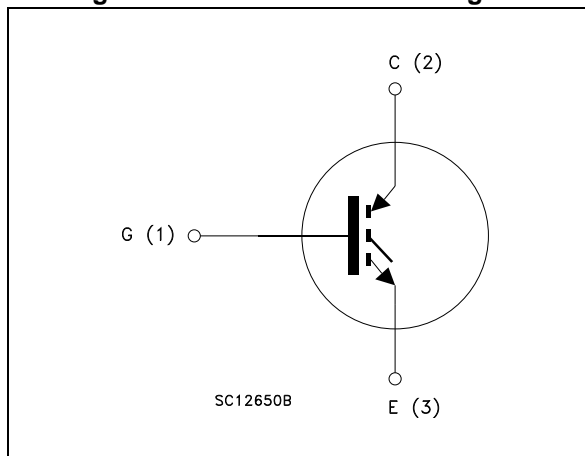


Figure 1. Internal schematic diagram



Features

- High frequency operation up to 50 kHz
- Lower C_{RES} / C_{IES} ratio (no cross-conduction susceptibility)
- High current capability

Applications

- High frequency inverters
- UPS, motor drivers
- HF, SMPS and PFC in both hard switch and resonant topologies

Description

This IGBT utilizes the advanced PowerMESH™ process resulting in an excellent trade-off between switching performance and low on-state behavior.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STGB20NC60V	GB20NC60V	D ² PAK	Tape and reel
STGP20NC60V	GP20NC60V	TO-220	Tube
STGW20NC60V	GW20NC60V	TO-247	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	D2PAK type A package information	10
4.2	TO-220 type A package information	13
4.3	TO-247 package information	15
5	Packing information	17
6	Revision history	19

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	600	V
$I_C^{(1)}$	Collector current (continuous) at 25 °C	60	A
$I_C^{(1)}$	Collector current (continuous) at 100 °C	30	A
$I_{CL}^{(2)}$	Turn-off latching current	100	A
$I_{CP}^{(3)}$	Pulsed collector current	100	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at $T_C = 25$ °C	200	W
T_j	Operating junction temperature	- 55 to 150	°C

1. Calculated according to the iterative formula:

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

2. $V_{clamp} = 80\%(V_{CES})$, $T_j = 150$ °C, $R_G = 10$ Ω, $V_{GE} = 15$ V

3. Pulse width limited by max junction temperature allowed

Table 3. Thermal resistance

Symbol	Parameter	Value		Unit
		TO-247	TO-220 D ² PAK	
$R_{thj-case}$	Thermal resistance junction-case max	0.62		°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max	50	62.5	°C/W

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)CES}	Collector-emitter breakdown voltage (V _{GE} = 0)	I _C = 1 mA	600			V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} =15 V, I _C = 20 A V _{GE} =15 V, I _C = 20 A, T _C = 125 °C		1.8 1.7	2.5	V V
V _{GE(th)}	Gate threshold voltage	V _{CE} = V _{GE} , I _C = 250 µA	3.75		5.75	V
I _{CES}	Collector-emitter cut-off current (V _{GE} = 0)	V _{CE} = 600 V V _{CE} = 600 V, T _C =125 °C			10 1	µA mA
I _{GES}	Gate-emitter cut-off current (V _{CE} = 0)	V _{GE} = ±20 V			± 100	nA
g _{fs} ⁽¹⁾	Forward transconductance	V _{CE} = 15 V, I _C = 20 A		15		S

1. Pulse duration = 300 µs, duty cycle 1.5%

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{ies}	Input capacitance	V _{CE} = 25 V, f = 1 MHz, V _{GE} =0	-	2200	-	pF
C _{oes}	Output capacitance		-	225	-	pF
C _{res}	Reverse transfer capacitance		-	50	-	pF
Q _g	Total gate charge	V _{CE} = 390 V, I _C = 20 A, V _{GE} = 15 V, (see Figure 17)	-	100	-	nC
Q _{ge}	Gate-emitter charge		-	16	-	nC
Q _{gc}	Gate-collector charge		-	45	-	nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$ $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, (see Figure 16)	-	31	-	ns
t_r	Current rise time		-	11	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	1600	-	A/ μ s
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$ $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$ (see Figure 16)	-	31	-	ns
t_r	Current rise time		-	11.5	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	1500	-	A/ μ s
$t_{r(Voff)}$	Off voltage rise time	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$, $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$ (see Figure 18)	-	28	-	ns
$t_{d(off)}$	Turn-off delay time		-	100	-	ns
t_f	Current fall time		-	75	-	ns
$t_{r(Voff)}$	Off voltage rise time	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$, $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$ (see Figure 18)	-	66	-	ns
$t_{d(off)}$	Turn-off delay time		-	150	-	ns
t_f	Current fall time		-	130	-	ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching losses	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$ $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, (see Figure 18)	-	220	-	μ J
$E_{off}^{(1)}$	Turn-off switching losses		-	330	-	μ J
E_{ts}	Total switching losses		-	550	-	μ J
E_{on}	Turn-on switching losses	$V_{CC} = 390\text{ V}$, $I_C = 20\text{ A}$ $R_G = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$ (see Figure 18)	-	450	-	μ J
$E_{off}^{(1)}$	Turn-off switching losses		-	770	-	μ J
E_{ts}	Total switching losses		-	1220	-	μ J

