EPC2049 – Enhancement-Mode Power Transistor
Preliminary Specification Sheet

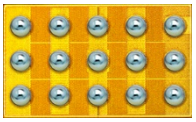
Status: Engineering

Features:

- V_{DS}, 40 V
- Maximum $R_{DS(on)}$, 5 mΩ
- I_D, 16 A

Applications:

- Point of Load Converters
- Envelope Tracking Power Supplies
- LiDAR/Pulsed Power Applications
- Class D Audio
- Low Inductance Motor Drive



EPC2049 eGaN® FETs are supplied in passivated die form with solder bumps.
Die Size: 2.5 mm x 1.5 mm

Maximum Ratings			
V_{DS}	Drain-to-Source Voltage (Continuous)	40	V
	Drain-to-Source Voltage (up to 10,000 5ms pulses at 150˚C)	48	
I_D	Continuous (T_A = 25˚C, $R_{\theta JA}$= 8 ˚C/W)	16	A
	Pulsed (25˚C, T_{PULSE} = 300 µs)	175	
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-4	
T_J	Operating Temperature	-40 to 150	˚C
T_{STG}	Storage Temperature	-40 to 150	

Static Characteristics (T_J= 25˚C unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-to-Source Voltage	V_{GS} = 0 V, I_D = 0.5 mA	40			V
I_{DSS}	Drain Source Leakage	V_{DS} = 32 V, V_{GS} = 0 V		0.1	0.4	mA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		0.5	5.5	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		0.1	0.4	mA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 6 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 15 A		4.3	5	mΩ
V_{SD}	Source-Drain Forward Voltage	I_S = 0.5 A, V_{GS} = 0 V		2		V

All measurements were done with substrate shorted to source.

Thermal Characteristics			
		TYP	UNIT
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.4	˚C/W
$R_{\theta JB}$	Thermal Resistance, Junction to Board	8.5	˚C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	64	˚C/W

Note 1: $R_{\theta JA}$ is determined with the device mounted on one square inch of copper pad, single layer 2 oz copper on FR4 board.

See http://epc-co.com/epc/documents/product-training/Appnote_Thermal_Performance_of_eGaN_FETs.pdf for details.

Dynamic Characteristics (T_J= 25˚C unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance	V_{DS} = 20 V, V_{GS} = 0 V		670	805	pF
C_{RSS}	Reverse Transfer Capacitance			12		
C_{OSS}	Output Capacitance			350	525	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (note 2)	V_{DS} = 0 to 20 V, V_{GS} = 0 V		551		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (note 3)			623		
R_G	Gate Resistance			0.6		Ω
Q_G	Total Gate Charge	V_{DS} = 20 V, V_{GS} = 5 V, I_D=15 A		6.1	7.6	nC
Q_{GS}	Gate-to-Source Charge	V_{DS} = 20 V, I_D = 15 A		2.1		
Q_{GD}	Gate-to-Drain Charge			1.1		
$Q_{G(TH)}$	Gate Charge at Threshold			1.5		
Q_{OSS}	Output Charge	V_{DS} = 20 V, V_{GS} = 0 V		13	20	
Q_{RR}	Source-Drain Recovery Charge			0		

Note 2: $C_{OSS(ER)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 50% BV_{DSS}.

Note 3: $C_{OSS(TR)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 50% BV_{DSS}.

All measurements were done with substrate shorted to source.

