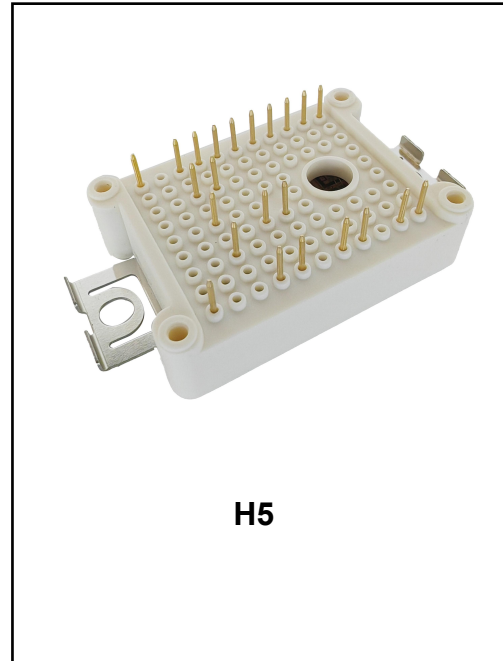


H5 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

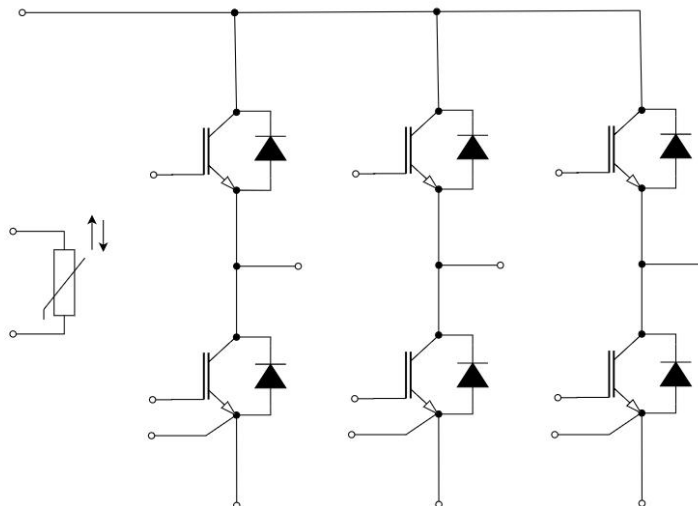
- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- 5 μ s short circuit capability
- Al₂O₃ substrate with low thermal resistance
- Solder Contact Technology



Typical Applications

- Air Conditioning
- Motor Drives
- Servo Drives
- UPS Systems

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 60 s	2.5	kV
Internal isolation		basic insulation(class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{creep}	terminal to terminal	6.3	mm
Clearance	d_{clear}	terminal to heatsink	10.0	mm
Clearance	d_{clear}	terminal to terminal	5.0	mm
Comparative tracking index (electrical)	CTI		>200	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{CE}			--	25	--	nH
Storage temperature	T_{stg}			-40	--	125	°C
Mounting torque for module mounting	M	Mounting according to valid application note	M5, Screw	40	--	80	Nm
Weight	G			--	24	--	g

IGBT

Absolute Maximum Ratings (T_c = 25°C unless otherwise noted)

Symbol	Description	Value	Unit
V _{CES}	Collector-Emitter Voltage	650	V
V _{GES}	Gate-Emitter Voltage	±30	V
I _{CDC}	Continuous Collector Current @ T _c = 100 °C	60	A
I _{CM}	Pulsed Collector Current, t _p limited by T _{vj max}	120	A
P _{tot}	Total power dissipation, T _c = 25 °C, T _{vj max} = 175 °C	226	W

Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =60 A, V _{GE} = 15 V	T _{vj} = 25 °C	--	1.40	V
			T _{vj} = 125 °C	--	1.55	
			T _{vj} = 175 °C	--	1.65	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	I _C =1 mA, V _{CE} =V _{GE}	4.50	5.25	6.00	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 650 V	--	--	500	uA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = ±30 V, V _{CE} = 0 V, T _{vj} = 25 °C	--	--	200	nA
R _{Gint}	Internal Gate Resistance	f=1 MHz	--	0.5	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25 V, V _{GE} =0 V, f=1 MHz	4.03	4.74	5.45	nF
C _{oes}	Output Capacitance		--	0.158	--	nF
C _{res}	Reverse Transfer		--	0.03	--	nF
Q _G	Gate Charge	V _{CC} =480V, V _{GE} =15V, I _C =60A	--	142	--	nC
t _{d(on)}	Turn-On Delay Time	V _{CC} =400V, I _C =60A, V _{GE} =0/15V, R _g =8.0Ω, Inductive Load T _{vj} = 25 °C	--	48	--	ns
t _r	Rise Time		--	20	--	
t _{d(off)}	Turn-off Delay Time		--	192	--	
t _f	Fall Time		--	30	--	
E _{on}	Turn-On Switching Loss per Pulse		--	1.9	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	0.9	--	
t _{d(on)}	Turn-On Delay Time	V _{CC} =400V, I _C =60A, V _{GE} =0/15V, R _g =8.0Ω, Inductive Load T _{vj} = 125 °C	--	TBD	--	ns
t _r	Rise Time		--	TBD	--	
t _{d(off)}	Turn-off Delay Time		--	TBD	--	
t _f	Fall Time		--	TBD	--	
E _{on}	Turn-on Switching Loss per Pulse		--	TBD	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	TBD	--	
t _{d(on)}	Turn-On Delay Time	V _{CC} =400V, I _C =60A, V _{GE} =0/15V, R _g =8.0Ω, Inductive Load T _{vj} = 175 °C	--	TBD	--	ns
t _r	Rise Time		--	TBD	--	
t _{d(off)}	Turn-off Delay Time		--	TBD	--	
t _f	Fall Time		--	TBD	--	
E _{on}	Turn-on Switching Loss per Pulse		--	2.5	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	1.3	--	
I _{C(SC)}	Short circuit collector curren	V _{GE} =15V, V _{CC} =400V, t _{sc} ≤5us, T _{vj} ≤150°C	--	300	--	A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.59	--	K/W
T _{vj op}	Temperature under switching conditions		-40		175 ¹⁾	°C

¹⁾T_{vj op} > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

Diode

Absolute Maximum Ratings (T_C = 25°C unless otherwise noted)

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	650	V
I _F	Diode Continuous Forward Current	60	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	120	A

Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 60 A, T _{vj} = 25 °C	--	1.60	2.4	V
		I _F = 60 A, T _{vj} = 125 °C	--	1.50	--	
		I _F = 60 A, T _{vj} = 175 °C	--	1.45	--	
T _{rr}	Reverse Recovery Time	I _F =60 A, R _G =8.0 Ω T _{vj} = 25 °C	--	107	--	ns
I _{RM}	Peak Reverse Recovery Current		--	30	--	A
Q _{rr}	Recovered Charge		--	1.88	--	μC
E _{rec}	Reverse Recovery Energy		--	0.23	--	mJ
T _{rr}	Reverse Recovery Time	I _F =60 A, R _G =8.0 Ω T _{vj} = 125 °C	--	TBD	--	ns
I _{RM}	Peak Reverse Recovery Current		--	TBD	--	A
Q _{rr}	Recovered Charge		--	TBD	--	μC
E _{rec}	Reverse Recovery Energy		--	TBD	--	mJ
T _{rr}	Reverse Recovery Time	I _F =60 A, R _G =8.0 Ω T _{vj} = 175 °C	--	160	--	ns
I _{RM}	Peak Reverse Recovery Current		--	46	--	A
Q _{rr}	Recovered Charge		--	3.92	--	μC
E _{rec}	Reverse Recovery Energy		--	0.35	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.69	--	K/W
T _{vj op}	Temperature under switching conditions		-40		175 ²⁾	°C

²⁾T_{vj op} > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

NTC Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R ₂₅	Rated Resistance		--	5.0	--	kΩ
ΔR/R	Deviation of R ₁₀₀	T _C =100 °C, R ₁₀₀ =493.3 Ω	-5	--	5	%
P ₂₅	Power Dissipation		--	--	20.0	mW
B _{25/50}	B-value	R ₂ =R ₂₅ exp[B _{25/50} (1/T ₂ - 1/(298.15K))]	--	3375	--	K
B _{25/80}	B-value	R ₂ =R ₂₅ exp[B _{25/80} (1/T ₂ - 1/(298.15K))]	--	3411	--	K
B _{25/100}	B-value	R ₂ =R ₂₅ exp[B _{25/100} (1/T ₂ - 1/(298.15K))]	--	3433	--	K