1. Turn-off losses include also the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

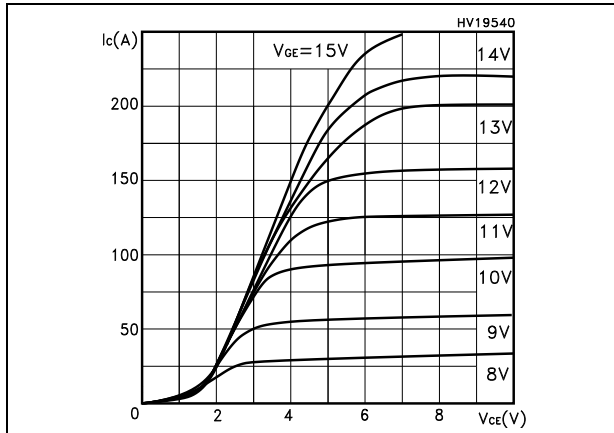


Figure 3. Transfer characteristics

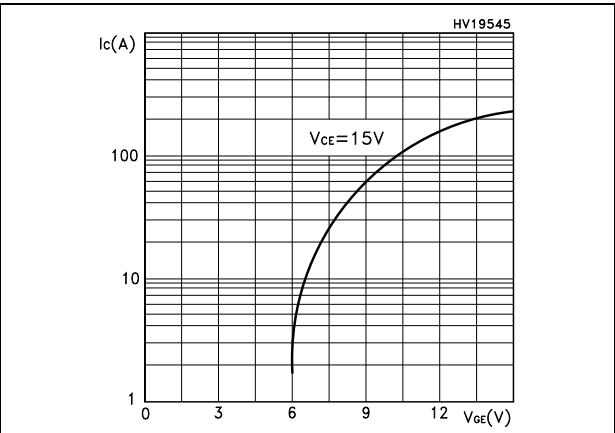


Figure 4. Transconductance

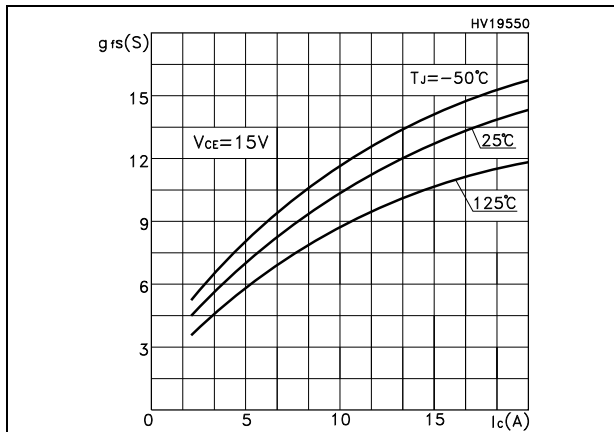


Figure 5. Collector-emitter on voltage vs temperature

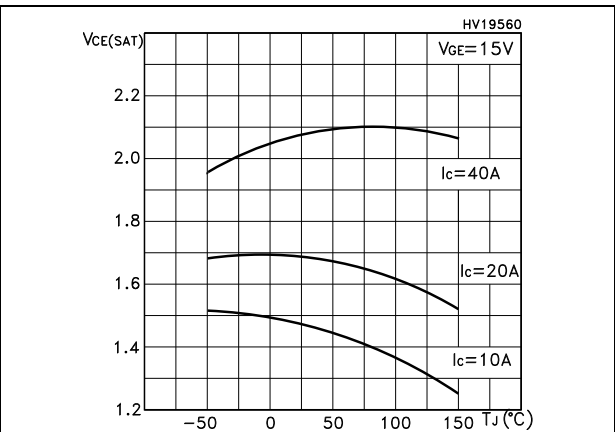


Figure 6. Gate charge vs gate-source voltage

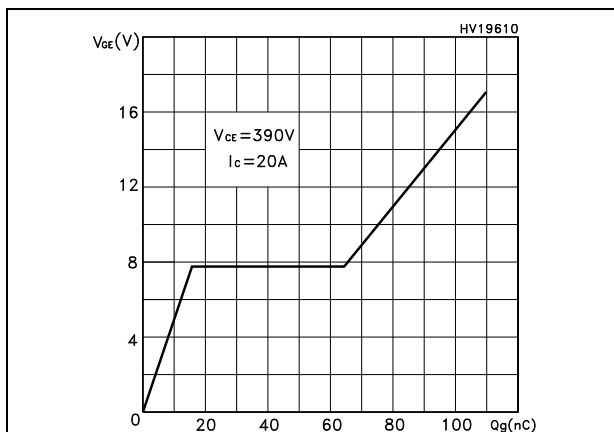


Figure 7. Capacitance variations

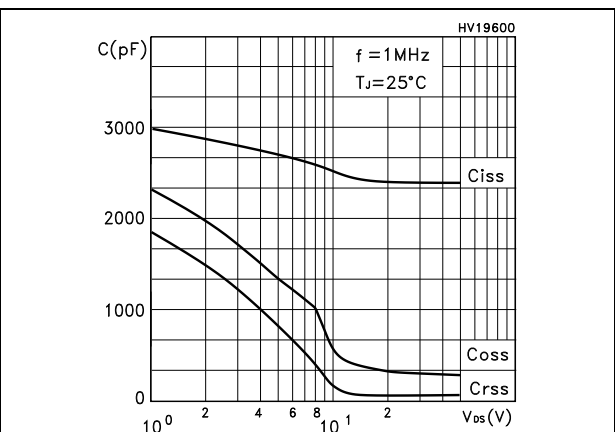