Figure 1: Typical Output Characteristics at 25°C

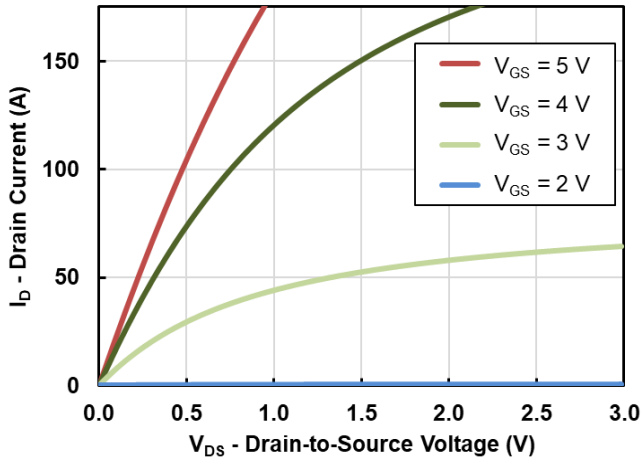


Figure 2: Transfer Characteristics

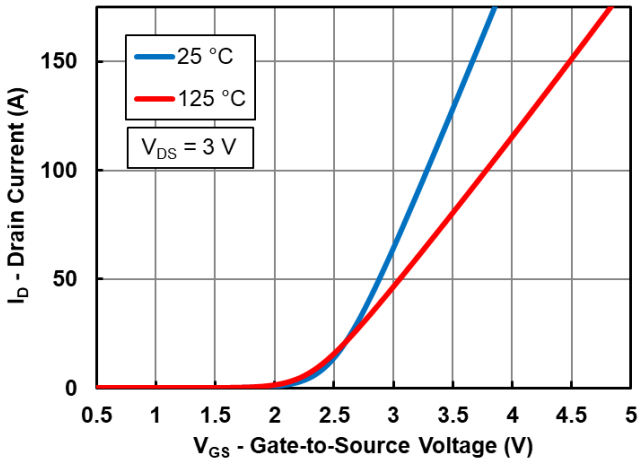


Figure 3: $R_{DS(on)}$ vs V_{GS} for Various Drain Currents

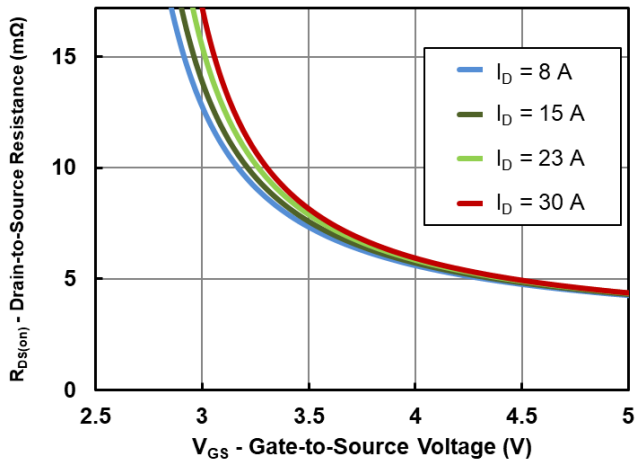


Figure 4: $R_{DS(on)}$ vs V_{GS} for Various Temperatures

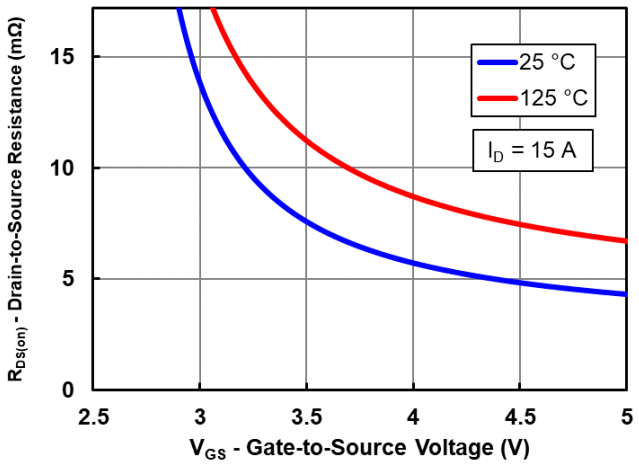


Figure 5a: Capacitance (Linear Scale)

