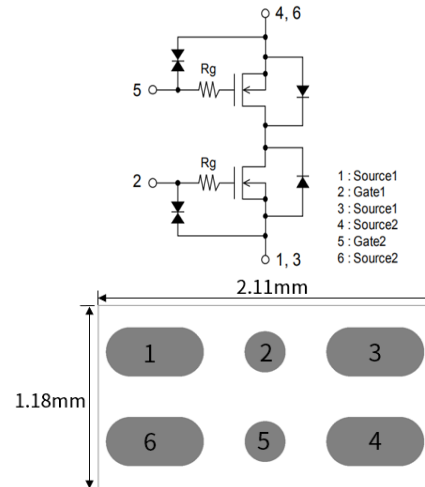


## Key Features

- 2.5 V Drive
- Common-Drain configuration for design simplicity
- Low source-source ON resistance
- 2kV HBM ESD Diode-Protected Gate
- Pb-Free, Halogen Free and RoHS compliance

## Benefits

- High short-circuit overcurrent capability
- Strong avalanche capability
- Stronger mechanical pressure tolerance



## Applications

- 1-Cell Lithium-ion battery charging and discharging switch
- Battery protection switch



## Device information

Part Number	V <sub>SS</sub>	I <sub>S</sub> Max(T <sub>C</sub> =25°C)	R <sub>SS(on)</sub> VGS=4.5V, ID=5A, T <sub>J</sub> =25°C	T <sub>J</sub> max	Package
NPM12055A-CCAER	12V	10A	5.5mΩ	150°C	CSP

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## 1. Maximum Ratings

at  $T_j=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test conditions	Value	Unit
$BV_{SSS}$	Source-Source Breakdown Voltage		12	V
$I_s$	Source Current (DC) $\textcircled{1}$ <sup>(1)</sup>	$T_C=25^\circ\text{C}$	10	A
	Source Current (DC) $\textcircled{2}$ <sup>(1)</sup>	$T_C=25^\circ\text{C}$	17	A
$I_{sp}$	Source Current (Pulse) <sup>(1)</sup>	Pulse width $t_p$ limited by $T_{jmax}$ $PW \leq 10\mu\text{s}, \text{Duty Cycle} \leq 1\%$	80	A
$V_{GSmax}$	Gate-Source Voltage		-8/+8	V
$P_{tot}$	Power Dissipation $\textcircled{1}$ <sup>(1)</sup>	$T_C=25^\circ\text{C}$	1.1	W
	Power Dissipation $\textcircled{2}$ <sup>(1)</sup>	$T_C=25^\circ\text{C}$	3.3	W
$T_j, T_{stg}$	Operating Junction and Storage Temperature		-55~150	$^\circ\text{C}$

## 2. Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-a)}$	Thermal Resistance from Junction to Ambient $\textcircled{1}$ <sup>(1)</sup>			116	$^\circ\text{C/W}$
	Thermal Resistance from Junction to Ambient $\textcircled{2}$ <sup>(1)</sup>			38	$^\circ\text{C/W}$

Note  $\textcircled{1}$  Mounted on FR4 board (20mm x 15 mm x t1 mm)  
using the minimum recommended pad size (36  $\mu\text{m}$  Copper).

$\textcircled{2}$  Mounted on Ceramic substrate (70 mm x 70 mm x t1.0 mm).

