HP950FS75

750V 950A IGBT Module

RoHS Compliant

PRODUCT FEATURES

- ☐ 750V Field Stop Trench IGBT
- ☐ $V_{CE(sat)}$ with positive temperature coefficient
- ☐ Fast switching and short tail current
- ☐ Free wheeling diodes with fast and soft reverse recovery
- ☐ Max Junction Temperature 175°C
- ☐ Temperature sense included



APPLICATIONS

- ☐ Automotive Traction Modules
- ☐ General Power Modules

IGBT-inverter

ABSOLUTE MAXIMUM RATINGS(T_F =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	750	V
V_{GES}	Gate Emitter Voltage		±20	
I_{CN}	Implemented Collector Current		950	A
I_C	DC Collector Current	T_F=90℃, T_{Jmax}=175℃	450	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1900	
P_{tot}	Power Dissipation Per IGBT	T_F=60℃, T_{Jmax}=175℃	958	W

Diode-inverter

ABSOLUTE MAXIMUM RATINGS (T_F =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	750	V
I_{FN}	Implemented Forward Current		950	A
$I_{F(AV)}$	Average Forward Current		450	
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	1900	
I^2t		T_J =150℃, t=10ms, V_R=0V	28	kA^2s

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IGBT-inverter

ELECTRICAL CHARACTERISTICS *(T_F =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=9mA		5.2	5.9	6.6	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=450A, V_{GE}=15V, T_J=25℃			1.08		
		I_C=450A, V_{GE}=15V, T_J=125℃			1.09		
		I_C=450A, V_{GE}=15V, T_J=150℃			1.1		
		I_C=950A, V_{GE}=15V, T_J=25℃			1.38		
		I_C=950A, V_{GE}=15V, T_J=125℃			1.54		
		I_C=950A, V_{GE}=15V, T_J=150℃			1.55		
I_{CES}	Collector Leakage Current	V_{CE}=750V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=750V, V_{GE}=0V, T_J=150℃			5		mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0.6		Ω
Q_G	Gate Charge	V_{CE}=400V, I_C=450A , V_{GE}=15V			2.3		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =100kHz			82		nF
C_{ies}	Output Capacitance				2.3		nF
C_{res}	Reverse Transfer Capacitance				0.38		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=400V,I_C=450A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		210		ns
			T_J=125℃		225		ns
			T_J=150℃		230		ns
t_r	Rise Time		T_J=25℃		66		ns
			T_J=125℃		83		ns
			T_J=150℃		77		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=400V,I_C=450A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		600		ns
			T_J=125℃		675		ns
			T_J=150℃		710		ns
t_f	Fall Time		T_J=25℃		100		ns
			T_J=125℃		135		ns
			T_J=150℃		140		ns
E_{on}	Turn on Energy	V_{CC}=400V,I_C=450A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		14.4		mJ
			T_J=125℃		21.3		mJ
			T_J=150℃		24.5		mJ
E_{off}	Turn off Energy		T_J=25℃		20.5		mJ
			T_J=125℃		30.5		mJ
			T_J=150℃		32.5		mJ
I_{SC}	Short Circuit Current	tpsc≤5μs , V_{GE}=15V T_J=150℃,V_{CC}=400V			4100		A
R_{thJF}	Junction to cooling fluid, △V/△t = 10 dm³/min, T_F = 60°C （Per IGBT）				0.1	0.115	K /W

HP950FS75

Diode-inverter

ELECTRICAL CHARACTERISTICS *(T_F =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=450A , V_{GE}=0V, T_J=25℃		1.45		V
		I_F=450A , V_{GE}=0V, T_J=125℃		1.43		
		I_F=450A , V_{GE}=0V, T_J=150℃		1.39		
		I_F=950A , V_{GE}=0V, T_J=25℃		1.88		
		I_F=950A , V_{GE}=0V, T_J=125℃		1.94		
		I_F=950A , V_{GE}=0V, T_J=150℃		1.94		
t_{rr}	Reverse Recovery Time	I_F=450A , V_R=400V dI_F/dt=-7400A/μs T_J =150℃		325		ns
I_{RRM}	Max. Reverse Recovery Current			68		A
Q_{RR}	Reverse Recovery Charge			475		μC
E_{rec}	Reverse Recovery Energy			25.9		mJ
R_{thJF}	Junction to cooling fluid, △V/△t = 10 dm³/min, T_F = 60°C （Per Diode）			0.14	0.16	K /W

