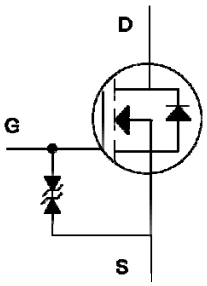
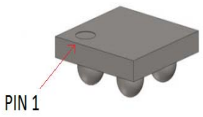
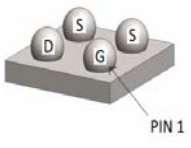
N-Channel Logic Level Enhancement Mode Field Effect Transistor

Product Summary:

BV_{DSS}	30V
$R_{DSON\ (MAX.)}$	60mΩ
I_D	3.2A







Pb-Free Lead Plating & Halogen Free

ESD Protection

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNIT
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current	T_A = 25 °C	I_D	3.2	A
	T_A = 70 °C		2.5	
Pulsed Drain Current[1]		I_{DM}	12.8	
Power Dissipation	T_A = 25 °C	P_D	1.3	W
	T_A = 70 °C		0.84	
Operating Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150	°C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Ambient[3]	$R_{\theta JA}$		95	°C / W

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]95°C / W when mounted on a 1 in^2 pad of 2 oz copper.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	30			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	0.4	0.8	1.2	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±12V			±5	μA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 24V, V_{GS} = 0V			1	μA
		V_{DS} = 20V, V_{GS} = 0V, T_J = 125 °C			10	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 5V, V_{GS} = 4.5V	3.2			A
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 4.5V, I_D = 1A		50	60	mΩ
		V_{GS} = 2.5V, I_D = 1A		63	80	
		V_{GS} = 1.8V, I_D = 0.5A		82	110	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 1A		7		S
DYNAMIC						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 15V, f = 1MHz		515		pF
Output Capacitance	C_{oss}			90		
Reverse Transfer Capacitance	C_{rss}			75		
Total Gate Charge[1,2]	Q_g	V_{DS} = 15V, V_{GS} = 4.5V, I_D = 1A		8.5		nC
Gate-Source Charge[1,2]	Q_{gs}			1.0		
Gate-Drain Charge[1,2]	Q_{gd}			2.7		
Turn-On Delay Time[1,2]	$t_{d(on)}$	V_{DS} = 15V, I_D = 1A, V_{GS} = 4.5V, R_{GEN} = 6Ω		23		nS
Rise Time[1,2]	t_r			12		
Turn-Off Delay Time[1,2]	$t_{d(off)}$			35		
Fall Time[1,2]	t_f			18		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25 °C)						
Continuous Current	I_S				3.2	A
Pulsed Current[3]	I_{SM}				12.8	
Forward Voltage[1]	V_{SD}	I_F = 1A, V_{GS} = 0V			1.2	V

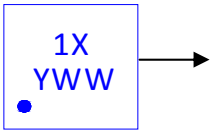
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

[3]Pulse width limited by maximum junction temperature.

Ordering & Marking Information:

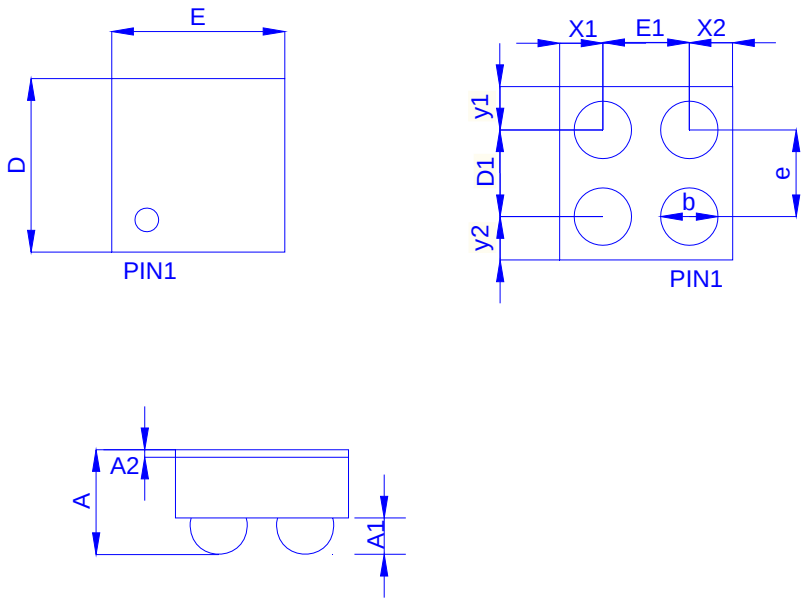
Device Name: EMZF60N03Z for WLCSP



1X Device Code, 1X for EMZF60N03Z

YWW: Date Code

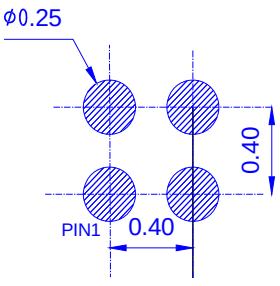
Outline Drawing



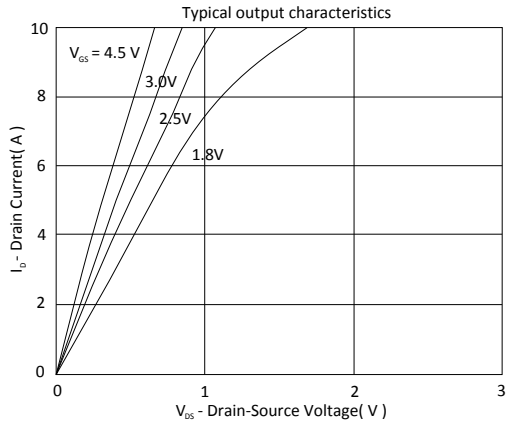
Dimension in mm

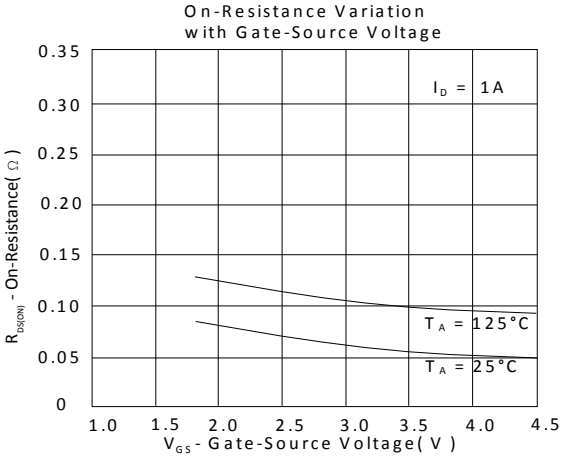
Dimension	A	A1	A2	D	D1	E	E1	b	e	X1	X2	y1	y2
Min.	0.463	0.168	0.020	0.770	0.400 (BSC)	0.770	0.400 (BSC)	0.265	0.400 (BSC)	0.200 (REF)	0.200 (REF)	0.200 (REF)	0.200 (REF)
Max.	0.503	0.228	0.050	0.830		0.830							

