

EPC2108 – Enhancement-Mode GaN Power Transistor Half Bridge With Integrated Synchronous Bootstrap Preliminary Specification Sheet

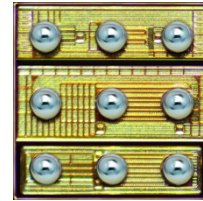
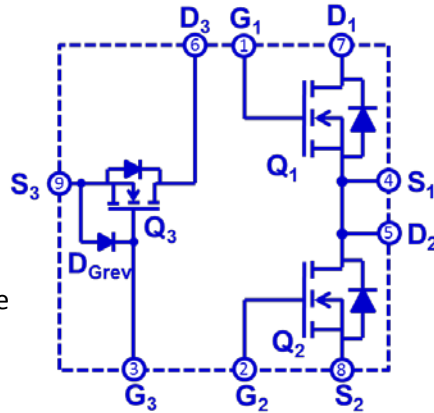
Status: Engineering

Features:

- V_{DS} , 60 V
- High Frequency Operation
- High Density Footprint
- Low Inductance Package
- Pb-Free (RoHS Compliant), Halogen Free

Applications:

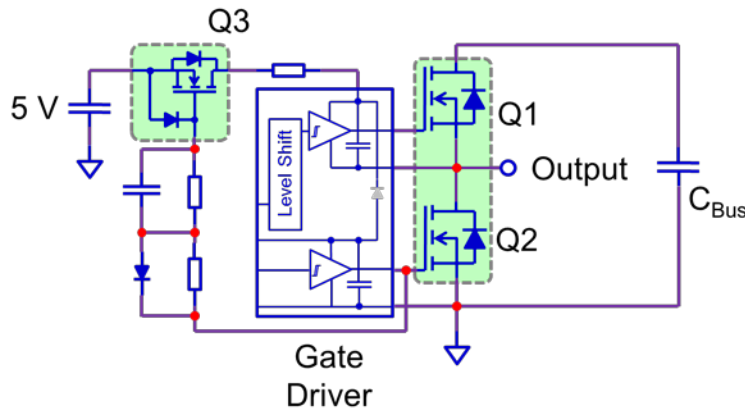
- High Frequency DC-DC Conversion
- Class-D Audio
- Wireless Power (Highly Resonant and Inductive)



EPC2108 devices are supplied only in passivated die form with solder balls

Die Size: 1.35 mm x 1.35 mm

Typical Circuit



MAXIMUM RATINGS

Parameter	Device	Value
Maximum Drain – Source Voltage	Q1 & Q2	60 V
	Q3	100 V
Maximum Gate – Source Voltage Range	Q1 & Q2	-4 V < V_{GS} < 6 V
	Q3	-2 V < V_{GS} < 6 V
Continuous Drain Current, 25 °C	Q1 & Q2, $R_{\theta JA} = 124 \text{ }^\circ\text{C/W}$	1.7 A
	Q3, $R_{\theta JA} = 95 \text{ }^\circ\text{C/W}$	0.5 A
Maximum Pulsed Drain Current, 25 °C, $T_{pulse} = 300 \text{ } \mu\text{s}$	Q1 & Q2	5.5 A
	Q3	0.5 A
Operating Temperature Range	-40 °C < T_J < 150 °C	

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STATIC CHARACTERISTICS

Parameter	Conditions	Q1 & Q2	Q3
Maximum Drain – Source Voltage (BV_{DSS})	$V_{GS} = 0\text{ V}$, $I_D = 0.3\text{ mA}$	60 V	100 V
Maximum Drain – Source Leakage	Q1/Q2: $V_{DS} = 48\text{ V}$, $V_{GS} = 0\text{ V}$ Q3: $V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$	0.25 mA	0.1 mA
Maximum $R_{DS(on)}$	Q1/Q2: $V_{GS} = 5\text{ V}$, $I_D = 2.5\text{ A}$ Q3: $V_{GS} = 5\text{ V}$, $I_D = 0.05\text{ A}$	190 m Ω	2.8 Ω
Typical $R_{DS(on)}$		150 m Ω	2.1 Ω
Gate – Source Threshold Voltage	Q1/Q2: $I_D = 0.2\text{ mA}$, $V_{DS} = V_{GS}$ Q3: $I_D = 0.02\text{ mA}$, $V_{DS} = V_{GS}$	$0.8\text{ V} < V_{GS(TH)} < 2.5\text{ V}$	
Gate – Source Maximum Positive Leakage	$V_{GS} = 5\text{ V}$	1 mA	1 mA
Gate – Source Maximum Negative Leakage	Q1/Q2: $V_{GS} = -4\text{ V}$ Q3: $V_{GS} = -1\text{ V}$	-0.25 mA	-0.1 mA
Source-Gate Maximum Forward Voltage	Q3: $I_{SG} = 0.2\text{ mA}$, $V_{DS} = 0\text{ V}$		-2 V

