

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

Datasheet - obsolete product

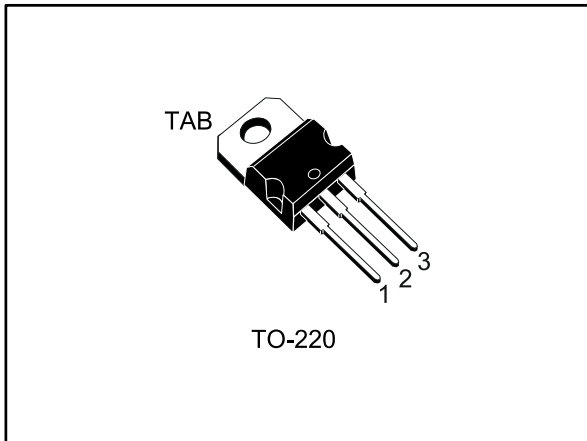
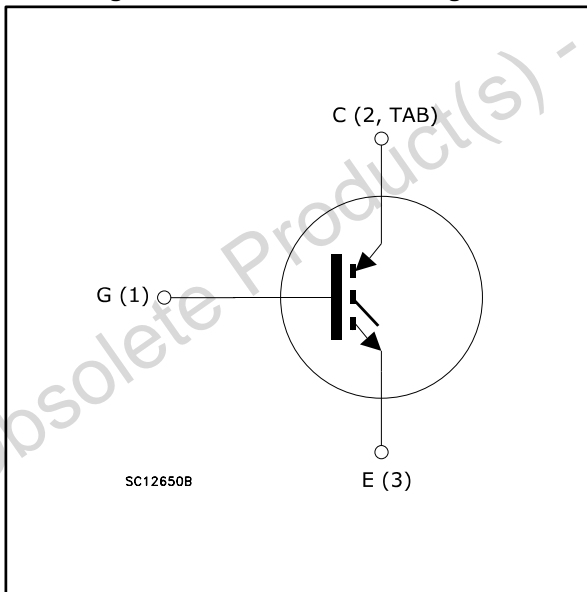


Figure 1: Internal schematic diagram



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

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves).....	6
3	Test circuits	9
4	Package information	10
	4.1 TO-220 type A package information.....	11
5	Revision history	13

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

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified

Table 4: Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 7\text{ A}$		1.85	2.5	V
		$V_{GE} = 15\text{ V}$, $I_C = 7\text{ A}$, $T_J = 125\text{ °C}$		1.7		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$	3.75		5.75	V
I_{CES}	Collector cut-off current	$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$			10	μA
		$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			1	mA
I_{GES}	Gate-emitter leakage current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$			± 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	$V_{CE} = 15\text{ V}$, $I_C = 7\text{ A}$		4.30		S
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$		720		pF
C_{oes}	Output capacitance			81		pF
C_{res}	Reverse transfer capacitance			17		pF
Q_g	Total gate charge		$V_{CE} = 390\text{ V}$, $I_C = 7\text{ A}$, $V_{GE} = 15\text{ V}$ (see Figure 18: "Gate charge test circuit")		35	48
Q_{ge}	Gate-emitter charge			7		
Q_{gc}	Gate-collector charge			16		
I_{CL}	Turn-off SOA minimum current	$V_{clamp} = 480\text{ V}$, $T_J = 150\text{ °C}$, $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$	50			A

Notes:

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

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	
$t_{r(on)}$	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.

