N-Channel Enhancement Mode MOSFET

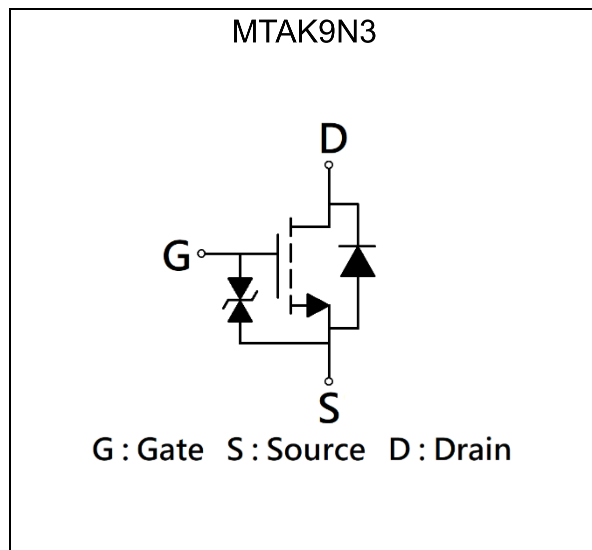
MTAK9N3

Features

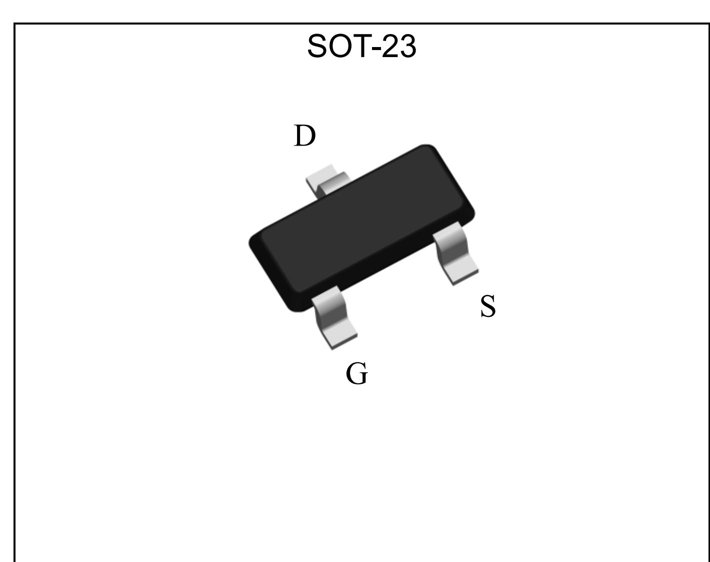
- ESD protected gate, typical 3kV (HBM)
- High speed switching
- Easily designed drive circuits
- Low-voltage drive
- Easy to use in parallel
- RoHS compliant package

BV_{DSS}	20V
I_D@V_{GS}=4.5V, T_A=25˚C	0.67A
$R_{DS(ON)}$ typ.@V_{GS}=4.5V, I_D=0.2A	0.32Ω
$R_{DS(ON)}$ typ.@V_{GS}=2.5V, I_D=0.2A	0.4Ω
$R_{DS(ON)}$ typ.@V_{GS}=1.8V, I_D=0.2A	0.8Ω

Equivalent Circuit

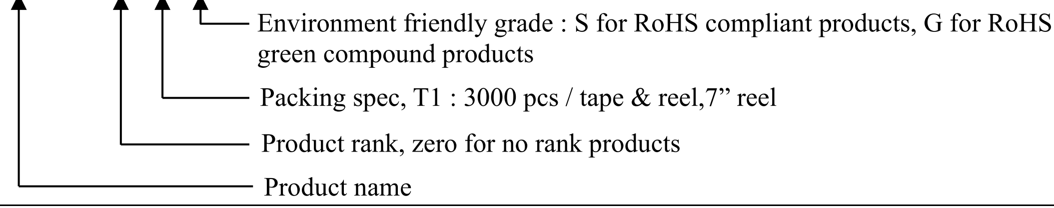


Outline



Ordering Information

Device	Package	Shipping
MTAK9N3-0-T1-G	SOT-23 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel



Absolute Maximum Ratings (T_A=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	±8	
Continuous Drain Current @V_{GS}=4.5V, T_A=25°C	I_D	0.67	A
Continuous Drain Current @V_{GS}=4.5V, T_A=70°C		0.54	
Pulsed Drain Current *a	I_{DM}	2.7	
Continuous Body Diode Forward Current @ T_A=25°C	I_S	0.3	
ESD susceptibility *b	V_{ESD}	3000	V
Total Power Dissipation @ T_A=25°C	P_D	0.35	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	°C

Thermal Data

Parameter	Symbol	Steady State	Unit
Thermal Resistance, Junction-to-ambient	$R_{\theta JA}$	357	°C/W

Note:
*a. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to keep initial T_J=25°C.
*b. Human body model, 1.5kΩ in series with 100pF.