$T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated

DYNAMIC CHARACTERISTICS

Parameter	Conditions	Typical Value			Unit
		Q1	Q2	Q3	
C_{ISS} (Input Capacitance)	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$	22		7	pF
C_{OSS} (Output Capacitance)		13	23	2.5	
C_{RSS} (Reverse Transfer Capacitance)		0.5		0.05	
Q_G (Total Gate Charge)	Q1 & Q2: $V_{DS} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 2.5\text{ A}$	220			pC
	Q3: $V_{DS} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 0.05\text{ A}$			44	
Q_{GS} (Gate to Source Charge)	$V_{DS} = 30\text{ V}$	85		16	
Q_{GD} (Gate to Drain Charge)	Q1 & Q2: $I_D = 2.5\text{ A}$	45		4.5	
$Q_{G(TH)}$ (Gate Charge at Threshold)	Q3: $I_D = 0.05\text{ A}$	48		14	
Q_{OSS} (Output Charge)	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$	650	1000	100	
Q_{RR} (Source-Drain Recovery Charge)		0			

$T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated

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THERMAL CHARACTERISTICS

		TYPICAL	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	6	$^{\circ}\text{C}/\text{W}$
$R_{\theta JB}$	Thermal Resistance, Junction to Board (Note 2)	33	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	81	$^{\circ}\text{C}/\text{W}$

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.

Thermal models for EPC devices available at <http://epc-co.com/epc/DesignSupport/DeviceModels.aspx>

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Figure 1a: EPC2108 - Q1 & Q2: Typical Output Characteristics at 25°C