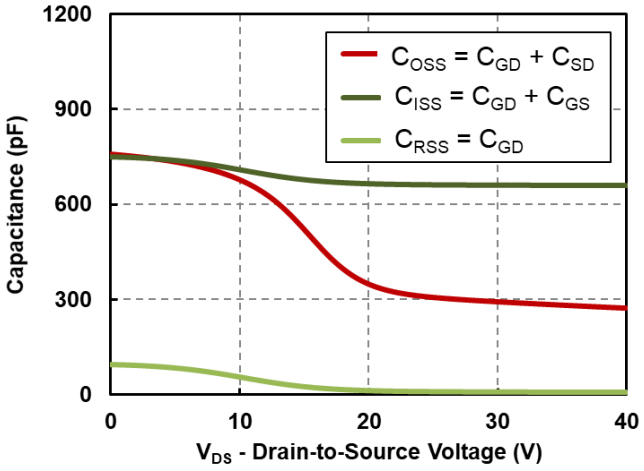


Figure 5b: Capacitance (Log Scale)

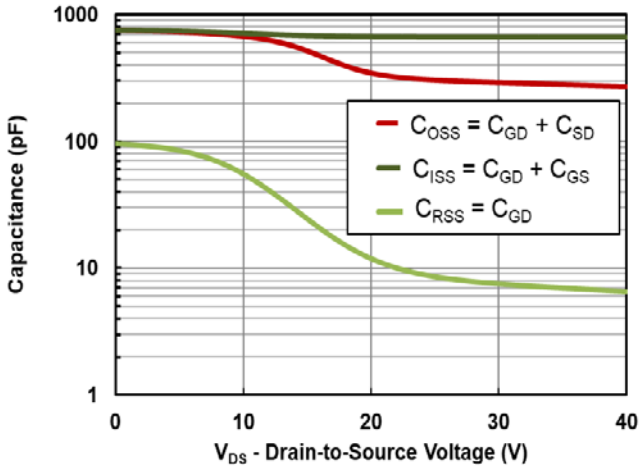


Figure 5c: Output Charge and C_{OSS} Stored Energy

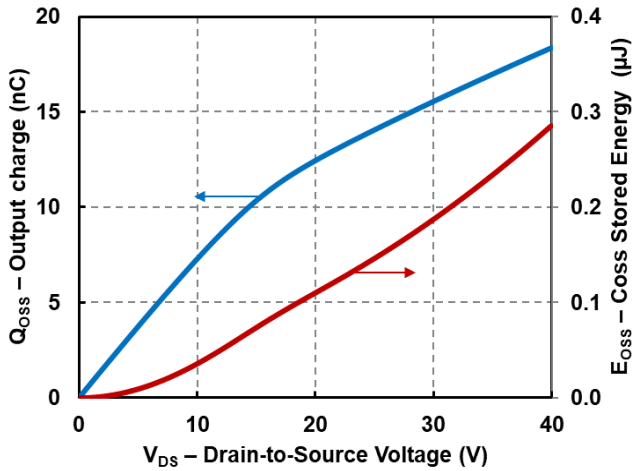


Figure 6: Gate Charge

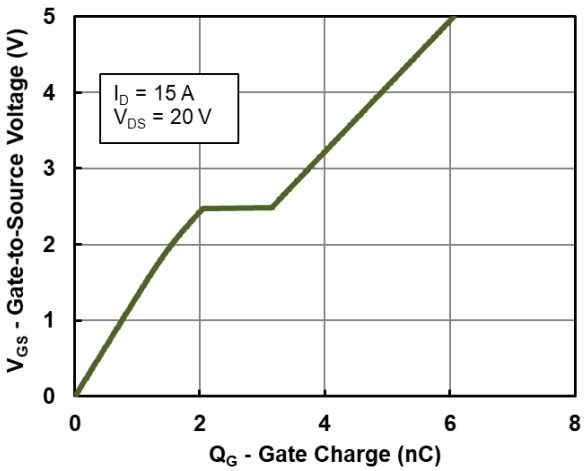


