

# CEM9407A

-60V ▲ 100mΩ ▲ -3.7A ▲ Si MOSFET

SILICON Si MOSFET ▲ SMD type

P-channel enhancement mode

UL94V-0 rated flame retardant epoxy

SO8 package ▲ MSL 3

Super high dense cell density for extremely low  $R_{DS(ON)}$

**High power and current handling capability**






## MAXIMUM RATINGS

Parameter ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)		Characteristics
Drain-Source Voltage	$V_{DS}$	-60V
Gate-Source Voltage	$V_{GS}$	$\pm 20\text{V}$
Continuous Drain Current	$I_D$	-3.7A
Pulsed Drain Current <sup>Note 1</sup>	$I_{DM}$	-14.8A
Maximum Power Dissipation	$P_D$	2.5W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55°C to +150°C

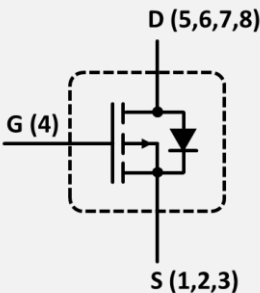
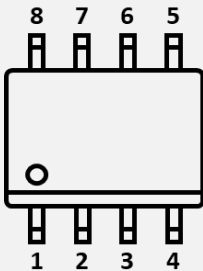
## THERMAL CHARACTERISTICS

Parameter	Symbol	Limit
Thermal Resistance, Junction-to-Ambient <sup>Note 2</sup>	$R_{TH\_JA}$	50°C/W

## APPLICATIONS

DC/DC Converter	DC Fan	Load Switches	Power Banks	USB Storage
				

## PIN DESCRIPTION

Circuit Diagram	Outline - Top View	Pin No.	Description
 <p>D (5,6,7,8)</p> <p>G (4)</p> <p>S (1,2,3)</p>	 <p>8 7 6 5</p> <p>1 2 3 4</p>	<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p>	<p>Source</p> <p>Source</p> <p>Source</p> <p>Gate</p> <p>Drain</p> <p>Drain</p> <p>Drain</p> <p>Drain</p>

## ELECTRICAL CHARACTERISTICS ▲ $T_A = 25^\circ\text{C}$ , unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-60			V
Zero Gate Voltage Drain Current	$V_{DS} = -48V, V_{GS} = 0V$	$I_{DSS}$			-1	$\mu A$
Gate Body Leakage Current, Forward	$V_{GS} = 20V, V_{DS} = 0V$	$I_{GSSF}$			100	nA
Gate Body Leakage Current, Reverse	$V_{GS} = -20V, V_{DS} = 0V$	$I_{GSSR}$			-100	nA
<b>On Characteristics</b> <sup>Note 3</sup>						
Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\mu A$	$V_{GS(th)}$	-1		-3	V
Static Drain-Source On-Resistance	$V_{GS} = -10V, I_D = -3.7A$	$R_{DS(ON)}$		100	125	m $\Omega$
Static Drain-Source On-Resistance	$V_{GS} = -4.5V, I_D = -3.1A$	$R_{DS(ON)}$		130	165	m $\Omega$
Forward Transconductance	$V_{DS} = -5V, I_D = -3.1A$	$g_{FS}$		7		S
<b>Dynamic Characteristics</b> <sup>Note 4</sup>						
Input Capacitance	$V_{DS} = -30V, V_{GS} = 0V, f = 1MHz$	$C_{ISS}$		615		pF
Output Capacitance	$V_{DS} = -30V, V_{GS} = 0V, f = 1MHz$	$C_{OSS}$		140		pF
Reverse Transfer Capacitance	$V_{DS} = -30V, V_{GS} = 0V, f = 1MHz$	$C_{RSS}$		45		pF
<b>Switching Characteristics</b> <sup>Note 4</sup>						
Turn-On Delay Time	$V_{DD} = -30V, V_{GS} = -10V, I_D = -1A, R_{G(ext)} = 6\Omega$	$t_{D(ON)}$		11	22	ns
Turn-On Rise Time	$V_{DD} = -30V, V_{GS} = -10V, I_D = -1A, R_{G(ext)} = 6\Omega$	$t_R$		4.5	9	ns
Turn-Off Delay Time	$V_{DD} = -30V, V_{GS} = -10V, I_D = -1A, R_{G(ext)} = 6\Omega$	$t_{D(OFF)}$		50	100	ns
Turn-Off Fall Time	$V_{DD} = -30V, V_{GS} = -10V, I_D = -1A, R_{G(ext)} = 6\Omega$	$t_F$		15	30	ns
Total Gate Charge	$V_{DS} = -30V, V_{GS} = -10V, I_D = -3.7A$	$Q_G$		17	22	nC
Gate Source Charge	$V_{DS} = -30V, V_{GS} = -10V, I_D = -3.7A$	$Q_{GS}$		2		nC
Gate Drain Charge	$V_{DS} = -30V, V_{GS} = -10V, I_D = -3.7A$	$Q_{GD}$		4		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Drain-Source Diode Forward Current <sup>Note 2</sup>		$I_S$			-1.3	A
Drain-Source Diode Forward Voltage <sup>Note 3</sup>	$V_{GS} = 0V, I_S = -1.3A$	$V_{SD}$			-1.2	V