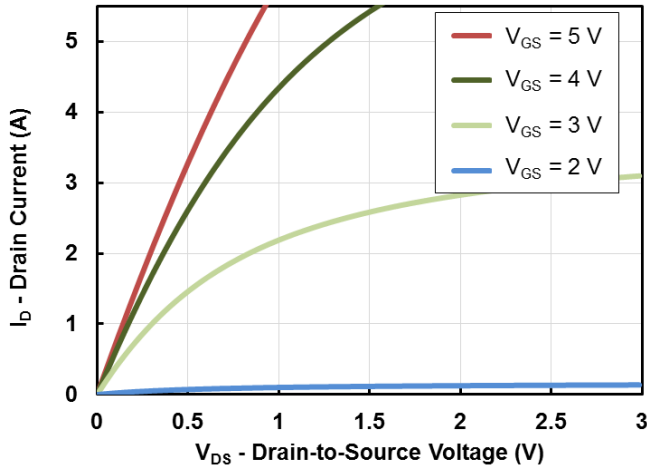


Figure 1b: EPC2108-Q3: Typical Output Characteristics at 25°C

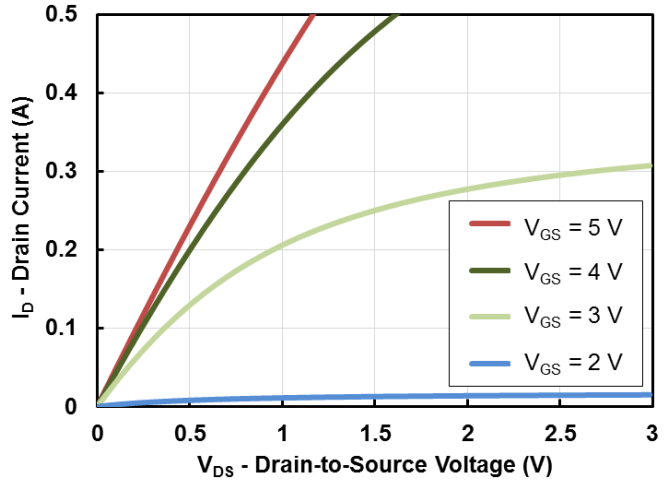


Figure 2a: EPC2108 - Q1 & Q2: Transfer Characteristics

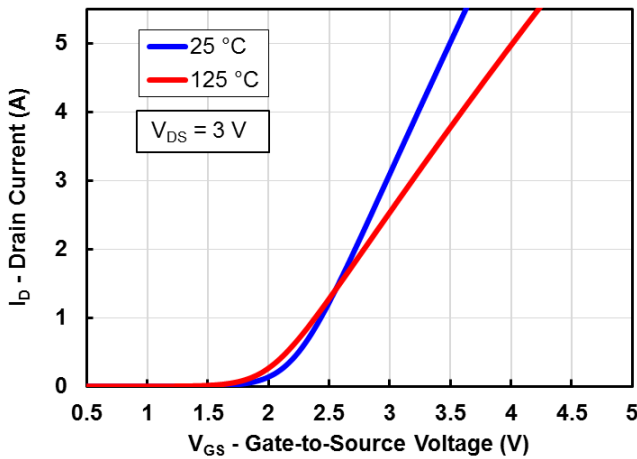


Figure 2b: EPC2108 - Q3: Transfer Characteristics

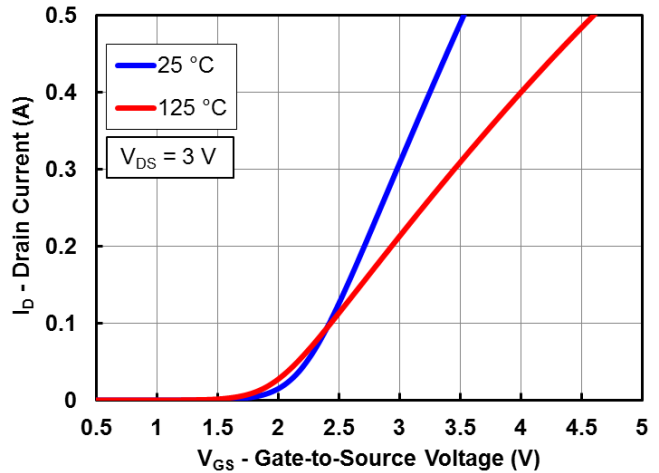


Figure 3a: EPC2108-Q1&Q2: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

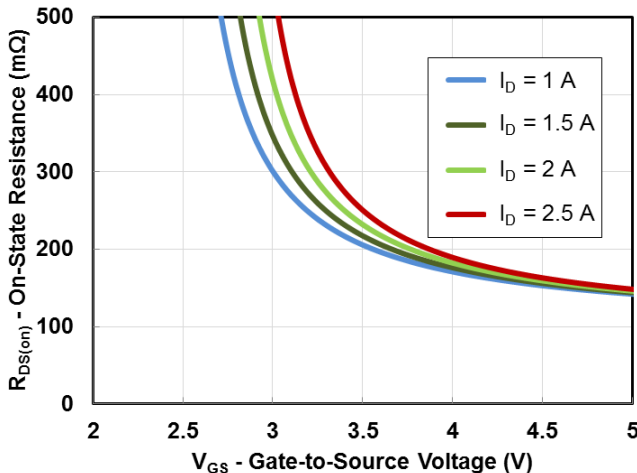
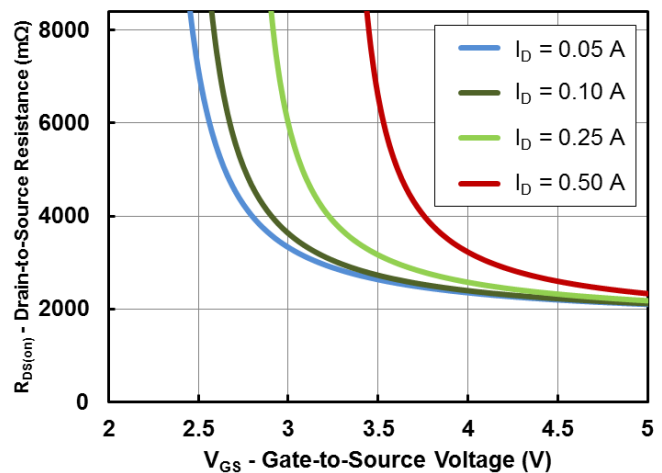


