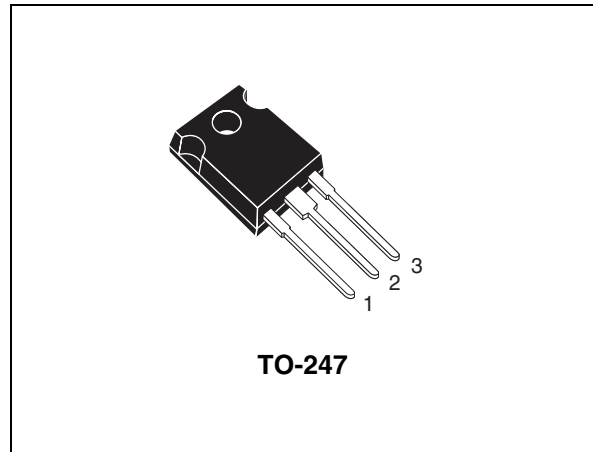


### Features

- Maximum junction temperature :  $T_J = 175\text{ }^\circ\text{C}$
- Very high speed switching
- Negligible tail current
- Low saturation voltage:  $V_{CE(sat)} = 1.9\text{ V (typ.)}$   
@  $I_C = 40\text{ A}$
- Tight parameters distribution
- Safe paralleling
- Low thermal resistance
- Very fast soft recovery antiparallel diode
- Lead free package



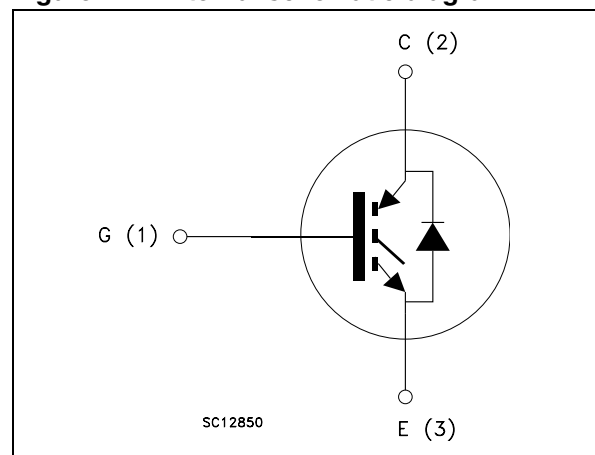
### Applications

- Photovoltaic inverters
- Uninterruptible power supply
- Welding
- Power factor correction
- Very high frequency converters

### Description

This device is an IGBT developed using an advanced proprietary trench gate and field stop structure. The device is part of the "V" series of IGBTs, which represent an optimum compromise between conduction and switching losses to maximize the efficiency of very high frequency converters. Furthermore, a positive  $V_{CE(sat)}$  temperature coefficient and very tight parameter distribution result in safer paralleling operation.

**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
STGW40V65DF	GW40V65DF	TO-247	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0$ )	650	V
$I_C$	Continuous collector current at $T_C = 25\text{ °C}$	80	A
$I_C$	Continuous collector current at $T_C = 100\text{ °C}$	40	A
$I_{CP}^{(1)}$	Pulsed collector current	160	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$I_F$	Continuous forward current at $T_C = 25\text{ °C}$	60	A
$I_F$	Continuous forward current at $T_C = 100\text{ °C}$	30	A
$I_{FP}^{(1)}$	Pulsed forward current	160	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	TBD	W
$T_{STG}$	Storage temperature range	- 55 to 175	°C
$T_J$	Operating junction temperature		

1. Pulse width limited by maximum junction temperature and turn-off within RBSOA

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case IGBT	TBD	°C/W
$R_{thJC}$	Thermal resistance junction-case diode	1.38	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	°C/W

## 2 Electrical characteristics

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

**Table 4. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ( $V_{GE} = 0$ )	$I_C = 2\text{ mA}$	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 40\text{ A}$		1.9		V
		$V_{GE} = 15\text{ V}, I_C = 40\text{ A}$ $T_J = 125\text{ °C}$		2.2		
		$V_{GE} = 15\text{ V}, I_C = 40\text{ A}$ $T_J = 175\text{ °C}$		2.35		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 1\text{ mA}$		6.0		V
$I_{CES}$	Collector cut-off current ( $V_{GE} = 0$ )	$V_{CE} = 650\text{ V}$			25	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}$			250	nA

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GE} = 0$	-	5000	-	pF
$C_{oes}$	Output capacitance			150		
$C_{res}$	Reverse transfer capacitance			95		
$Q_g$	Total gate charge	$V_{CC} = 520\text{ V}, I_C = 40\text{ A},$ $V_{GE} = 15\text{ V}$	-	150	-	nC
$Q_{ge}$	Gate-emitter charge			TBD		
$Q_{gc}$	Gate-collector charge			TBD		

**Table 6. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$ $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	TBD TBD TBD	-	ns ns A/ $\mu$ s
$t_{d(on)}$ $t_r$ $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	TBD TBD TBD	-	ns ns A/ $\mu$ s
$t_r(V_{off})$ $t_{d(off)}$ $t_f$	Off voltage rise time Turn-off delay time Current fall time	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	TBD TBD TBD	-	ns ns ns
$t_r(V_{off})$ $t_{d(off)}$ $t_f$	Off voltage rise time Turn-off delay time Current fall time	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	TBD TBD TBD	-	ns ns ns

**Table 7. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$ $E_{off}^{(2)}$ $E_{ts}$	Turn-on switching losses Turn-off switching losses Total switching losses	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	TBD 0.5 TBD	-	mJ mJ mJ
$E_{on}^{(1)}$ $E_{off}^{(2)}$ $E_{ts}$	Turn-on switching losses Turn-off switching losses Total switching losses	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	TBD 0.75 TBD	-	mJ mJ mJ

1. Energy losses include reverse recovery of the diode.
2. Turn-off losses include also the tail of the collector current.