### 3. Electrical Characteristics

Static Characteristics, at  $T_j = 25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)SSS}$	Source to Source Breakdown Voltage	$I_S = 1 \text{ mA}$ , $V_{GS} = 0 \text{ V}$ Test Circuit 1	12			V
$I_{SSS}$	Zero Gate Voltage Source Current	$V_{SS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ Test Circuit 1			1.0	$\mu\text{A}$
$I_{GSS1}$	Gate-Source Leakage Current	$V_{GS} = \pm 5 \text{ V}$ , $V_{SS} = 0 \text{ V}$ Test Circuit 2			$\pm 1.5$	$\mu\text{A}$
$I_{GSS2}$	Gate-Source Leakage Current	$V_{GS} = \pm 8 \text{ V}$ , $V_{SS} = 0 \text{ V}$ Test Circuit 2			$\pm 10$	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{SS} = 6 \text{ V}$ , $I_S = 1 \text{ mA}$ Test Circuit 3	0.4		1.0	V
$V_{F(S-S)}$	Forward Source to Source Voltage	$I_S = 1 \text{ A}$ , $V_{GS} = 0$ Test Circuit 7	0.4	0.6	1.0	V
$R_{SS(on)}$	Static Source to Source On-State Resistance	$I_S = 5 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ Test Circuit 4	3.3	5.5	6.9	$\text{m}\Omega$
		$I_S = 5 \text{ A}$ , $V_{GS} = 3.8 \text{ V}$ Test Circuit 4	4.5	6.0	8.5	$\text{m}\Omega$
		$I_S = 5 \text{ A}$ , $V_{GS} = 3.1 \text{ V}$ Test Circuit 4	5.0	7.0	9.0	$\text{m}\Omega$
		$I_S = 5 \text{ A}$ , $V_{GS} = 2.5 \text{ V}$ Test Circuit 4	6.0	8.8	11.0	$\text{m}\Omega$
$R_{G(int)}$	Internal Gate Resistance	$f = 1 \text{ MHz}$ , $V_{GS} = 0 \text{ V}^{(2)}$		1700		$\Omega$

### 4. Electrical Characteristics Diagrams

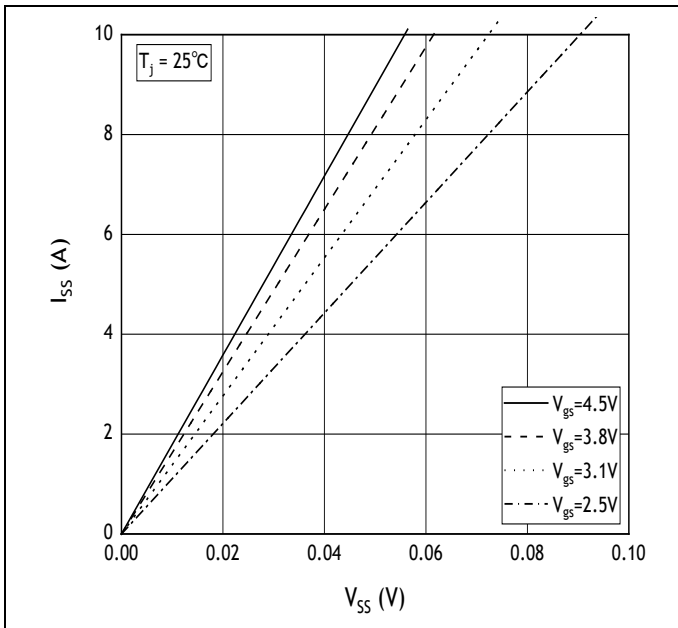


Figure 1. On-Region Characteristics ( $T_j = 25^\circ\text{C}$ )