Figure 8. Normalized gate threshold voltage vs temperature

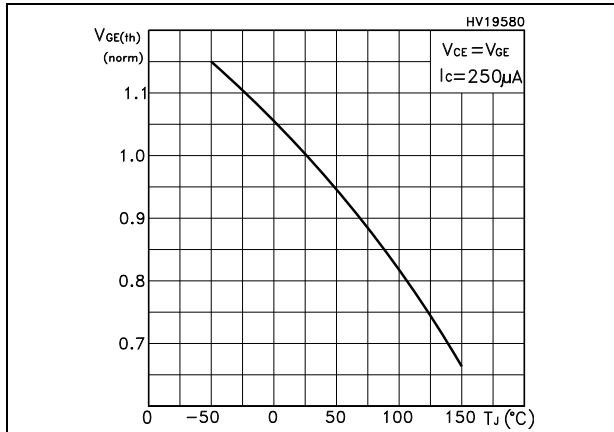


Figure 9. Collector-emitter on voltage vs collector current

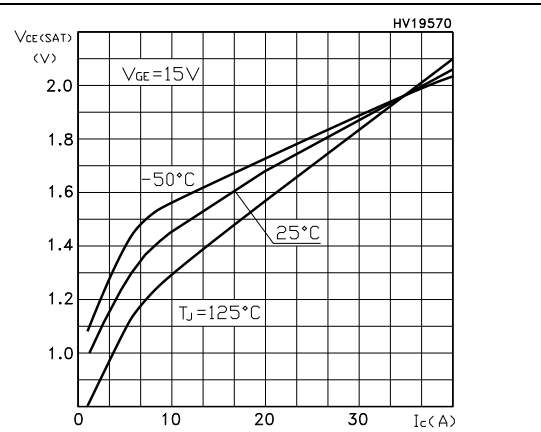


Figure 10. Normalized breakdown voltage vs temperature

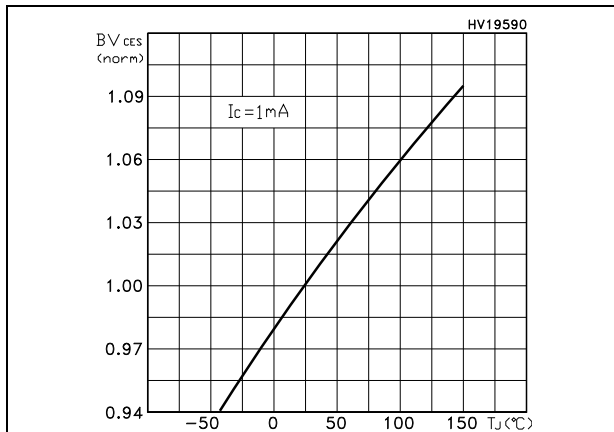


Figure 11. Switching losses vs temperature

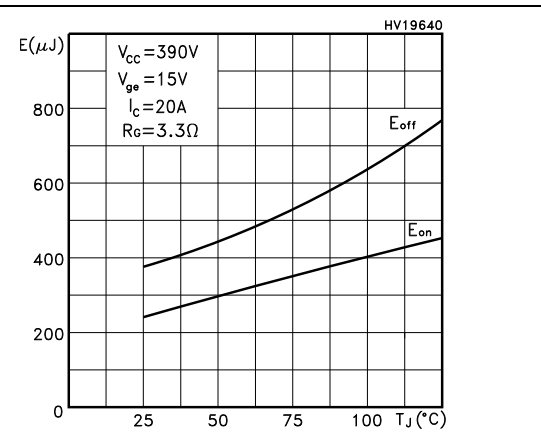


Figure 12. Switching losses vs gate resistance

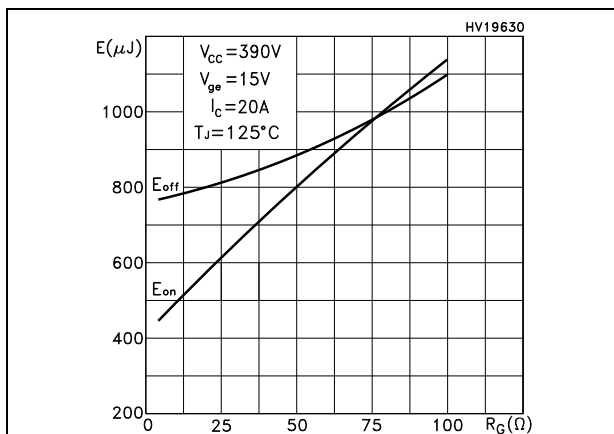


Figure 13. Switching losses vs collector current