Electrical Characteristics (T_A=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	20	-	-	V	V_{GS}=0V, I_D=250μA
$V_{GS(th)}$	0.3	-	1.2		V_{DS}=V_{GS}, I_D=250μA
G_{FS}	-	1	-	S	V_{DS}=5V, I_D=0.2A
I_{GSS}	-	-	±10	μA	V_{GS}=±8V, V_{DS}=0V
I_{DSS}	-	-	1		V_{DS}=16V, V_{GS}=0V
$R_{DS(ON)}$	-	0.32	0.45	Ω	V_{GS}=4.5V, I_D=0.2A
	-	0.4	0.6		V_{GS}=2.5V, I_D=0.2A
	-	0.8	1.2		V_{GS}=1.8V, I_D=0.2A
Dynamic					
Ciss	-	32	-	pF	V_{DS}=10V, V_{GS}=0V, f=1MHz
Coss	-	19	-		
Crss	-	17	-		
Qg *1, 2	-	0.8	-	nC	V_{DS}=10V, I_D=0.2A, V_{GS}=4.5V
Qgs *1, 2	-	0.2	-		
Qgd *1, 2	-	0.15	-		
$t_{d(ON)}$ *1, 2	-	4.8	-	ns	V_{DS}=10V, I_D=0.2A, V_{GS}=4.5V, R_{GS}=10Ω
tr *1, 2	-	16	-		
$t_{d(OFF)}$ *1, 2	-	20	-		
t_f *1, 2	-	15.6	-		
Source-Drain Diode					
V_{SD} *1	-	0.8	1.2	V	I_S=0.2A, V_{GS}=0V
trr	-	7	-	ns	I_F=0.2A, dI_F/dt=100A/μs
Qrr	-	1	-	nC	

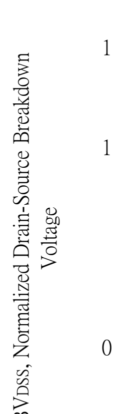
Note:
*1. Pulse Test : Pulse Width ≦300μs, Duty Cycle≦2%
*2. Independent of operating temperature

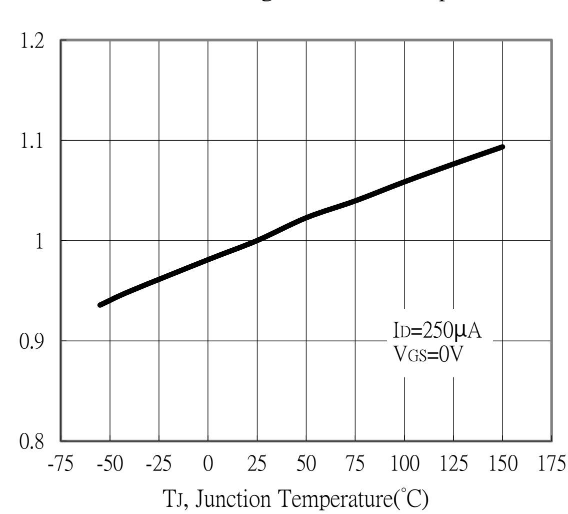
Typical Characteristics

Typical Output Characteristics

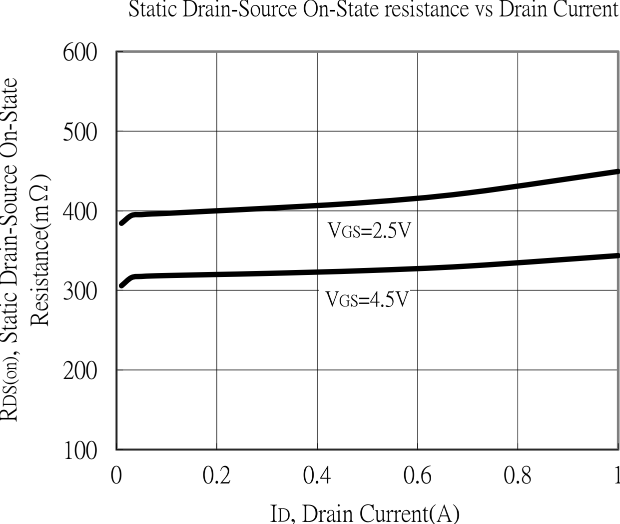
1.2
1
0.8
0.6
0.4
0.2
0
ID, Drain Current (A)
10V,9V,8V,7V,6V,5V,4.5V,4V,3V,2.5V,2V
1.5V
VGS=1.2V
0 1 2 3 4 5 6 7 8 9 10
VDS, Drain-Source Voltage(V)

