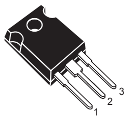
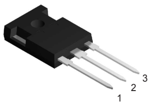
STGW30H60DFB, STGWA30H60DFB, STGWT30H60DFB

Datasheet

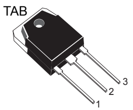
Trench gate field-stop 600 V, 30 A high speed HB series IGBT



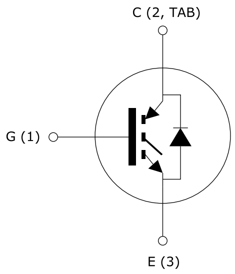
TO-247



TO-247 long leads



TO-3P



Features

- Maximum junction temperature: T_J = 175 °C
- High speed switching series
- Minimized tail current
- Low saturation voltage: $V_{CE(sat)}$ = 1.55 V (typ.) @ I_C = 30 A
- Tight parameter distribution
- Safe paralleling
- Positive $V_{CE(sat)}$ temperature coefficient
- Low thermal resistance
- Very fast soft recovery antiparallel diode

Applications

- Photovoltaic inverters
- High frequency converters

Description

These devices are IGBTs developed using an advanced proprietary trench gate field-stop structure. These devices are part of the new HB series of IGBTs, which represent an optimum compromise between conduction and switching loss to maximize the efficiency of any frequency converter. Furthermore, the slightly positive $V_{CE(sat)}$ temperature coefficient and very tight parameter distribution result in safer paralleling operation.

Product status link
STGW30H60DFB
STGWA30H60DFB
STGWT30H60DFB

1 Electrical ratings

Table 1. **Absolute maximum ratings**

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0 V)	600	V
I_C	Continuous collector current at T_C = 25 °C	60	A
	Continuous collector current at T_C = 100 °C	30	
I_{CP} (1)	Pulsed collector current	120	
V_{GE}	Gate-emitter voltage	±20	V
	Transient gate-emitter voltage	±30	
I_F	Continuous forward current at T_C = 25 °C	60	A
	Continuous forward current at T_C = 100 °C	30	
I_{FP} (1)	Pulsed forward current	120	
P_{TOT}	Total power dissipation at T_C = 25 °C	260	W
T_{STG}	Storage temperature range	- 55 to 150	°C
T_J	Operating junction temperature range	- 55 to 175	

1. *Pulse width limited by maximum junction temperature.*

Table 2. **Thermal data**

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.58	°C/W
R_{thJC}	Thermal resistance junction-case diode	2.08	
R_{thJA}	Thermal resistance junction-ambient	50	

2 Electrical characteristics

T_C = 25 °C unless otherwise specified

Table 3. **Static characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	V_{GE} = 0 V, I_C = 2 mA	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A		1.55	2	V
		V_{GE} = 15 V, I_C = 30 A, T_J = 125 °C		1.65		
		V_{GE} = 15 V, I_C = 30 A, T_J = 175 °C		1.75		
V_F	Forward on-voltage	I_F = 30 A		2	2.6	V
		I_F = 30 A, T_J = 125 °C		1.7		
		I_F = 30 A, T_J = 175 °C		1.6		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA	5	6	7	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 600 V			25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ±20 V			±250	nA

Table 4. **Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE}= 25 V, f = 1 MHz, V_{GE} = 0 V	-	3659	-	pF
C_{oes}	Output capacitance		-	101	-	
C_{res}	Reverse transfer capacitance		-	76	-	
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 30 A, V_{GE} = 0 to 15 V (see Figure 28. Gate charge test circuit)	-	149	-	nC
Q_{ge}	Gate-emitter charge		-	25	-	
Q_{gc}	Gate-collector charge		-	62	-	

Table 5. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω (see Figure 27. Test circuit for inductive load switching)	-	37	-	ns
t_r	Current rise time		-	14.6	-	
$(di/dt)_{on}$	Turn-on current slope		-	1643	-	A/µs
$t_{d(off)}$	Turn-off-delay time		-	146	-	ns
t_f	Current fall time		-	23	-	
E_{on} (1)	Turn-on switching energy		-	383	-	µJ
E_{off} (2)	Turn-off switching energy		-	293	-	
E_{ts}	Total switching energy		-	676	-	
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω, T_J = 175 °C (see Figure 27. Test circuit for inductive load switching)	-	35	-	ns
t_r	Current rise time		-	16.1	-	
$(di/dt)_{on}$	Turn-on current slope		-	1496	-	A/µs
$t_{d(off)}$	Turn-off-delay time		-	158	-	ns
t_f	Current fall time		-	65	-	
E_{on} (1)	Turn-on switching energy		-	794	-	µJ
E_{off} (2)	Turn-off switching energy		-	572	-	
E_{ts}	Total switching energy		-	1366	-	

1. *Including the reverse recovery of the diode.*
2. *Including the tail of the collector current.*