### Notes

- 1: Repetitive Rating: Pulse width limited by maximum junction temperature
- 2: Surface Mounted on FR4 Board,  $t \leq 10$  sec
- 3: Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
- 4: Guaranteed by design, not subject to production testing.

## REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 • Output Characteristics

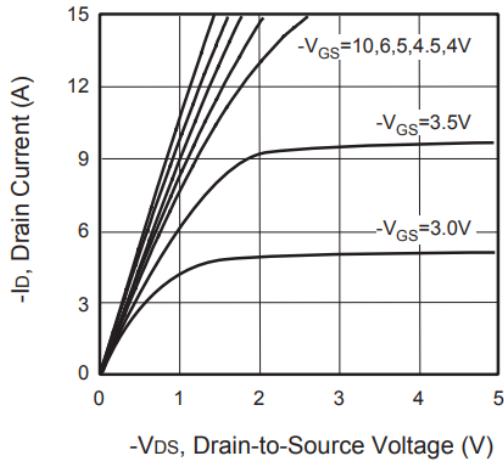


Fig. 2 • Transfer Characteristics

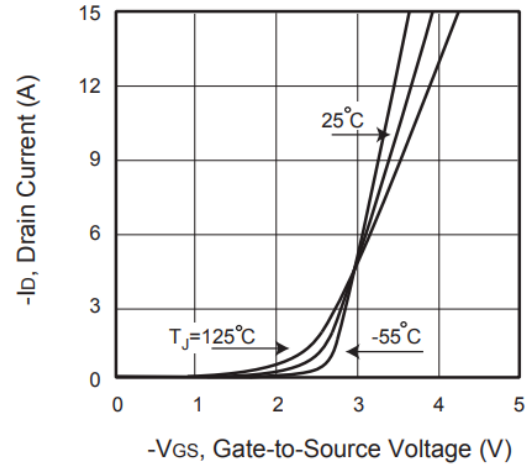


Fig. 3 • Capacitance

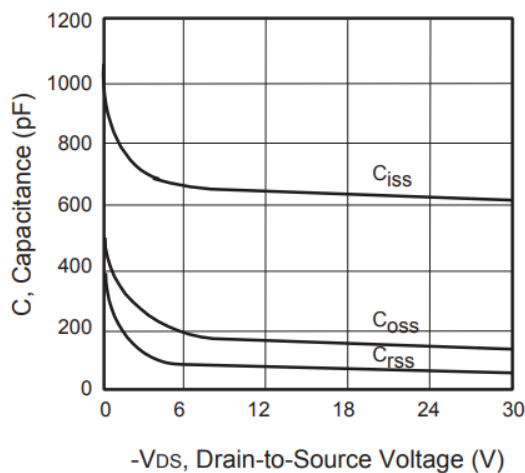


Fig. 4 • On-Resistance Variation with Temperature

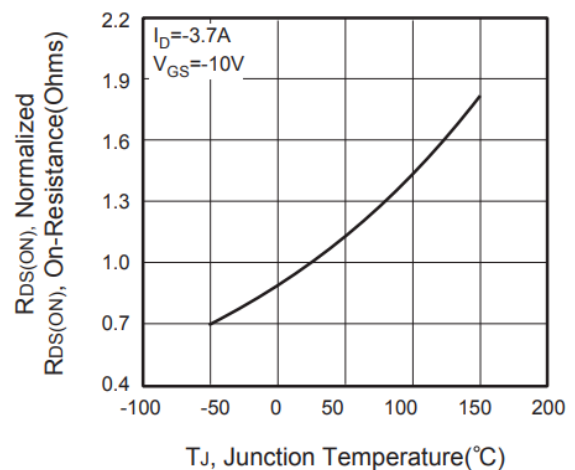


Fig. 5 • Gate Threshold Variation with Temperature

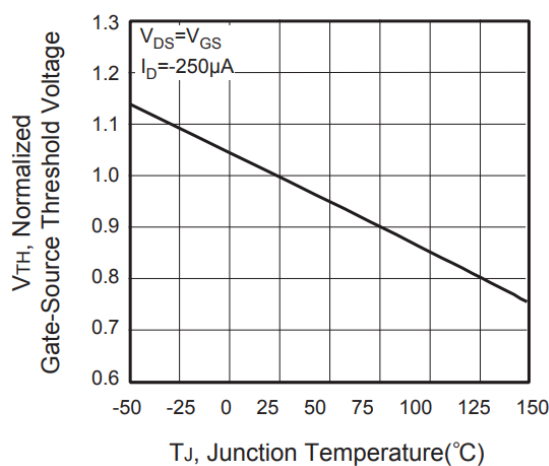
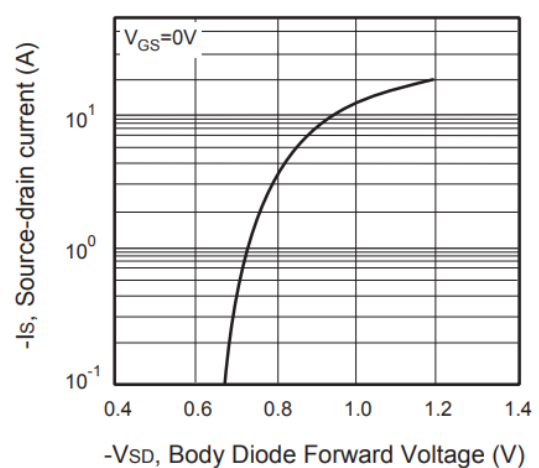