Figure1.output characteristic

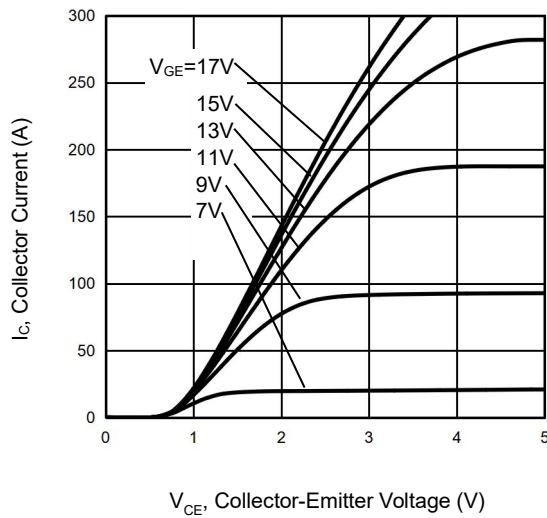


Figure2.Transfer Characteristics

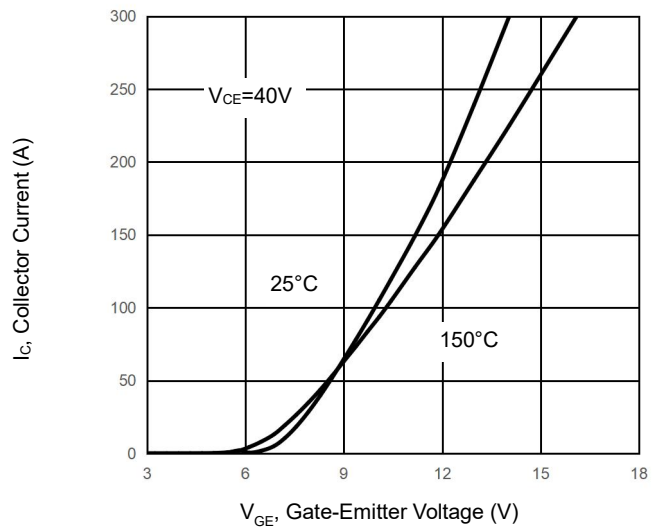


Figure3. $V_{CE(sat)}$ vs. Temperature

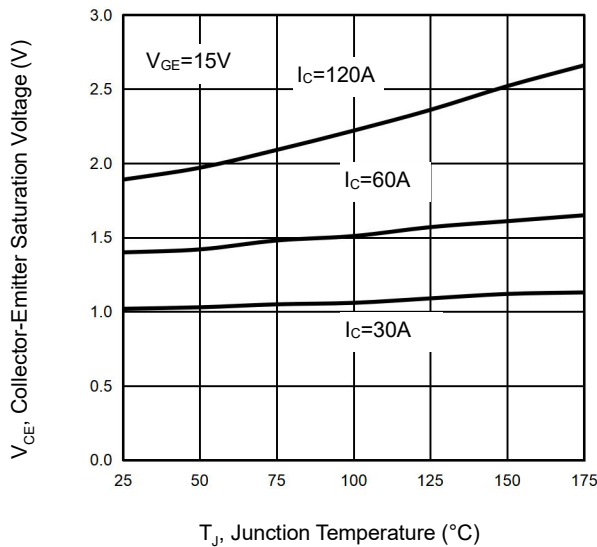


Figure4. Saturation Voltage vs. V_{GE}

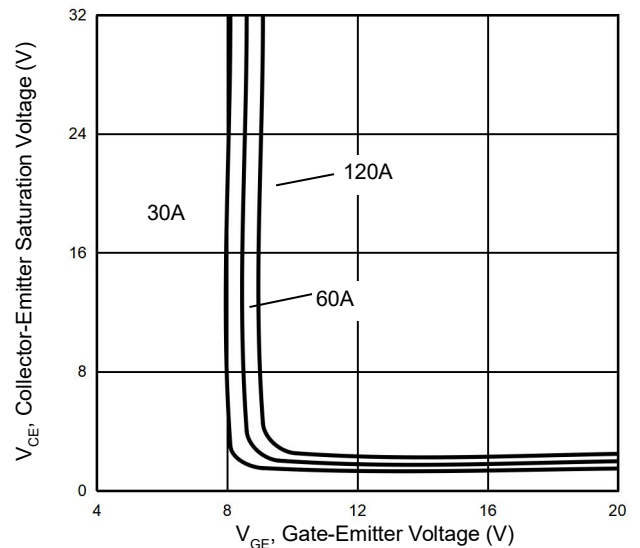