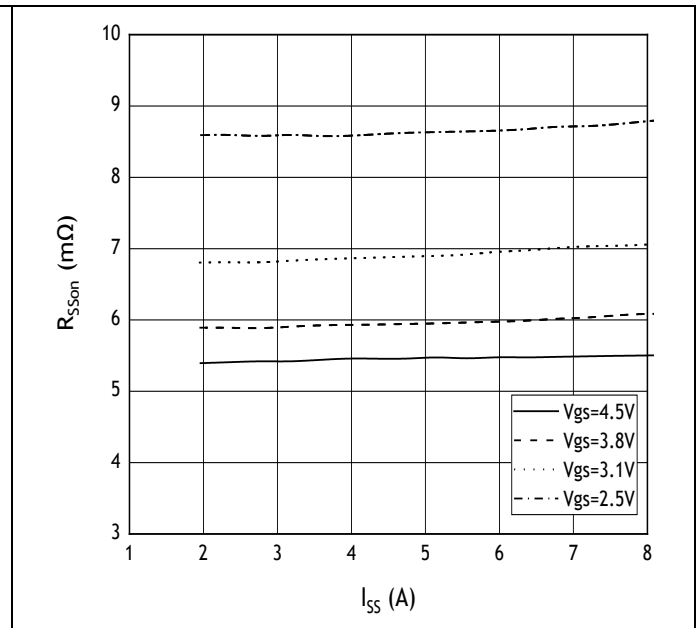


Figure 2. On-Resistance vs. Source Current and Gate Voltage

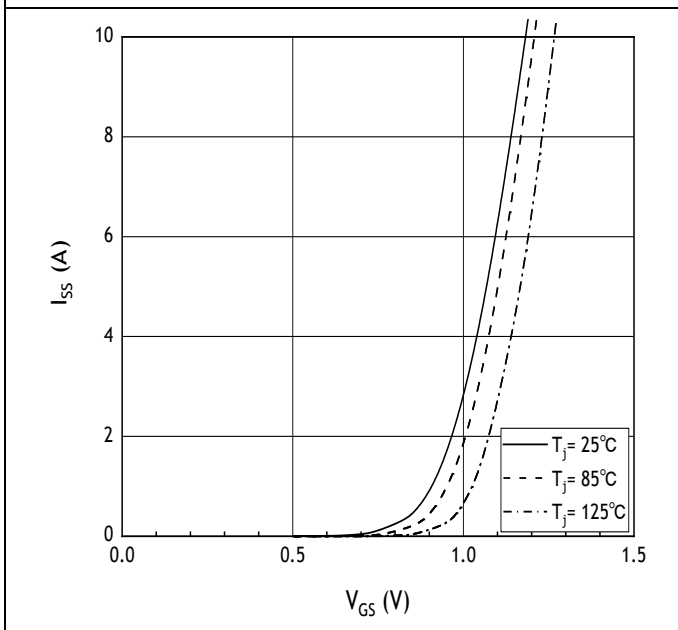


Figure 3. Typical Transfer Characteristics

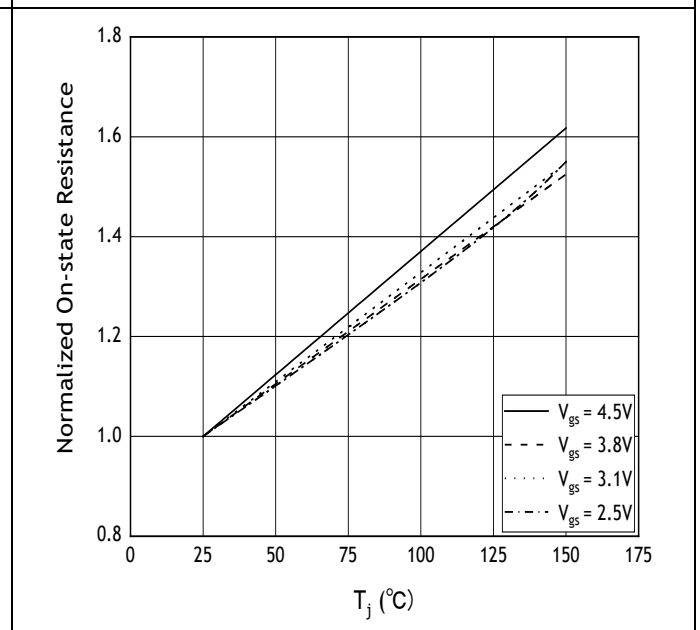


Figure 4. On-Resistance vs. Junction Temperature

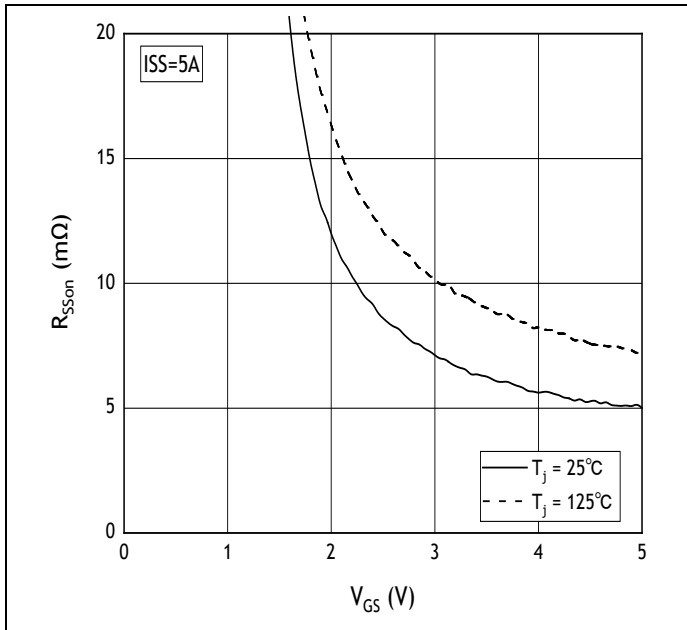