Figure 7: Reverse Drain-Source Characteristics

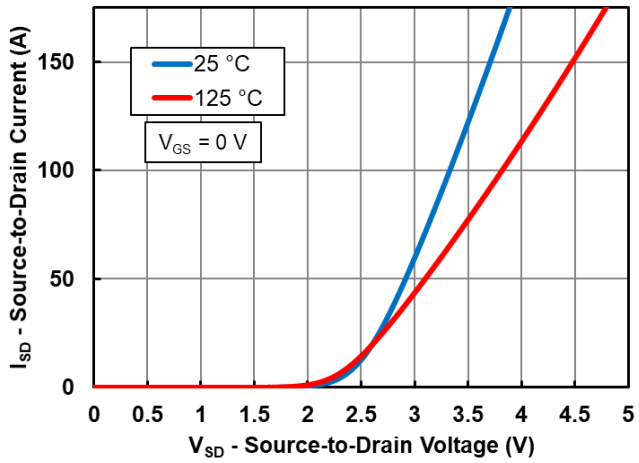


Figure 8: Normalized On-State Resistance vs Temperature

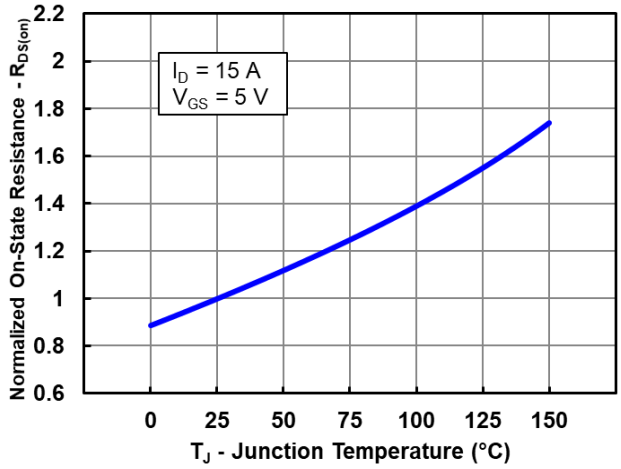


Figure 9: Normalized Threshold Voltage vs Temperature

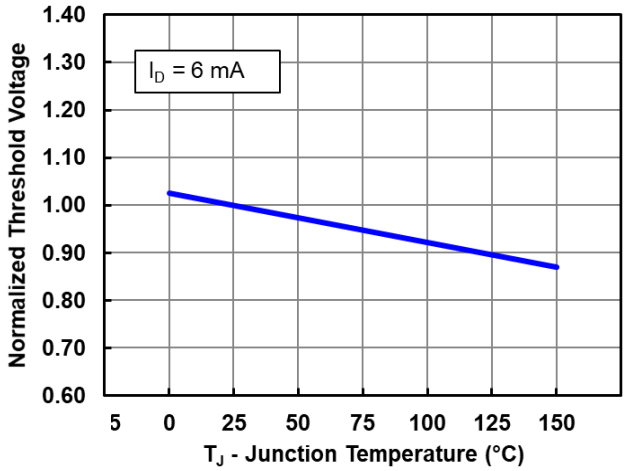