Table 6. Diode switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 30 A, V_R = 400 V, V_{GE} = 15 V, di/dt = 1000 A/µs (see Figure 27. Test circuit for inductive load switching)	-	53	-	ns
Q_{rr}	Reverse recovery charge		-	384	-	nC
I_{rrm}	Reverse recovery current		-	14.5	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	788	-	A/µs
E_{rr}	Reverse recovery energy		-	104	-	µJ
t_{rr}	Reverse recovery time	I_F = 30 A, V_R = 400 V, V_{GE} = 15 V, di/dt = 1000 A/µs, T_J = 175 °C (see Figure 27. Test circuit for inductive load switching)	-	104	-	ns
Q_{rr}	Reverse recovery charge		-	1352	-	nC
I_{rrm}	Reverse recovery current		-	26	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	310	-	A/µs
E_{rr}	Reverse recovery energy		-	407	-	µJ

2.1 Electrical characteristics (curves)

Figure 1. Power dissipation vs case temperature

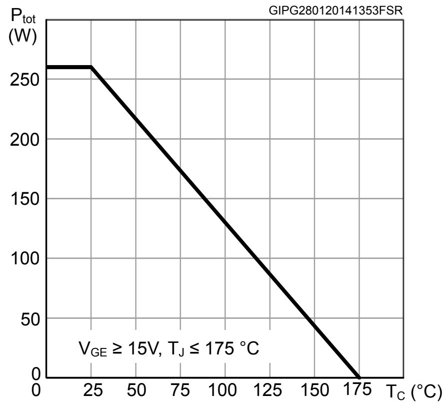


Figure 2. Collector current vs case temperature

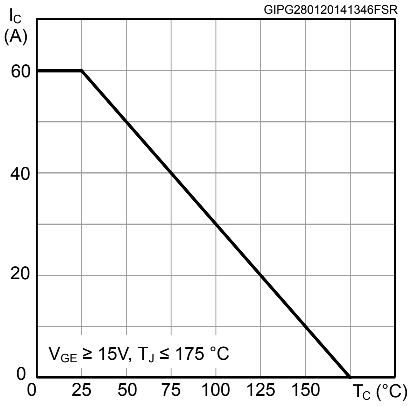


Figure 3. Output characteristics (T_J = 25 °C)

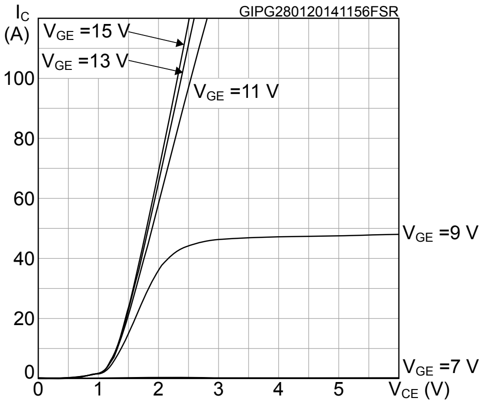


Figure 4. Output characteristics (T_J = 175 °C)

