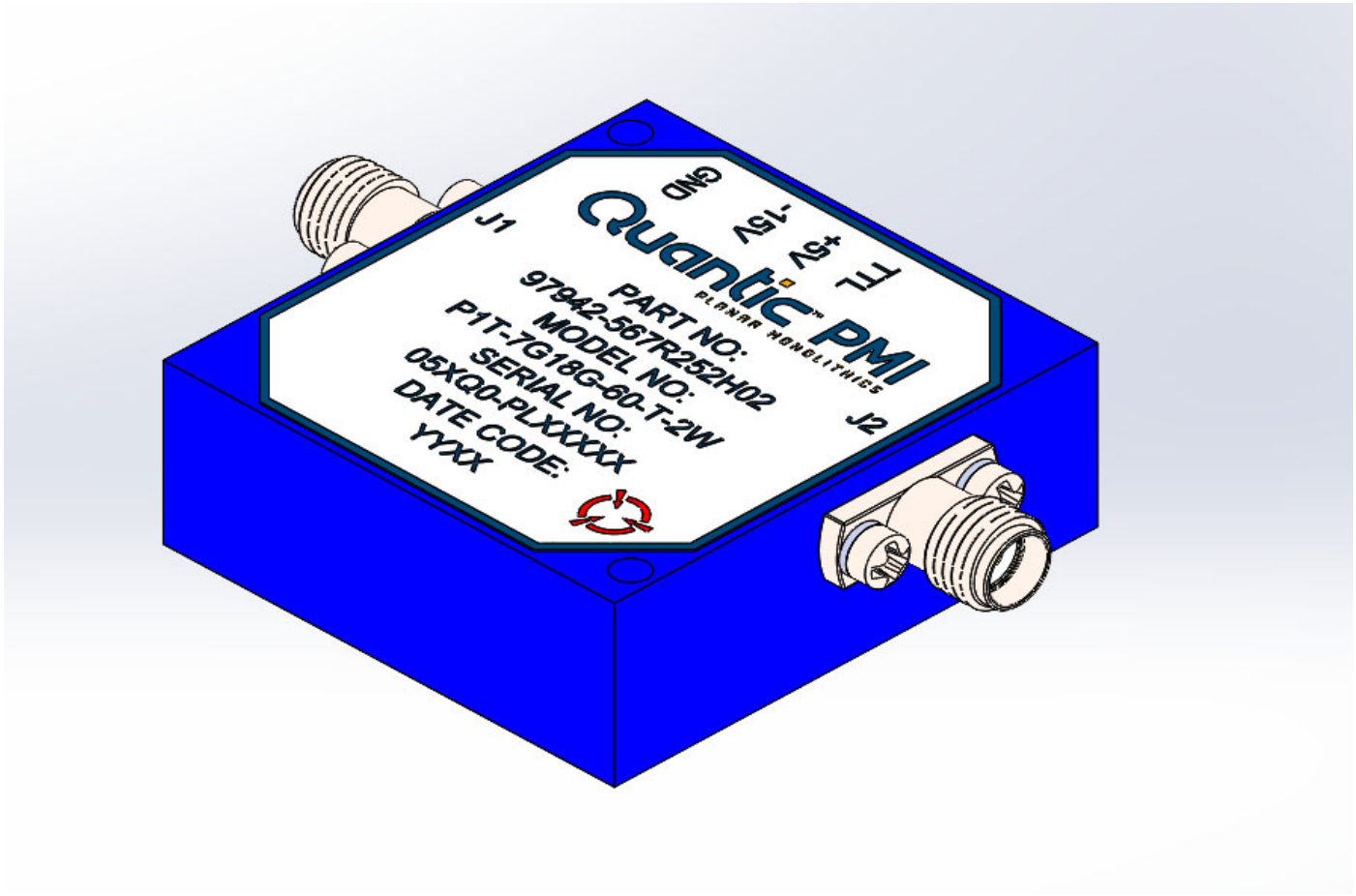
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

PMI MODEL NUMBER P1T-7G18G-60-T-2W IS A TERMINATED, SINGLE POLE SINGLE THROW SWITCH THAT OPERATES OVER THE FREQUENCY RANGE OF 7.0 GHz TO 17.5 GHz. THIS MODEL HANDLES 0.08W INPUT POWER WITH 50 dB OF ISOLATION, AND AN INSERTION LOSS OF 3.2 dB MAXIMUM.



October 26, 2023
Designed By:
PMI Engineering
Tested By:
Shane O'Neill
Reported By:
Robert Sirk

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SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

OUTLINE

DESCRIPTION:
PMI MODEL: P1T-7G18G-60-T-2W IS A TERMINATED, SINGLE POLE, SINGLE THROW SWITCH THAT OPERATES OVER THE FREQUENCY RANGE OF 7.0 GHz TO 17.5 GHz. THIS MODEL HANDLES 0.08W INPUT POWER WITH 50 dB OF ISOLATION. IT HAS INSERTION LOSS OF 3.2 dB MAXIMUM.

SPECIFICATIONS:

- FREQUENCY RANGE:..... 7.0 TO 17.5 GHz
- RF POWER HANDLING:..... 0.08 W (30% DUTY CYCLE & 130 µs PULSE WIDTH)
- ISOLATION:..... 50 dB MIN[1]
- INSERTION LOSS:..... 3.2 dB MAX[2]
- INSERTION LOSS RIPPLE:..... 0.3 dB MAX OVER ANT 500 MHz BANDWITH
- VSWR:..... 1.8:1 MAX (PORT SELECTED)
  (INTO TERMINATION/ SOURCE OF 1.3:1) 2.2:1 MAX (PORT NOT SELECTED)
- COMMAND LOGIC:..... TTL LOGIC - SEE TABLE
- DC POWER DISSIPATION:..... 1.25 W
- PHASE NOISE:..... RESIDUAL NOISE 100 Hz TO 1 kHz LINEAR; -90 TO -125 dBc/Hz[3]
  RESIDUAL NOISE 1 kHz TO 10 kHz; -125 dBc/Hz
- RISE TIME:..... 30 TO 70 ns (SEE PAGE 2)
- FALL TIME:..... 50 TO 100 ns (SEE PAGE 2)
- SWITCHING DELAY:..... 250 ns MAX (SEE PAGE 2)
- WEIGHT:..... 0.24 lbs MAX
- SEALING :..... HERMETICALLY SEALED
- CONNECTORS:..... SMA (F) REMOVABLE (FIELD REPLACEABLE)
- FINISH:..... PAINTED BLUE

NOTES:

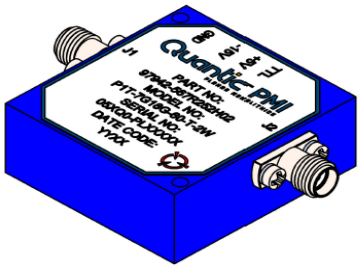
1. MEASURE AND RECORD S_{21} FROM 6 GHz TO 18 GHz (1201 POINTS), WITH THE DC VOLTAGE SUPPLY SET TO >2.6 V (PULSE MODULATOR IN THE OFF STATE). ISOLATION WILL BE VERIFIED FROM THIS DATA
2. INSERTION LOSS SHALL BE MEASURED WITH THE CONTROL SIGNAL RELATIVE TO ITS RETURN (i.e., ON OR LOW LOSS STATE) OVER THE FREQUENCY RANGE OF 7 GHz-17.5 GHz
3. PHASE NOISE REQUIRED ONLY DURING FUNCTIONAL VIBRATION AT AMBIENT TEMPERATURE