Figure 10: Safe Operating Area

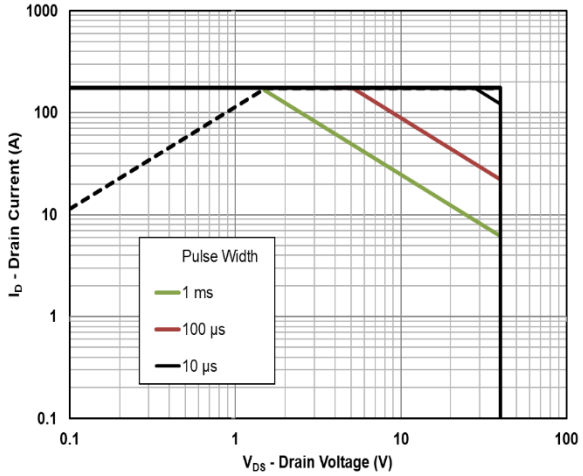
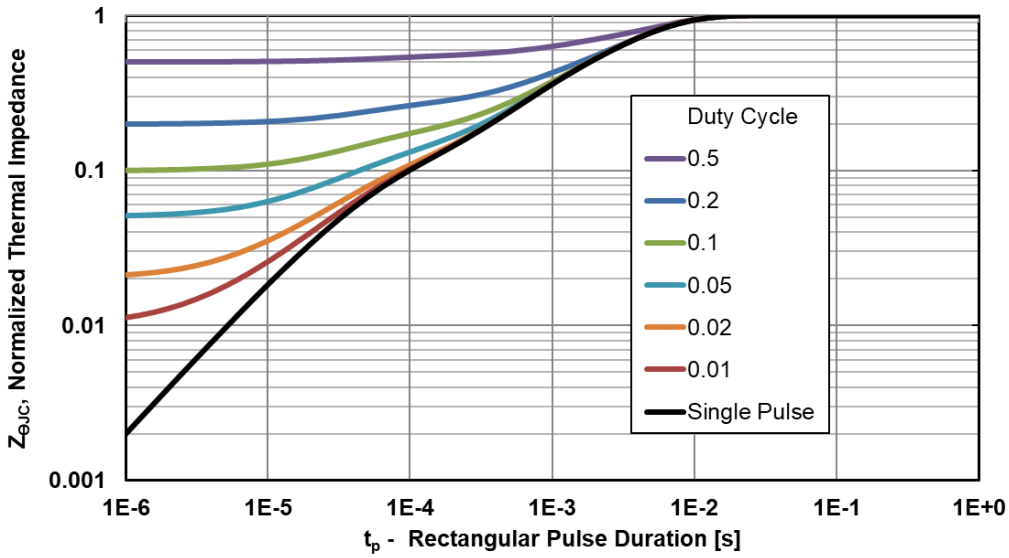
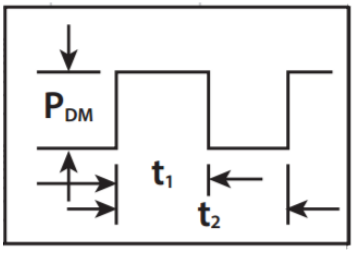


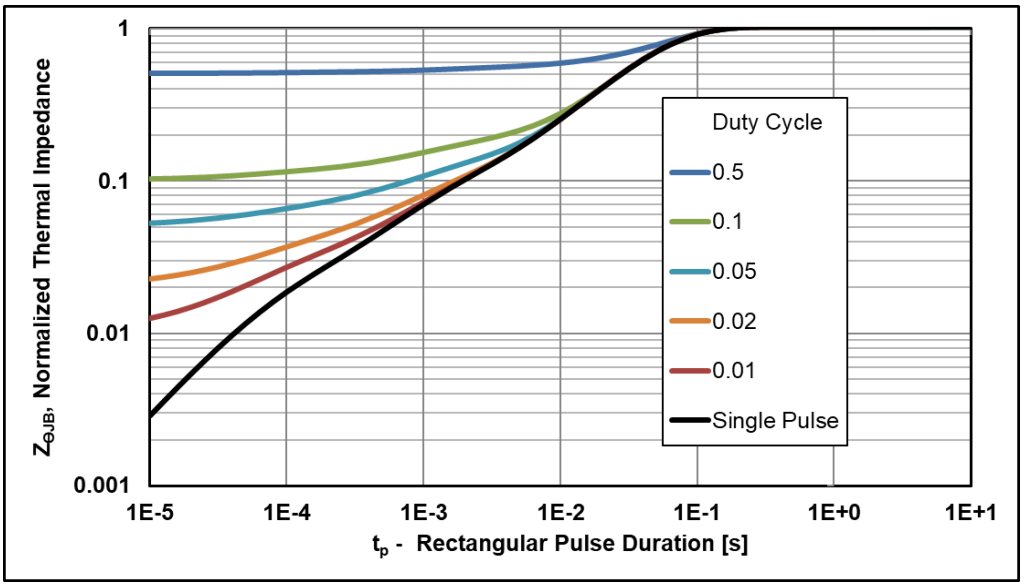
Figure 11a: Transient Thermal Response Curves (Junction-to-Case)