Figure 3b: EPC2108-Q3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents



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Figure 4a: EPC2108-Q1&Q2: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

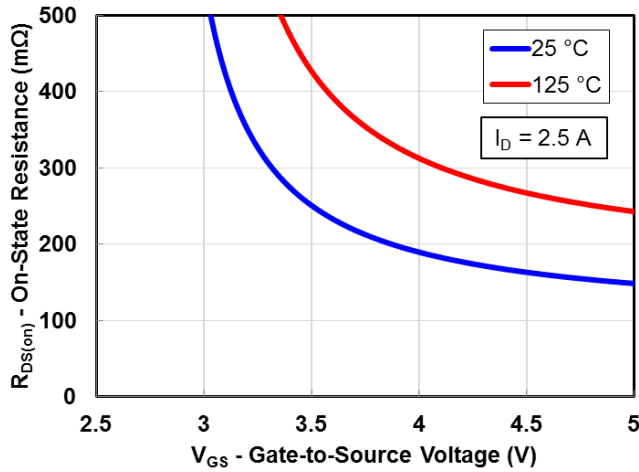


Figure 4b: EPC2108-Q3: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

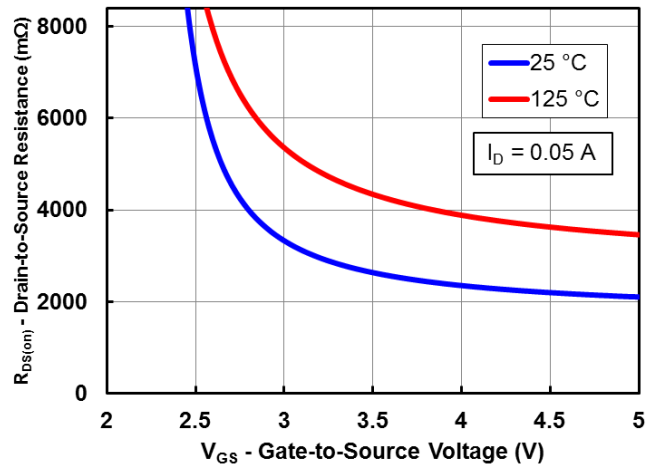


Figure 5a: EPC2108-Q1&Q2: Capacitance (Linear Scale)

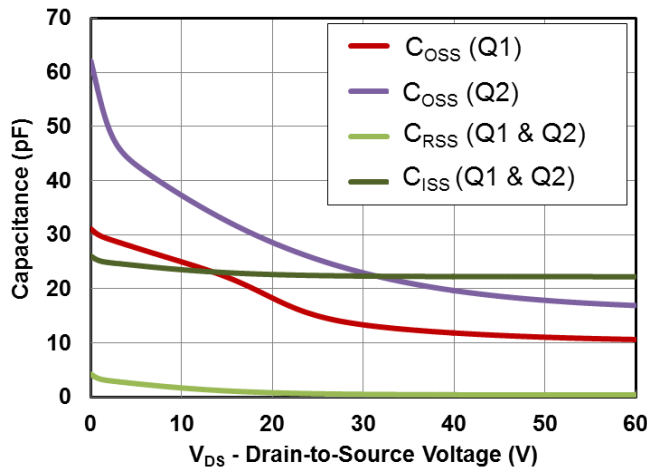


Figure 5b: EPC2108-Q3: Capacitance (Linear Scale)

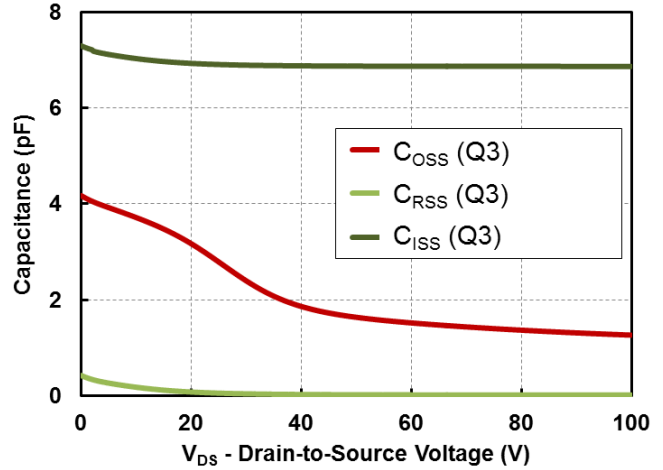


Figure 5c: EPC2108-Q1&Q2: Capacitance (Log Scale)

