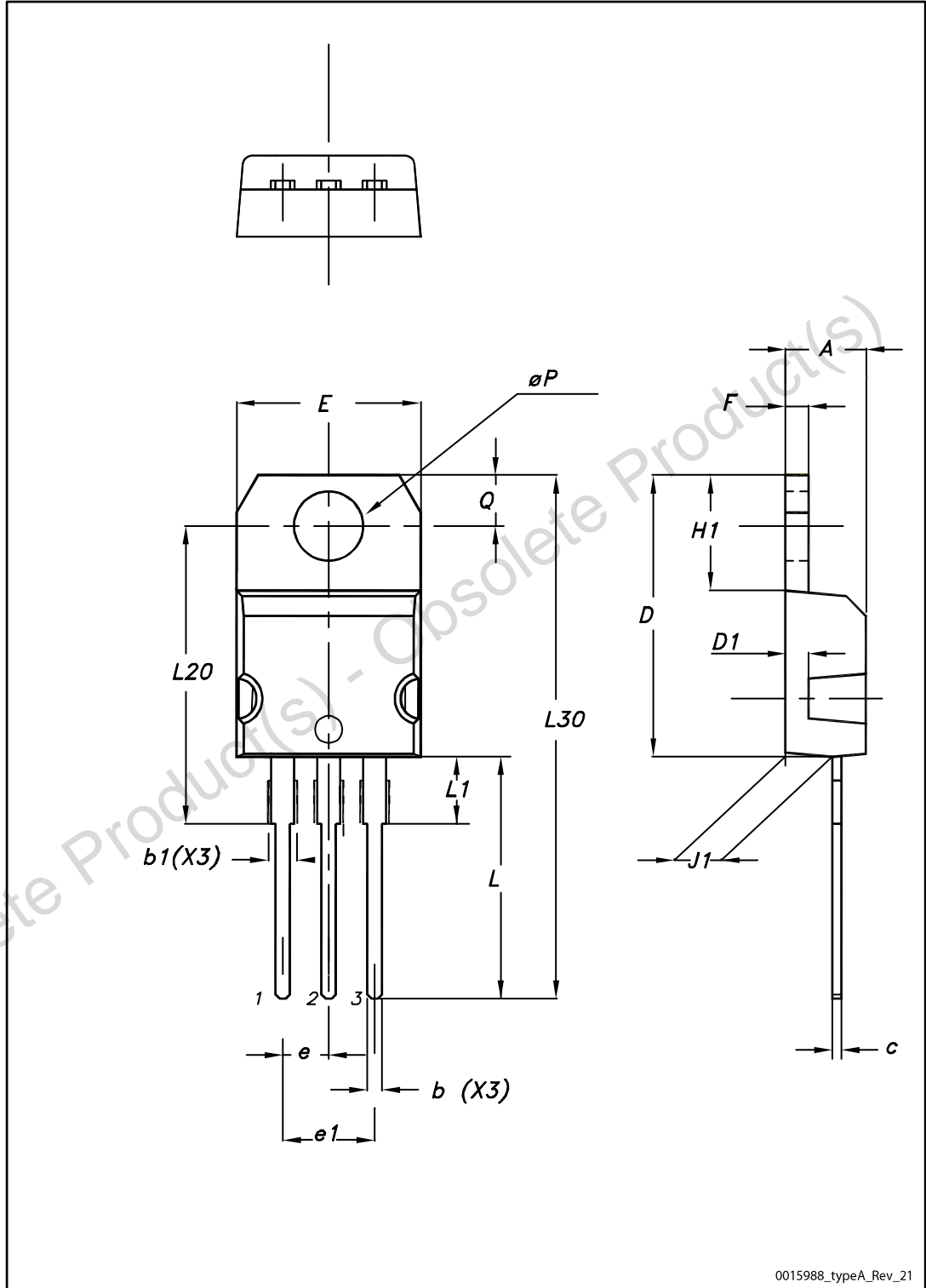
Obsolete Product(s) - Obsolete Product(s)

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Package information

4.1 TO-220 type A package information

Figure 20: TO-220 type A package outline



0015988_typeA_Rev_21

Package information

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Table 7: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

5 Revision history

Table 8: Document revision history

Date	Revision	Changes
20-Aug-2004	1	New datasheet.
09-Jun-2005	2	Modified title
04-Jul-2016	3	<p>The part number STGD7NC60HT4 has been moved to a separate datasheet.</p> <p>Modified: title, features and description.</p> <p>Modified: <i>Table 2: "Absolute maximum ratings"</i>, <i>Table 3: "Thermal data"</i>, <i>Table 4: "Static characteristics"</i>, <i>Table 5: "Dynamic characteristics"</i> and <i>Table 6: "IGBT switching characteristics (inductive load)"</i></p> <p>Updated: <i>Section 5.1: "TO-220 type A package information"</i>.</p> <p>Minor text changes.</p>

Obsolete Product(s) - Obsolete Product(s)

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