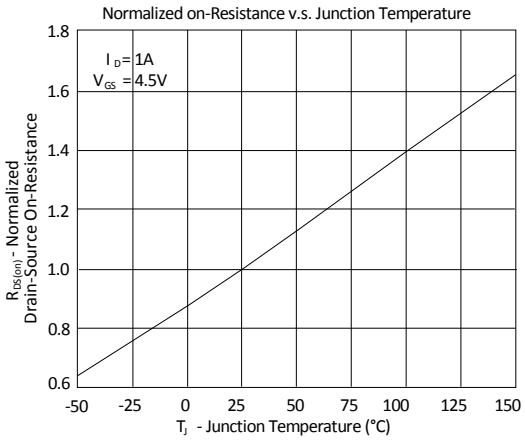
Footprint

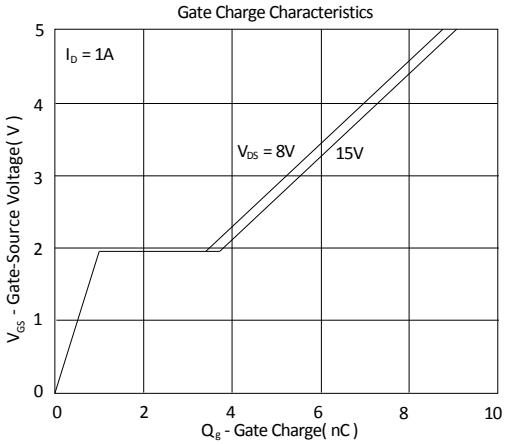


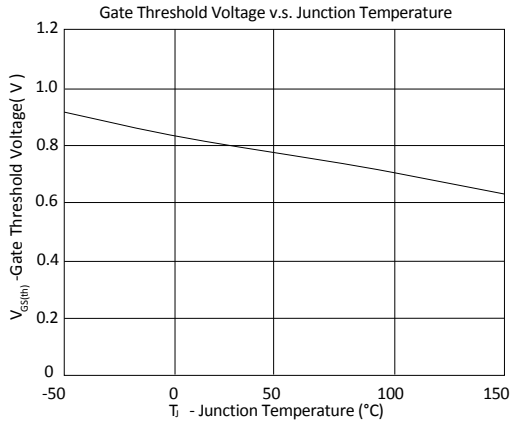
TYPICAL CHARACTERISTICS

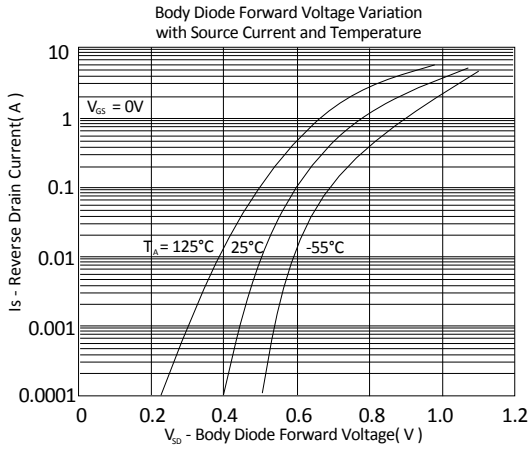


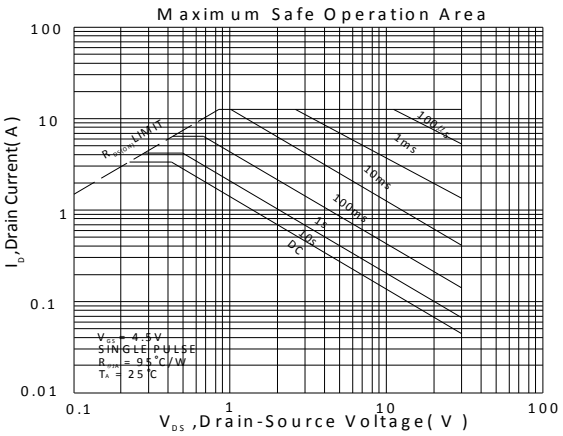


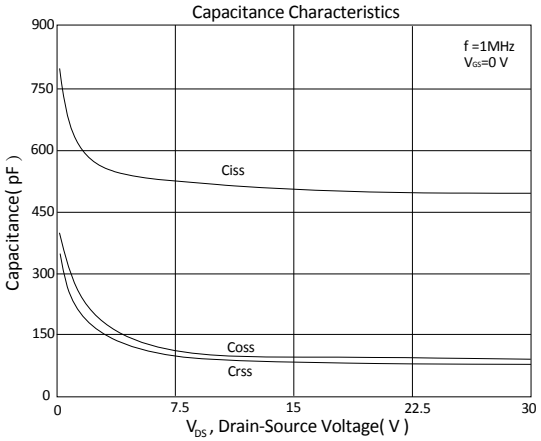


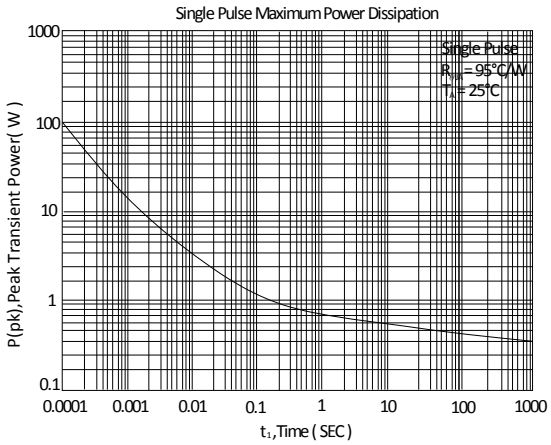


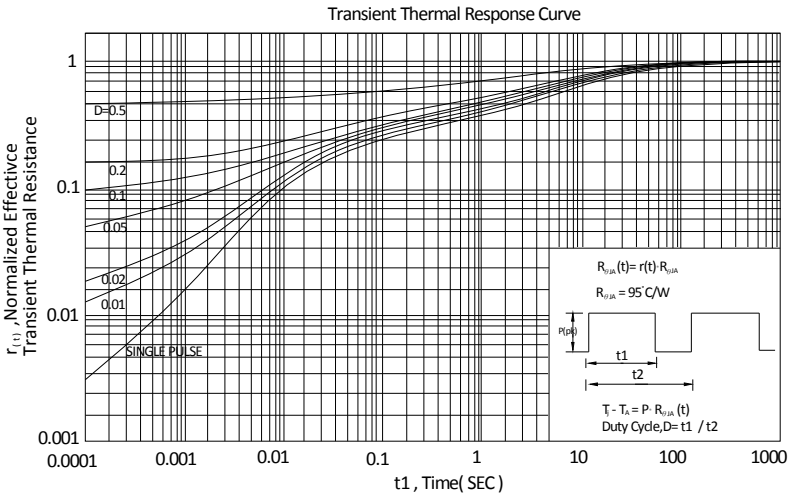





Maximum Safe Operation Area
100
10
1
0.1
0.01
0.1
1
10
100
I_D,Drain Current(A)
V_{DS} ,Drain-Source Voltage(V)
LIMIT
1ms
10ms
100ms
1s
DC
V_{GS} = 4.5 V
SINGLE PULSE
$R_{\theta JA}$ = 95 °C/W
T_A = 25 °C


Capacitance Characteristics
900
750
600
450
300
150
0
0
7.5
15
22.5
30
Capacitance(pF)
V_{DS} , Drain-Source Voltage(V)
f =1MHz
V_{GS}=0 V
Ciss
Coss
Crss


Single Pulse Maximum Power Dissipation
1000
100
10
1
0.1
0.0001
0.001
0.01
0.1
1
10
100
1000
P(pk),Peak Transient Power(W)
t_1,Time (SEC)
Single Pulse
$R_{\theta JA}$ = 95°C/W
T_A = 25°C


Transient Thermal Response Curve
1
0.1
0.01
0.001
0.0001
0.001
0.01
0.1
1
10
100
1000
$r_{(t)}$,Normalized Effectivce
Transient Thermal Resistance
t1 , Time(SEC)
D=0.5
0.2
0.1
0.05
0.02
0.01
SINGLE PULSE
$R_{\theta JA}(t)= r(t)\cdot R_{\theta JA}$
$R_{\theta JA}$ = 95°C/W
P(pk)
t1
t2
$T_j - T_A = P\cdot R_{\theta JA}(t)$
Duty Cycle,D= t1 / t2