ENVIRONMENTAL RATINGS:

- TEMPERATURE:..... 17°C TO +42°C (OPERATING)
  -55°C TO +95°C (STORAGE)
- HUMIDITY:..... MIL-STD-810, METHOD 507.5, PROCEDURE II (10 CYCLES)
- SHOCK:..... MIL-STD-810, METHOD 516, PROCEDURE I
- SOLVENT RESISTANT:..... MIL-STD-202, METHOD 215
- ALTITUDE:..... MIL-STD-202, METHOD 105 (50,000 ft)
- INTERNAL WATER VAPOR:..... MIL-STD-883, METHOD 1018
- SEAL:..... MIL-STD-883, METHOD 1014, COND. A & C

NOTE: SPECIFICATIONS WILL VARY OVER TEMPERATURE
NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION

ZONE	REV.	DESCRIPTION	DATE	APPROVED
	B2	ECN # 23-0052	3/9/2023	
	B3	ECN # 23-0073	4/14/2023	



PIN	SIGNAL NAME	CONDITION
E1	+5VDC	≤50 mV RIPPLE MAX, 50 Hz TO 500 MHz
E2	-15VDC	≤100 mV RIPPLE MAX, 50 Hz TO 500 MHz
E3	GND RETURN	GROUND RETURNS COMMON; TIED CASE TO GND
E4	SWITCH CTL 0	TTL SIGNALING IS DEFINED AS: E4 > 2.0 V RESULTS IN J1-J2 LOW ISOLATION STATE (ON STATE) E4 < 0.4 V RESULTS IN J1-J2 HIGH ISOLATION (OFF STATE)

TTL LOGIC SWITCH TABLE	
THRU	BITS LOGIC
NONE	0
J1 TO J2	1

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APPROVALS	DATE
DRAWN: R. SIRK	1/12/2023
REDRAWN	
ISSUED	

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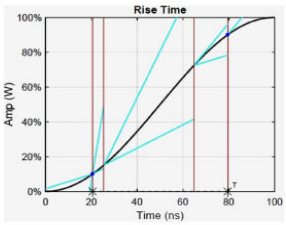
TITLE: OUTLINE
P1T-7G18G-60-T-2W

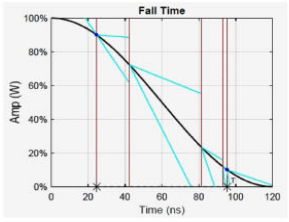
SIZE	FSCM NO.	DWG NO.	REV.
B	05XQ0	27030121	B3

SCALE 2:1 SHEET 1 OF 3

SCREENING DETAILS		
TEST	REQUIREMENT	METHOD
INTERNAL VISUAL INSPECTION	SHALL MEET ALL VISUAL REQUIREMENTS FOUND IN THE METHOD	MIL-STD-883, METHOD 2017, CONDITION B.
ELECTRICL TEST	SHALL MEET ALL ELECTRICAL REQUIREMENTS WHEN SUBJECT TO ANY COMBINATION OF ENVIROMENTAL CONDITIONS	ACCEPTANCE TEST PROCEDURE
NON-OPERATING TEMPERATURE CYCLING[2]	ELECTRIAL SPECIFICATIONS SHALL BE MET BEFORE AND AFTER CYCLING	-40°C TO 95°C AND BACK FOR 25 CYCLES THE TEMPERATURE EXTREMES SHALL BE REACHED WITHIN ±3°C FOR AT LEAST 15 MINUTES PER CYCLE.
MECHANICAL SHOCK[2]	ELECTRIAL SPECIFICATIONS SHALL BE MET BEFORE AND AFTER SHOCK	MIL-STD-202-, METHOD 213, CONDITION J, 30 g's PEAK, 11 ms DURATION, HALF SINE WAVEFORM, 6.8 ft/s VELOCITY CHANGE
BURN-IN TEST[1]	---	MIL-STD-883, METHOD 1015 96 HOURS MINIMUM @ 125°C JUCTION TEMPERATRE, 48 HOURS MINIMUM POST SEAL. 48 HOURS MAY BE PERFORMED BEFORE SEALING
FINE AND GROSS LEAK[3]	ELECTRIAL SPECIFICATIONS SHALL BE MET BEFORE AND AFTER SEAL	MIL-STD-883, METHOD 1014, CONDITION A
EXTERNAL VISUAL	SHALL MEET ALL VISUAL REQUIREMENTS FOUND IN THE METHOD	MIL-STD-883, METHOD 2009

NOTES:
1.) PRE-SEAL BURN IN MAY BE PERFORMED AS FOLLOWS
a. MAXIMUM PRE-SEAL BURN IN TIME, ACCUMULATED FOR SCREENING COMPLIANCE SHALL NOT EXCEED ONE-HALF THE TOTAL BURN-IN TIME. PRE-SEAL BURN-IN, WHEN UTILIZED SHALL BE ACCOMPLISHED IN AN OVEN PROVIDING AN INERT GAS ENVIROMENT.
b. A MINIMUM OF ONE-HALF THE BURN-IN SHALL BE PERFORMED AFTER SEAL.
c. THE ACTUAL PROCESS FLOW SHALL BE CLEARLY DOCUMENTED ON THE WORK ORDER TRAVELERS.
d. PARTS SHALL RECEIVE INTERNAL VISUAL INSPECTION, AS SPECIFIED, PRIOR TO SEALING.
2.) TEMPERATURE CYCLING AND MECHANICAL SHOCK, AS SPECIFIED, SHALL BE PERFORMED AFTER COMPLETION OF THE SEAL OPERATION.
3.) SEAL TEST SHALL BE PERFORMED ON PARTS AFTER COMPLETION OF TEMPERATURE CYCLING AND MECHINCAL SHOCK.





TIME INTERVAL	MINIMUM SLOPE (% MAX (W)/ns)	MAXIMUM SLOPE (% MAX (W)/ns)
RF_{1Rise} to RF_{10Rise} 4/	0.35%/ns	8%/ns
RF_{10Rise} to RF_{10Rise} + 5 ns	0.67%/ns	8%/ns
RF_{10Rise} + 5 ns to RF_{10Rise} + 0.75*T	0.67%/ns	3.6%/ns
RF_{10Rise} + 0.75*T to RF_{90Rise}	0.35%/ns	1.6%/ns
RF_{90Rise} to RF_{Max}		1.6%/ns

TIME INTERVAL	MAXIMUM SLOPE (% MAX (W)/ns)	MINIMUM SLOPE (% MAX (W)/ns)
RF_{Max} to RF_{90Fall}		-1.6%/ns
RF_{90Fall} to RF_{90Fall} + 0.25*T	-0.08%/ns	-1.6%/ns
RF_{90Fall} + 0.25*T to RF_{90Fall} + 0.8*T	-0.32%/ns	-2.16%/ns
RF_{90Fall} + 0.8*T to RF_{10Fall} - 2.5 ns	-0.67%/ns	-4.2%/ns
RF_{10Fall} - 2.5 ns to RF_{10Fall}	-0.67%/ns	-8%/ns
RF_{10Fall} to RF_{1Fall} 4/	0.35%/ns	-8%/ns