2.2 Electrical characteristics (curves)

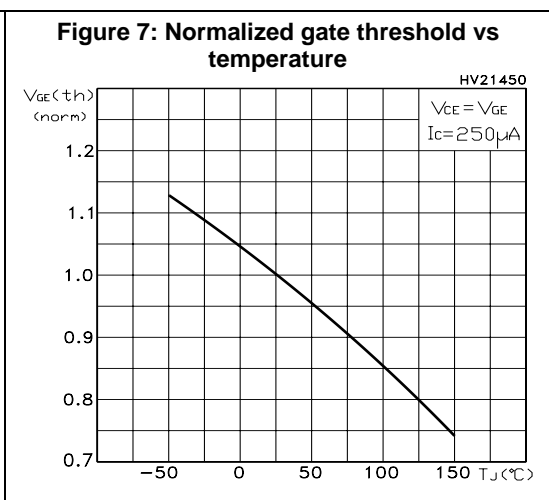
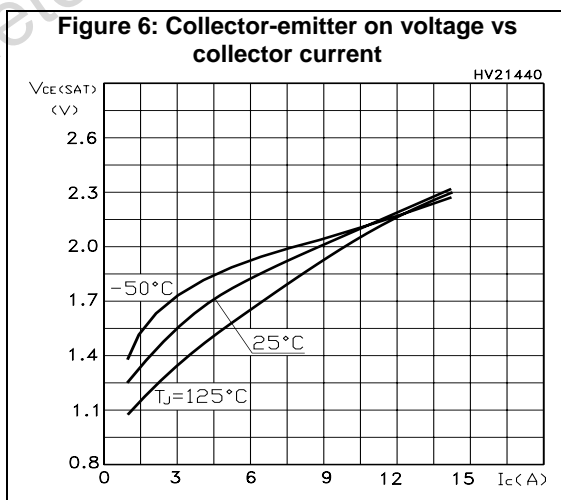
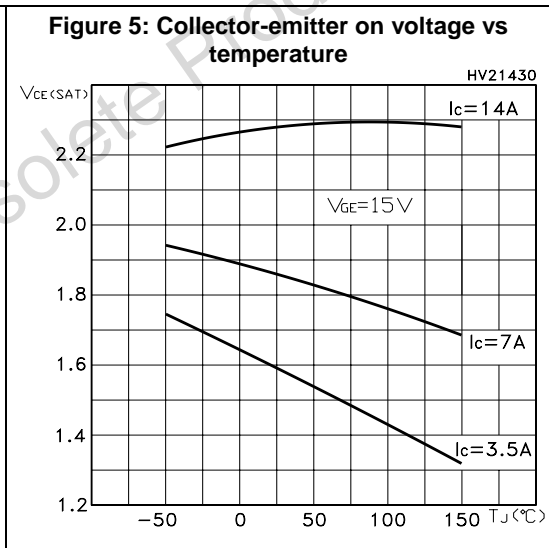
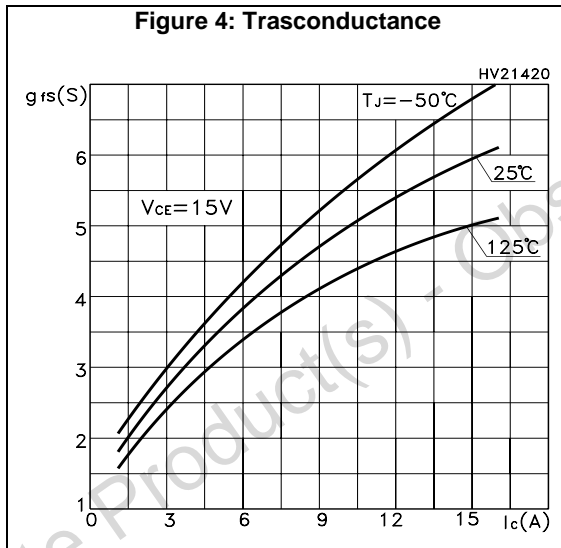
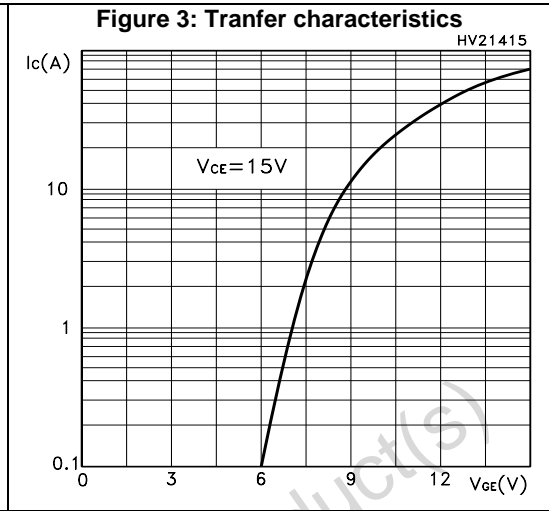
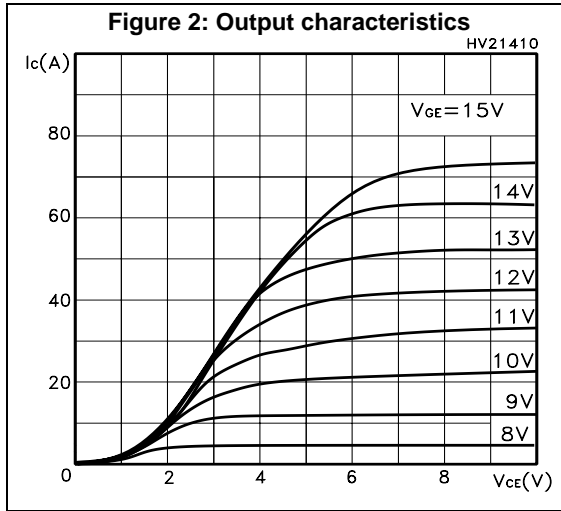