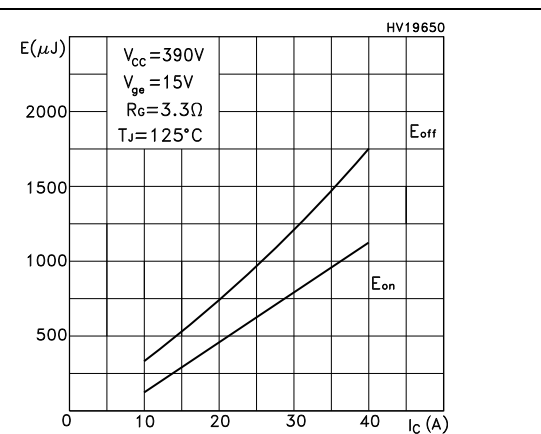


Figure 14. Thermal impedance

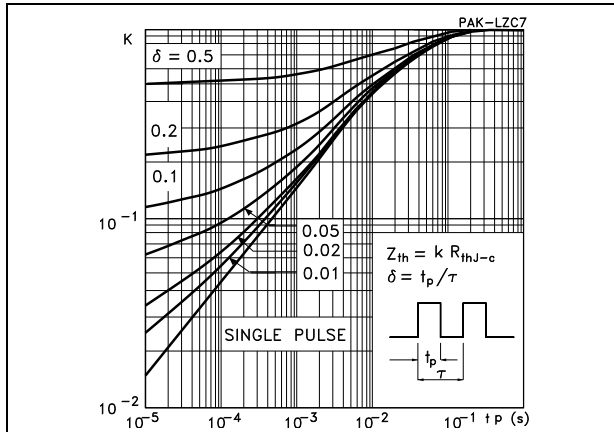
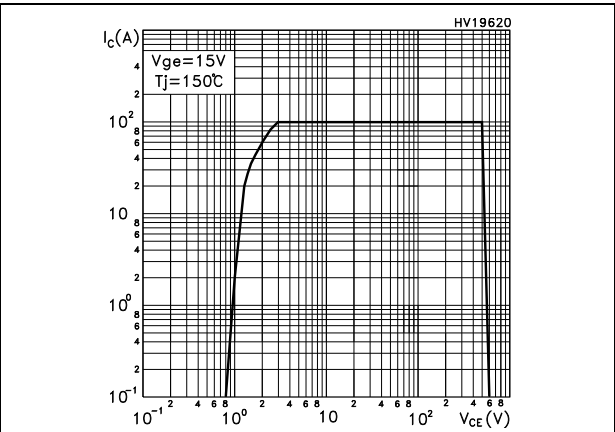


Figure 15. Turn-off SOA



3 Test circuits

Figure 16. Test circuit for inductive load switching

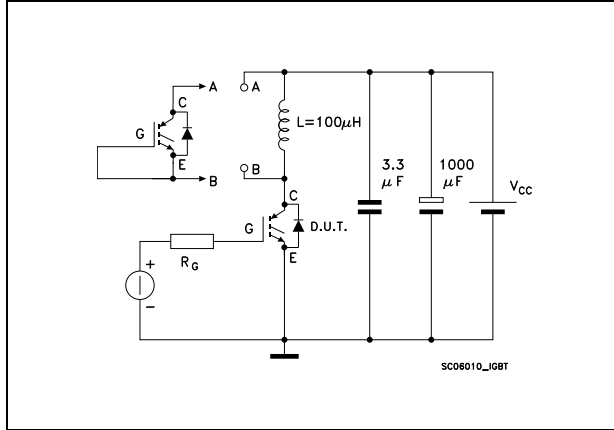


Figure 17. Gate charge test circuit

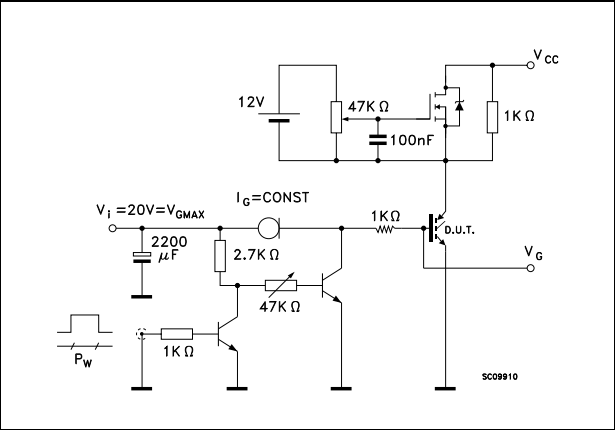
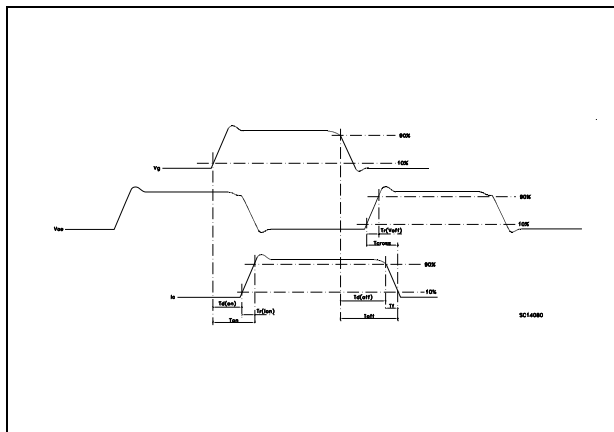


Figure 18. Switching waveform



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 D²PAK type A package information