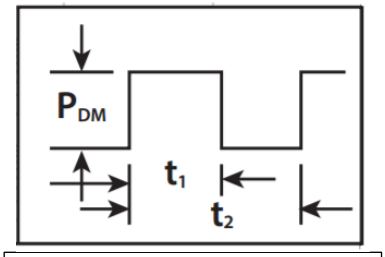




Notes:
Duty Factor: $D = t_1/t_2$
Peak $T_J = P_{DM} \times Z_{\theta JC} \times R_{\theta JC} + T_C$

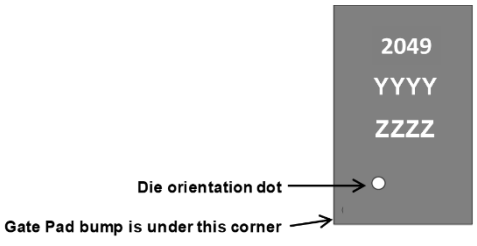
Figure 11b: Transient Thermal Response Curves (Junction-to-Board)





Notes:
Duty Factor: $D = t_1/t_2$
Peak $T_J = P_{DM} \times Z_{\theta JB} \times R_{\theta JB} + T_B$

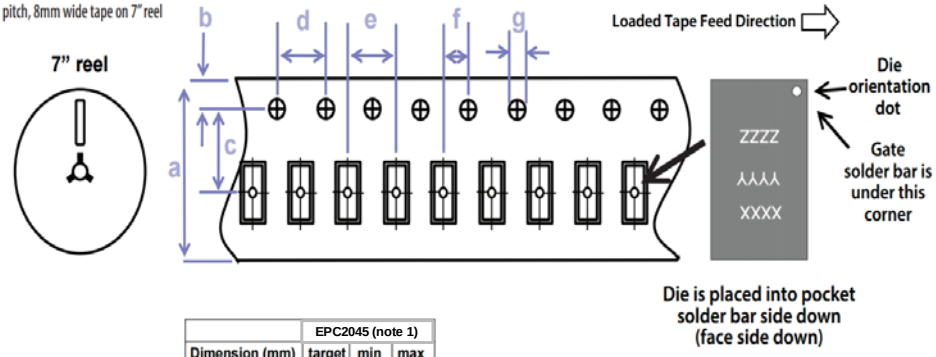
DIE MARKINGS



Part Number	Laser Marking		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2049ENGRT	2049	YYYY	ZZZZ

TAPE AND REEL CONFIGURATION

4mm pitch, 8mm wide tape on 7" reel

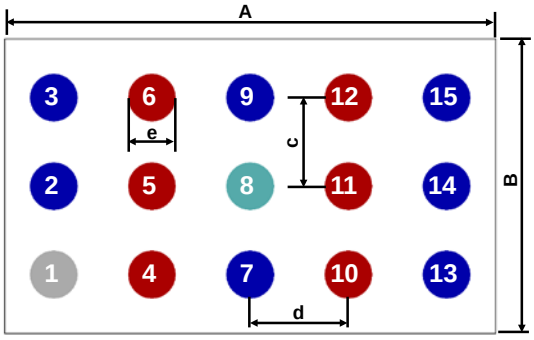


	EPC2045 (note 1)		
Dimension (mm)	target	min	max
a	8.00	7.90	8.30
b	1.75	1.65	1.85
c (see note)	3.50	3.45	3.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (see note)	2.00	1.95	2.05
g	1.5	1.5	1.6

Note 1: MSL 1 (moisture sensitivity level 1) classified according to IPC/JEDEC industry standard.
Note 2: Pocket position is relative to the sprocket hole measured as true position of the pocket, not the pocket hole.