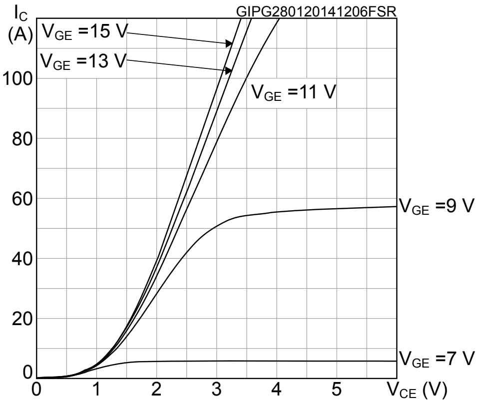


Figure 5. $V_{CE(sat)}$ vs junction temperature

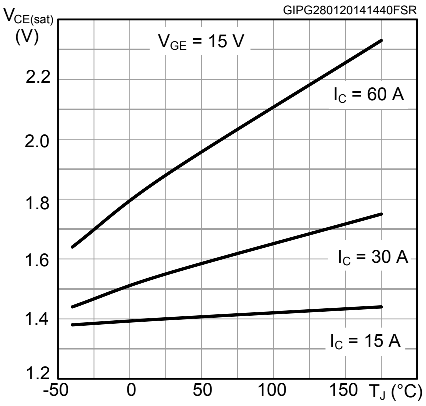


Figure 6. $V_{CE(sat)}$ vs collector current

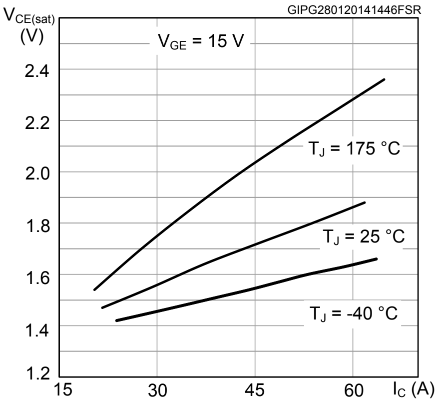


Figure 7. Collector current vs switching frequency

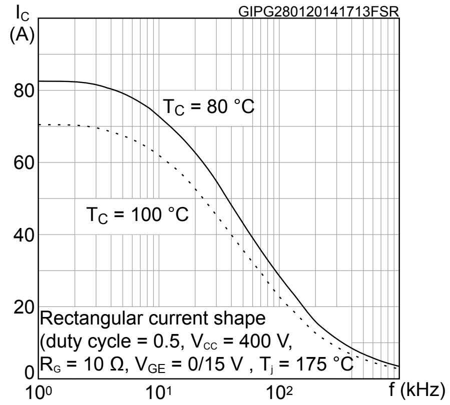


Figure 8. Forward bias safe operating area

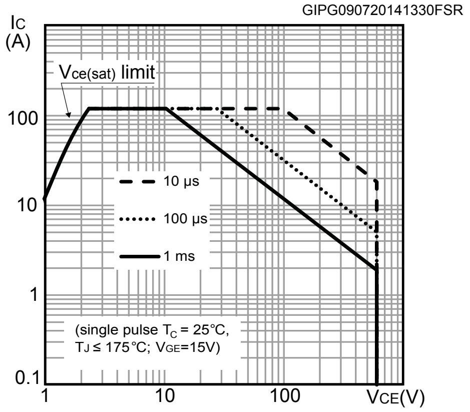


Figure 9. Transfer characteristics

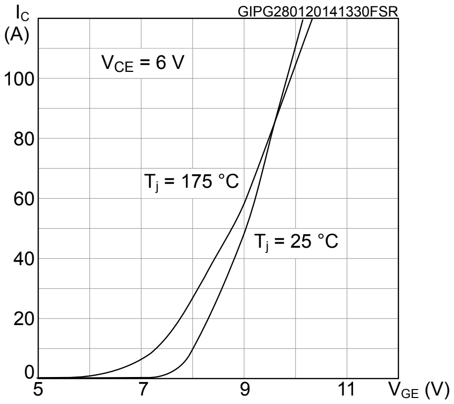


Figure 10. Diode V_F vs forward current

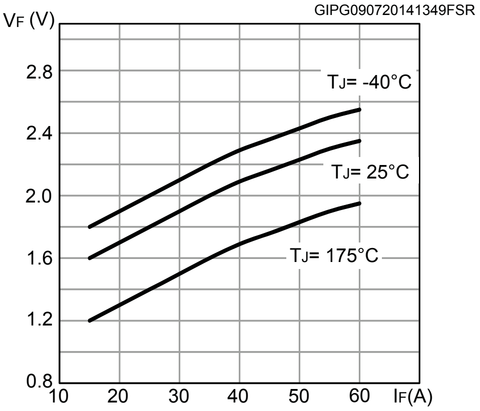


Figure 11. Normalized $V_{GE(th)}$ vs junction temperature

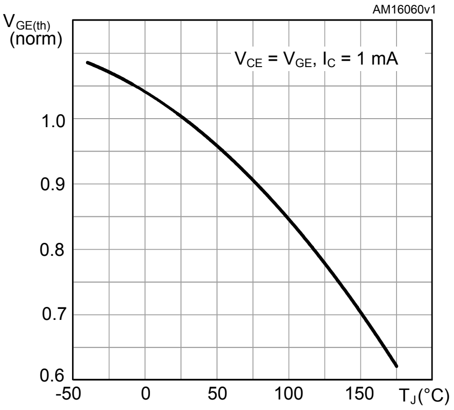