**Table 8. Collector-emitter diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_F$	Forward on-voltage	$I_F = 30\text{ A}$ $I_F = 30\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$	-	1.7 1.25	-	V V
$t_{rr}$ $Q_{rr}$ $I_{rrm}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_F = 30\text{ A}$ , $V_R = 400\text{ V}$ , $R_G = 10\ \Omega$	-	TBD TBD TBD	-	ns nC A
$t_{rr}$ $Q_{rr}$ $I_{rrm}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_F = 30\text{ A}$ , $V_R = 400\text{ V}$ , $R_G = 10\ \Omega$ $T_J = 175\text{ }^\circ\text{C}$	-	TBD TBD TBD	-	ns nC A



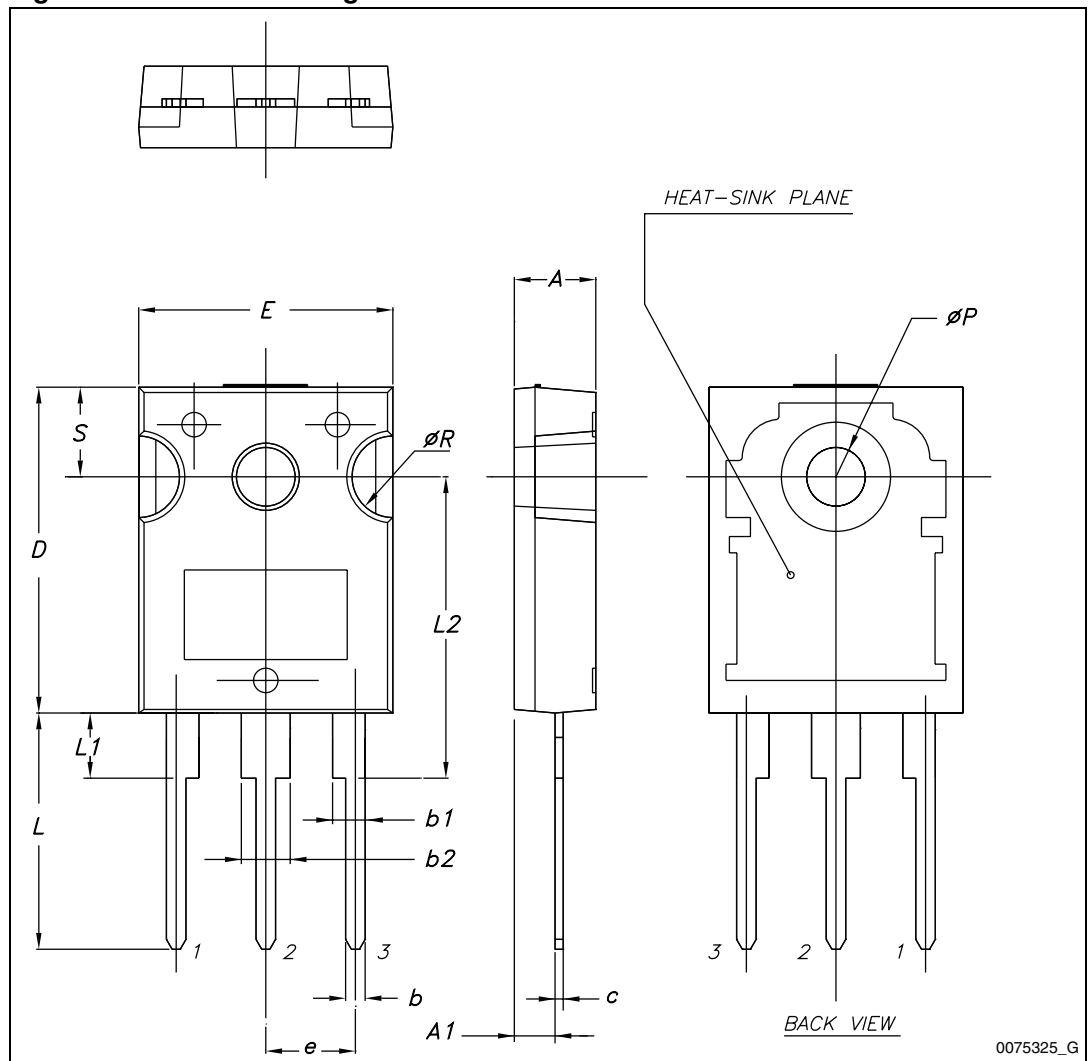
## 4 Package mechanical data

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](http://www.st.com). ECOPACK is an ST trademark.

**Table 9. TO-247 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

Figure 6. TO-247 drawing



## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
20-Sep-2012	1	Initial release.



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