

SK1450V GaN TRANSISTOR

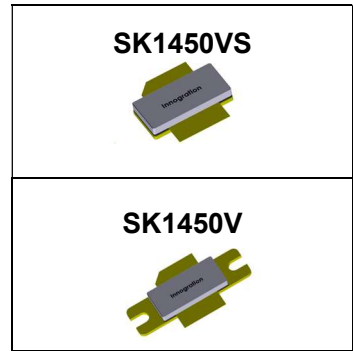
Document Number: SK1450V
Preliminary Datasheet V1.2

Gallium Nitride 50V, 500W, RF Power Transistor

Description

The SK1450V is a 500-watt, internally matched GaN HEMT, designed for commercial pulsed amplifier applications with frequencies from 960MHz to 1400MHz.

There is no guarantee of performance when this part is used in applications designed outside of these frequencies.



- Typical Performance under different pulse(On Innogration fixture with device soldered):

SK1450VS Vgs=-3.46V Vds=48V Idq=100mA Pulse 100us 10%						
Freq (MHz)	Psat (dBm)	Psat (W)	Ids (A)	Pin (dBm)	Gain (dB)	Eff (%)
960	58.93	781.6	2.64	43.16	15.77	61.68
1000	58.23	665.3	2.30	41.73	16.50	60.26
1050	57.16	520.0	1.75	41.71	15.45	61.90
1100	57.32	539.5	1.93	40.69	16.63	58.24
1150	57.78	599.8	2.18	40.78	17.00	57.32
1200	57.84	608.1	2.08	40.81	17.03	60.91
1225	57.43	553.4	1.87	41.70	15.73	61.65
SK1450V Vgs=-3.46V Vds=48V Idq=100mA Pulse 300us 30%						
Freq (MHz)	Psat (dBm)	Psat (W)	Ids (A)	Pin (dBm)	Gain (dB)	Eff (%)
960	58.70	741.3	7.77	42.26	16.44	59.63
1000	57.93	620.9	6.71	41.83	16.10	57.83
1050	57.13	516.4	5.26	41.76	15.37	61.36
1100	57.12	515.2	5.82	41.78	15.34	55.33
1150	57.60	575.4	6.48	40.82	16.78	55.50
1200	57.71	590.2	6.13	40.88	16.83	60.18
1225	57.35	543.3	5.63	41.80	15.55	60.31

Applications and Features

- Suitable for broad band application within L band
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

■ Turning the device ON

- 1) Set VGS to the pinch-off (VP) voltage, typically -5 V
- 2) Turn on VDS to nominal supply voltage (50 V)
- 3) Increase VGS until IDS current is attained
- 4) Apply RF input power to desired level

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■ Turning the device OFF

- 1) Turn RF power off
- 2) Reduce VGS down to VP, typically -5 V
- 3) Reduce VDS down to 0 V
- 4) Turn off VGS

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to +0	Vdc
Operating Voltage	V_{DD}	0 to 55	Vdc
Maximum Forward Gate Current @ $T_C = 25^\circ C$	I_{gmax}	72	mA
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ C$
Case Operating Temperature	T_C	+150	$^\circ C$
Operating Junction Temperature	T_J	+225	$^\circ C$

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case, $P_{OUT}=500W$ @1030MHz 100us/10%, $T_{case}=85^\circ C$, 50 Vdc, $I_{DQ}=100\text{ mA}$	$R_{\theta JC}$	0.3	$^\circ C/W$

Table 3. Electrical Characteristics ($T_A = 25^\circ C$ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8V$; $I_{DS}=72mA$	V_{DSS}	---	200	---	V
Gate Threshold Voltage	$V_{DS} = 10V$, $I_D = 72mA$	$V_{GS(th)}$	---	-3.0	---	V
Gate Quiescent Voltage	$V_{DS} = 50V$, $I_{DS}=100mA$, Measured in Functional Test	$V_{GS(Q)}$	---	-3.1	---	V

Functional Tests (In Innogation Test Fixture, 50 ohm system) : $V_{DD} = 48Vdc$, $I_{DQ} = 100\text{ mA}$, $f = 1030MHz$, Pulse CW, Pulse width=100us, Duty cycle=10%.