DIE OUTLINE

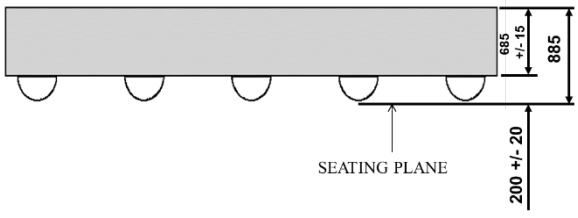
Solder Bar View



DIM	MICROMETERS		
	MIN	Nominal	MAX
A	2470	2500	2530
B	1470	1500	1530
c		450	
d		500	
e	238	264	290

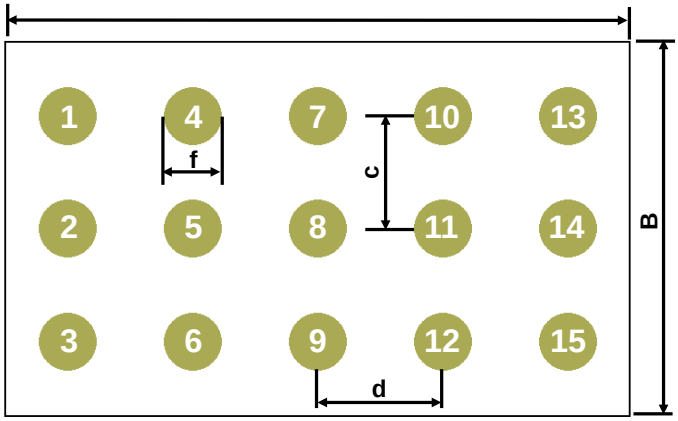
Pads 1 is Gate;
Pads 2, 3, 7, 9, 13, 14, 15 are Source;
Pads 4, 5, 6, 10, 11, 12 are Drain;
Pad 8 is substrate

Side View



RECOMMENDED LAND PATTERN

(measurements in µm)



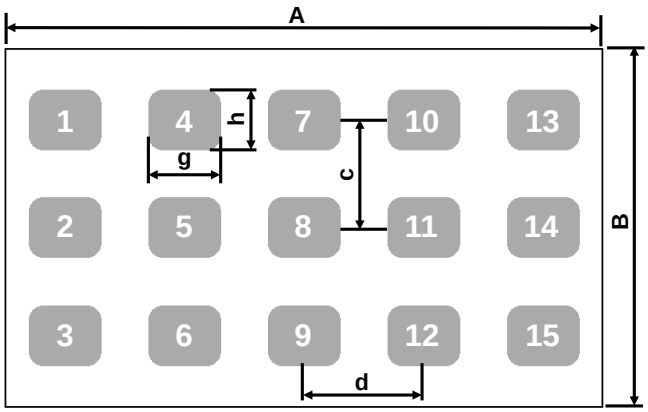
The land pattern is solder mask defined
Solder mask is 10µm smaller per side than bump

DIM	MICROMETERS
A	2500
B	1500
c	450
d	500
f	230

Pads 1 is Gate;
Pads 2, 3, 7, 9, 13, 14, 15 are Source;
Pads 4, 5, 6, 10, 11, 12 are Drain;
Pad 8 is substrate

RECOMMENDED STENCIL DRAWING

(measurements in µm)



DIM	MICROMETERS
A	2500
B	1500
c	450
d	500
g	300
h	250

Recommended stencil should be 4mil (100µm) thick, must be laser cut, openings per drawing.

The corner has a radius of R60

Intended for use with SAC305 Type 4 solder, reference 88.5% metals content.

Additional assembly resources available at epc-co.com/epc/DesignSupport/AssemblyBasics.aspx

Revised December, 2017