NOTE: SPECIFICATIONS WILL VARY OVER TEMPERATURE
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TITLE: OUTLINE
P1T-7G18G-60-T-2W

SIZE	FSCM NO.	DWG NO.	REV.
B	05XQ0	27030121	B3

SCALE 2:1 SHEET 2 OF 3

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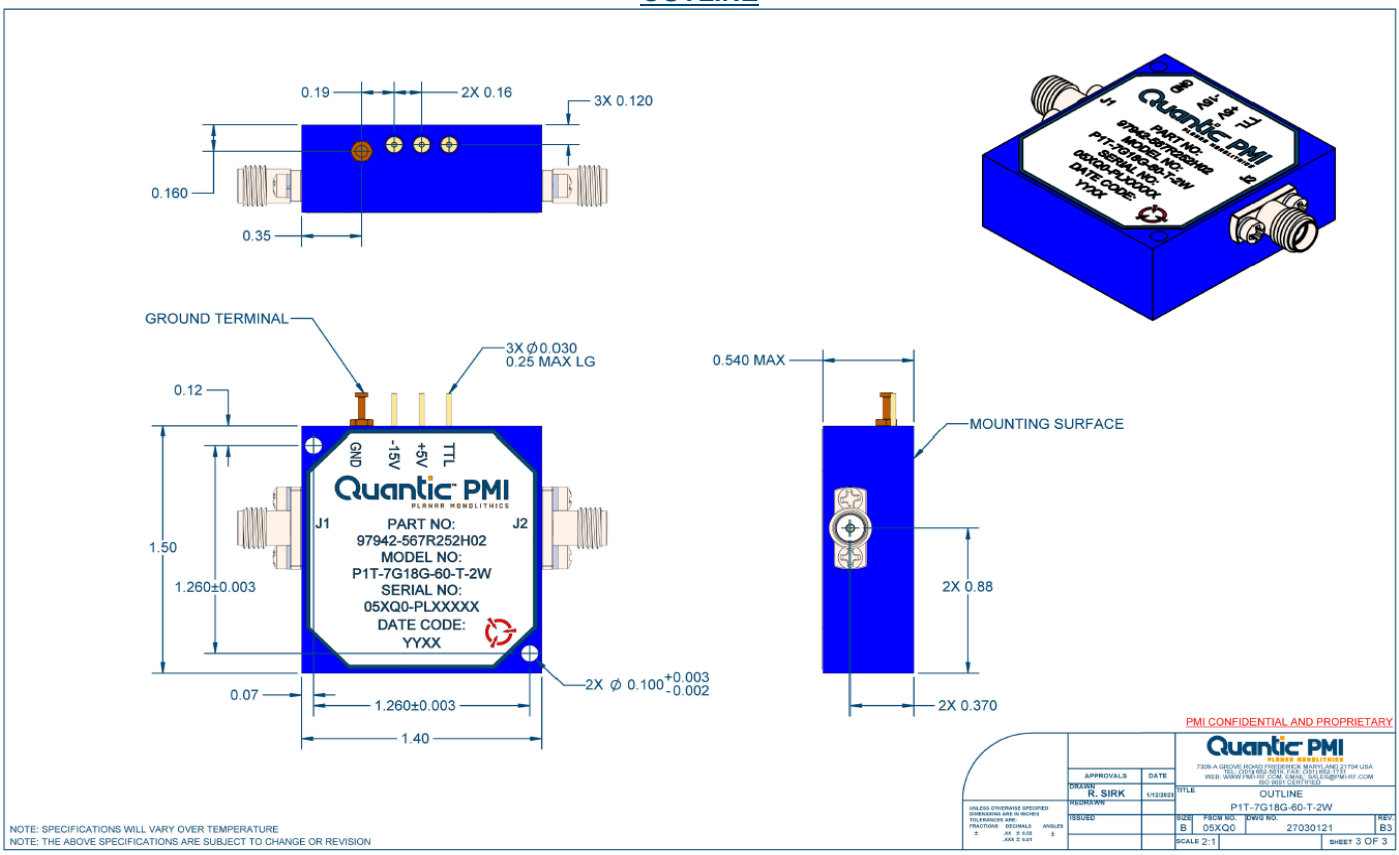
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

OUTLINE



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SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

TEST ITEM NO.	PARAMETERS	SPECIFIED VALUE	TEST RESULTS		
			+25°C	+17°C	+42°C
1	Frequency Range:	7.0 to 17.5 GHz	**7.0 to 17.5 GHz**	**7.0 to 17.5 GHz**	**7.0 to 17.5 GHz**
2	RF Power Handling:	0.08 W (30% Duty Cycle & 130 µs Pulse Width)	**0.08 W**	**0.08 W**	**0.08 W**
3	Isolation:	50 dB Min S21 to be measured from 6 to 18 GHz (1201 points) with DC voltage supply set to > 2.6 V (pulse modulator in the off state)	**57.95 dB See Plot**	**58.14 dB See Plot**	**58.37 dB See Plot**
4	Insertion Loss:	3.2 dB Max. Measuered with control signal relative to its return to its return (i.e. ON or low loss state) over 7 to 17.5 GHz frequency range	**2.67 dB See Plot**	**2.75 dB See Plot**	**2.8 dB See Plot**
5	Insertion Loss Ripple:	0.3 dB Max (Over any 500 MHz bandwidth within the operating frequency)	**0.25 dB**	**0.26 dB**	**0.24 dB**
6	VSWR (Into Termination/ Source of 1.3:1):	1.8:1 Max. (Port Selected) 2.2:1 Max. (Port Not Selected)	**1.56:1 Port Selected 1.63:1 Port Not Selected See Plots**	**1.61:1 Port Selected 1.62:1 Port Not Selected See Plots**	**1.55:1 Port Selected 1.59:1 Port Not Selected See Plots**
7	DC Power Dissipation:	1.25 W Max (V * I = P)	**+5V @ 0.026 A -15V @ 0 A P = 0.13 W**	**+5V @ 0.026 A -15V @ 0 A P = 0.13 W**	**+5V @ 0.026 A -15V @ 0 A P = 0.13 W**
8	Rise Time:	30-70 ns See Outline	**32.5 ns**	**31 ns**	**36 ns**
9	Fall Time:	50-100 ns See Outline	**76 ns**	**71.5 ns**	**76 ns**
10	On Switch Delay:	< 250 ns Max	**149.5 ns**	**141.5 ns**	**159 ns**
11	Off Switch Delay:	< 250 ns Max	**143.5 ns**	**143 ns**	**135 ns**