Figure5. Capacitance Characteristics

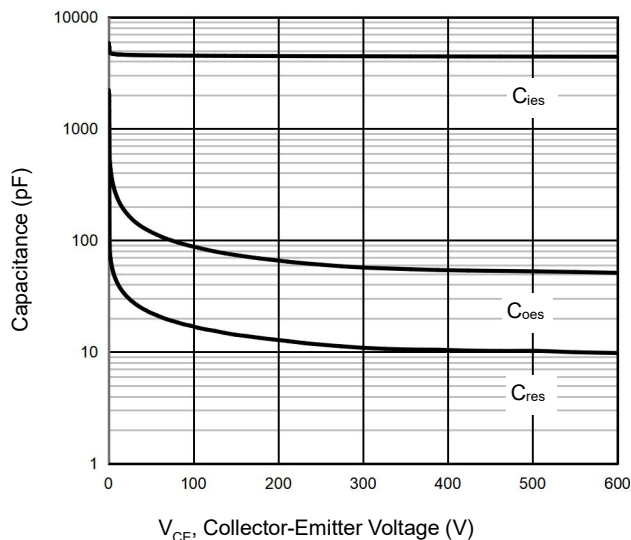


Figure6. Gate Charge Wave Form

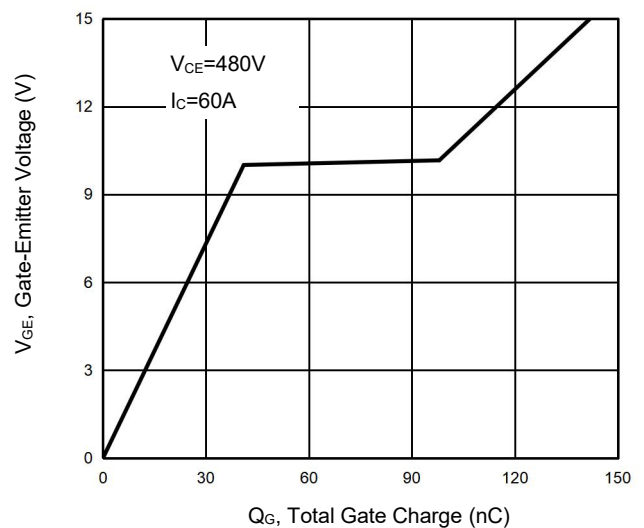


Figure7. Forward Characteristics

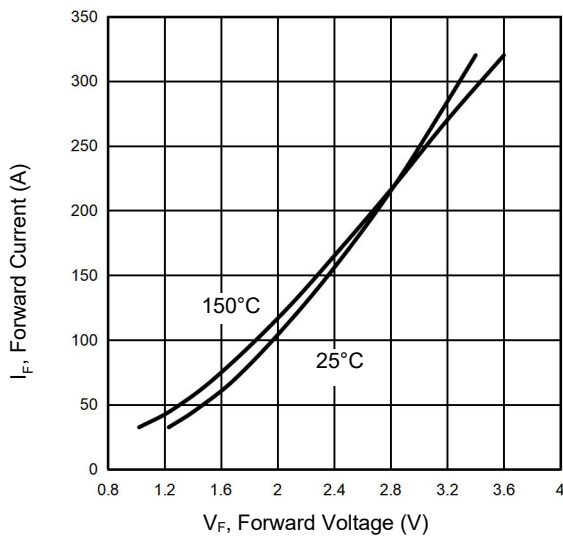


Figure8. V_F vs. Temperature