Fig. 6 • Body Diode Forward Voltage Variation with Source Current



## REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 • Gate Charge

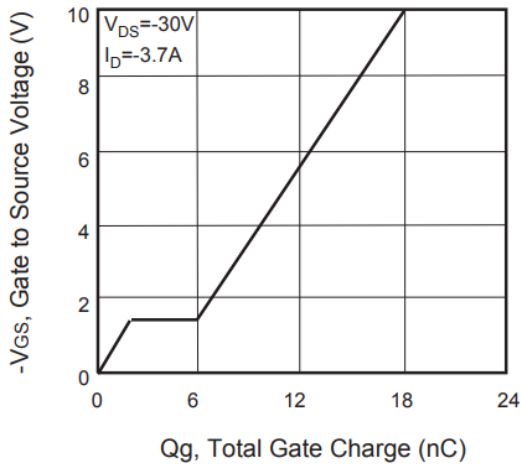


Fig. 8 • Maximum Safe Operating Area

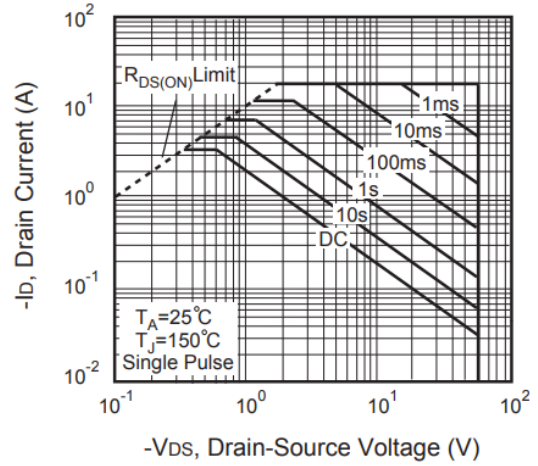


Fig. 9 • Switching Test Circuit

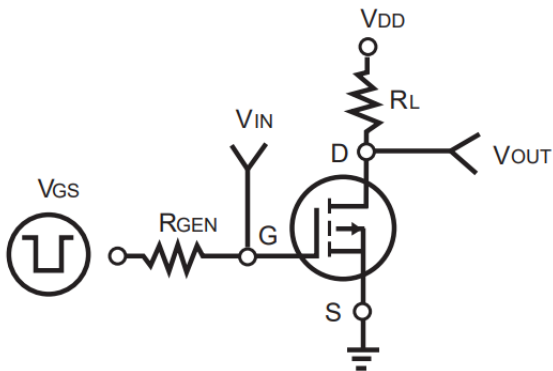


Fig. 10 • Switching Waveforms

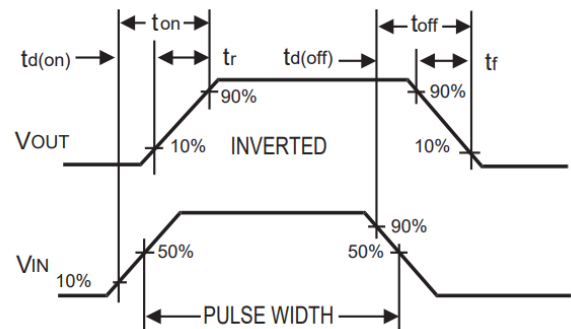