NTC CHARACTERISTICS *(T_F =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
R_{25}	Resistance	T_F =25℃		5		kΩ
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\ K))]$			3375		K

MODULE CHARACTERISTICS *(T_F =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~150	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	RMS, f = 0 Hz, t = 1 sec	4200	V
CTI	Comparative Tracking Index		> 200	
Torque	baseplate to heatsink	Recommended（M4）	1.8~2.2	Nm
	PCB to frame	Recommended（M3）	0.4~0.6	Nm
Weight			775	g

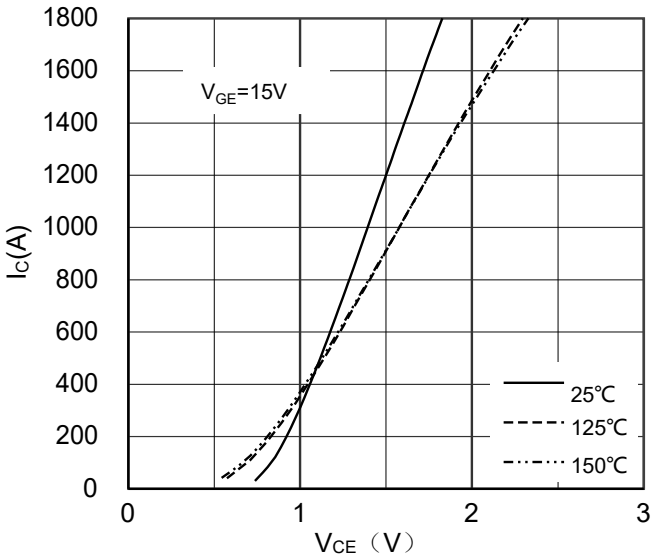


Figure 1. Typical Output Characteristics IGBT-inverter

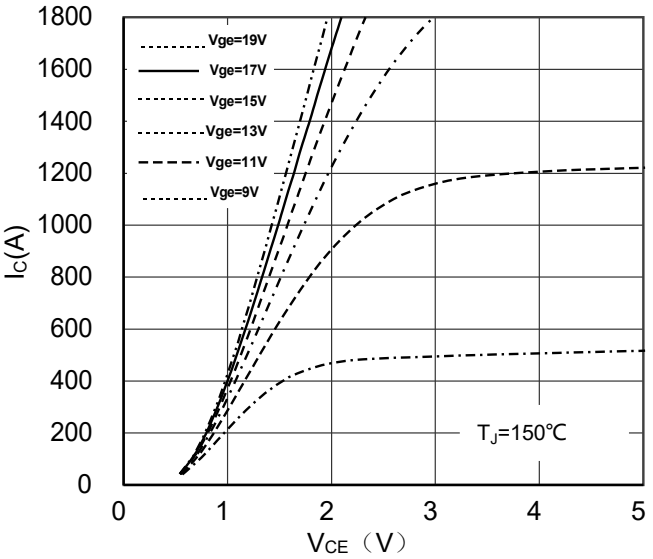


Figure 2. Typical Output Characteristics IGBT-inverter

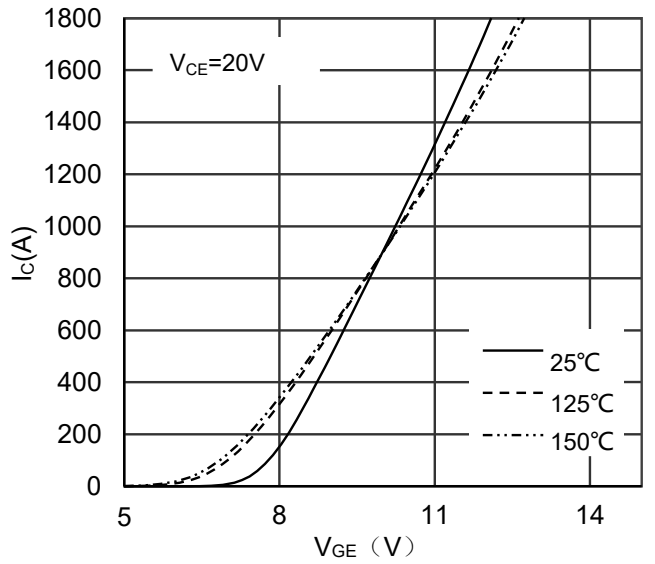


Figure 3. Typical Transfer characteristics IGBT-inverter

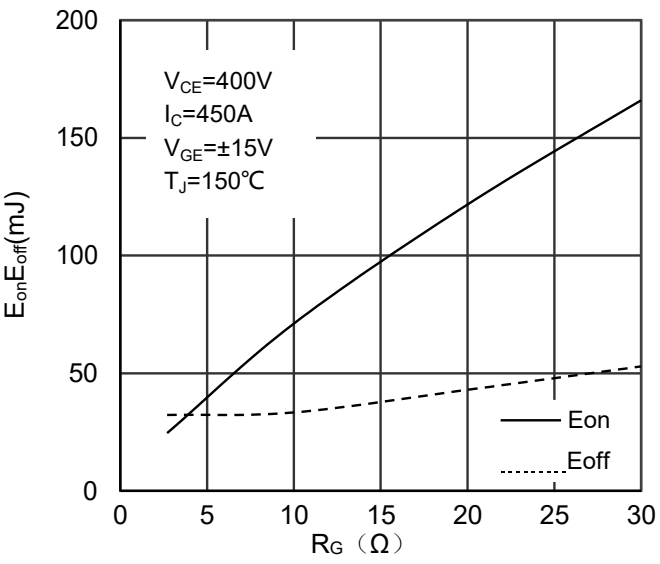


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

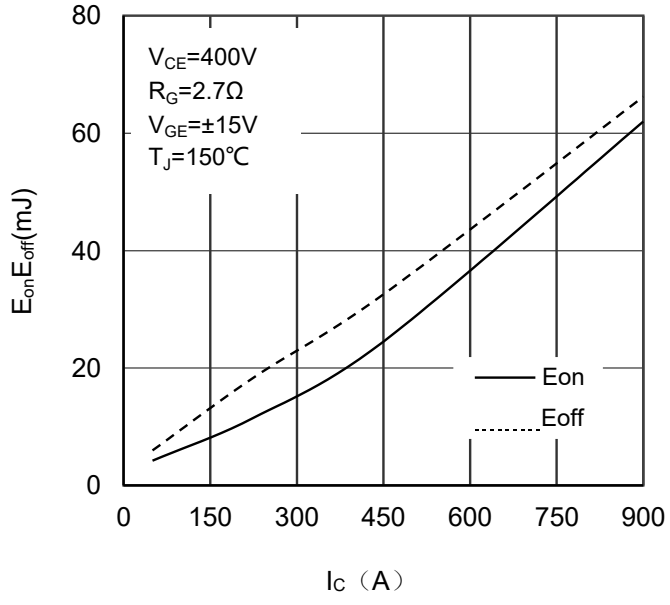


Figure 5. Switching Energy vs Collector Current IGBT-inverter

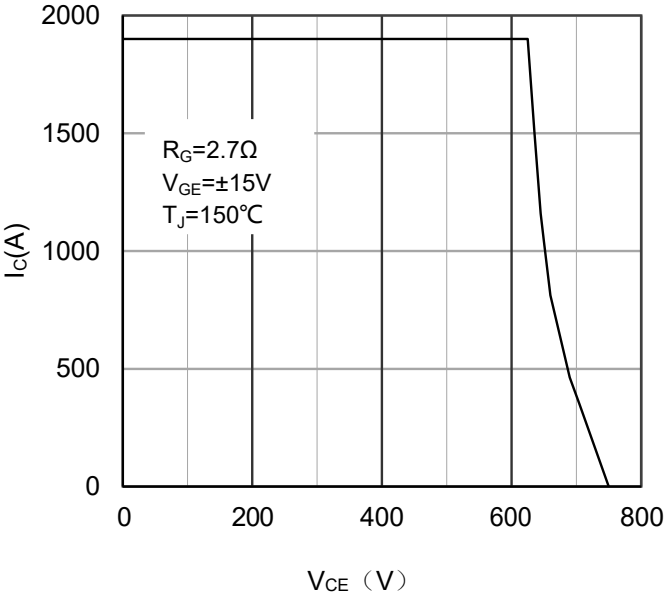


Figure 6. Reverse Bias Safe Operating Area IGBT-inverter

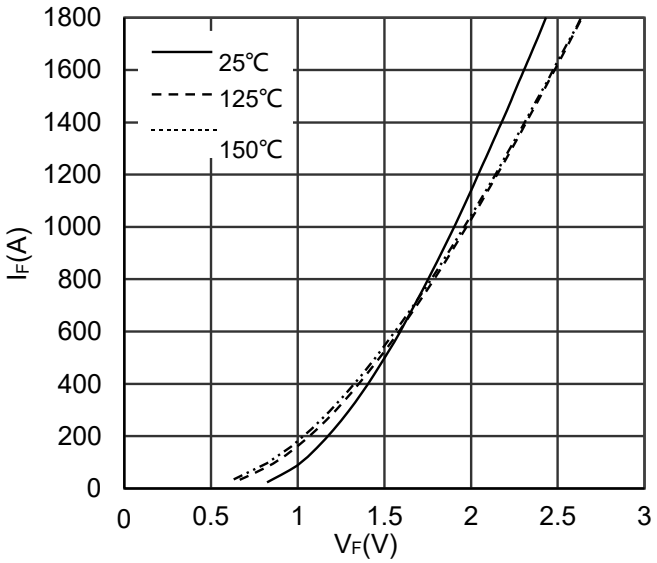


Figure 7. Diode Forward Characteristics Diode-inverter

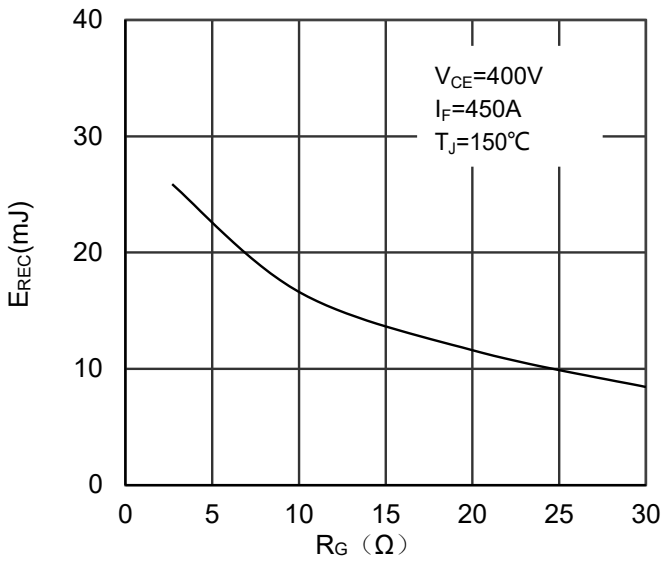


Figure 8. Switching Energy vs Gate Resistor Diode-inverter

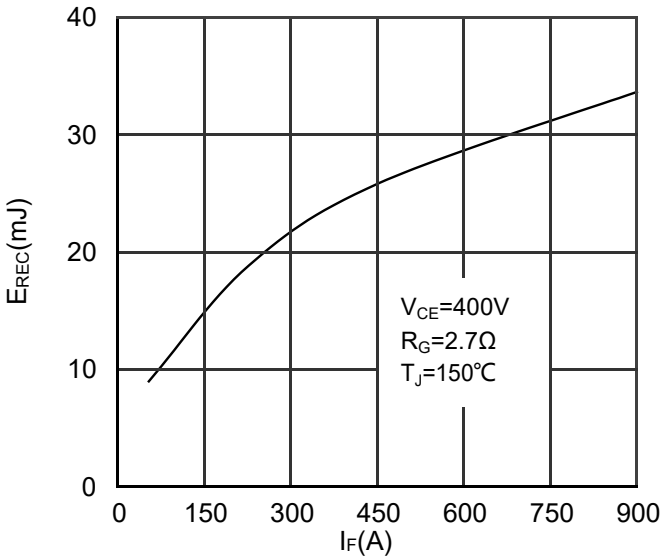


Figure 9. Switching Energy vs Forward Current Diode-inverter

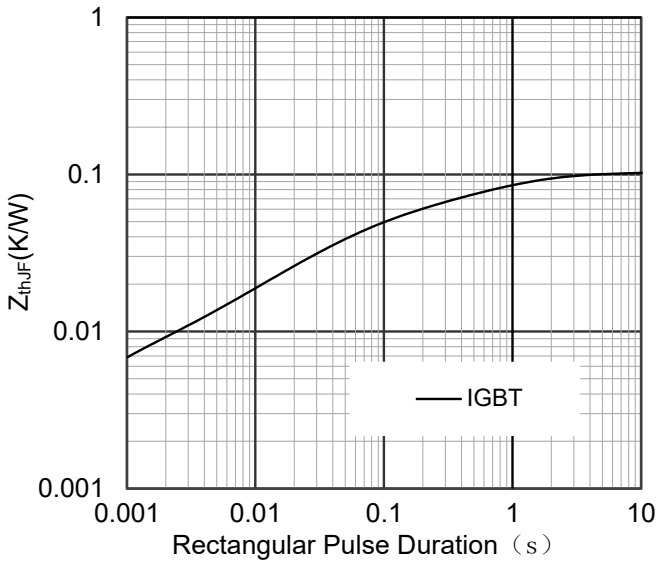


Figure 10. Transient Thermal Impedance of IGBT-inverter

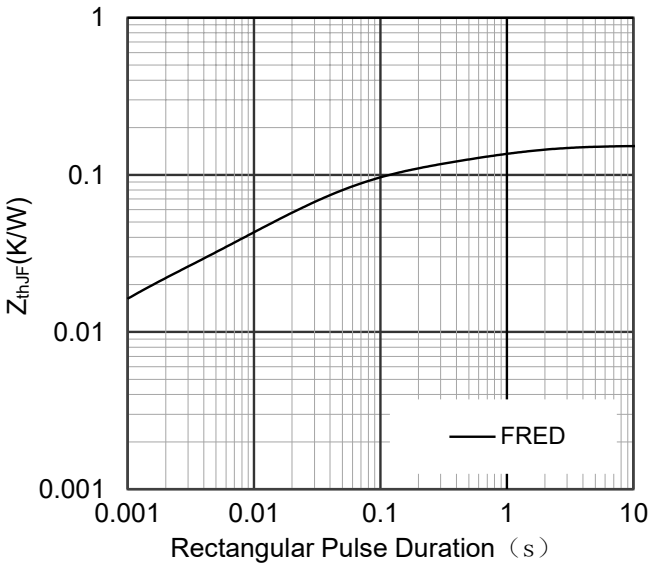


Figure 11. Transient Thermal Impedance of Diode-inverter

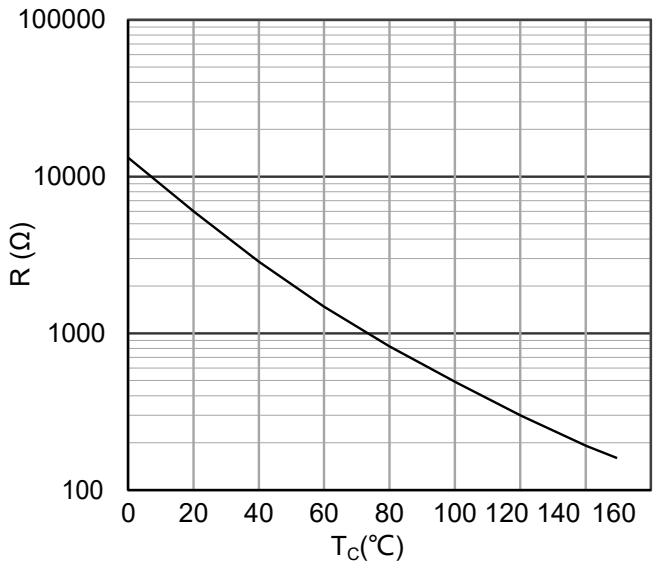


Figure 12. NTC Characteristics

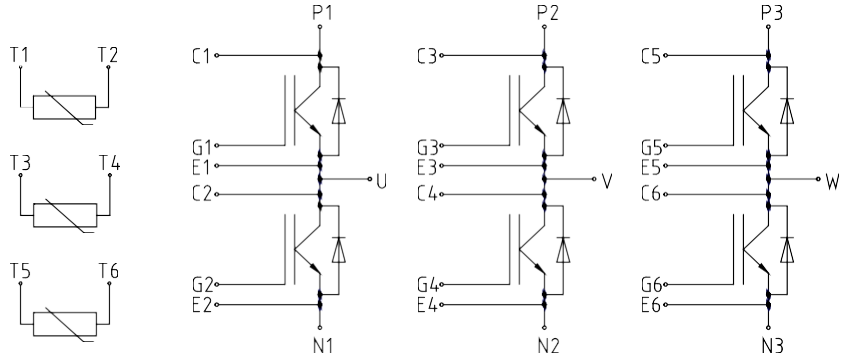
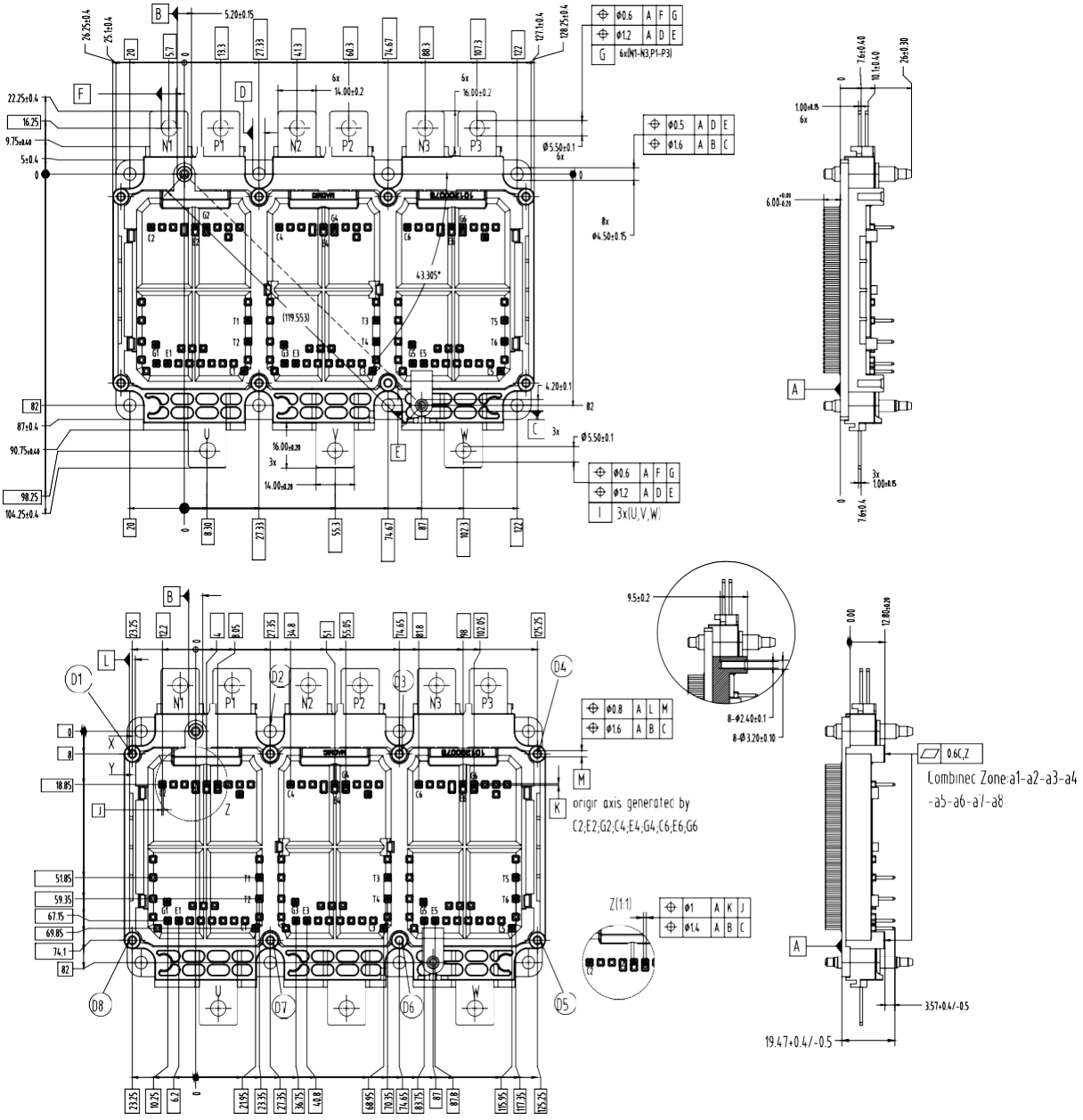


Figure 13. Circuit Diagram



Dimensions in (mm)
Figure 14. Package Outline