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @ P_{3dB}	G_P	---	17	---	dB
Drain Efficiency@ P_{SAT}	η_D	---	65	---	%
Saturated Power	P_{SAT}	57	57.5	---	dBm
Input Return Loss	IRL	---	-5	---	dB

Load Mismatch (In Innogation Test Fixture, 50 ohm system): $V_{DD} = 50\text{ Vdc}$, $I_{DQ} = 100\text{ mA}$, $f = 1030\text{ MHz}$

VSWR 10:1 at 500W pulse CW Output Power	No Device Degradation
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TYPICAL CHARACTERISTICS

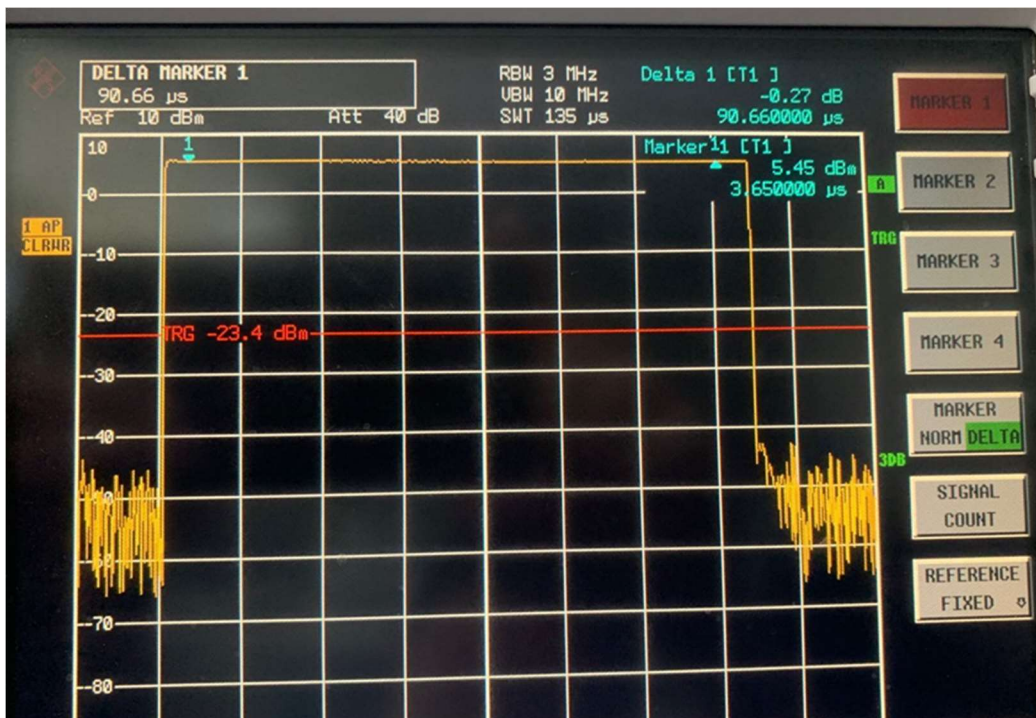


Figure 1. Pulse Amplitude droop at Psat 1030MHz

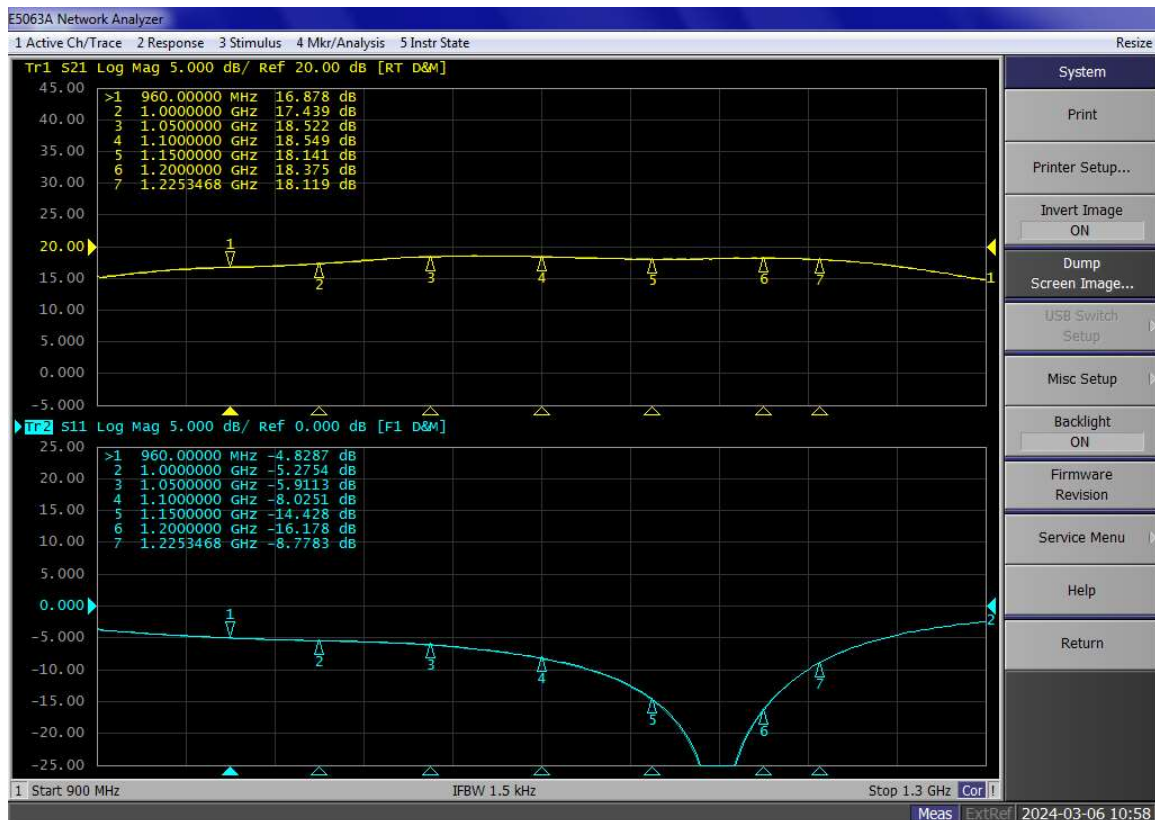


Figure 2. Network analyzer output S21/S11

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Reference Circuit of Test Fixture Assembly Diagram