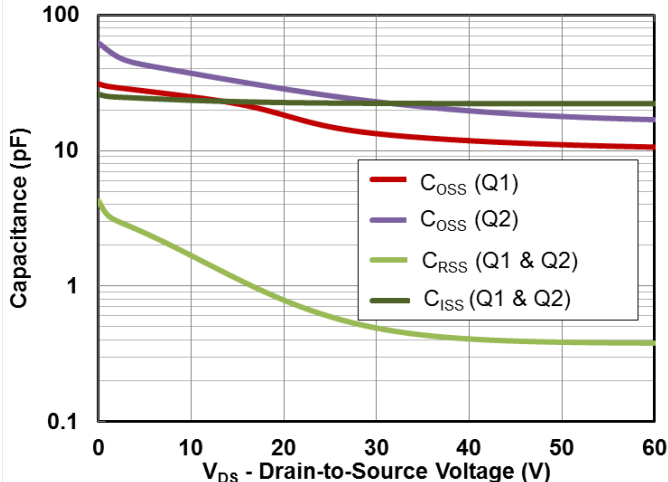
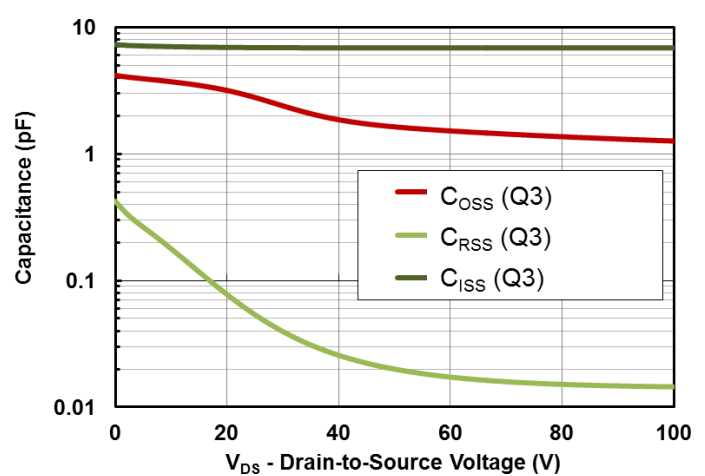


Figure 5d: EPC2108-Q3: Capacitance (Log Scale)



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Figure 6a: EPC2108-Q1&Q2: Gate Charge