Figure 5. On-Resistance vs. Gate-Source Voltage

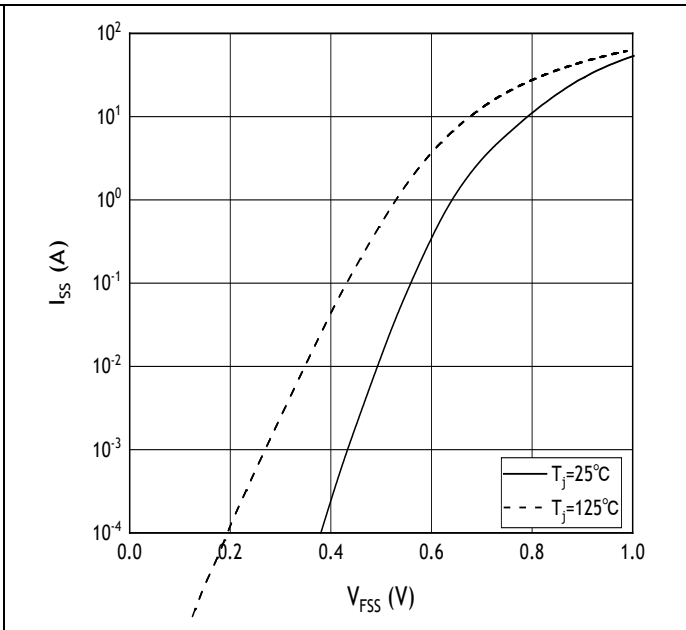


Figure 6. Forward Source to Source Characteristics

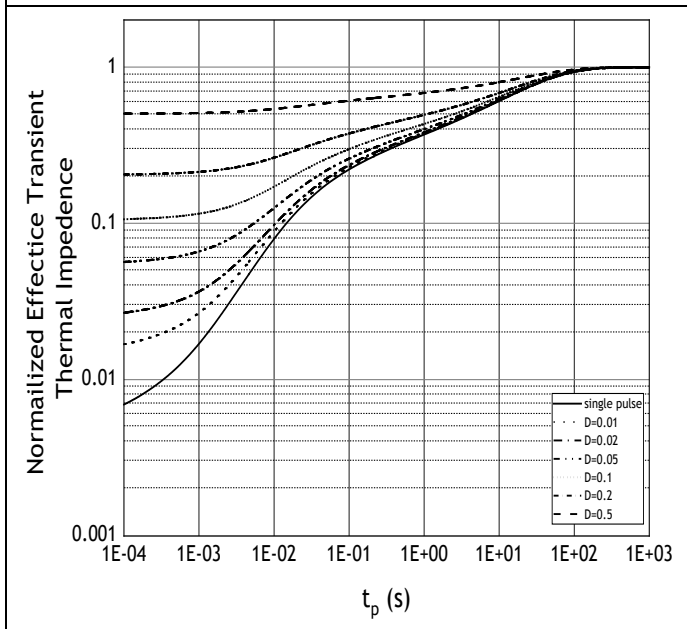


Figure 7. Normalized Maximum Transient Thermal Impedance

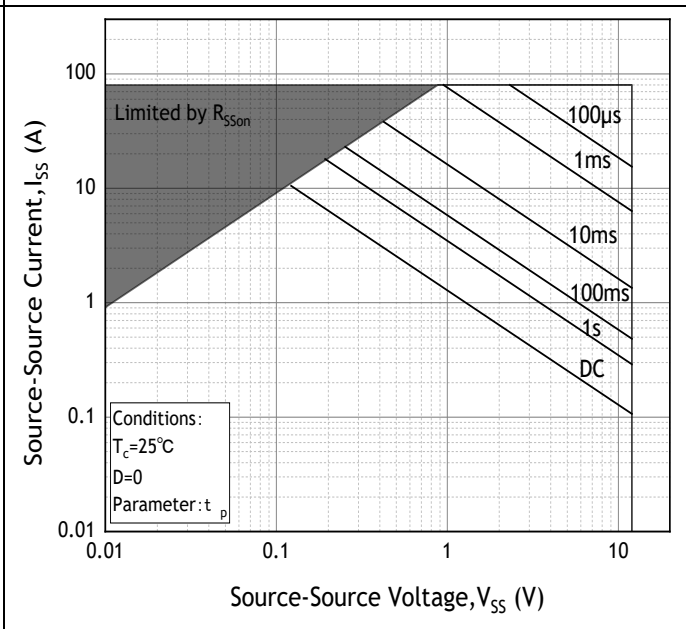
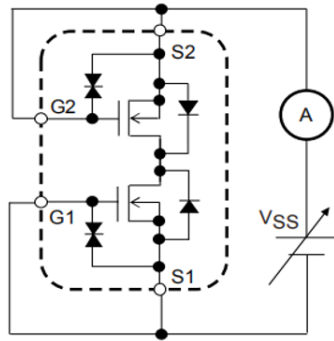