Figure 8: Normalized breakdown voltage vs temperature

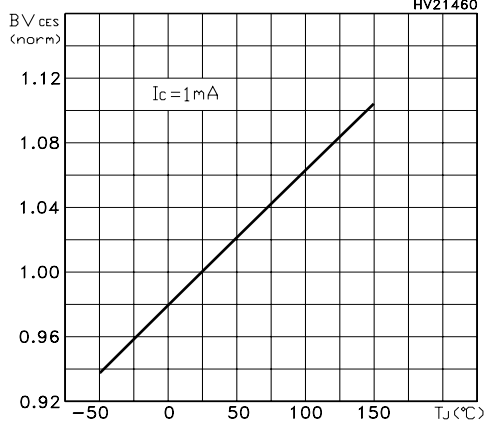


Figure 9: Gate charge vs gate-emitter voltage

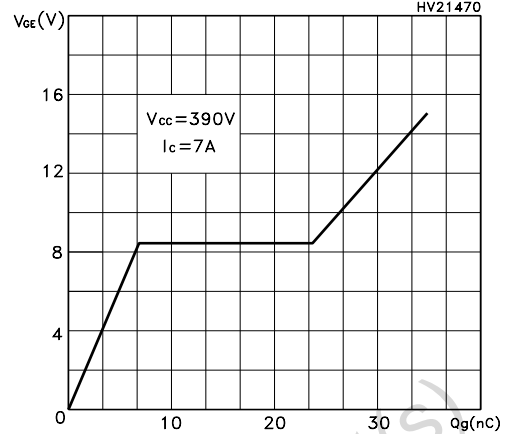