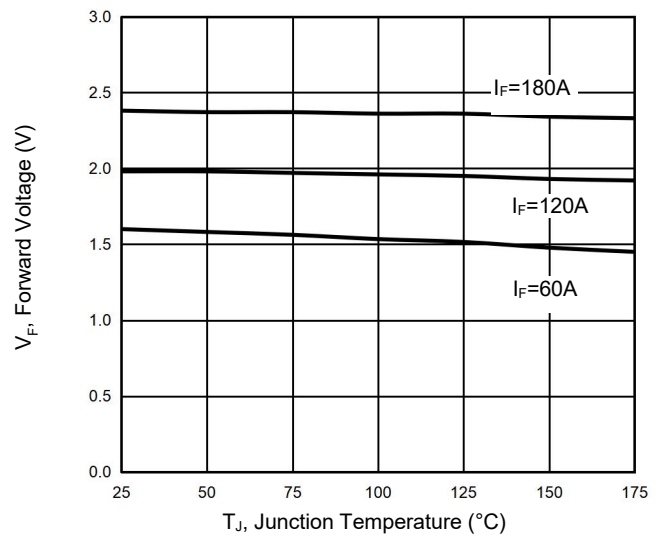


Figure9. $V_{(BR)CES}$ vs. Temperature

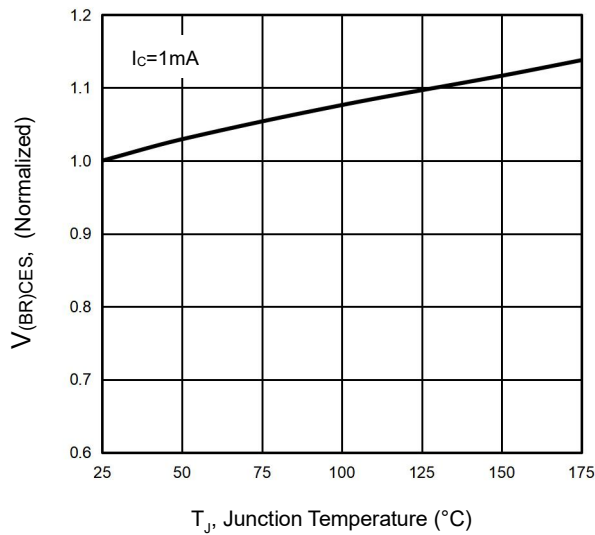


Figure10. $V_{CE(sat)}$ vs. Collector Current(Normalized)

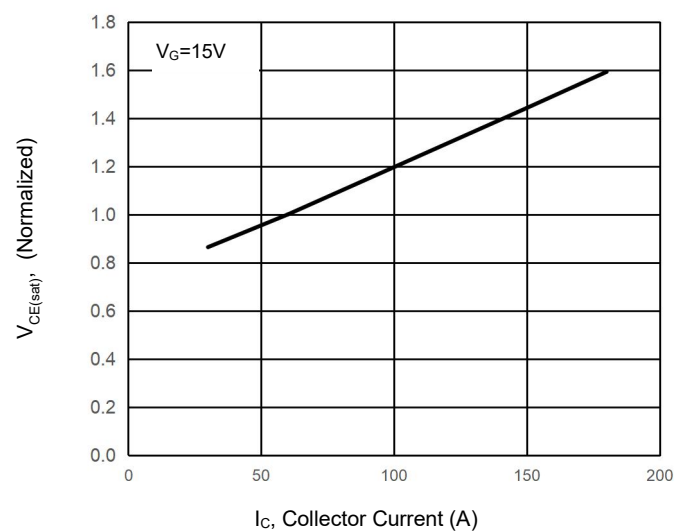


Figure11. Gate-Emitter Threshold Voltage as a Function of Junction Temperature(Normalized)