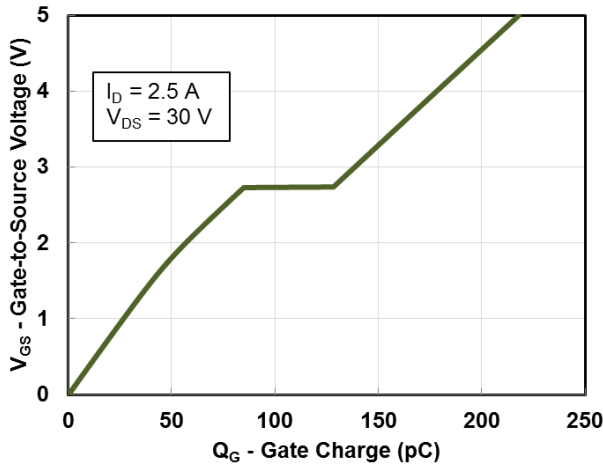


Figure 6b: EPC2108-Q3: Gate Charge

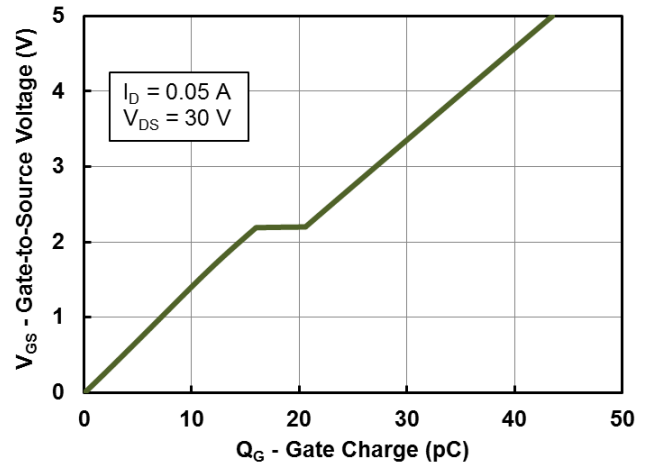


Figure 7a: EPC2108-Q1&Q2: Reverse Drain-Source Characteristics

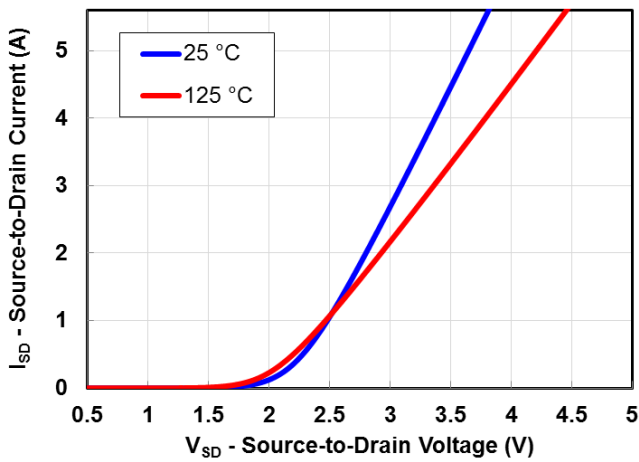


Figure 7b: EPC2108-Q3: Reverse Drain-Source Characteristics

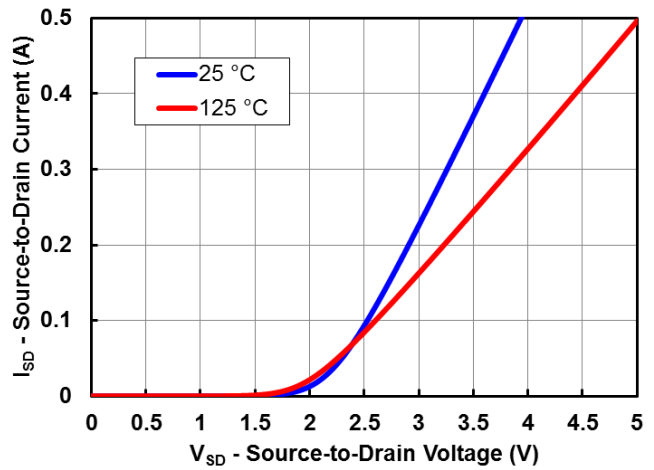


Figure 8a: EPC2108-Q1&Q2: Normalized On Resistance vs. Temperature

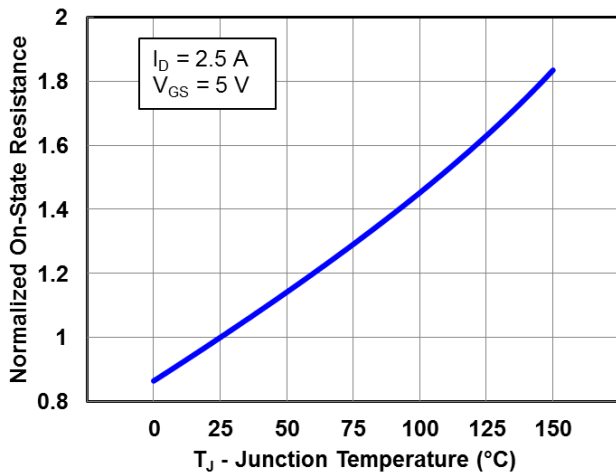
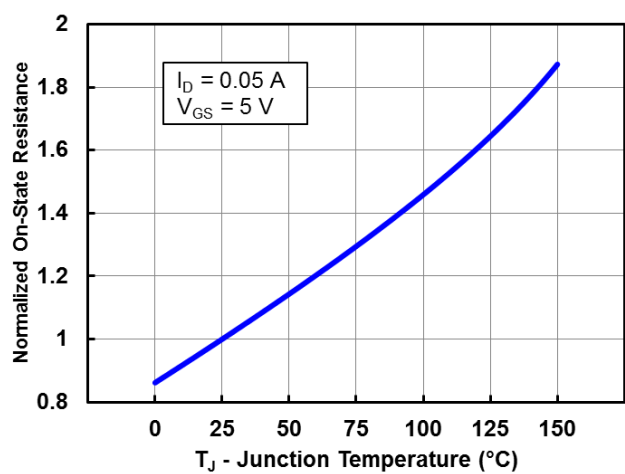