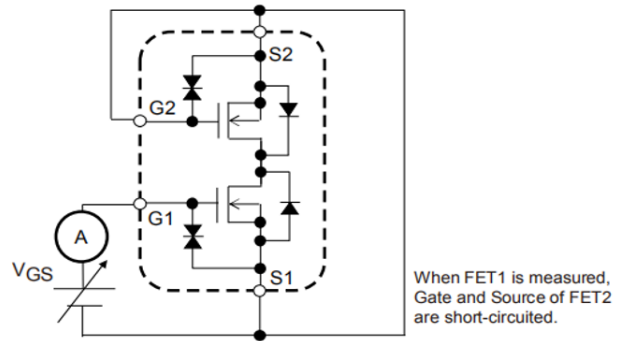
Figure 8. Safe Operating Area

### 5. Test Circuits Example

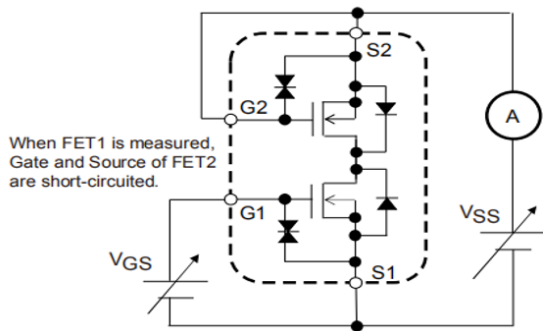
Test Circuit 1 VSSS/ISSS



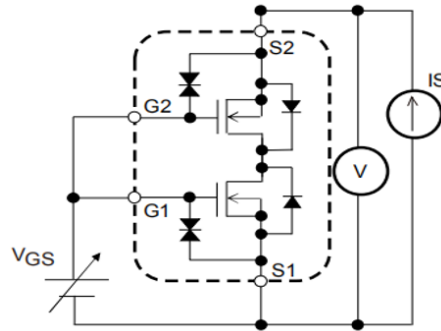
Test Circuit 2 IGSS



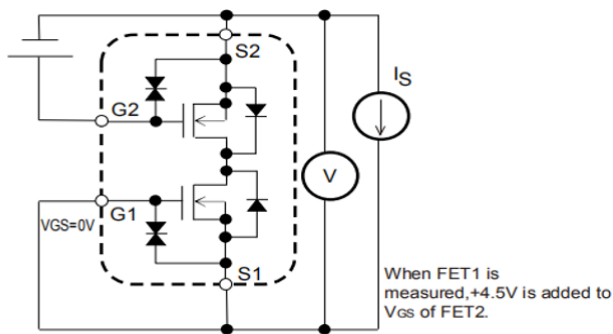
Test Circuit 3 VGS(th)