Figure 10: Capacitance variations

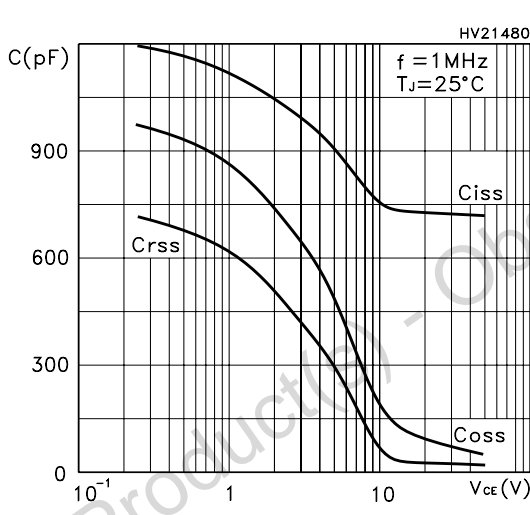


Figure 11: Total switching energy vs temperature

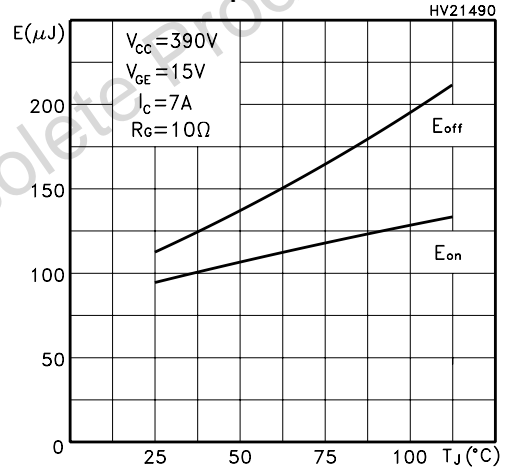