Breakdown Voltage vs Junction Temperature

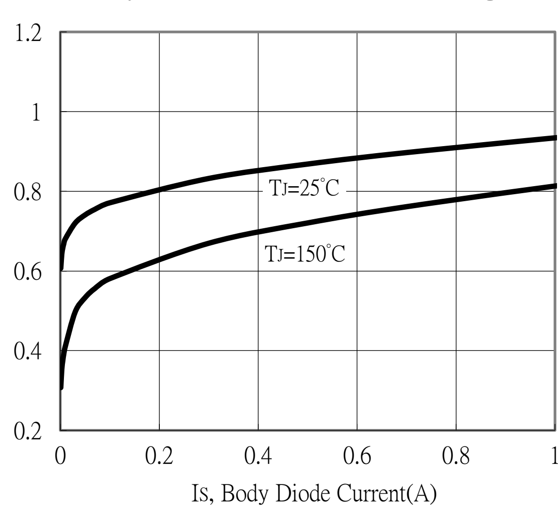




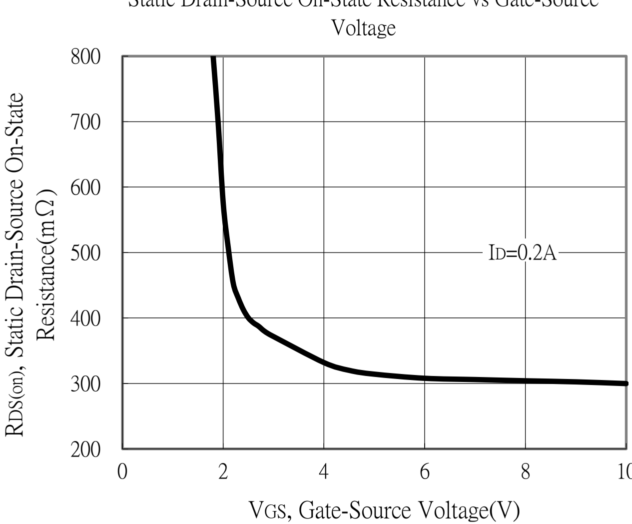
Static Drain-Source On-State resistance vs Drain Current



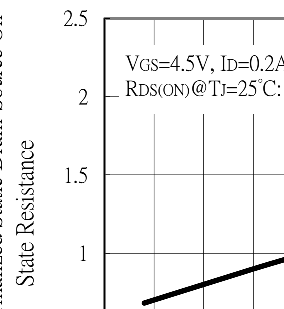
Body Diode Current vs Source-Drain Voltage