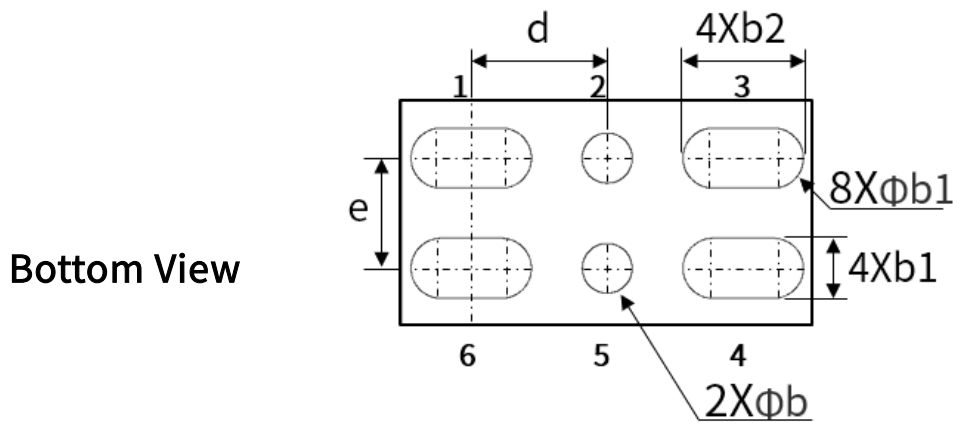
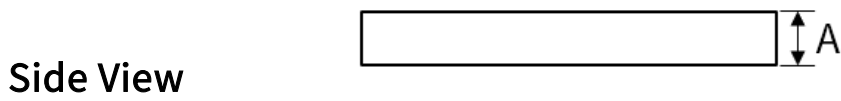
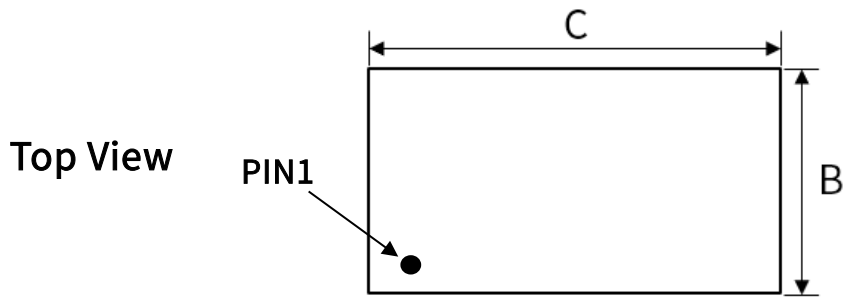
Test Circuit 4 RSS(on)



Test Circuit 5 VF(S-S)