Figure 19. D²PAK (TO-263) type A package outline

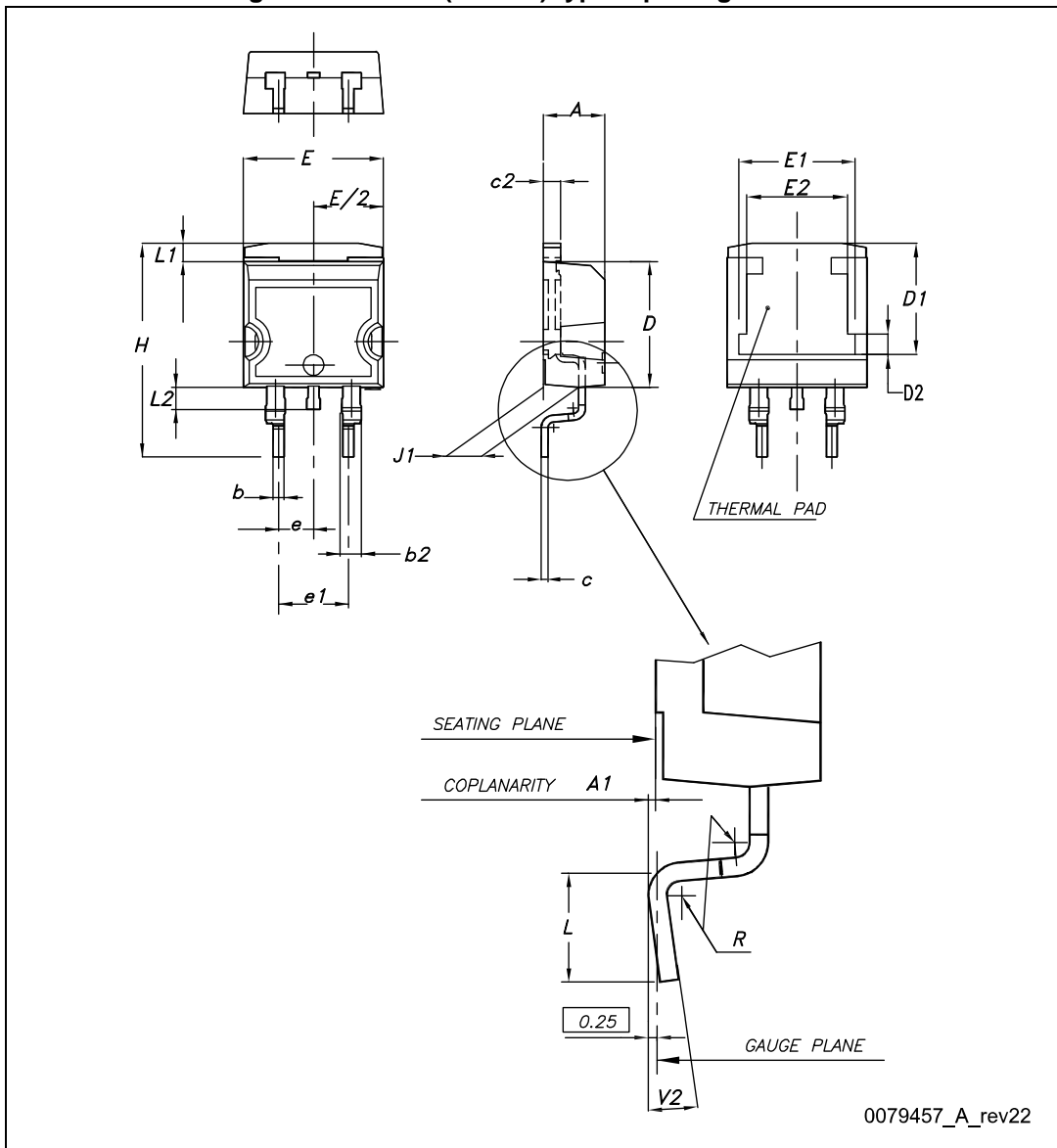
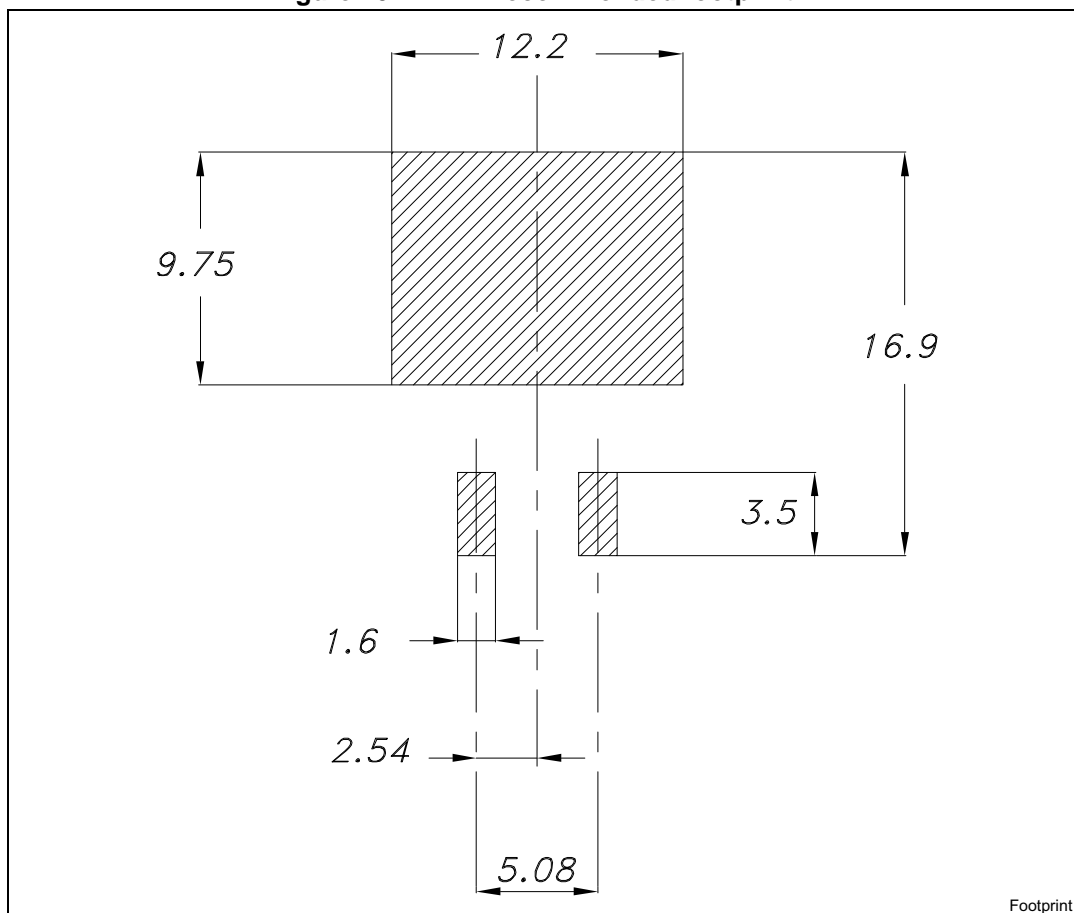