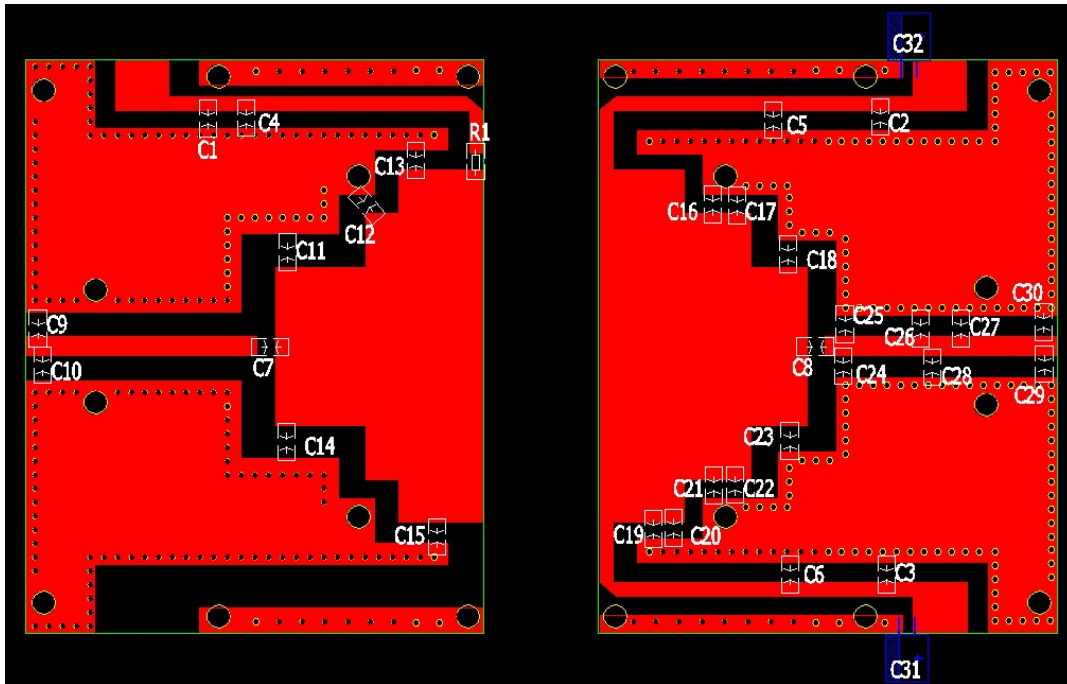


Figure 3. Test Circuit Component Layout (960-1215MHz)

Table 4. Test Circuit Component Designations and Values

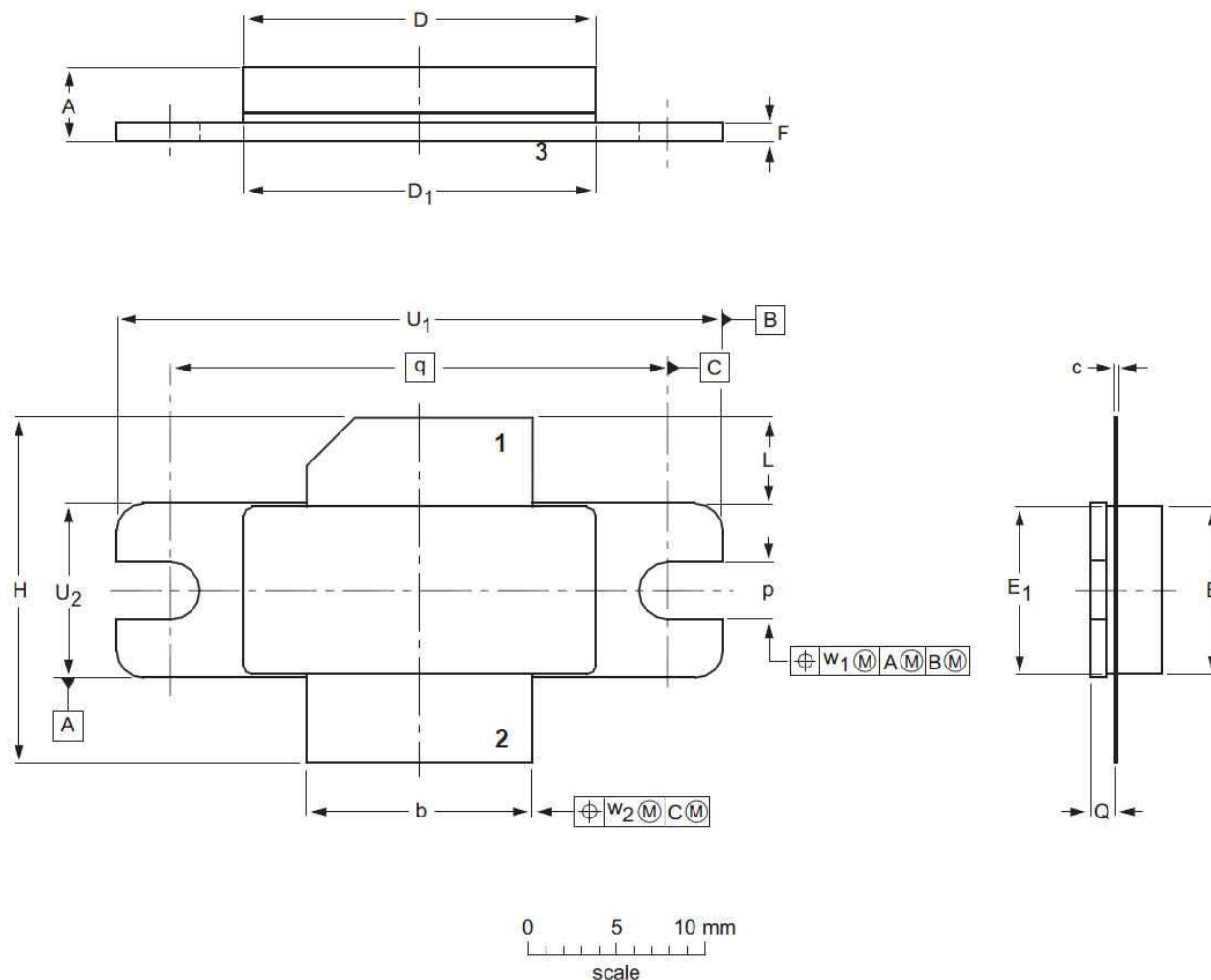
Component	Description	Suggestion
C1~C3	10uF	10uF/100V
C4~C6	47pF	BJYN MQ101111
C7	12pF	BJYN MQ101111
C8	22pF	ATC 800R
C9,C11,C14,C21,C24	1.8pF	BJYN MQ101111
C10	2.2pF	BJYN MQ101111
C12	2.7pF	BJYN MQ101111
C13,C15	3.3pF	BJYN MQ101111
C16	1.5pF	BJYN MQ101111
C17,C25,C30	0.8pF	BJYN MQ101111
C18,C22,C27,C29	0.5pF	BJYN MQ101111
C19,C23	1pF	BJYN MQ101111
C20	4.7pF	BJYN MQ101111
C26	1.2pF	BJYN MQ101111
C28	3.6pF	BJYN MQ101111
C31,C32	2000uF/63V	Electrolytic Capacitor
R1	10 Ω	
PCB	30mil Rogers 4350B	