Figure 12. Normalized $V_{(BR)CES}$ vs junction temperature

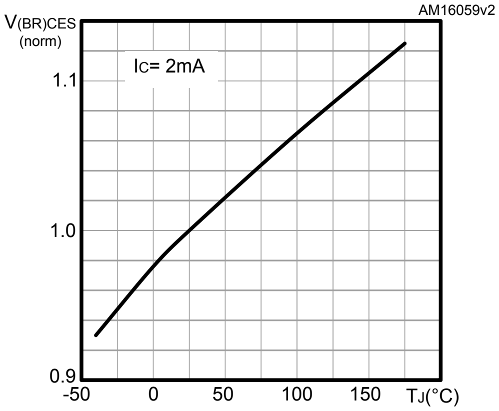


Figure 13. Capacitance variations

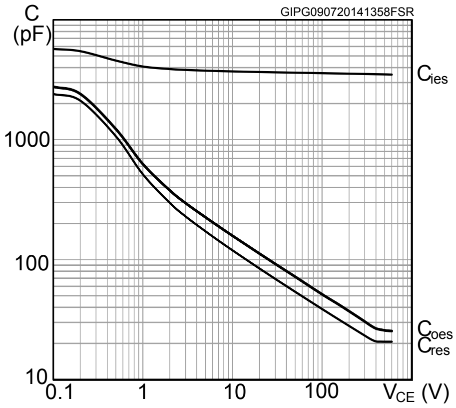


Figure 14. Gate charge vs. gate-emitter voltage

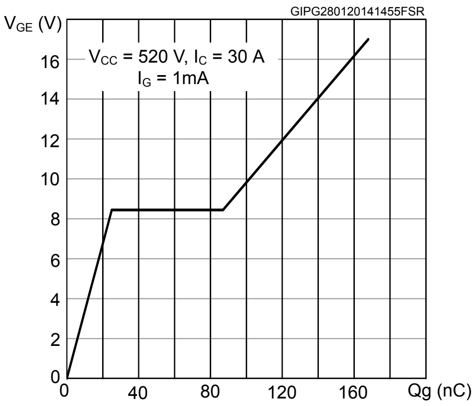


Figure 15. Switching energy vs collector current

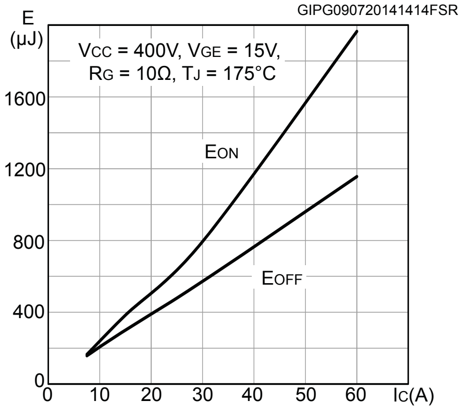


Figure 16. Switching energy vs gate resistance

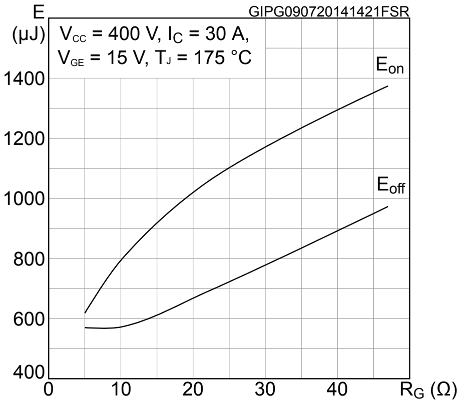


Figure 17. Switching energy vs temperature

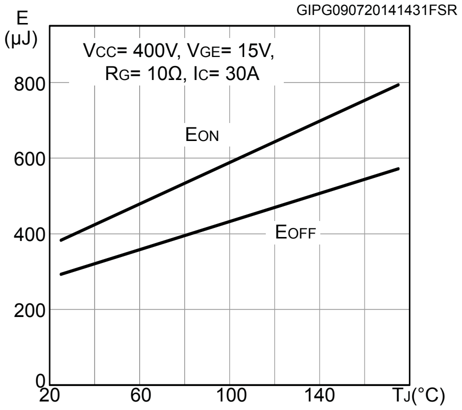


Figure 18. Switching energy vs collector emitter voltage

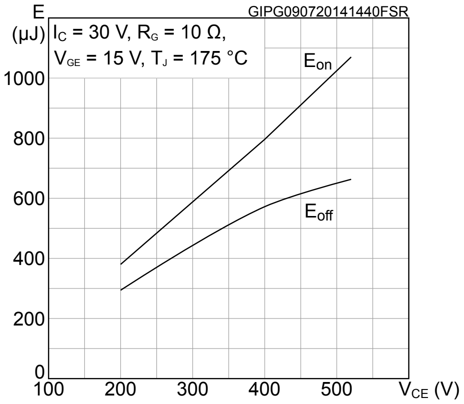


Figure 19. Switching times vs collector current