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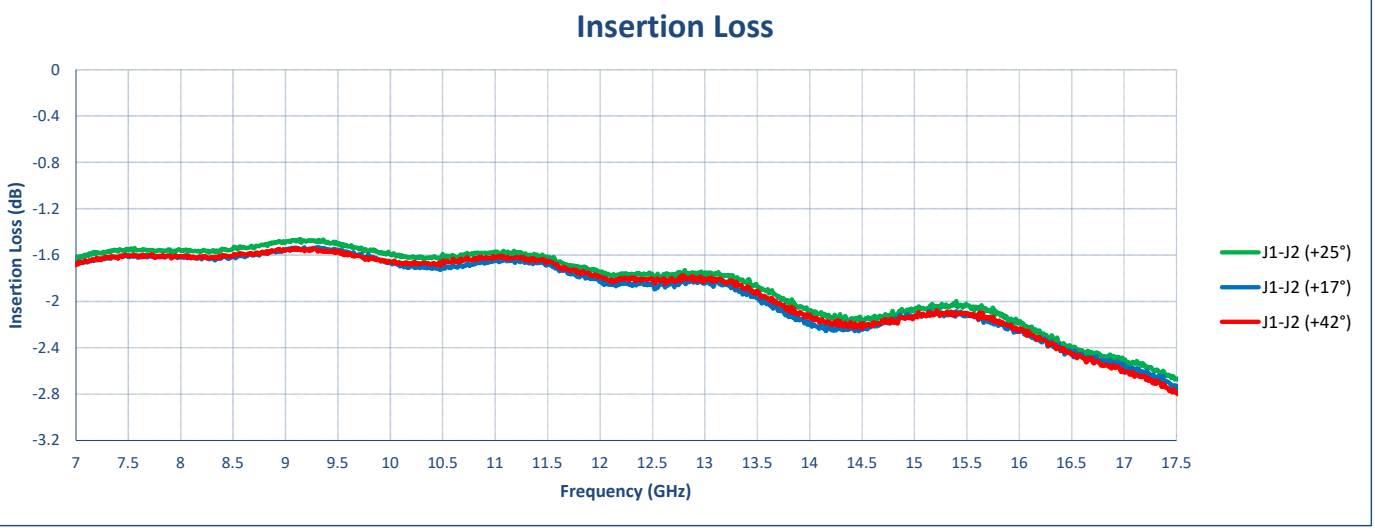