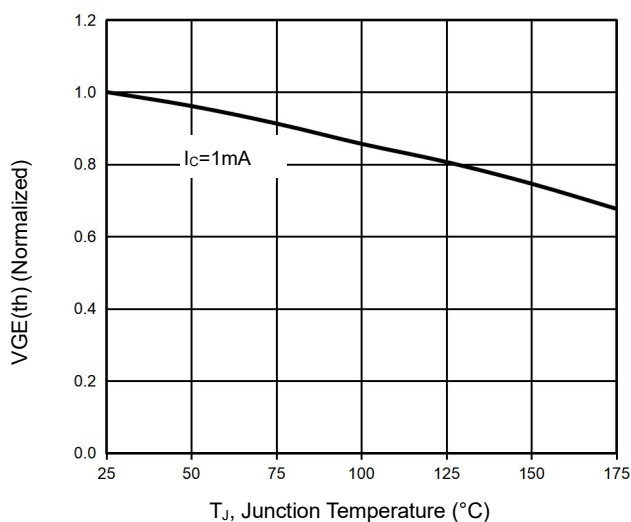
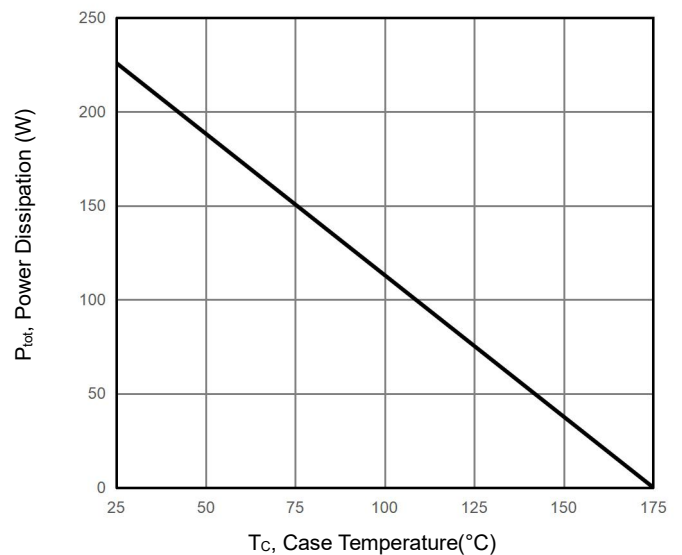


Figure 12 P_{tot} vs. Case Temperature



Technical drawing of a mechanical part with dimensions:

- Overall height: $16,47 \pm 0,5$
- Height of the base: $12 \pm 0,35$
- Height of the central feature: $0,8 \pm 0,03$
- Feature diameter: $\varnothing 20,4$

Technical drawing of a component with a vertical dimension line on the left indicating a height of $1,3 \pm 0,2$.

Technical drawing of a rectangular metal plate with a grid of holes and mounting features. The drawing includes the following dimensions and specifications:

- Overall width: $34 \pm 0,3$
- Overall height: $62,8 \pm 0,5$
- Top mounting flange width: $28,1 \pm 0,2$
- Top mounting flange height: $4,5 \pm 0,15$
- Top mounting hole diameter: $\varnothing 2,5 \pm 0,2 \times 1,1 \pm 0,2$
- Top mounting hole spacing (center-to-center): $19,4 \pm 0,2$
- Top mounting hole diameter (inner): $16,4 \pm 0,2$
- Top mounting hole diameter (outer): $42,5 \pm 0,2$
- Top mounting hole diameter (inner): $41,27 \pm 0,2$
- Top mounting hole diameter (outer): $48 \pm 0,3$
- Top mounting hole diameter (inner): $36,8 \pm 0,2$
- Top mounting hole diameter (outer): $53 \pm 0,2$
- Top mounting hole diameter (inner): $25,6$
- Top mounting hole diameter (outer): $22,4$
- Top mounting hole diameter (inner): $02,3 \pm 0,2 \times 8 \pm 0,2$

Technical drawing of a mechanical part, likely a bracket or support, showing dimensions and labels. The drawing includes a side view on the left and a top view on the right.

Dimensions (mm):

- Overall width: 32
- Overall height: 25,6
- Top flange width: 28,8
- Top flange height: 25,6
- Top flange thickness: 22,4
- Top flange hole diameter: 16
- Top flange hole offset: 12,8
- Top flange hole diameter: 6,4
- Top flange hole offset: 3,2
- Top flange hole diameter: 3,2
- Top flange hole offset: 9,6
- Top flange hole offset: 6,4
- Top flange hole offset: 16
- Top flange hole offset: 19,2
- Top flange hole offset: 22,4

Labels:

- G5W
- V
- V
- G3
- G1U
- G6
- G4
- EV
- T1
- T2
- EV
- EU
- G2
- EU