Figure 8b: EPC2108-Q3: Normalized On Resistance vs. Temperature



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Figure 9a:
EPC2108-Q1&Q2: Normalized Threshold Voltage vs. Temperature

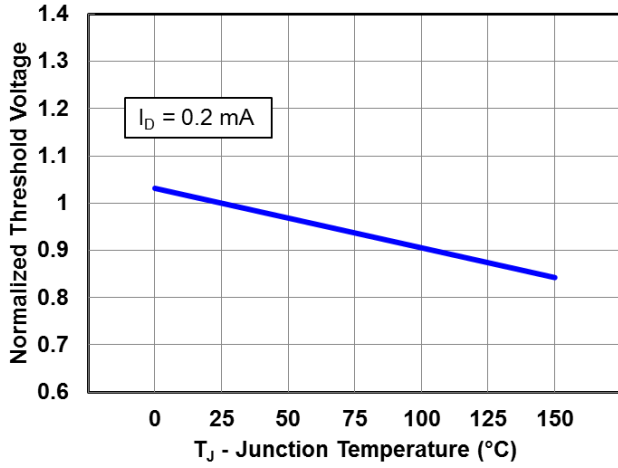
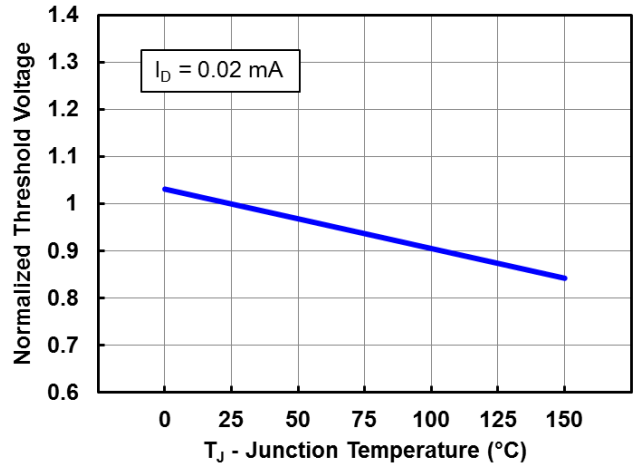
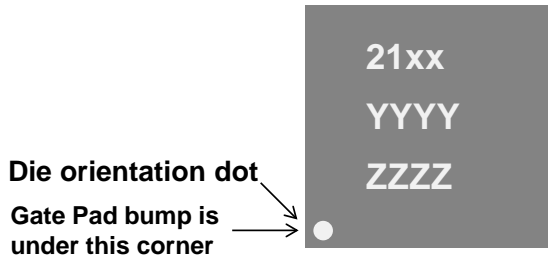


Figure 9b:
EPC2108-Q3: Normalized Threshold Voltage vs. Temperature



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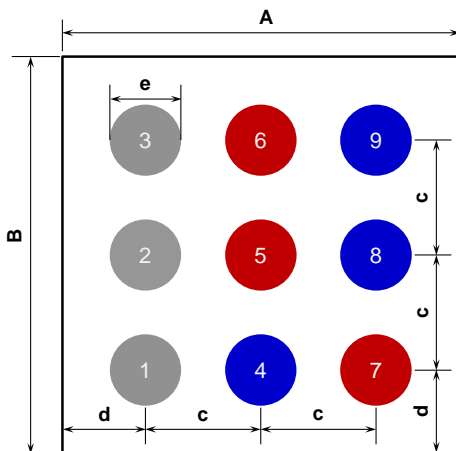
DIE MARKINGS