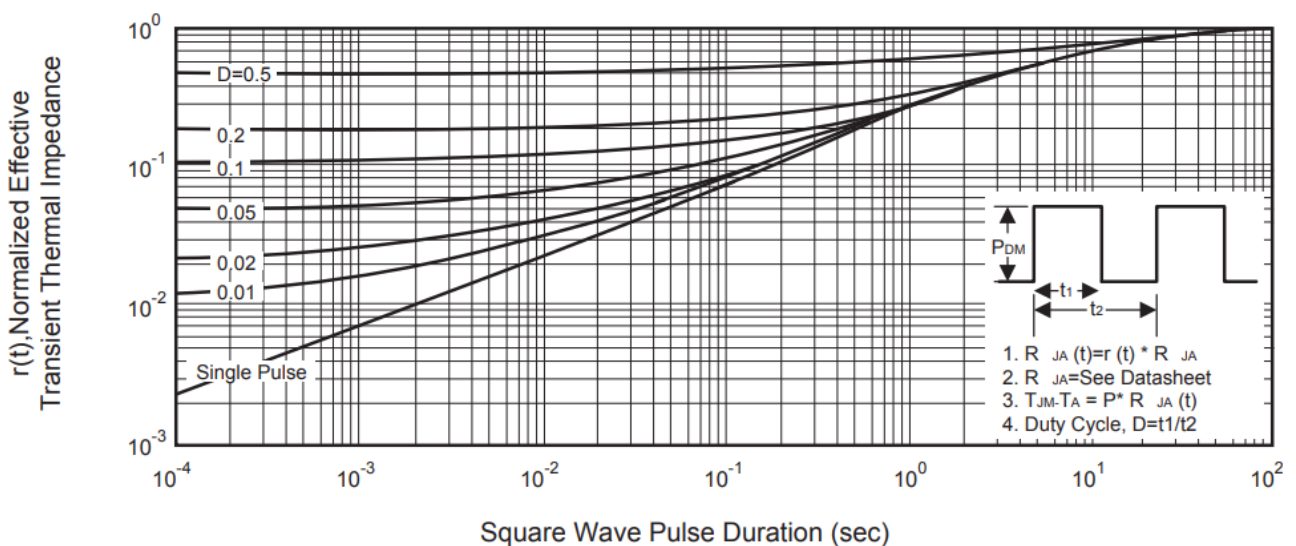
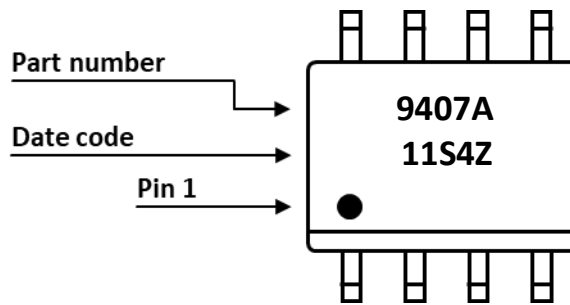


Fig. 11 • Normalized Thermal Transient Impedance Curve



## PART MARKING



## DATE CODE

Example: 11S4Z



Coding list for „Day“

1	2	3	4	5	6	7	8	9	A
01	02	03	04	05	06	07	08	09	10
B	C	D	E	F	G	H	I	J	K
11	12	13	14	15	16	17	18	19	20
L	M	N	O	P	Q	R	S	T	U
21	22	23	24	25	26	27	28	29	30
V									
31									