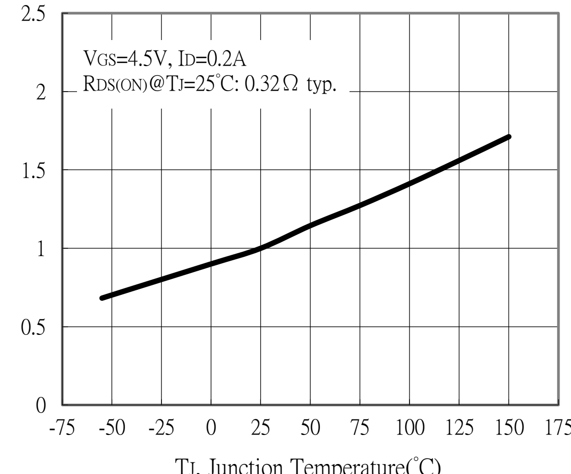


Static Drain-Source On-State Resistance vs Gate-Source Voltage

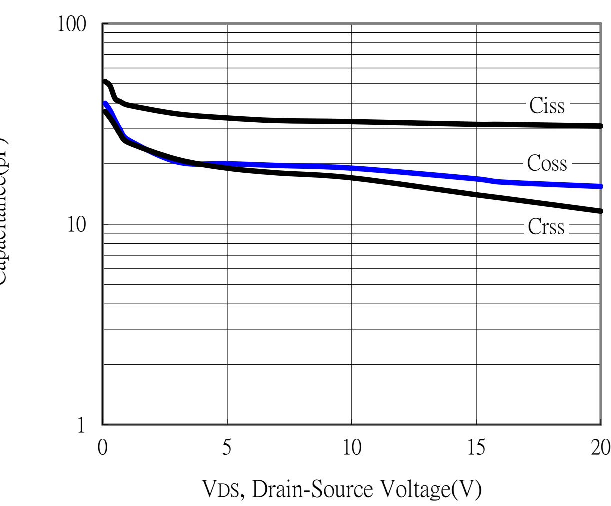


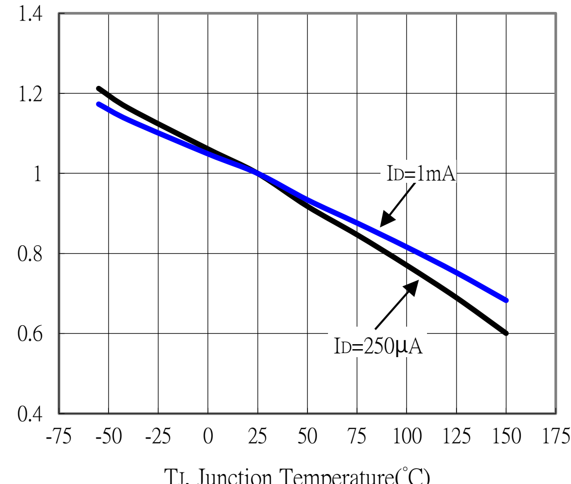
Drain-Source On-State Resistance vs Junction Temperature

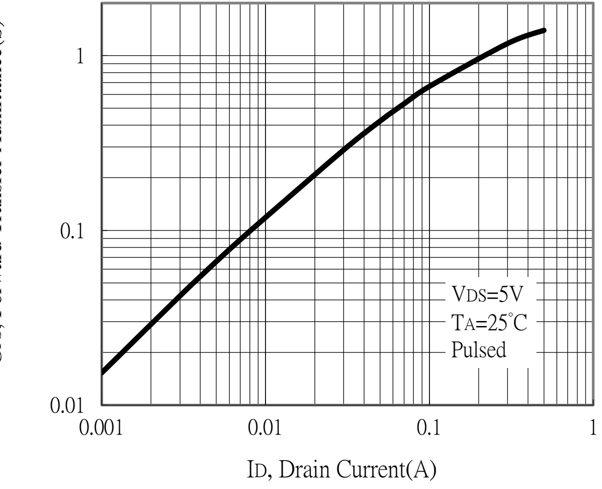


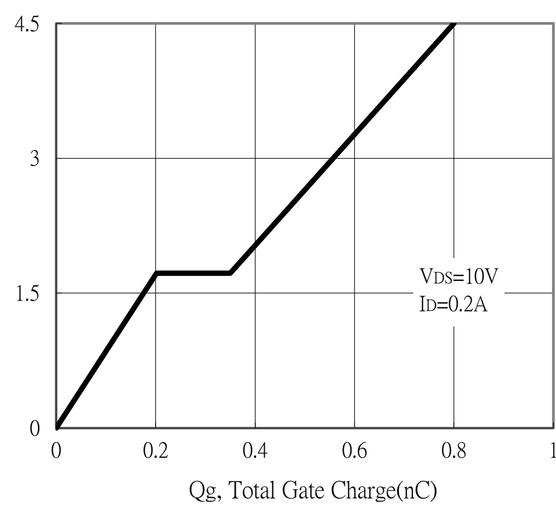


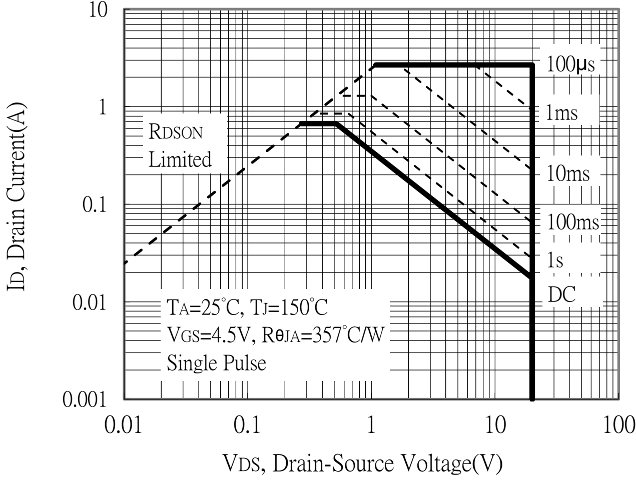
Typical Characteristics (Cont.)