Table 8. D²PAK (TO-263) type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 20. D²PAK recommended footprint^(a)



a. All dimension are in millimeters

4.2 TO-220 type A package information

Figure 21. TO-220 type A package outline

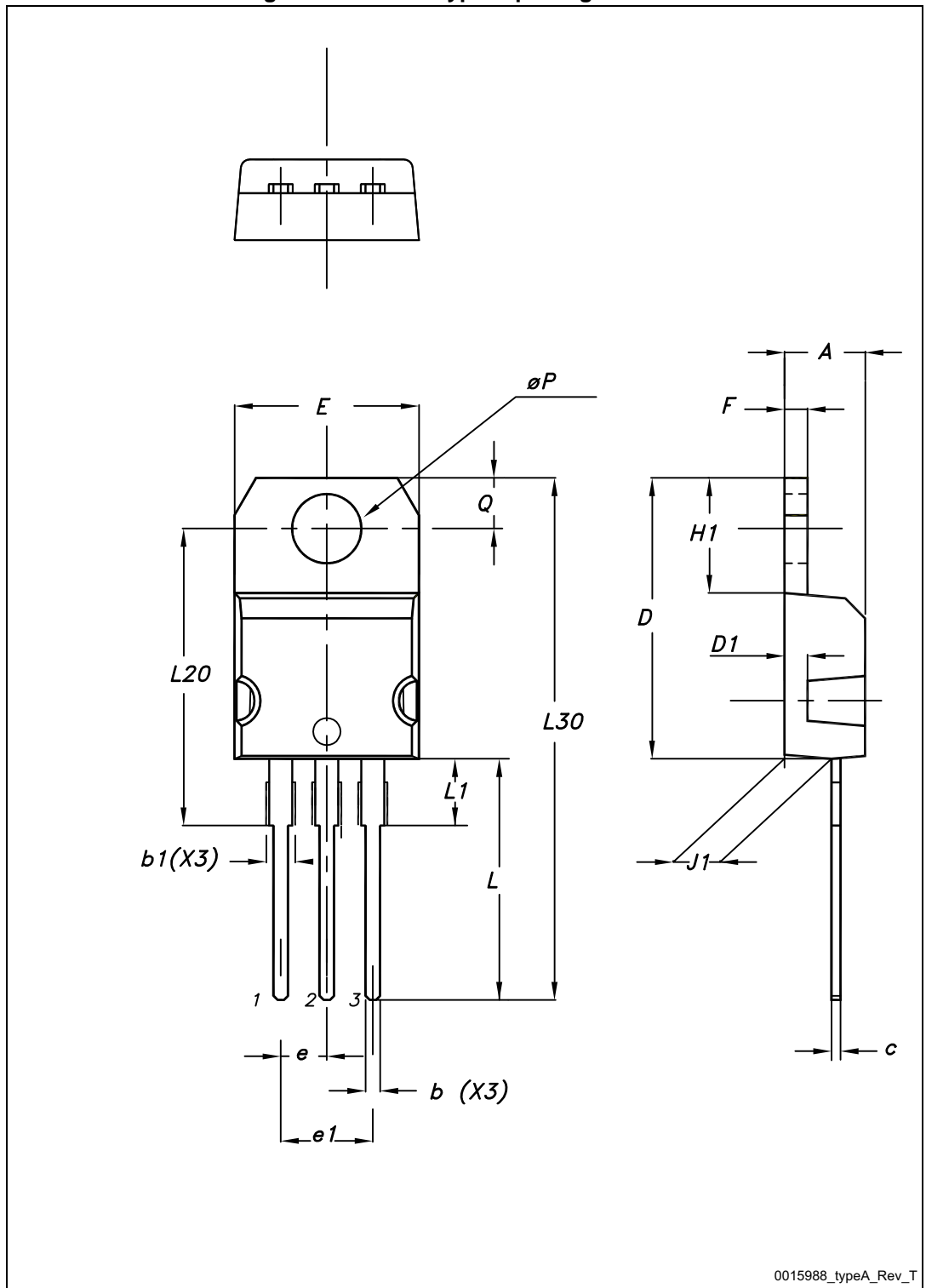


Table 9. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		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		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