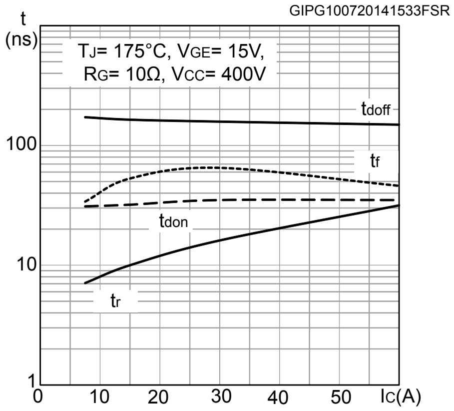


Figure 20. Switching times vs gate resistance

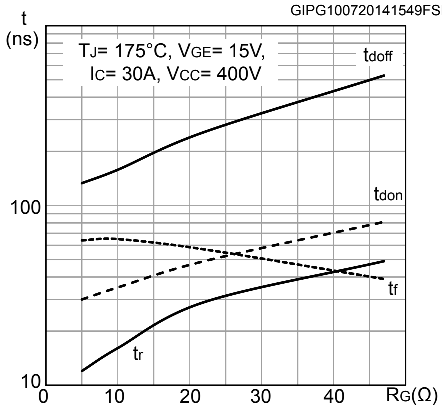


Figure 21. Reverse recovery current vs diode current slope

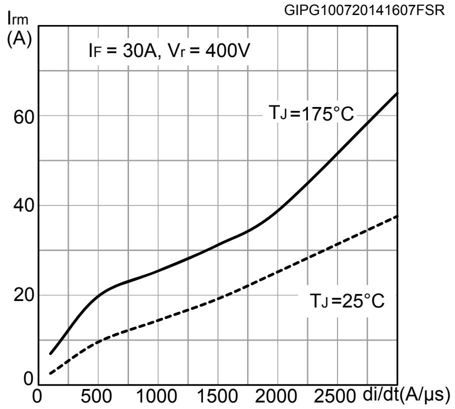


Figure 22. Reverse recovery time vs diode current slope

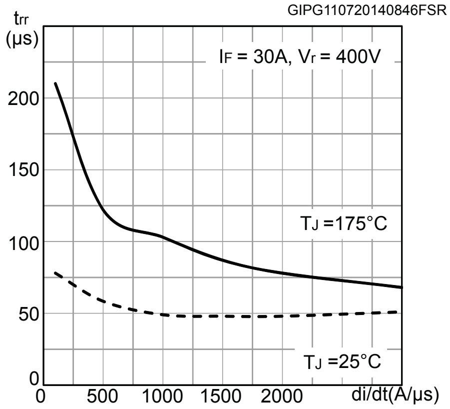


Figure 23. Reverse recovery charge vs diode current slope

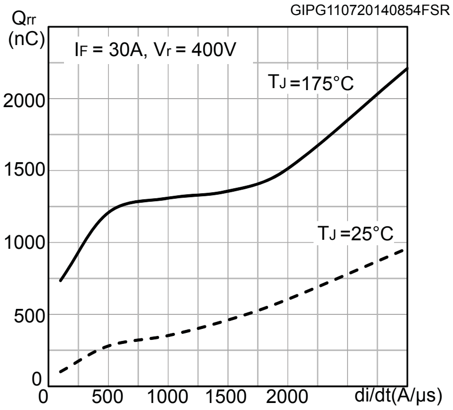


Figure 24. Reverse recovery energy vs diode current slope

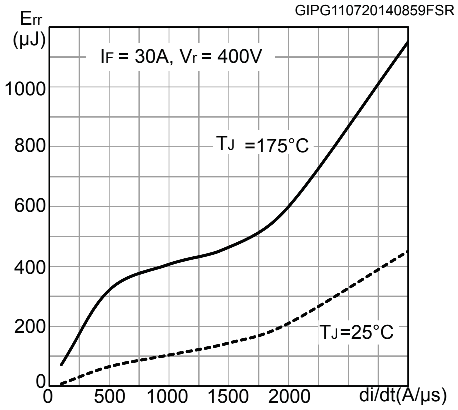


Figure 25. Thermal impedance for IGBT

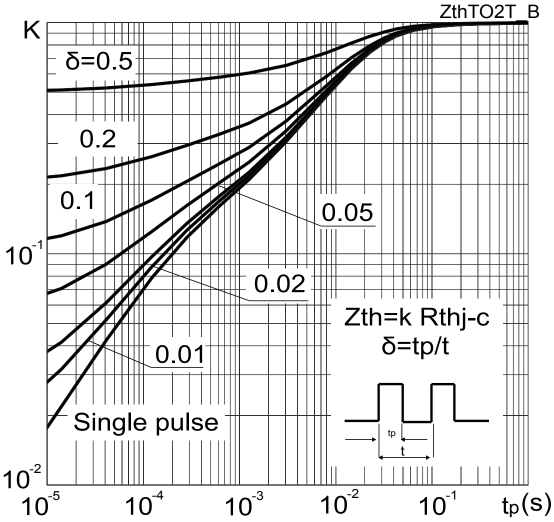
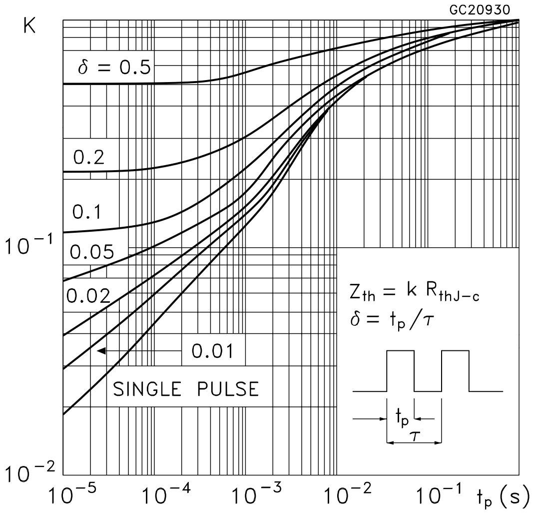