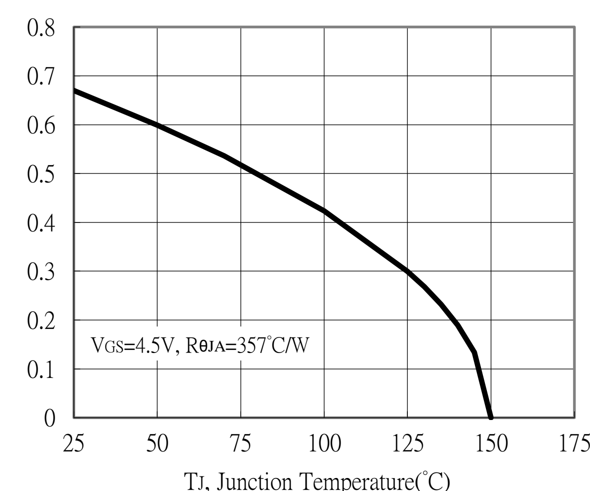




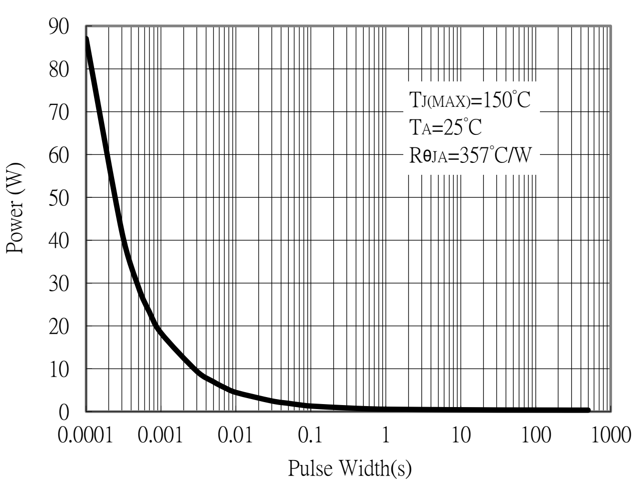


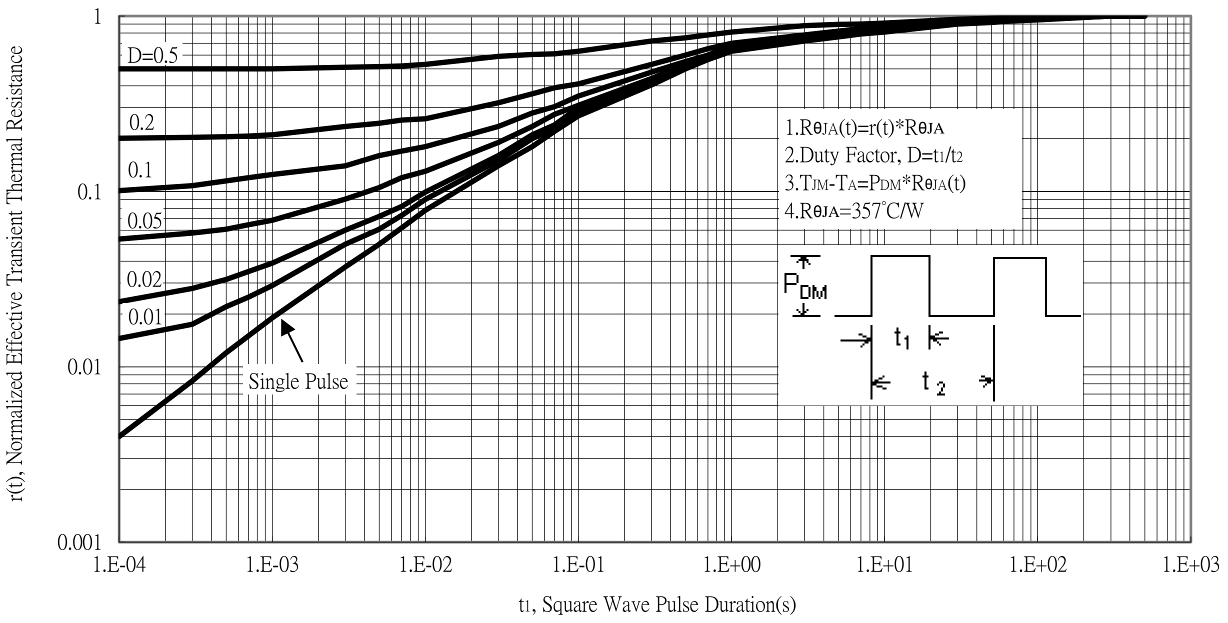




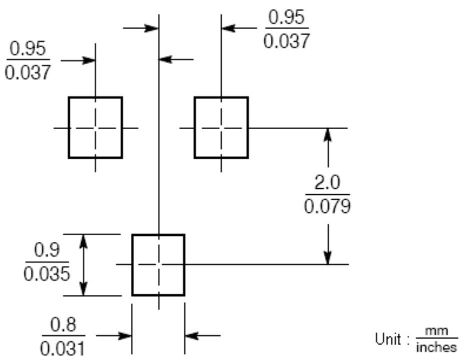


Typical Characteristics (Cont.)