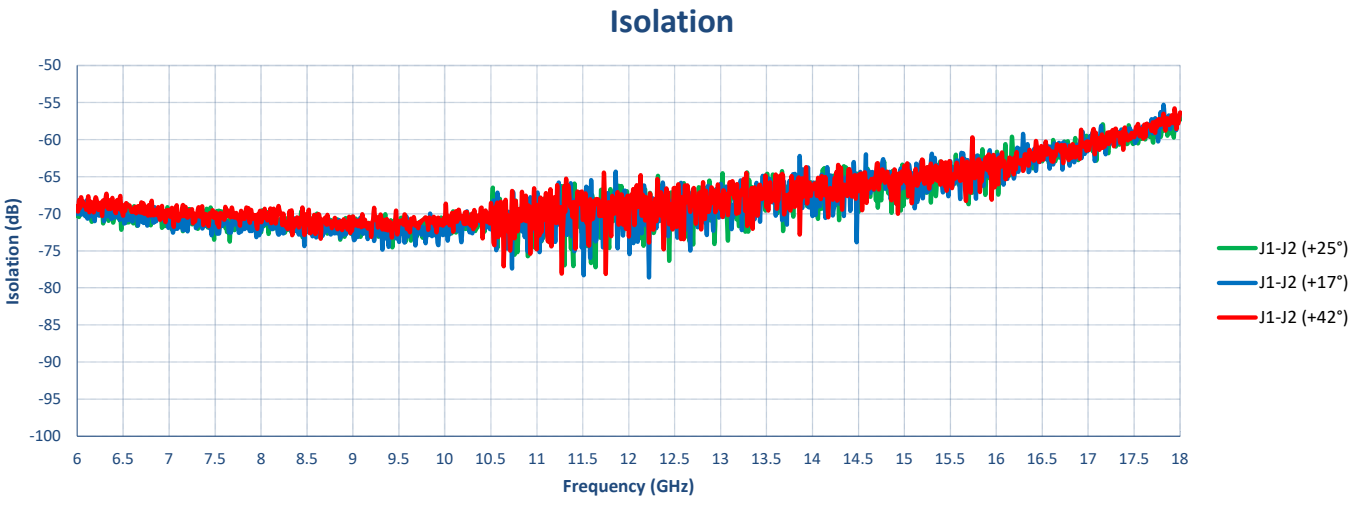

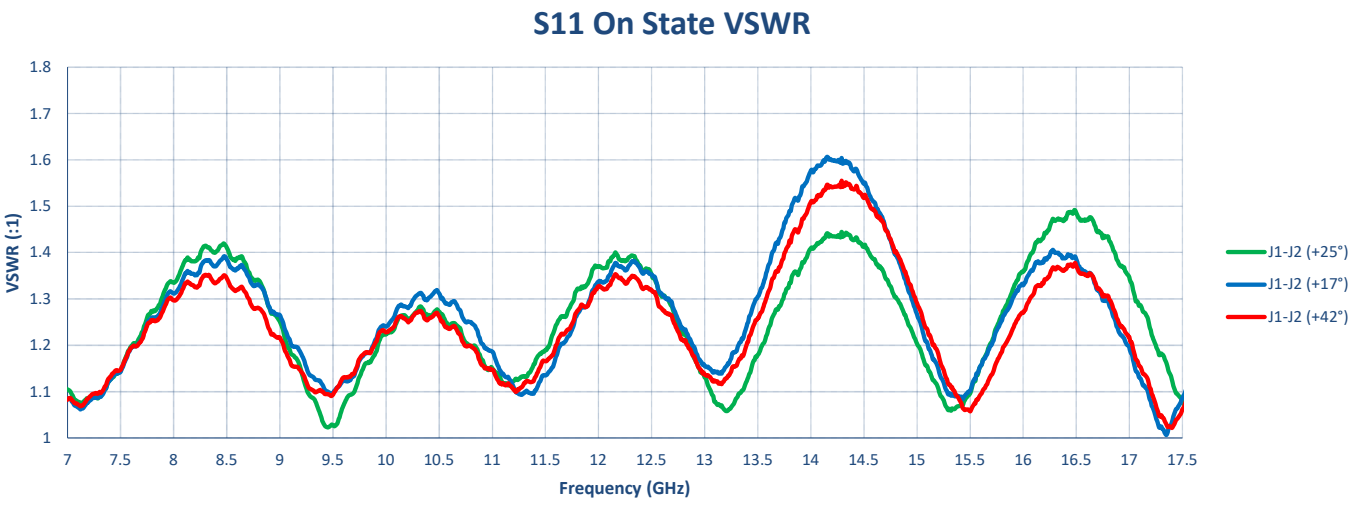

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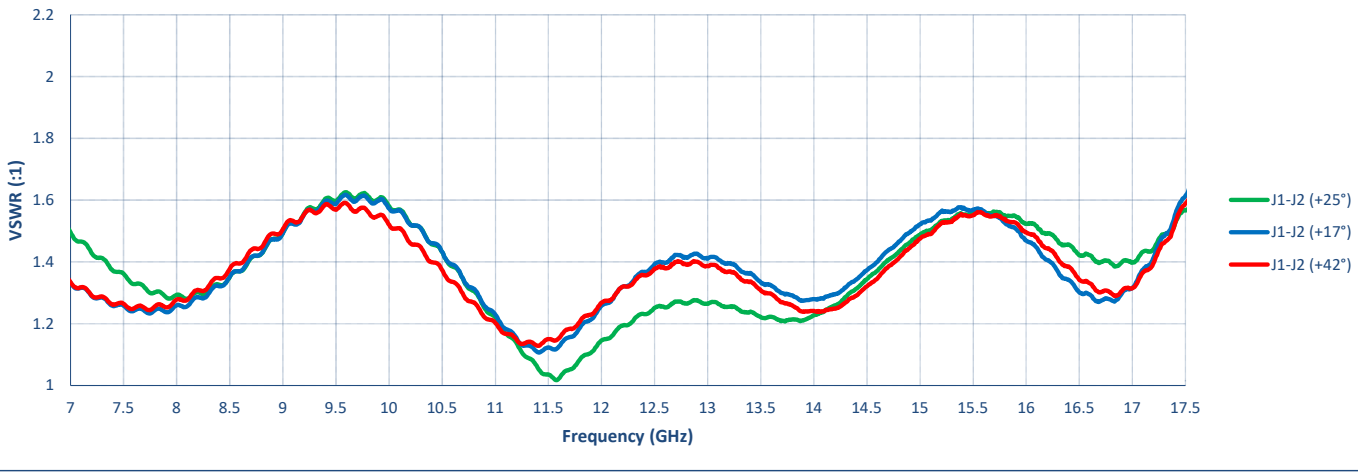

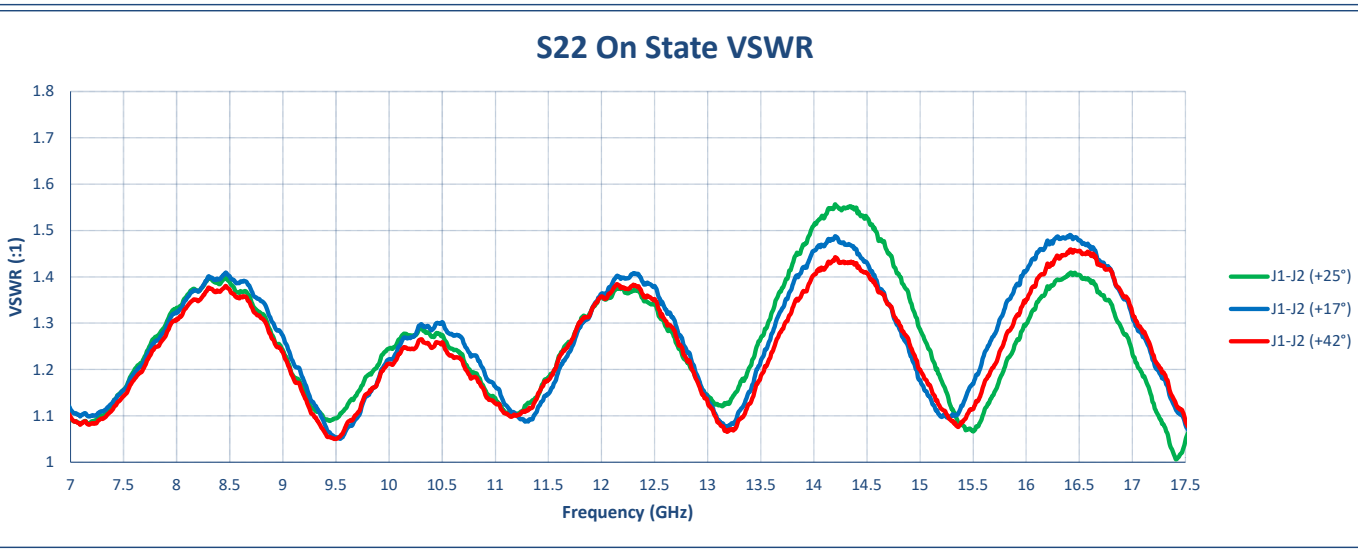

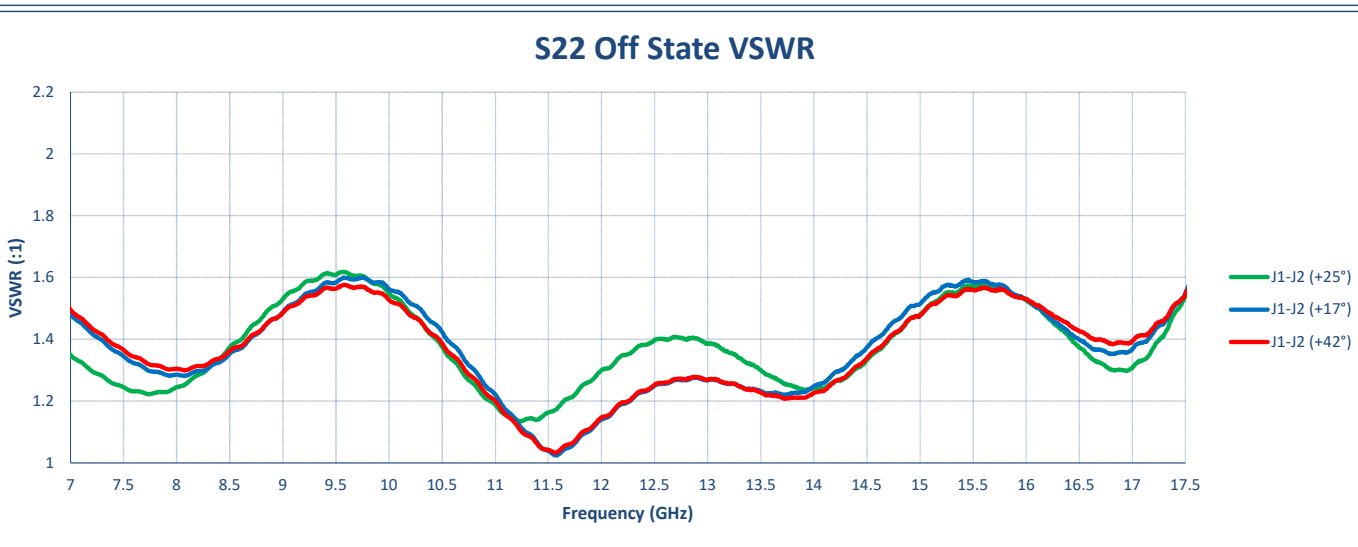

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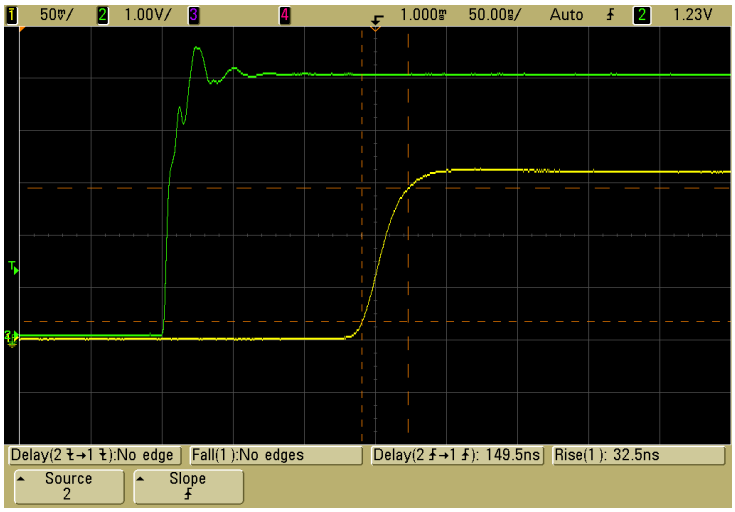
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