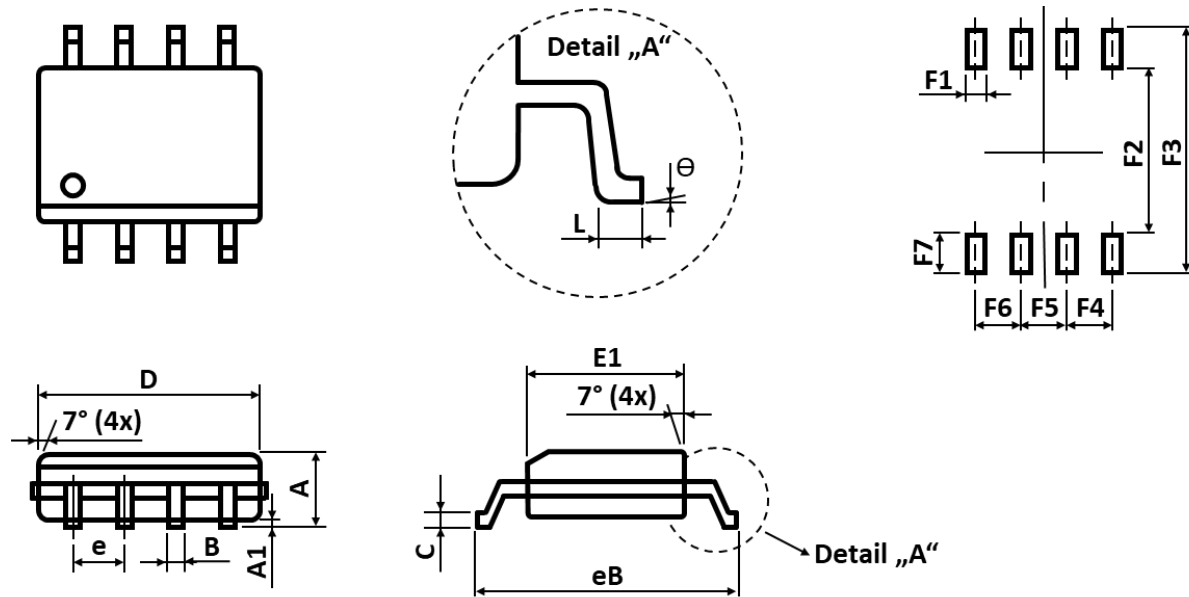
Coding list for „Month“

1	2	3	4	5	6
Jan	Feb	Mar	Apr	May	Jun
7	8	9	A	B	C
Jul	Aug	Sep	Oct	Nov	Dec

Coding list for „Year“

0	1	2	3	4
2020	2021	2022	2023	2024
5	6	7	8	9
2025	2026	2027	2028	2029

## PACKAGE OUTLINE AND RECOMMENDED PAD LAYOUT



Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
A	1.350	-	1.750
A1	0.100	-	0.250
B	0.310	-	0.510
C	0.170	-	0.250
D	4.690	-	5.000

Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
F1	-	0.500	-
F2	-	4.250	-
F3	-	6.250	-
F4	-	1.270	-

Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
E1	3.700	-	4.060
eB	5.800	-	6.200
e	-	1.270	-
L	0.400	-	0.950
θ	0°	-	8°

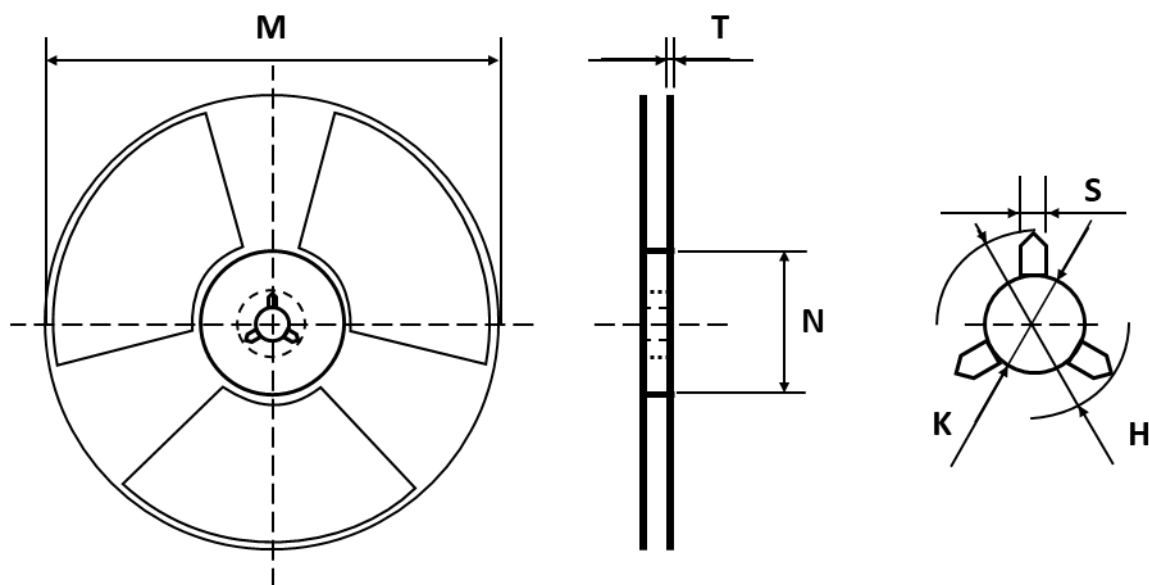
Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
F5	-	1.270	-
F6	-	1.270	-
F7	-	1.000	-