Part Number	Laser Marking		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2108ENGR	21XX	YYYY	ZZZZ

DIE OUTLINE

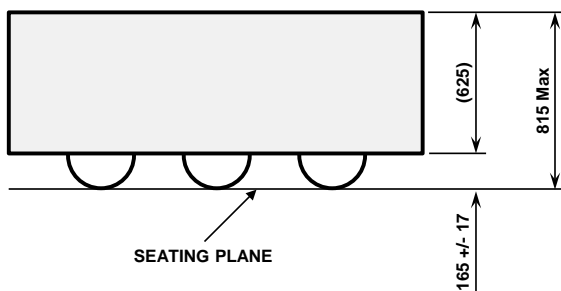
Solder Bar View



- Pad 1 is Gate1 (Q1)
- Pad 2 is Gate2 (Q2)
- Pad 3 is Gate 3 (Q3)
- Pad 7 is Drain1 (Q1)
- Pad 5 is Drain2 (Q2)
- Pad 6 is Drain3 (Q3)
- Pad 4 is Source1 (Q1)
- Pad 8 is Source2 (Q2)
- Pad 9 is Source3 (Q3)

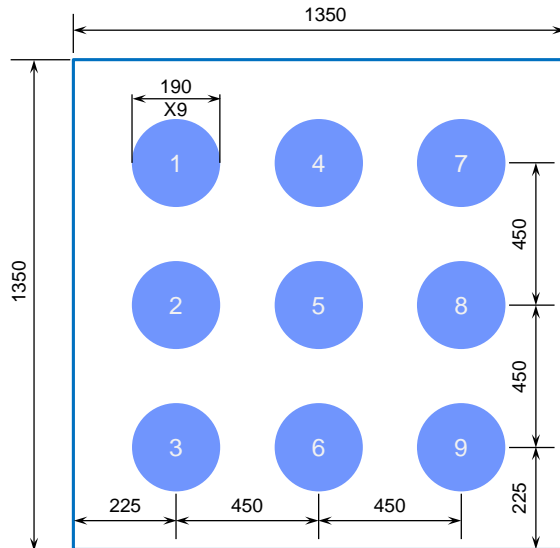
DIM	MICROMETERS		
	MIN	Nominal	MAX
A	1320	1350	1380
B	1320	1350	1380
c	450	450	450
d	210	225	240
e	187	208	229

Side View



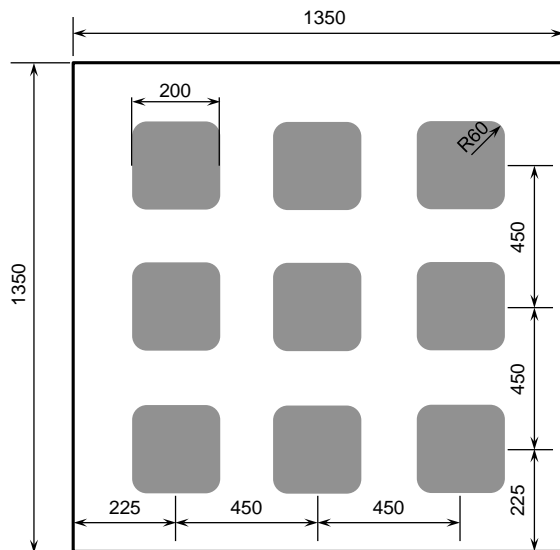
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RECOMMENDED LAND PATTERN (Units in μm)



- Pad 1 is Gate1 (Q1)**
- Pad 2 is Gate2 (Q2)**
- Pad 3 is Gate3 (Q3)**
- Pad 7 is Drain1 (Q1)**
- Pad 5 is Drain2 (Q2)**
- Pad 6 is Drain3 (Q3)**
- Pad 4 is Source1 (Q1)**
- Pad 8 is Source2 (Q2)**
- Pad 9 is Source3 (Q3)**

RECOMMENDED STENCIL DESIGN (Units in μm)



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

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

Additional assembly resources available at <http://epc-co.com/epc/DesignSupport/AssemblyBasics.aspx>

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U.S. Patents 8,350,294; 8,404,508; 8,431,960; 8,436,398; 8,785,974; 8,890,168; 8,969,918; 8,853,749; 8,823,012

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