Figure 26. Thermal impedance for diode



3 Test circuits

Figure 27. Test circuit for inductive load switching

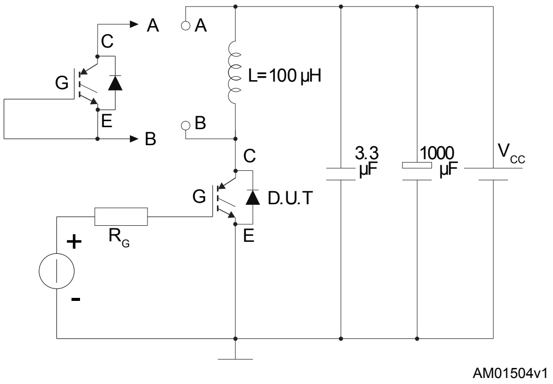


Figure 28. Gate charge test circuit

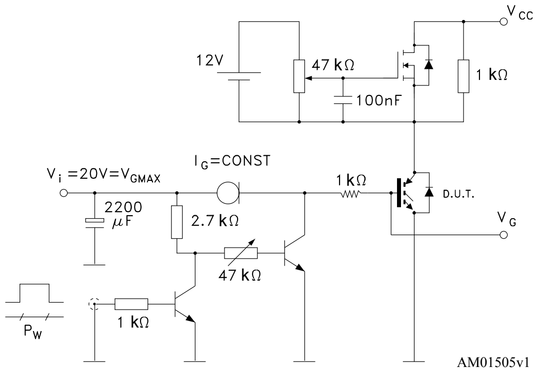


Figure 29. Switching waveform

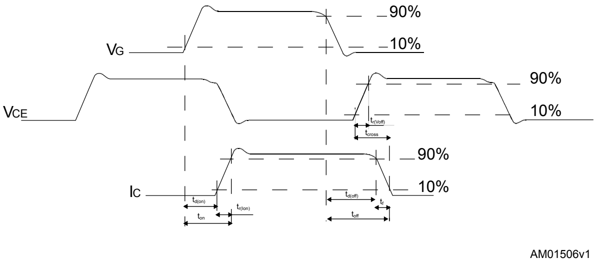
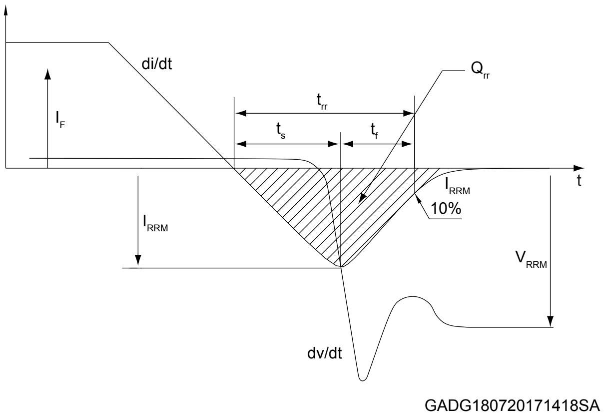


Figure 30. Diode reverse recovery waveform

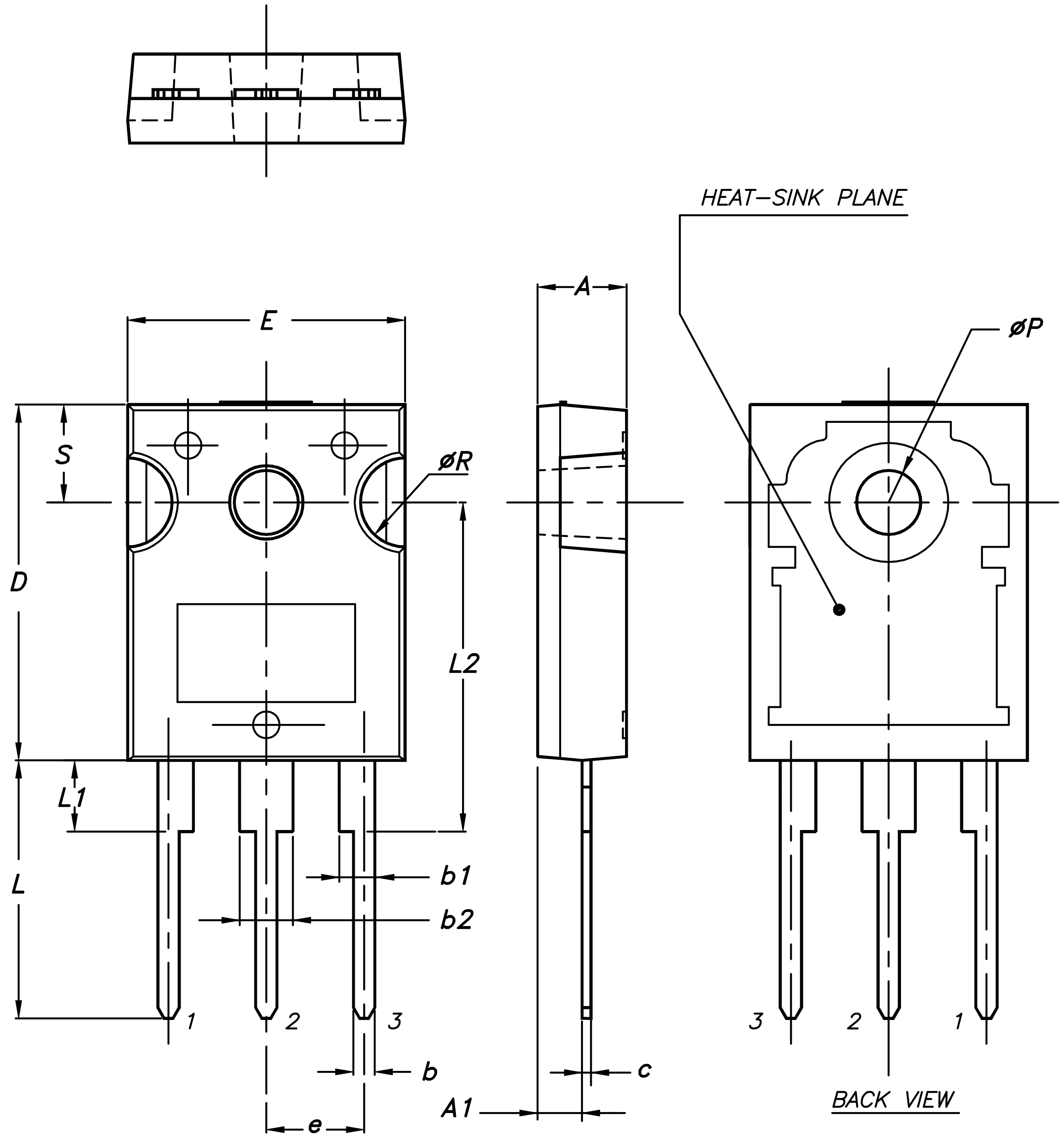


4 Package information

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.