4.3 TO-247 package information

Figure 22. TO-247 package outline

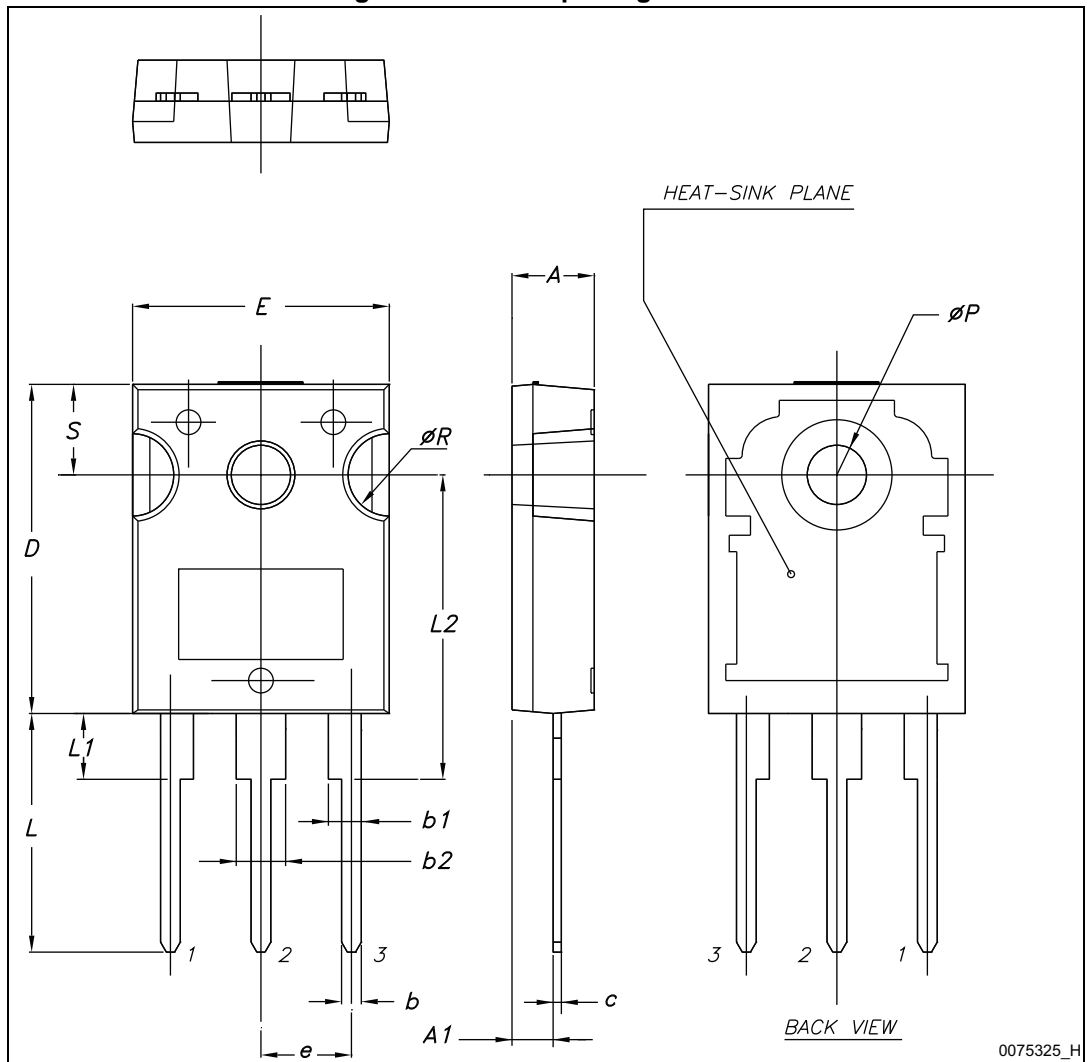


Table 10. TO-247 package mechanical data

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

5 Packing information

Figure 23. Tape

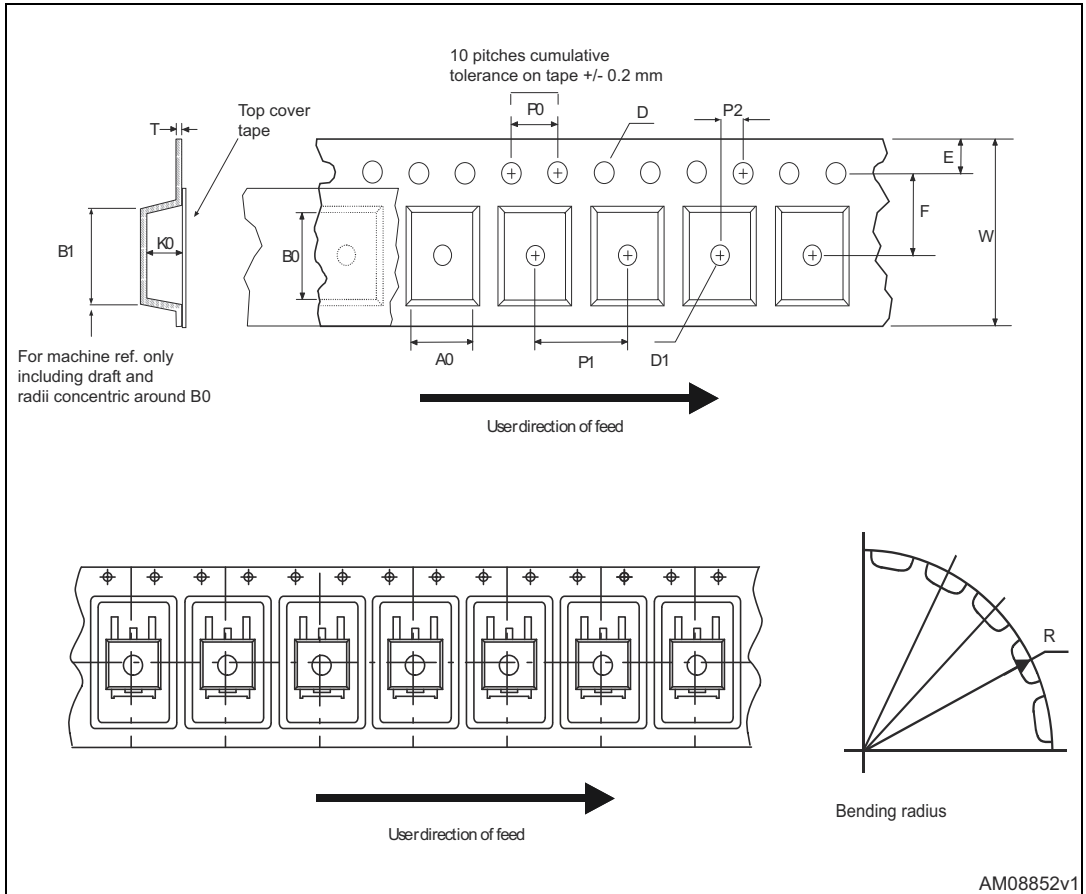


Figure 24. Reel

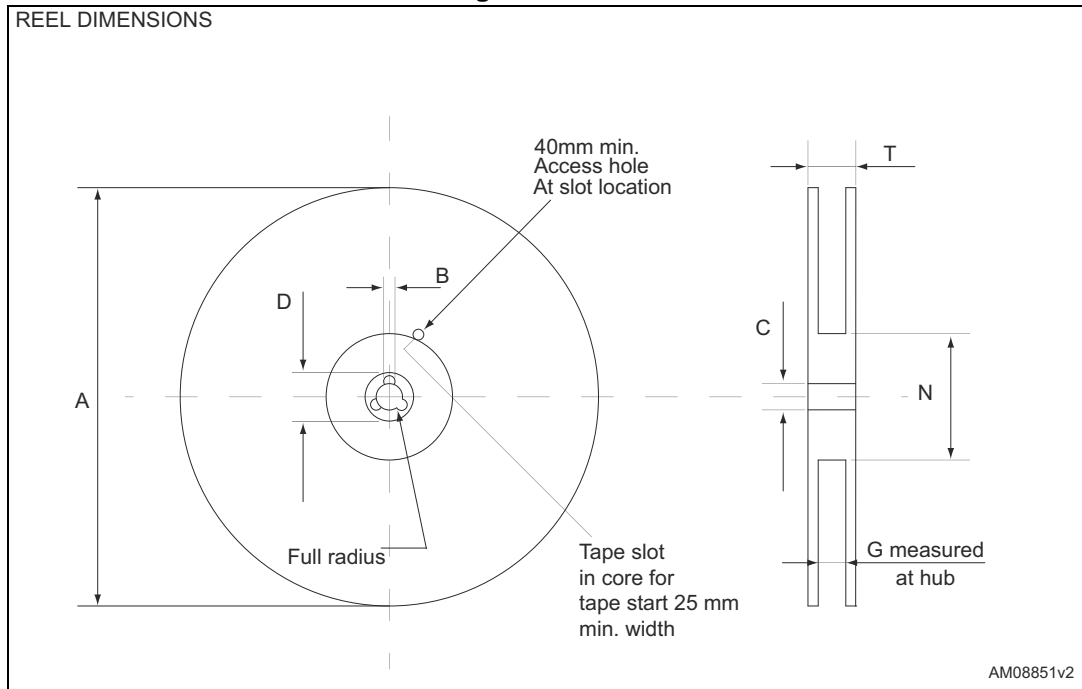


Table 11. D²PAK (TO-263) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

6 Revision history

Table 12. Document revision history

Date	Revision	Changes
07-Jun-2004	4	Stylesheet update. No content change
14-May-2008	5	Inserted D ² PAK
18-Jun-2015	6	Updated Table 1: Device summary . Updated Section 4: Package information and Section 5: Packing information .

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.

© 2015 STMicroelectronics – All rights reserved



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.