Figure 12: Total switching energy vs gate resistance

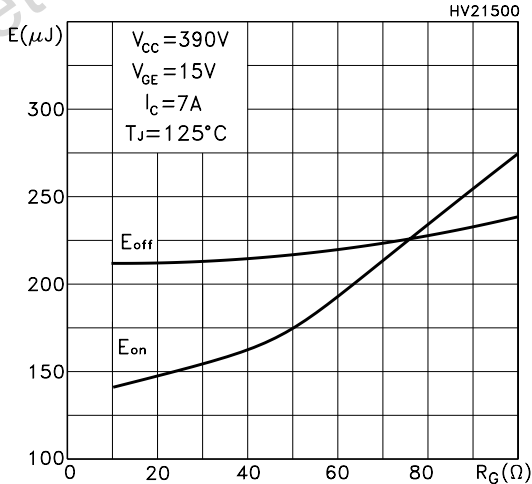
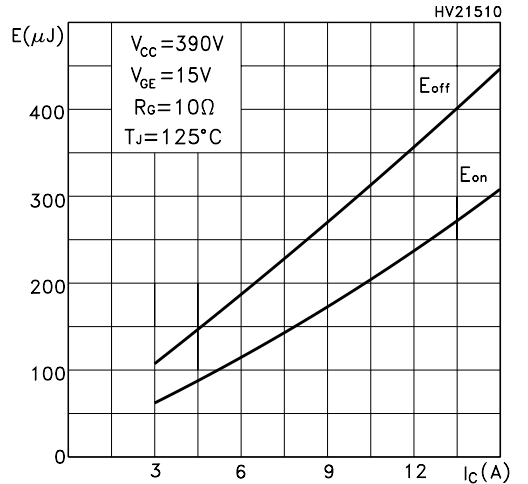
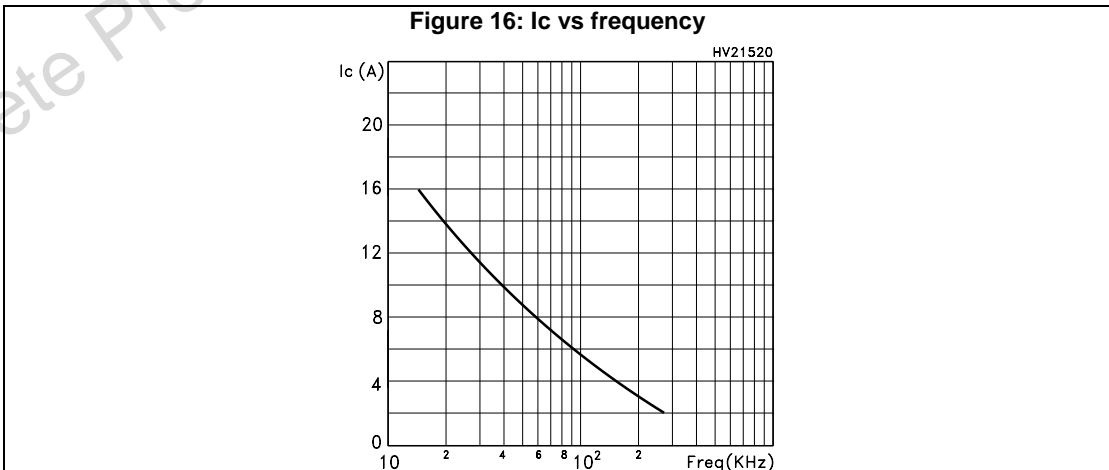