4.1 TO-247 package information

Figure 31. TO-247 package outline



0075325_9

Table 7. **TO-247 package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

4.2 TO-247 long leads package information

Figure 32. TO-247 long leads package outline

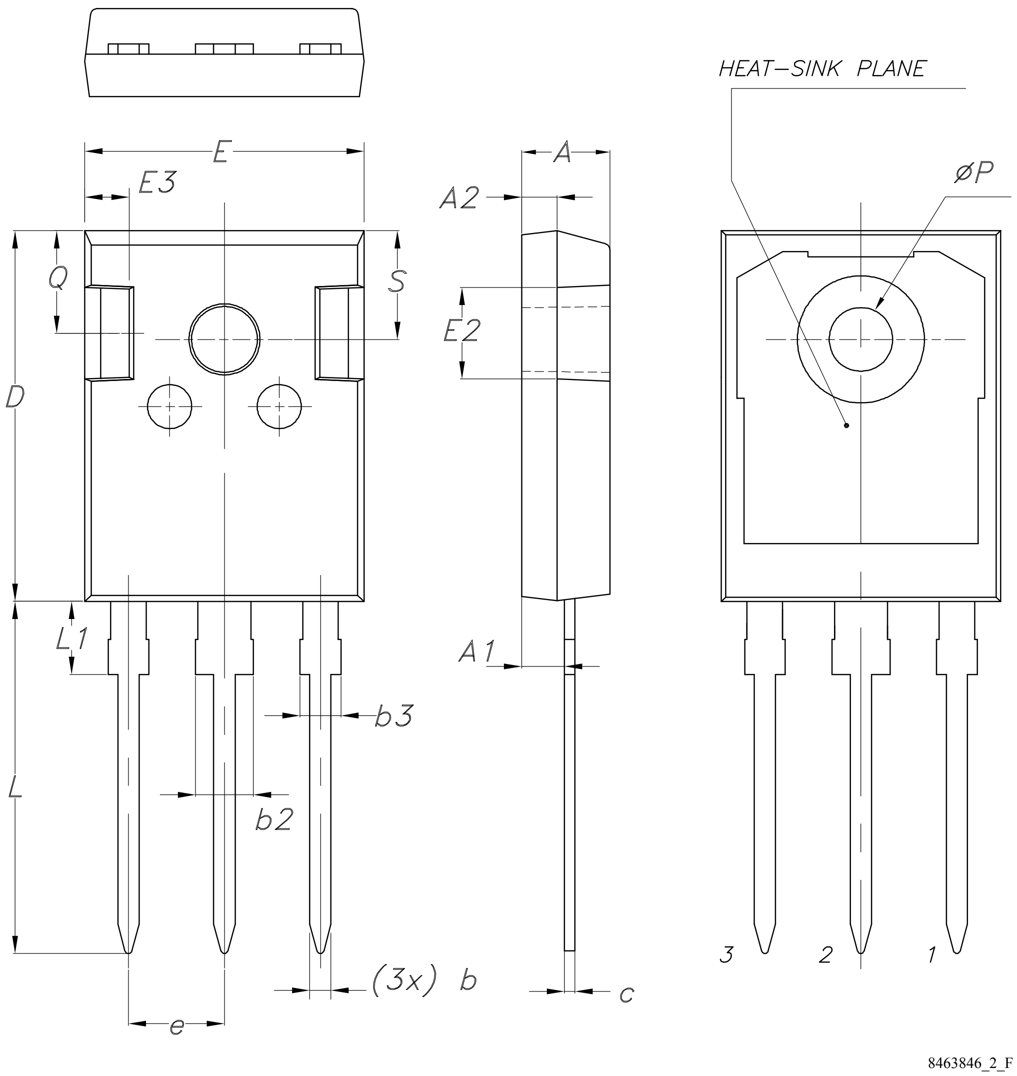


Table 8. **TO-247 long leads package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25