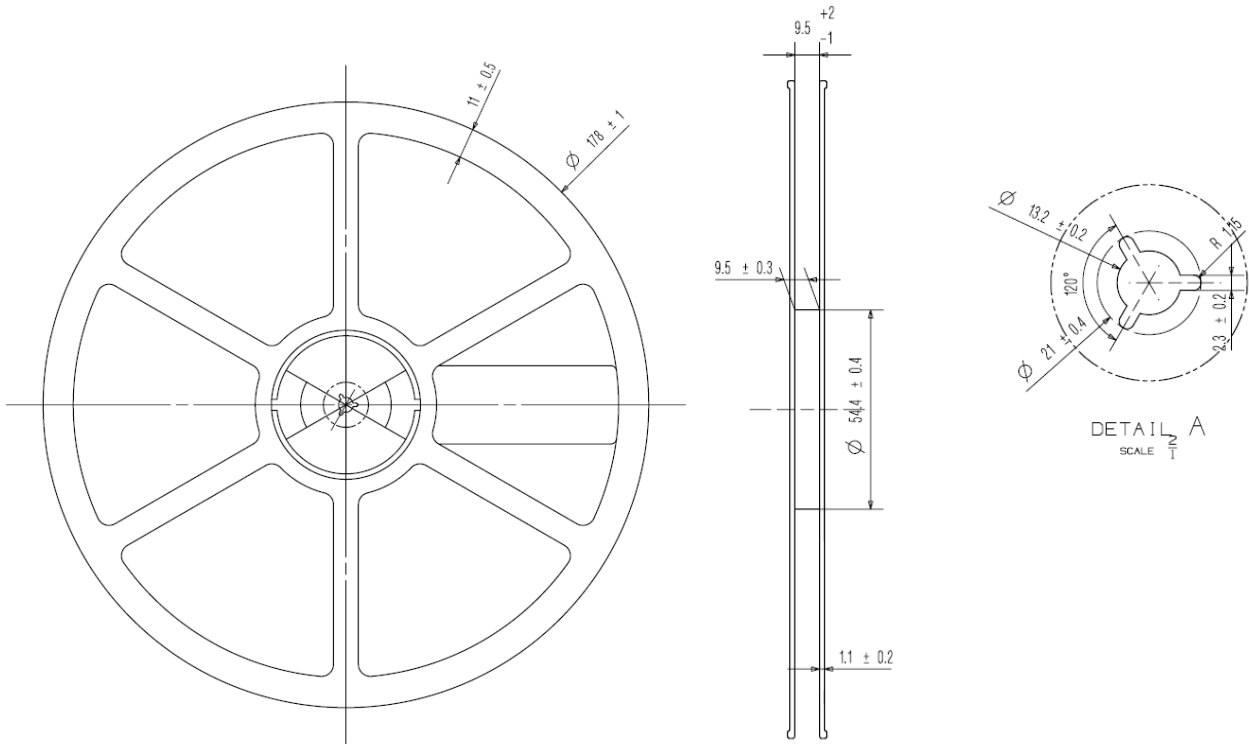


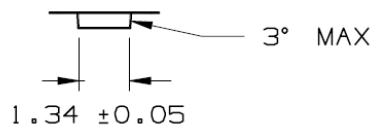
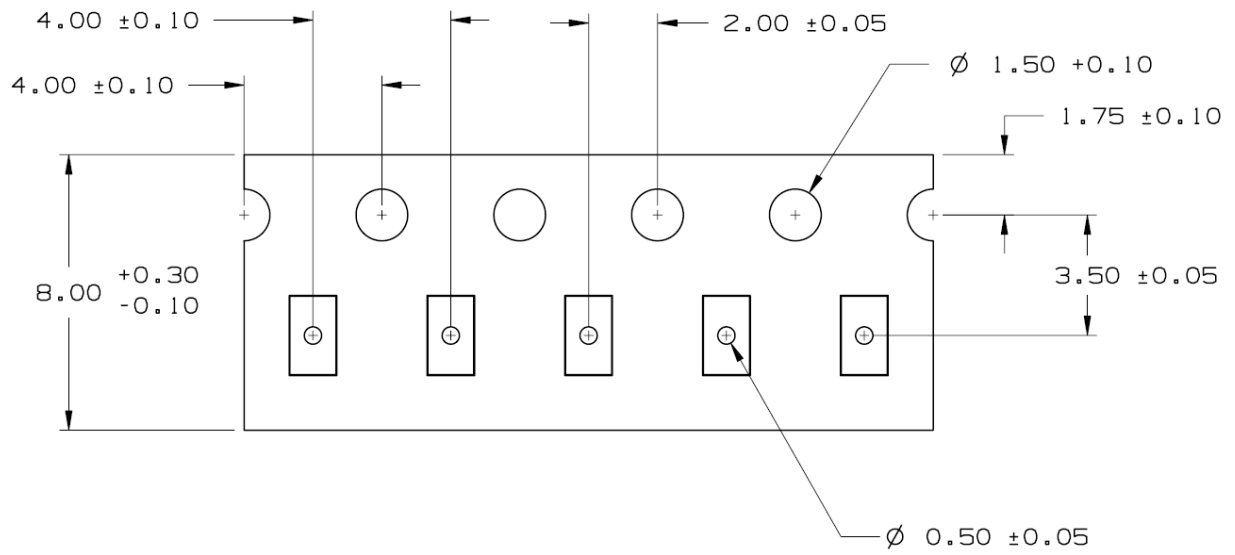
6. Package Information



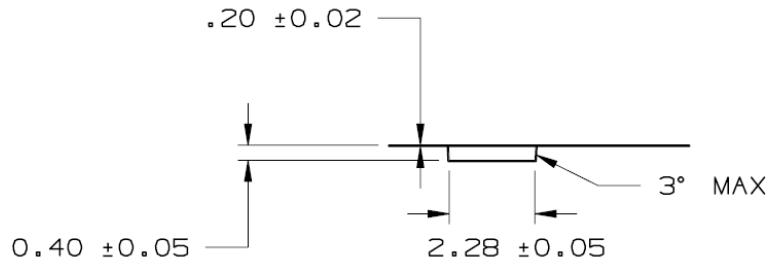
Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.2625	0.3	0.3375	0.01033	0.0118	0.01328
B	1.12	1.18	1.24	0.0441	0.0465	0.0488
C	2.05	2.11	2.17	0.0807	0.0831	0.0854
b	0.22	0.25	0.28	0.0087	0.0098	0.0110
b1	0.27	0.3	0.33	0.0106	0.0118	0.0130
b2	0.57	0.6	0.63	0.0224	0.0236	0.0248
d	0.6575	0.6775	0.6975	0.0259	0.0267	0.0275
e	0.53	0.55	0.57	0.0209	0.0217	0.0224

### 7. Tape and Reel Information





$A_0$



$K_0$

$B_0$

## 8. Ordering Information

Part Number	Package Type	Packing Type	SPQ
NPM12055A-CCAER	CSP	Tape on Reel	3000

## 9. Revision History

Revision	Description	Date
1.0	Released version	2024/8/28
1.1	Update plot, Add Tape and Reel Information SPQ	2024/12/20

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