- Notes: 1. The suggested land pattern dimensions have been provided for reference only.  
2. For further information, please reference document IPC-7351A.

## ORDERING INFORMATION

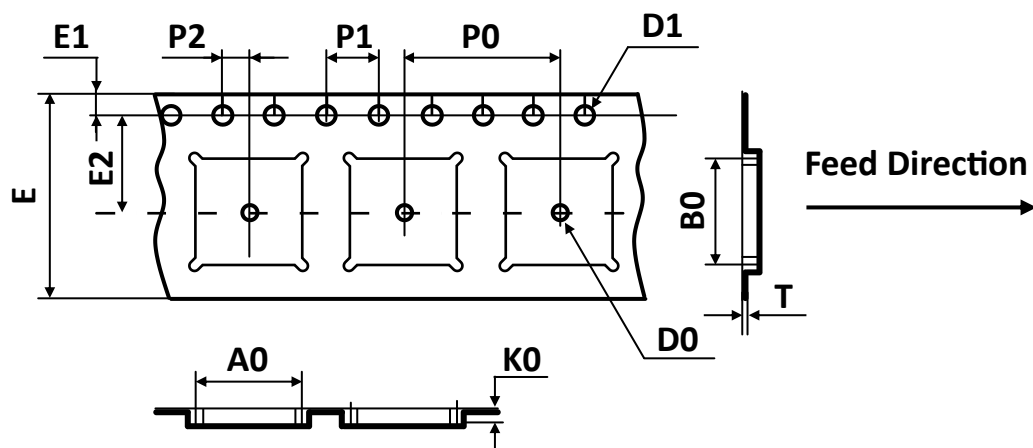
Part Number	Package	Packing	Reel Qty.	Inner Box Qty.	Outer Box Qty.
CEM9407A	SO8	13" Reel	2,500pcs	5,000pcs	40,000pcs

## REEL DIMENSIONS ▲ All dimensions in mm



Tape Size	Reel Size	M	N	T	H	K	S
12mm	Ø330	Ø330.00 ±2.00	Ø100.00 ±0.50	2.20 ±0.20	20.00 ±1.00	13.20 ±0.20	3.00 ±1.00

## TAPE DIMENSIONS ▲ All dimensions in mm



Package	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SO8	6.50 ±0.10	5.30 ±0.10	2.05 ±0.15	1.50 ±0.10	1.50 ±0.10	12.00 ±0.10	1.75 ±0.10	5.50 ±0.10	8.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.02

**Note:** All dimensions meet EIA-481-D requirements.

## RECOMMENDED REFLOW SOLDERING PROFILE



### Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s \min}$	100 °C	150 °C
Preheat temperature max.	$T_{s \max}$	150 °C	200 °C
Preheat time $t_s$ from $T_{s \min}$ to $T_{s \max}$	$t_s$	120 seconds	120 seconds
Ramp-up rate ( $T_L$ to $T_p$ )		max. 3 °C/second	max. 3 °C/second
Liquidous temperature	$T_L$	183 °C	217 °C
Time $t_L$ maintained above $T_L$	$t_L$	150 seconds max.	150 seconds max.
Peak package body temperature	$T_p$	235°C	260°C
Timeframe of within 5°C below and up to max actual peak body temperature	$t_p$	20 seconds max.	30 seconds max.
Ramp-down rate ( $T_L$ to $T_p$ )		max. 6 °C/second	max. 6 °C/second
Time 25°C to peak temperature		max. 6 minutes	max. 8 minutes



## REVISION TABLE

Revision	Date	Status	Notes
001	30/09/2022	Initial release	Initial publication

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