4.3 TO-3P package information

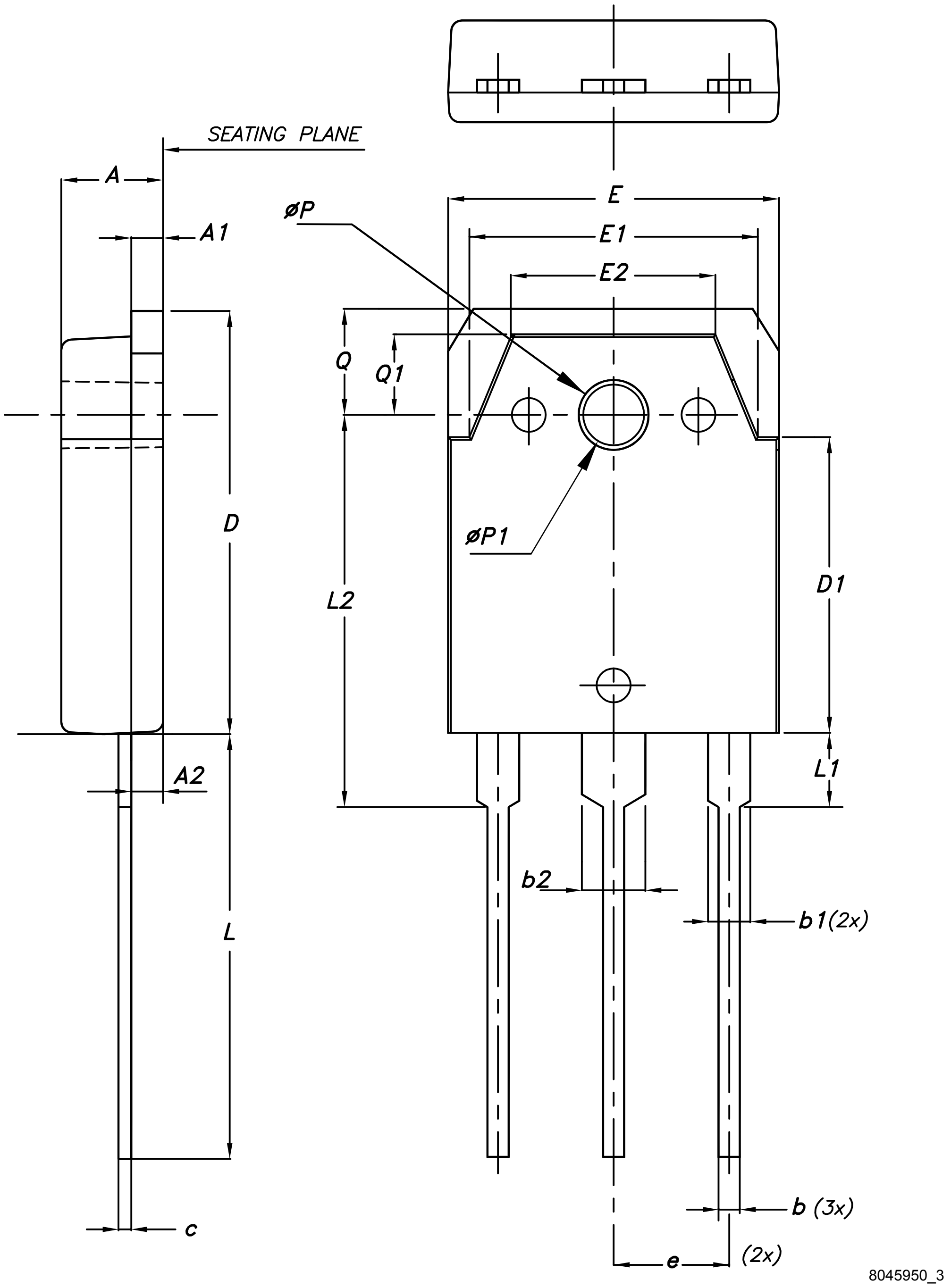


Figure 33. TO-3P package outline

Table 9. **TO-3P package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.60	4.80	5.00
A1	1.45	1.50	1.65
A2	1.20	1.40	1.60
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
c	0.55	0.60	0.75
D	19.70	19.90	20.10
D1	13.70	13.90	14.10
E	15.40	15.60	15.80
E1	13.40	13.60	13.80
E2	9.40	9.60	9.90
e	5.15	5.45	5.75
L	19.80	20.00	20.20
L1	3.30	3.50	3.70
L2	18.20	18.40	18.60
ØP	3.30	3.40	3.50
ØP1	3.10	3.20	3.30
Q	4.80	5.00	5.20
Q1	3.60	3.80	4.00

5 Ordering information

Table 10. **Order codes**

Order code	Marking	Package	Packing
STGW30H60DFB	GW30H60DFB	TO-247	Tube
STGWA30H60DFB	GWA30H60DFB	TO-247 long leads	
STGWT30H60DFB	GWT30H60DFB	TO-3P	

Revision history

Table 11. **Document revision history**

Date	Revision	Changes
01-Aug-2014	1	Initial version.
17-Feb-2016	2	Modified: *Table 2, Table 4* and *6* Modified: *Figure 16* Updated: *Section 3* Updated: *Section 4.1: TO-247, STGW30H60DFB* Minor text changes
04-Nov-2016	3	Added device in TO-247 long leads. Document updated accordingly. Minor text changes.
10-May-2019	4	Modified Figure 3. Output characteristics (T_J = 25 °C), Figure 4. Output characteristics (T_J = 175 °C), Figure 9. Transfer characteristics, Figure 7. Collector current vs switching frequency, Figure 18. Switching energy vs collector emitter voltage. Minor text changes.

Contents

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Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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