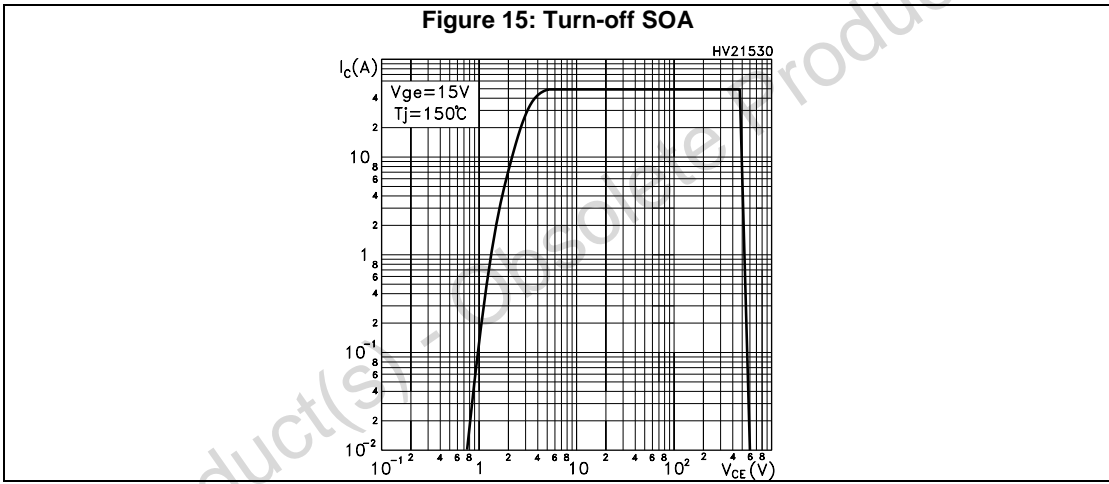
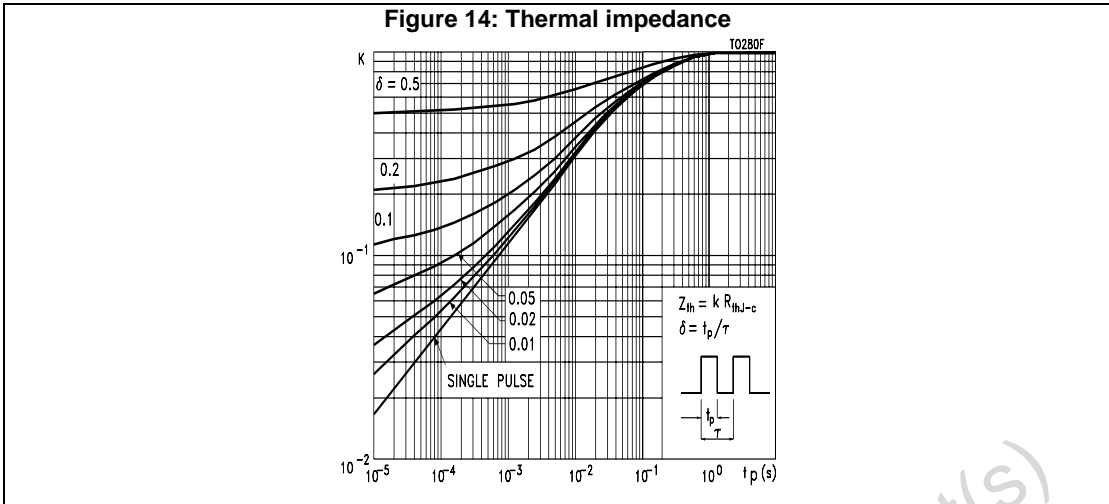
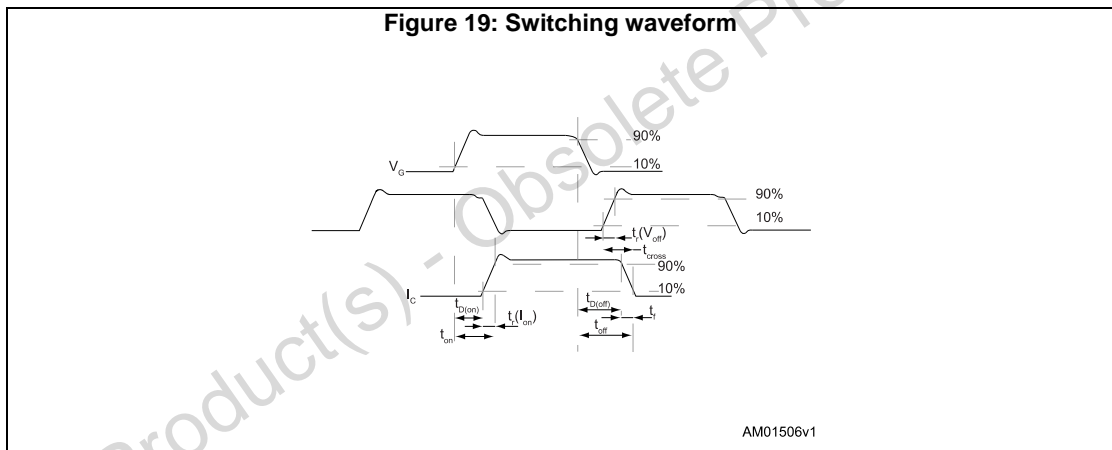
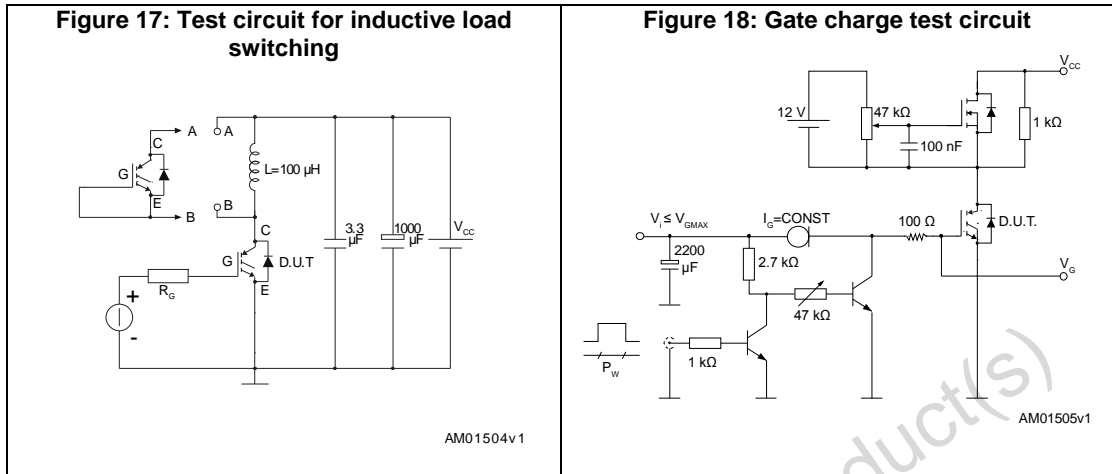