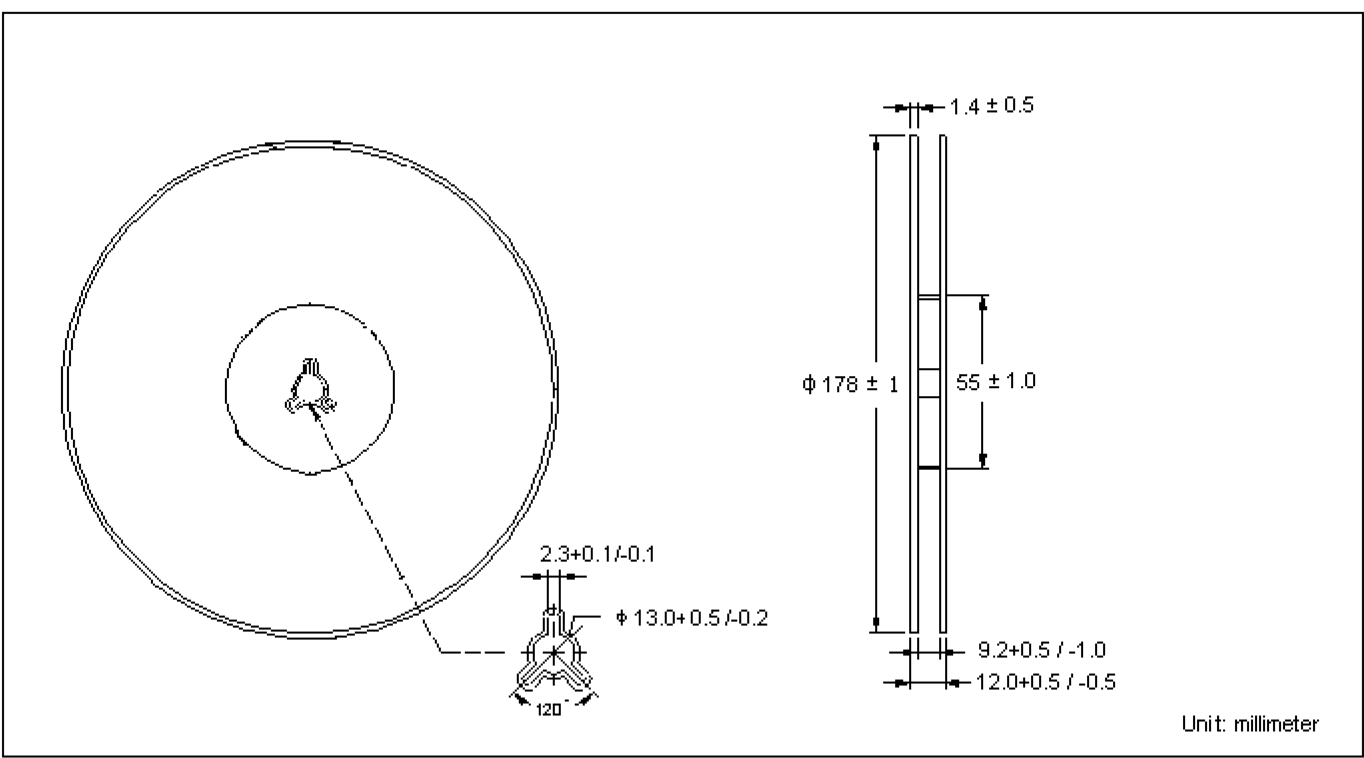




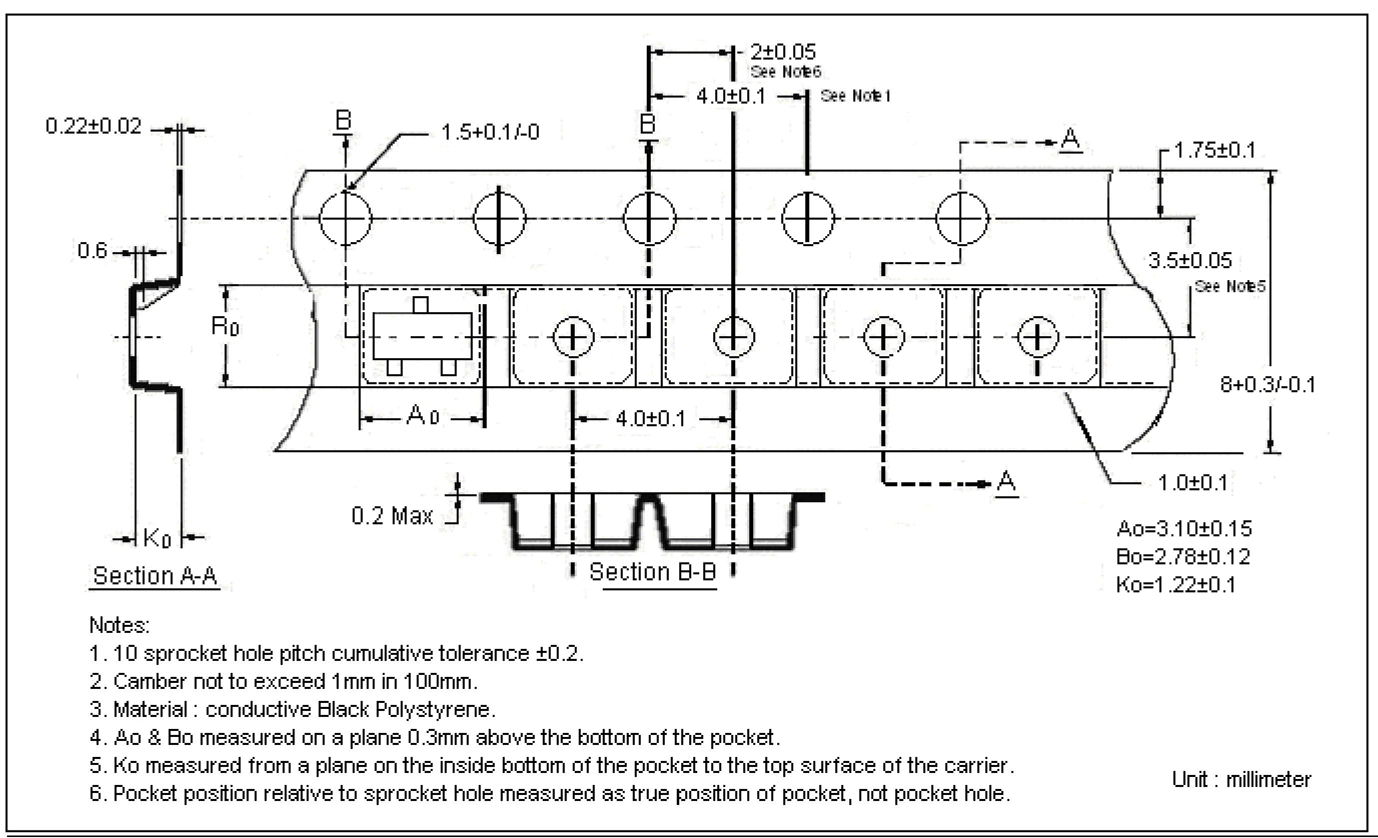
Recommended Soldering Footprint



Reel Dimension



Carrier Tape Dimension



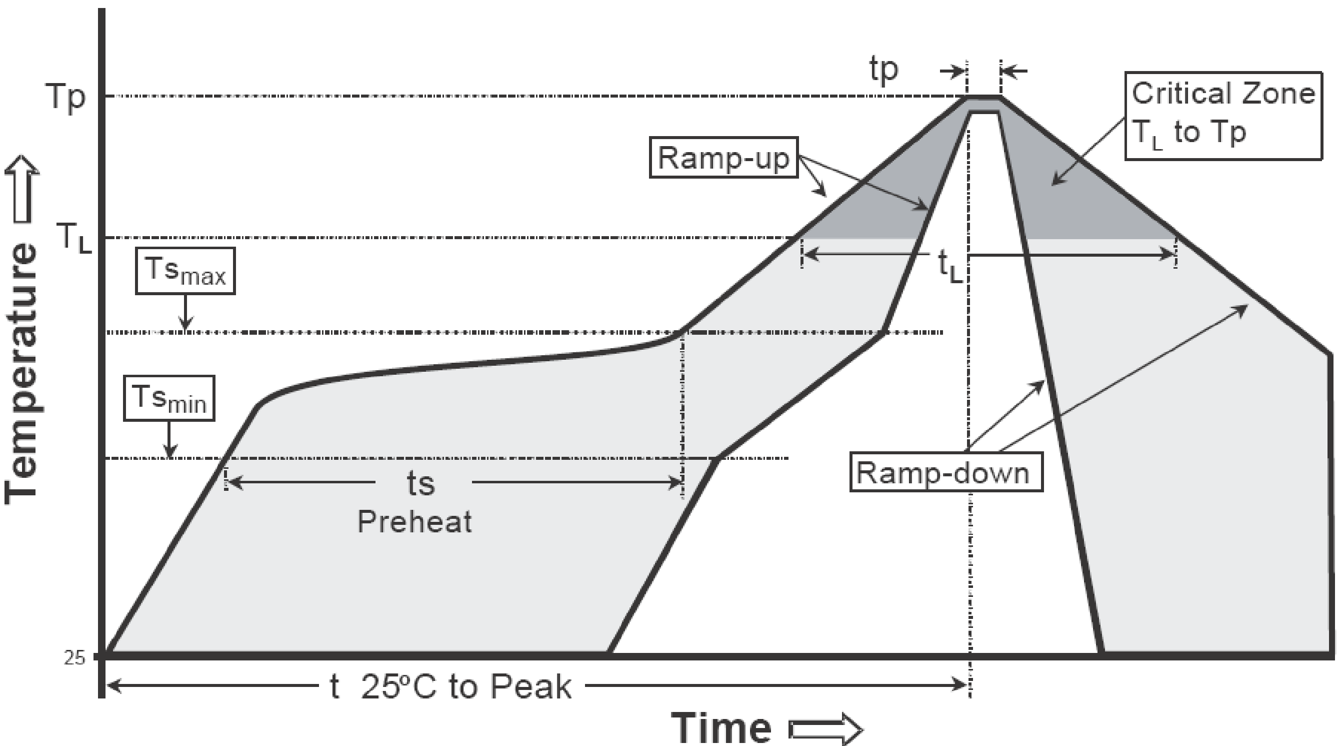
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : conductive Black Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

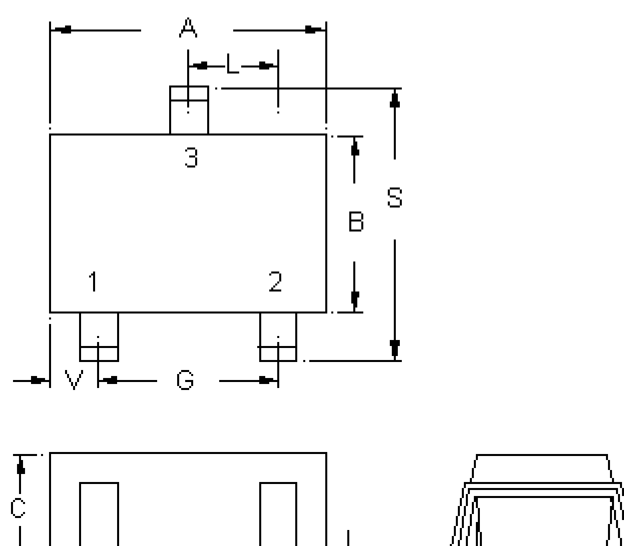
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(Ts min) −Temperature Max(Ts max) −Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: −Temperature (TL) − Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : 1. All temperatures refer to topside of the package, measured on the package body surface.
2. For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are not matched well, the solder joints may crack or the bodies of the parts may crack or shatter as the assembly cools.

SOT-23 Dimension



Marking:

Date Code

AK9 xx

Device Code

3-Lead SOT-23 Plastic
Surface Mounted Package
CYStek Package Code: N3

Style: Pin 1.Gate 2.Source 3.Drain

Date Code：Year + Month

Year : 9→2019,0→2020,…, etc

Month : 1→Jan,2→Feb, …, 9→Sep, A→Oct, B→Nov, C→Dec

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1102	0.1181	2.80	3.00	J	0.0032	0.0059	0.08	0.15
B	0.0472	0.0551	1.20	1.40	K	0.0217	REF	0.55	REF
C	0.0354	0.0413	0.90	1.05	L	0.0374	TYP	0.95	TYP
D	0.0118	0.0197	0.30	0.50	S	0.0886	0.1004	2.25	2.55
G	0.0709	0.0787	1.80	2.00	V	0.0098	0.0256	0.25	0.65
H	0.0000	0.0040	0.00	0.10	L1	0.0118	0.0197	0.30	0.50

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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