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Package Outline

Flanged ceramic package; 2 mounting holes; 2 leads (1—DRAIN、2—GATE、3—SOURCE)



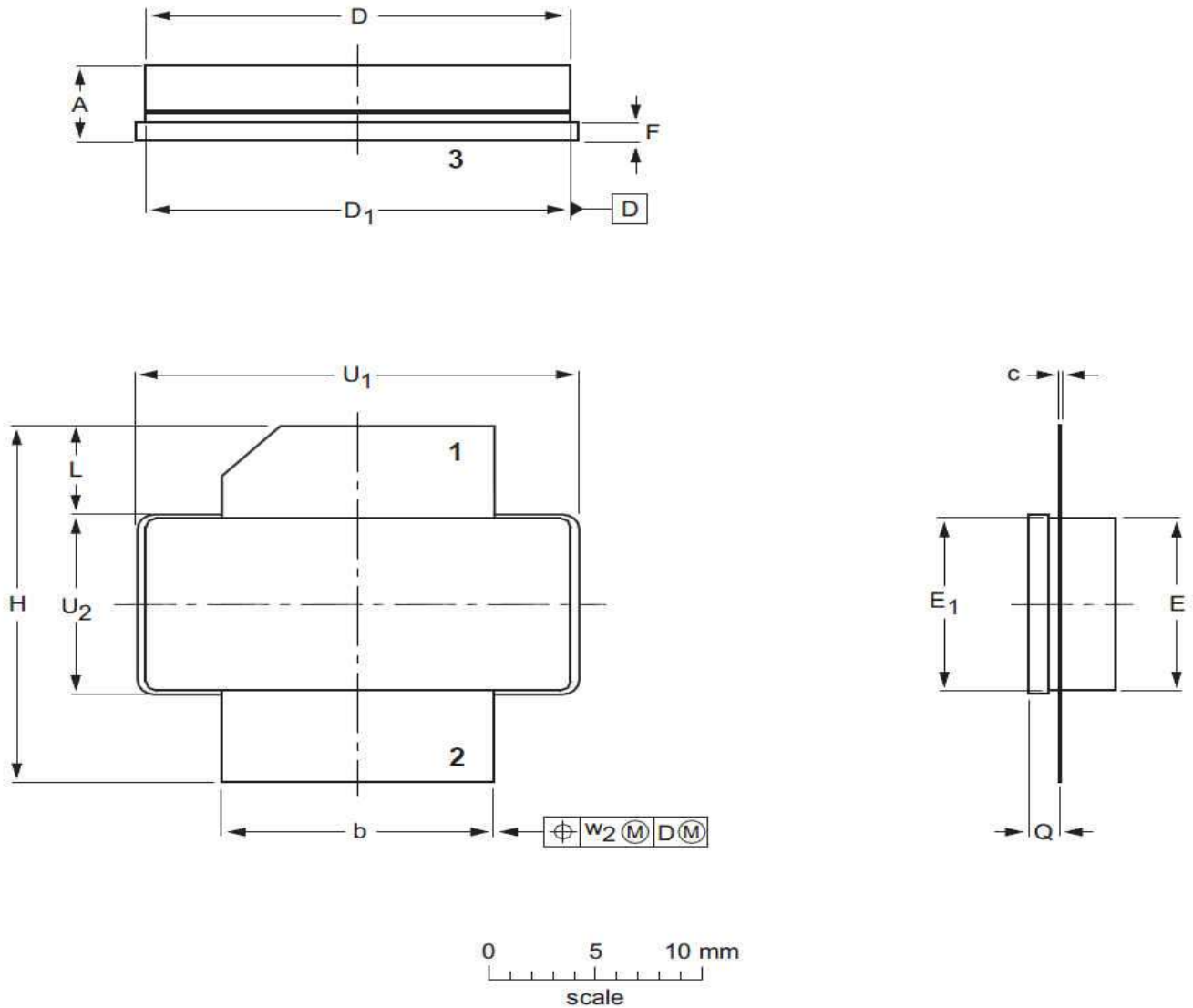
UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	W_1	W_2
mm	4.72	12.83	0.15	20.02	19.96	9.50	9.53	1.14	19.94	5.33	3.38	1.70	27.94	34.16	9.91	0.25	0.51
	3.43	12.57	0.08	19.61	19.66	9.30	9.25	0.89	18.92	4.32	3.12	1.45		33.91	9.65		
inches	0.186	0.505	0.006	0.788	0.786	0.374	0.375	0.045	0.785	0.210	0.133	0.067	1.100	1.345	0.390	0.01	0.02
	0.135	0.495	0.003	0.772	0.774	0.366	0.364	0.035	0.745	0.170	0.123	0.057		1.335	0.380		

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-B2E					03/12/2013

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Earless flanged ceramic package; 2 leads (1—DRAIN、2—GATE、3—SOURCE)



UNIT	A	b	c	D	D ₁	E	E ₁	F	H	L	Q	U ₁	U ₂	W ₂
mm	4.72	12.83	0.15	20.02	19.96	9.50	9.53	1.14	19.94	5.33	1.70	20.70	9.91	0.25
	3.43	12.57	0.08	19.61	19.66	9.30	9.25	0.89	18.92	4.32	1.45	20.45	9.65	
inches	0.186	0.505	0.006	0.788	0.786	0.374	0.375	0.045	0.785	0.210	0.067	0.815	0.390	0.010
	0.135	0.495	0.003	0.772	0.774	0.366	0.364	0.035	0.745	0.170	0.057	0.805	0.380	

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
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PKG-B2					03/12/2013

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Revision history

Table 5. Document revision history

Date	Revision	Datasheet Status
2020/6/19	Rev 1.0	Preliminary Datasheet
2020/7/2	Rev 1.1	Performance update based on latest report of Rev1
2024/3/6	Rev 1.2	Update NK1450V to SK1450V

Application data based on YHG-20-16/TC-24-09

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