Figure 13: Total switching energy vs collector current





3 Test circuits



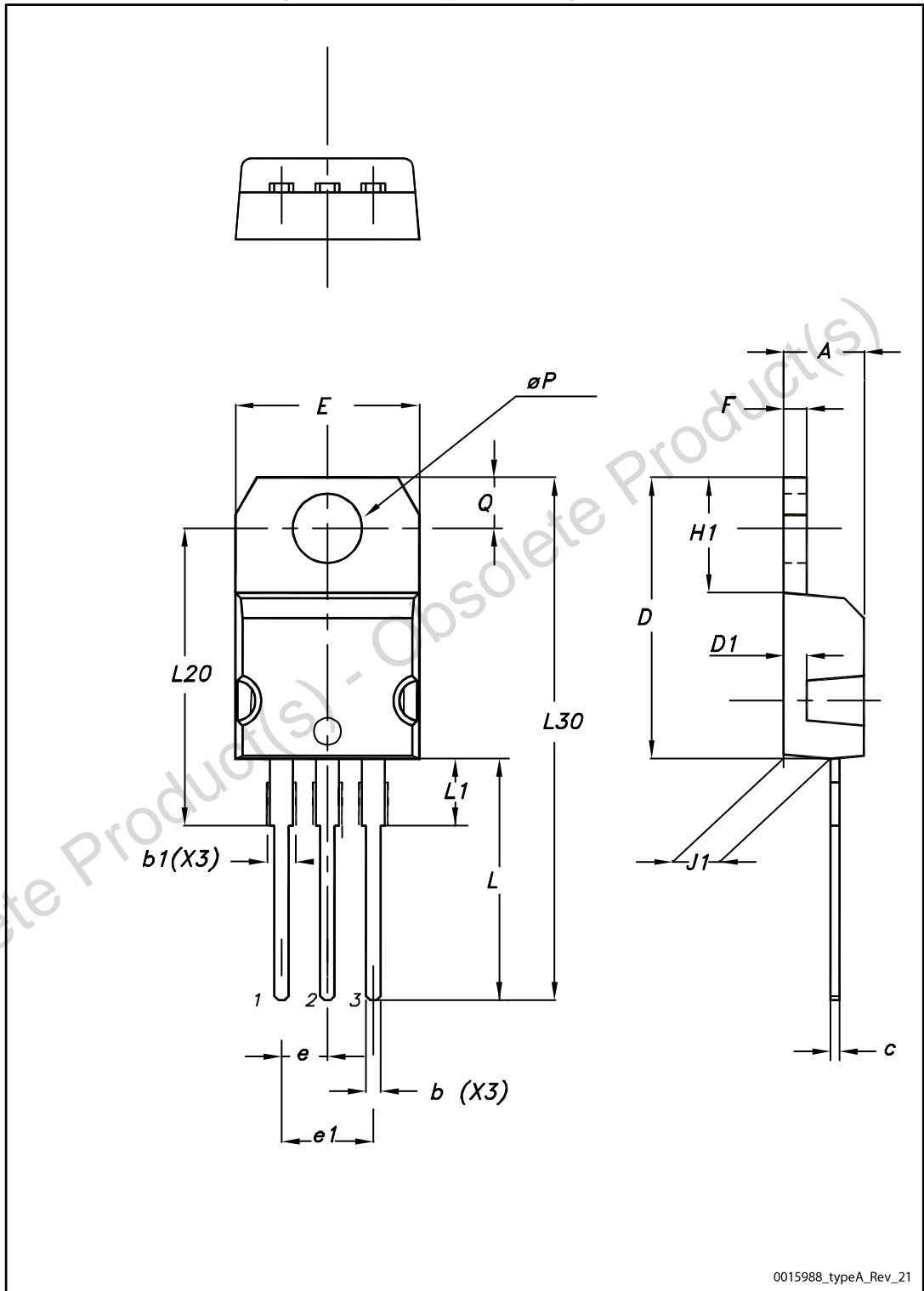
4 Package information

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)

4.1 TO-220 type A package information

Figure 20: TO-220 type A package outline



0015988_typeA_Rev_21

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 (inductive load)"</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>

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved