IGBT f A m i e
A lica i n

1200 V, 25 A

AFGHL25T120RHD

www.onsemi.com

Description

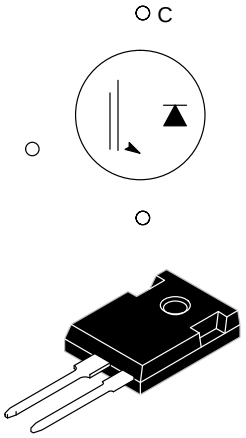
This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop II Trench construction. Provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss, which is AEC Q101 qualified offer the optimum performance for both hard and soft switching topology in automotive application.

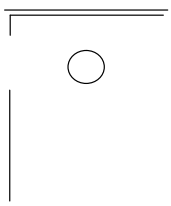
Features

- Extremely Efficient Trench with Field Stop Technology
- Maximum Junction Temperature: T_J = 175°C
- Short Circuit Withstand Time 8 μs
- 100% of the Parts Tested for I_{LM} (Note 2)
- Fast Switching
- Tighten Parameter Distribution
- AEC−Q101 Qualified and PPAP Capable
- This Device is Pb−Free, Halogen Free/BFR Free and is RoHS Compliant

Typical Applications

- Automotive HEV−EV e−compressor
- Automotive HEV−EV PTC heater
- Automotive HEV−EV Onboard Chargers
- Automotive HEV−EV DC−DC Converters





V

AFG25T120RHD	= Specific Device Code
$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= 3−Digit Date Code
&K	= 2−Digit Lot Traceability Code

ORDERING INFORMATION

AFGHL25T120RHD	TO−247−3L	30 Units / Rail

MAXIMUM RATINGS

Description	Symbol	Value	Units
Collector to Emitter Voltage	V_{CES}	1200	V
Gate to Emitter Voltage	V_{GES}	±20	V
Transient Gate to Emitter Voltage		±30	
Collector Current @ T_C = 25°C (Note 1)	I_C	48	A
Collector Current @ T_C = 100°C		25	
Pulsed Collector Current (Note 2)	I_{LM}	100	A
Pulsed Collector Current (Note 3)	I_{CM}	100	A
Diode Forward Current @ T_C = 25°C (Note 1)	I_F	48	A
Diode Forward Current @ T_C = 100°C		25	
Pulsed Diode Maximum Forward Current	I_{FM}	100	A
Maximum Power Dissipation @ T_C = 25°C	P_D	261	W
Maximum Power Dissipation @ T_C = 100°C		130	
Short Circuit Withstand Time V_{GE} = 15 V, V_{CE} = 600 V, T_J = 150°C	SCWT	8	μs
Operating Junction Temperature / Storage Temperature Range	$T_{J,}$ T_{STG}	−55 to +175	°C
Maximum Lead Temp. For Soldering Purposes, ⅛" from case for 5 seconds	T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Value limited by bond wire.
2. V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A, R_G = 15 Ω, Inductive Load, 100% Tested
3. Repetitive rating: pulse width limited by max. Junction temperature.

THERMAL CHARACTERISTICS

Rating	Symbol	Max.	Units
Thermal Resistance, Junction to Case, for IGBT	$R_{\theta JC}$	0.57	°C/W
Thermal Resistance, Junction to Case, Max for Diode	$R_{\theta JC}$	0.63	°C/W
Thermal Resistance, Junction to Ambient, Max	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Collector−emitter Breakdown Voltage, Gate−emitter Short−circuited	V_{GE} = 0 V, I_C = 1mA	BVCES	1250	−	−	V

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
DYNAMIC CHARACTERISTICS						
Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	−	3920	−	pF
Output Capacitance		C_{oes}	−	157	−	
Reverse Transfer Capacitance		C_{res}	−	71	−	
SWITCHING CHARACTERISTICS						
Turn−on Delay Time	T_J = 25°C V_{CC} = 600 V, I_C = 12.5 A Rg = 5 Ω V_{GE} = 15 V Inductive Load	$t_{d(on)}$	−	26	−	ns
Rise Time		t_r	−	10	−	
Turn−off Delay Time		$t_{d(off)}$	−	133	−	
Fall Time		t_f	−	106	−	
Turn−on Switching Loss		E_{on}	−	0.9	−	mJ
Turn−off Switching Loss		E_{off}	−	0.44	−	
Total Switching Loss		E_{ts}	−	1.34	−	
Turn−on Delay Time	T_J = 25°C V_{CC} = 600 V, I_C = 25 A Rg = 5 Ω V_{GE} = 15 V Inductive Load	$t_{d(on)}$	−	27	−	ns
Rise Time		t_r	−	16	−	
Turn−off Delay Time		$t_{d(off)}$	−	118	−	
Fall Time		t_f	−	101	−	
Turn−on Switching Loss		E_{on}	−	1.94	−	mJ
Turn−off Switching Loss		E_{off}	−	0.77	−	
Total Switching Loss		E_{ts}	−	2.71	−	
Turn−on Delay Time	T_J = 175°C V_{CC} = 600 V, I_C = 12.5 A Rg = 5 Ω V_{GE} = 15 V Inductive Load	$t_{d(on)}$	−	24	−	ns
Rise Time		t_r	−	12	−	
Turn−off Delay Time		$t_{d(off)}$	−	156	−	
Fall Time		t_f	−	280	−	
Turn−on Switching Loss		E_{on}	−	1.42	−	mJ
Turn−off Switching Loss		E_{off}	−	1.03	−	
Total Switching Loss		E_{ts}	−	2.45	−	
Turn−on Delay Time	T_J = 175°C V_{CC} = 600 V, I_C = 25 A Rg = TBD V_{GE} = 15 V Inductive Load	$t_{d(on)}$	−	28	−	ns
Rise Time		t_r	−	16	−	
Turn−off Delay Time		$t_{d(off)}$	−	132	−	
Fall Time		t_f	−	208	−	
Turn−on Switching Loss		E_{on}	−	2.87	−	mJ
Turn−off Switching Loss		E_{off}	−	1.57	−	
Total Switching Loss		E_{ts}	−	4.44	−	
Total Gate Charge	V_{CE} = 600 V, I_C = 25 A, V_{GE} = 15 V	Q_g	−	189	−	nC
Gate to Emitter Charge		Q_{ge}	−	33	−	

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AFGHL25T120RHD

TYPICAL CHARACTERISTICS

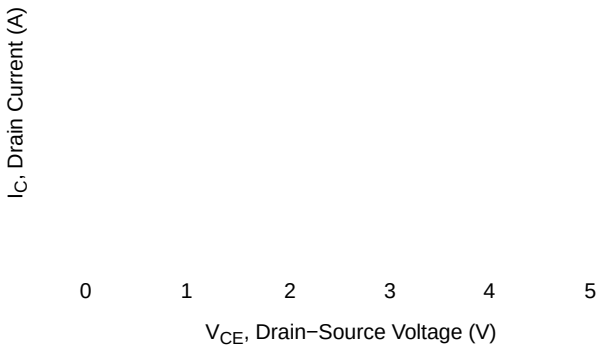


Figure 1. Typical Output Characteristics (25°C)

Figure 2. Typical Output Characteristics (175°C)

Figure 3. Typical Saturation Voltage Characteristics

Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

Figure 5. Saturation Voltage vs. V_{GE} (25°C)

Figure 6. Saturation Voltage vs. V_{GE} (175°C)

TYPICAL CHARACTERISTICS (continued)

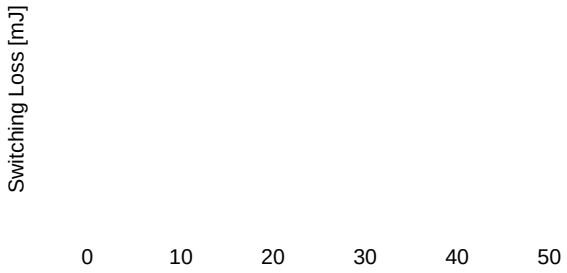


Figure 13. Switching Loss vs. Gate Resistance

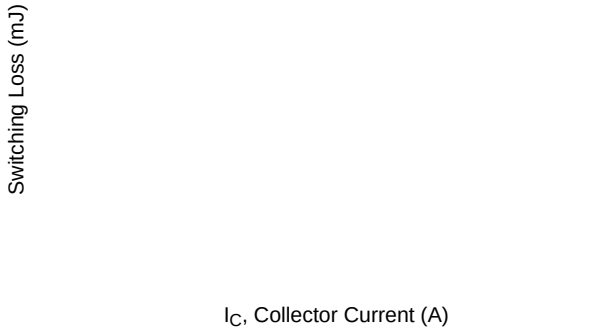


Figure 14. Switching Loss vs. Collector Current

Figure 15. SOA Characteristics

Figure 16. Forward Characteristics

Figure 17. Reverse Recovery Time

Figure 18. Stored Charge

TYPICAL CHARACTERISTICS (continued)

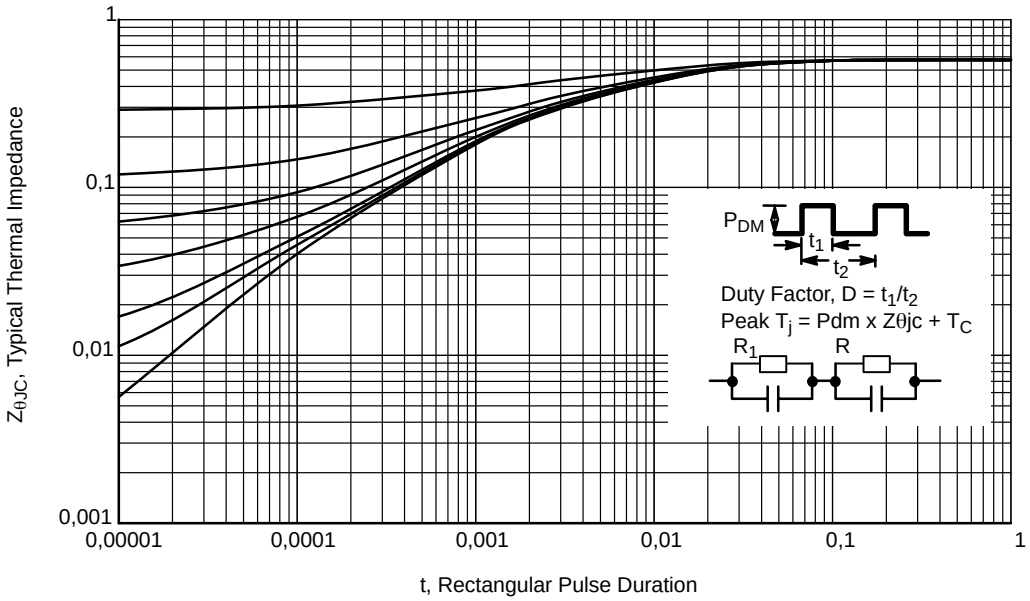
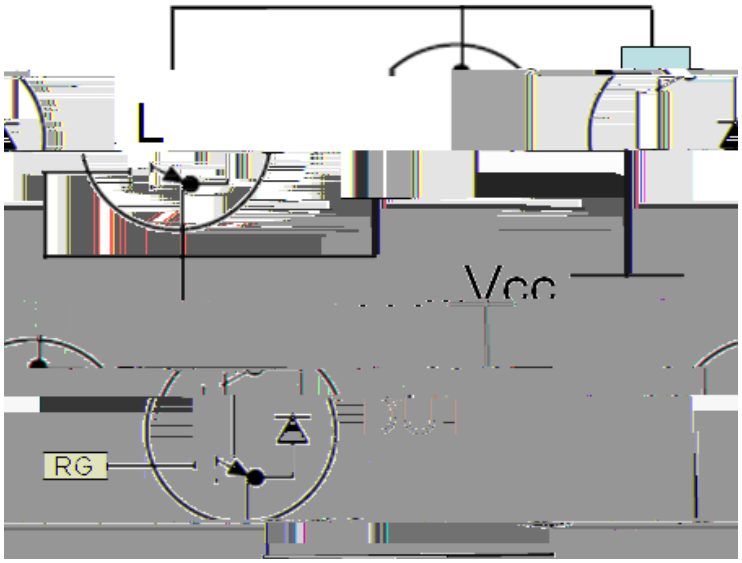


Figure 19. Transient Thermal Impedance of IGBT

t, Rectangular Pulse Duration

Figure 20. Transient Thermal Impedance of Diode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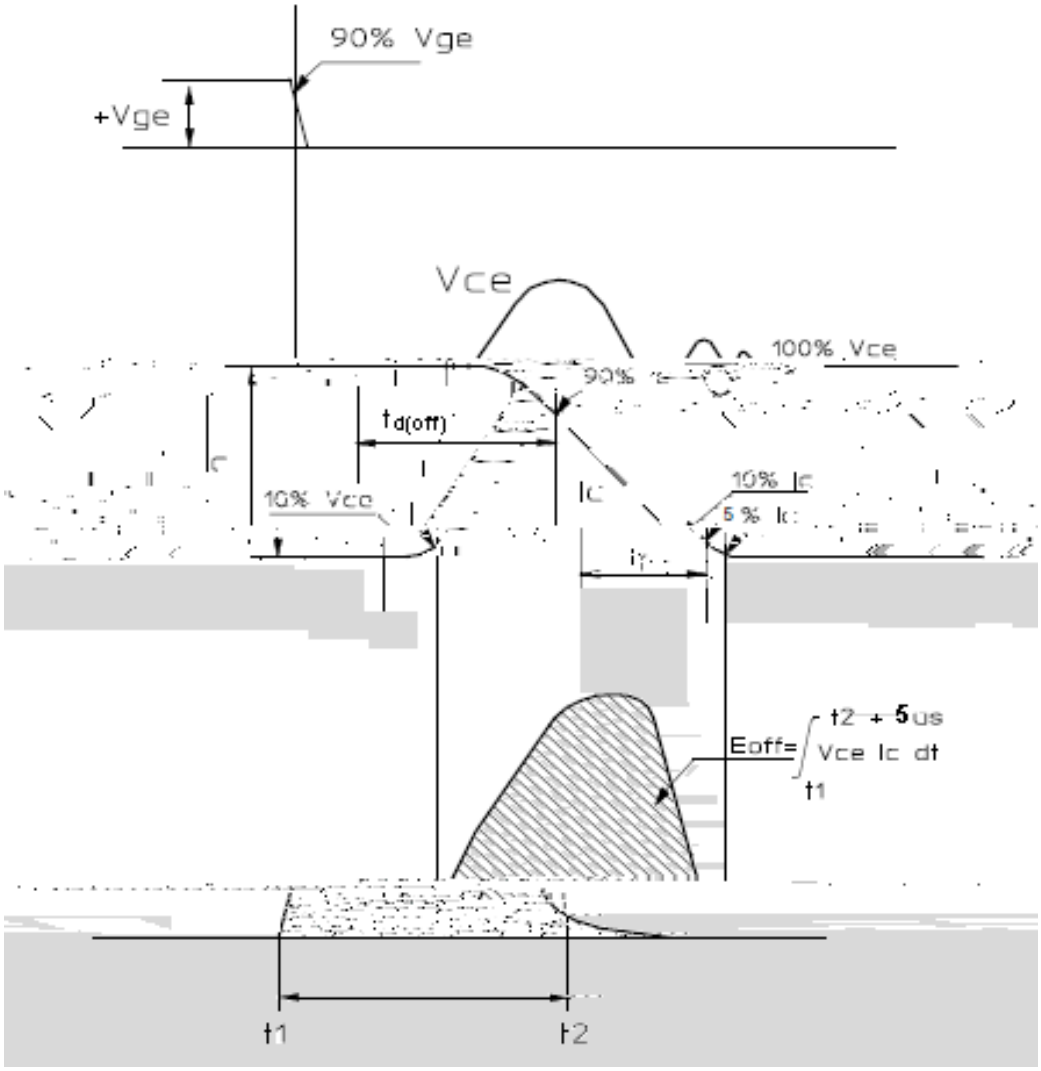
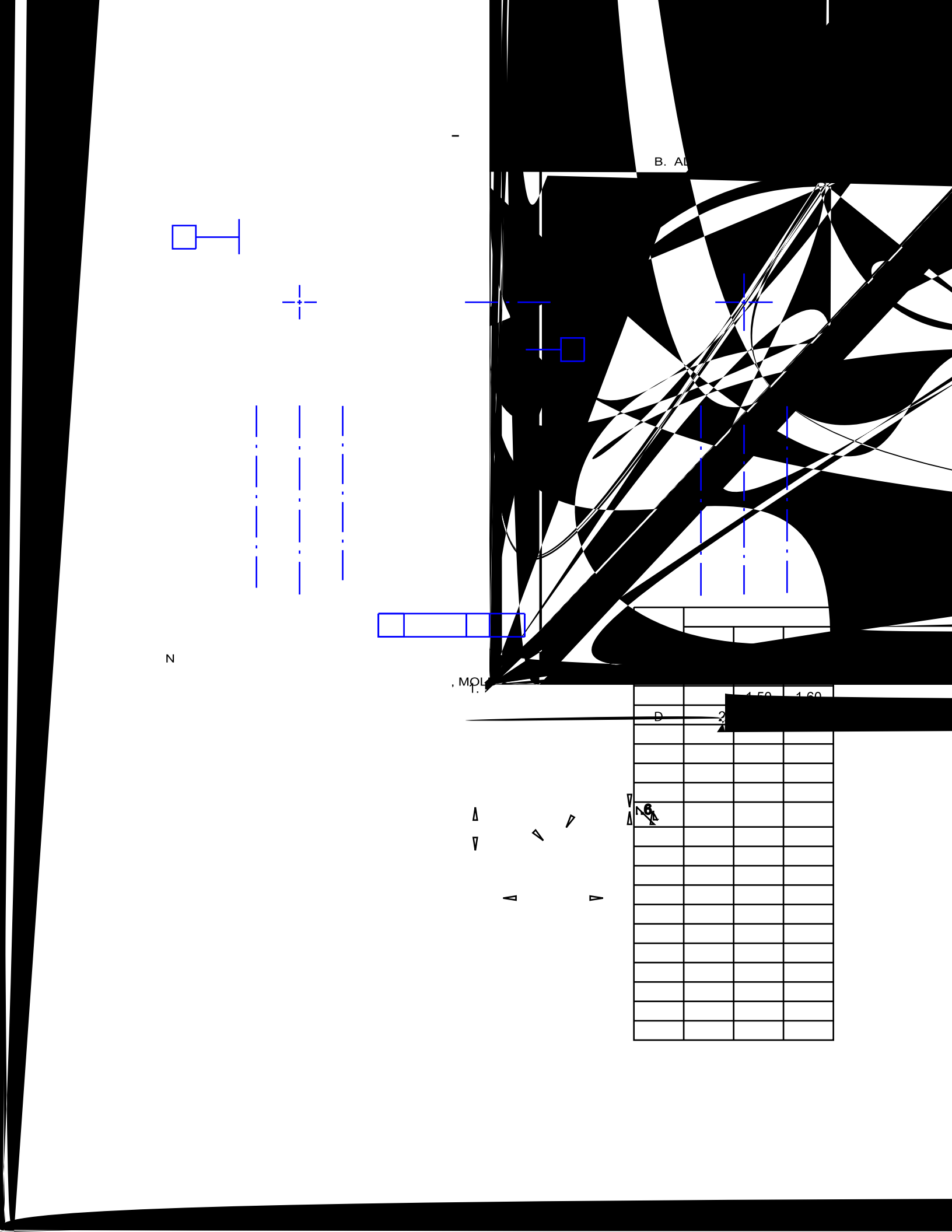


Figure 23. Definition of Turn Off Waveform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