Rise Time - J1-J2

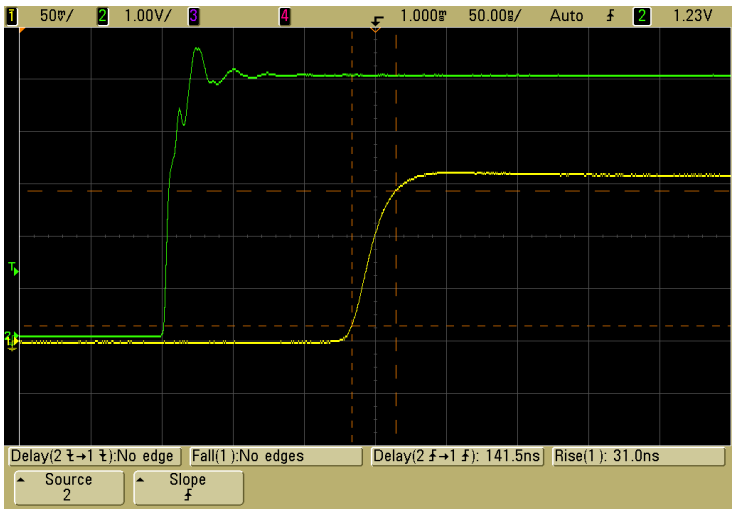
25°C

Rise Time - **32.5 ns**
Switching Delay - **149.5 ns**



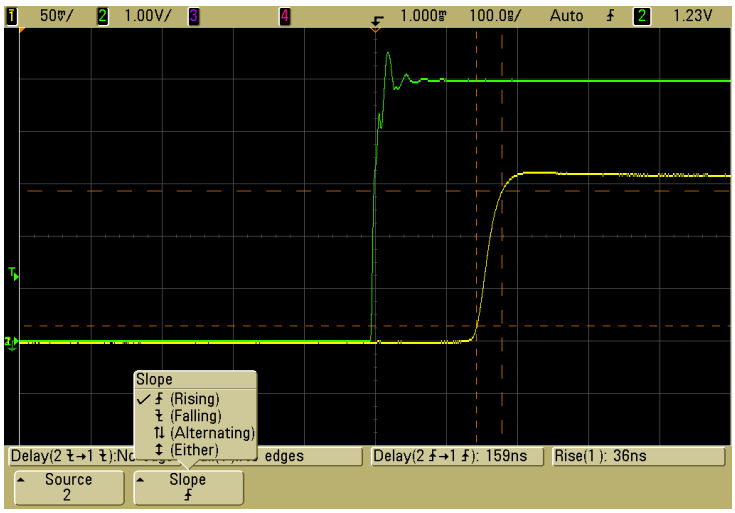
17°C

Rise Time - **31 ns**
Switching Delay - **141.5 ns**



42°C

Rise Time - **36 ns**
Switching Delay - **159 ns**



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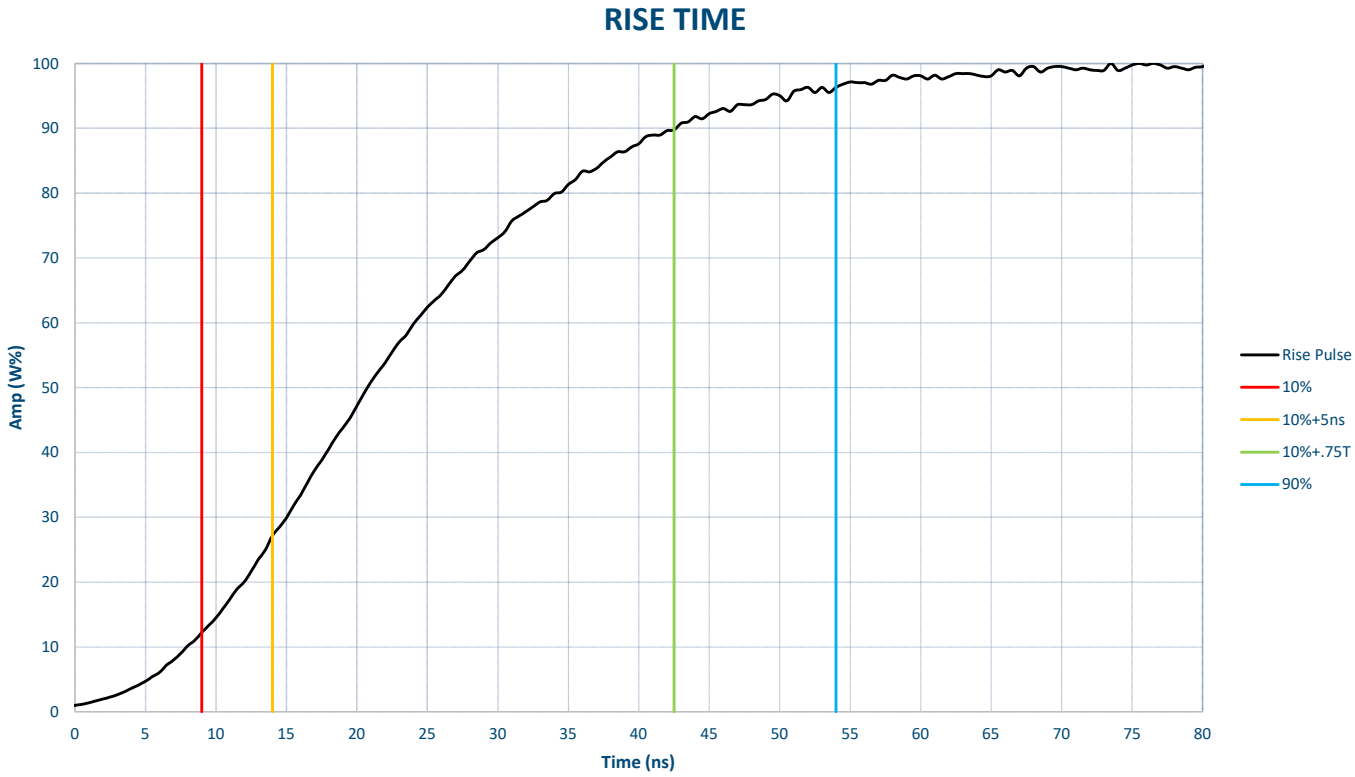
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

Rise Time - J1-J2 at 25°C



Time Interval 1/, 2/, 3/, 5/, 6/	Minimum Slope (% MAX (W)/ns)	Maximum Slope (% MAX (W)/ns)	**Measured Slope (% MAX (W)/ns)**
RF_{1Rise} to RF_{10Rise} 4/	0.35%/ns	8%/ns	**1.09%/ns**
RF_{10Rise} to RF_{10Rise} + 5 ns	0.67%/ns	8%/ns	**2.65%/ns**
RF_{10Rise} + 5 ns to RF_{10Rise} 0.75*T	0.67%/ns	3.6%/ns	**2.77%/ns**
RF_{10Rise} 0.75*T to RF_{90Rise}	0.35%/ns	1.6%/ns	**1.24%/ns**
RF_{90Rise} to RF_{Max}		1.6%/ns	**0.32%/ns**

Notes:

1/ RF_{1RISE}, RF_{10Rise} and RF_{90Rise} are the times (nanoseconds) for the -20 dB, -10 dB and -0.5 dB points of the rising RF pulse edge, respectively. Pulse power is referenced from the pulse max power while in "ON" state. Times are referenced from the start of monotonic pulse power increase.

2/ Max pulse power is the average maximum power (W) at the output of the switch, when it is at steady state in the "ON" position with an 80 mW CW signal between 7 GHz and 17.5 GHz applied to the input.

3/ T is the time difference between RF_{10Rise} and RF_{90Rise}.

4/ This interval refers to the slope between -20 dB and -10 dB points. Measured slope for this interval shall be measured as the average slope over the entire interval after applying a 3% smoothing function of the data. First and last points of this interval may be used for the average slope calculation.

5/ Measured slope at any given point will be measured as the average slope over any 5 ns interval after applying a 3% smoothing function to the data.

6/ Switching waveform shall be monotonic and contain no significant discontinuities.

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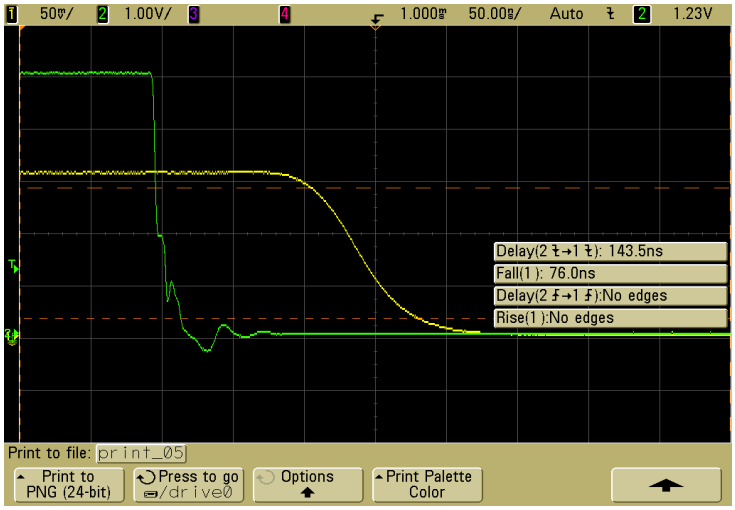
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

Fall Time - J1-J2

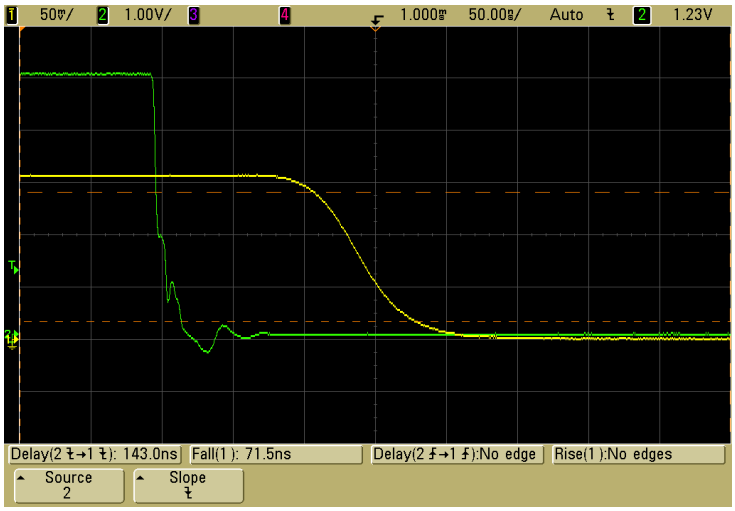
25°C

Fall Time - **76 ns**
Switching Delay - **143.5 ns**



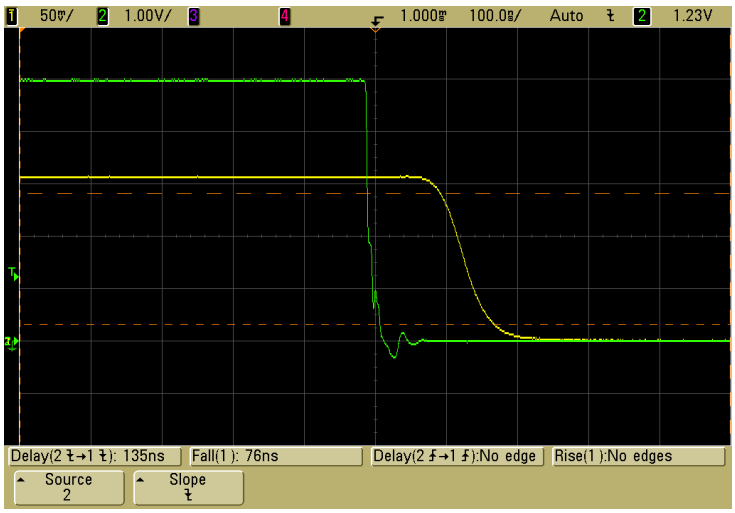
17°C

Fall Time - **71.5 ns**
Switching Delay - **143 ns**



42°C

Fall Time - **76 ns**
Switching Delay - **135 ns**



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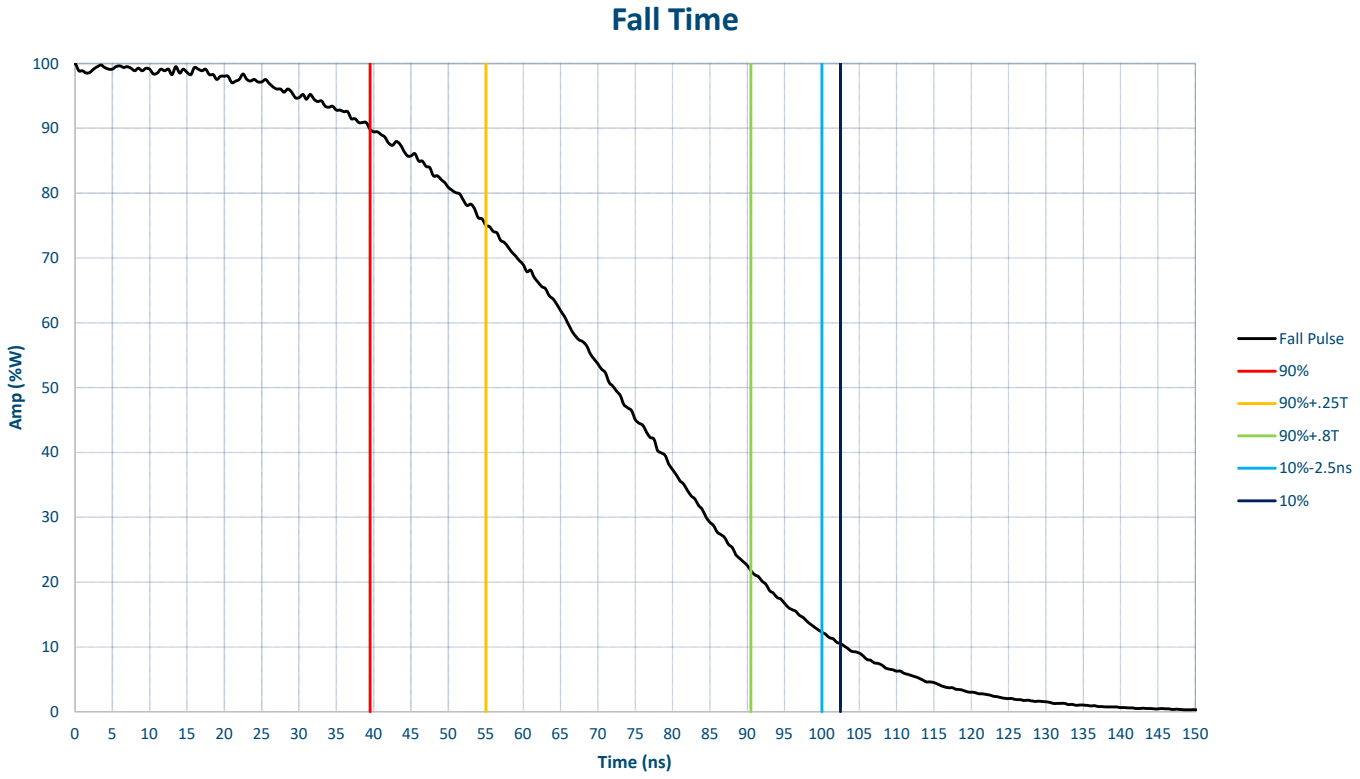
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

Fall Time - J1-J2 at 25°C



Time Interval 1/, 2/, 3/, 5/, 6/	Minimum Slope (% MAX (W)/ns)	Maximum Slope (% MAX (W)/ns)	**Measured Slope (% MAX (W)/ns)**
RF_{Max} to RF_{90Fall}		-1.6%/ns	**-0.36%/ns**
RF_{90Fall} to RF_{90Fall} + 0.25*T	-0.08%/ns	-1.6%/ns	**-0.95%/ns**
RF_{90Fall} + 0.25*T to RF_{90Fall} + 0.8*T	-0.32%/ns	-2.16%/ns	**-1.57%/ns**
RF_{90Fall} + 0.8*T to RF_{10Fall} - 2.5 ns	-0.67%/ns	-4.2%/ns	**-1%/ns**
RF_{10Fall} - 2.5 ns to RF_{10Fall}	-0.67%/ns	-8%/ns	**-0.73%/ns**
RF_{10Fall} to RF_{1Fall} 4/	0.35%/ns	-8%/ns	**-0.27%/ns**

Notes:

1/ RF_{1Fall}, RF_{10Fall}, and RF_{90Fall} are the times (nanoseconds) for the -20 dB, -10 dB and -0.5 dB points of the falling RF pulse edge, respectively. Pulse power is referenced from the pulse max power while in "ON" state. Times are referenced from the start of monotonic pulse power decrease.

2/ Max pulse power is the average maximum power (W) at the output of the switch, when it is at steady state in the "ON" position with an 80 mW CW signal between 7 GHz and 17.5 GHz applied to the input.

3/ T is the time difference between RF_{90Fall} and RF_{10Fall}.

4/ Measured slope for this interval shall be measured as the average slope over the entire interval after applying a 3% smoothing function of the data. First and last points of this interval may be used for the average slope calculation.

5/ Measured slope at any given point will be measured as the average slope over any 5 ns interval after applying a 3% smoothing function to the data.

6/ Switching waveform shall be monotonic and contain no significant discontinuities.

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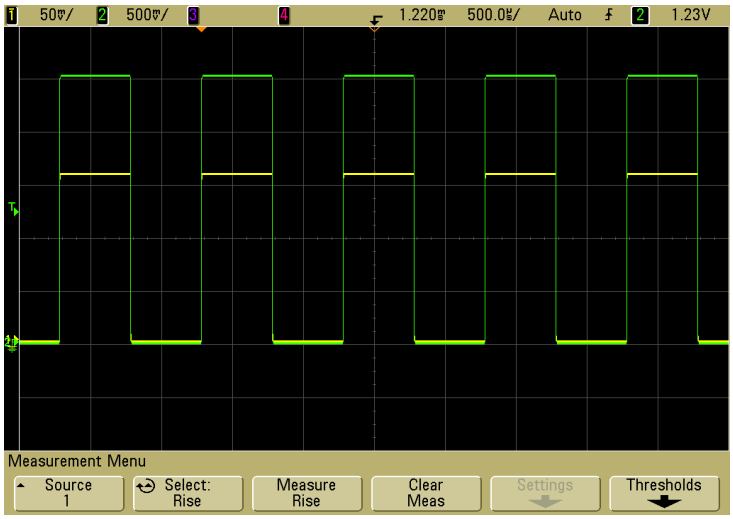
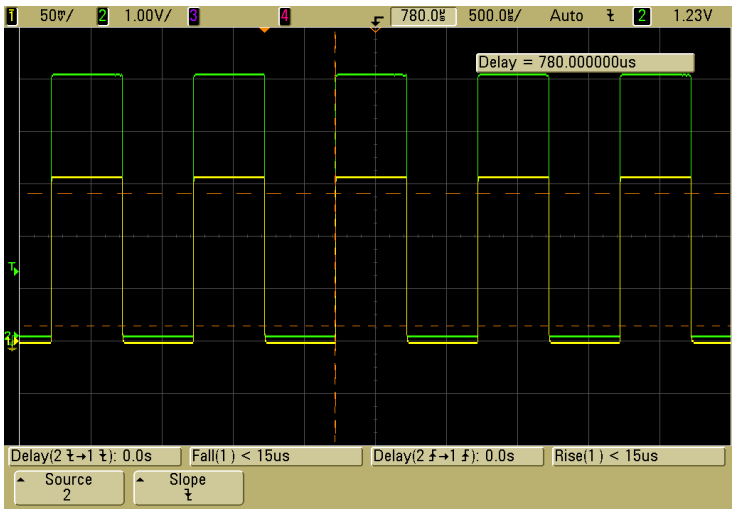
SUMMARY TEST DATA ON P1T-7G18G-60-T-2W

J1-J2 Full Pulse Switching Time

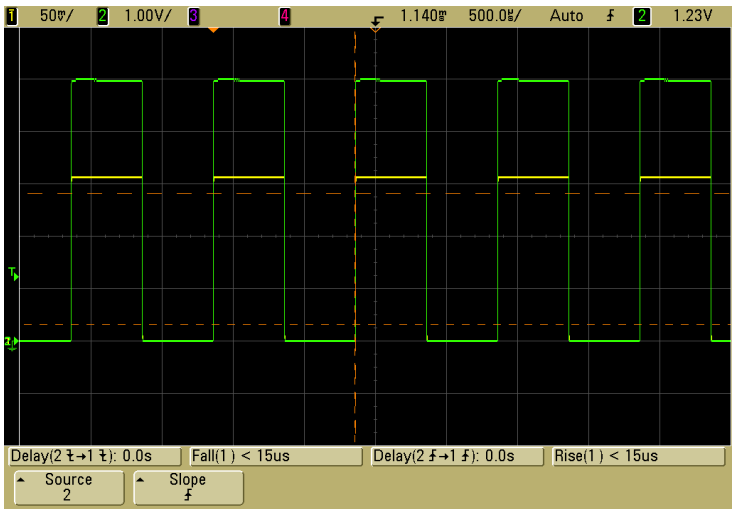
25°C



17°C



42°C



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