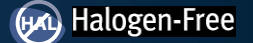


EPC2212 - Automotive 100 V (D-S) Enhancement Mode Power Transistor

 $V_{DS}, 100\text{ V}$
 $R_{DS(on)}, 13.5\text{ m}\Omega$
 $I_D, 18\text{ A}$

AEC-Q101



Gallium Nitride's exceptionally high electron mobility and low temperature coefficient allows very low $R_{DS(on)}$, while its lateral device structure and majority carrier diode provide exceptionally low Q_G and zero Q_{RR} . The end result is a device that can handle tasks where very high switching frequency, and low on-time are beneficial as well as those where on-state losses dominate.

Maximum Ratings

| PARAMETER | | VALUE | UNIT |
|-----------|-------------------------------------------------------------|------------|------------------|
| V_{DS} | Drain-to-Source Voltage (Continuous) | 100 | V |
| I_D | Continuous ($T_A = 25^\circ\text{C}$) | 18 | A |
| | Pulsed ($25^\circ\text{C}, T_{PULSE} = 300\ \mu\text{s}$) | 75 | |
| V_{GS} | Gate-to-Source Voltage | 6 | V |
| | Gate-to-Source Voltage | -4 | |
| T_J | Operating Temperature | -40 to 150 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature | -40 to 150 | |

Thermal Characteristics

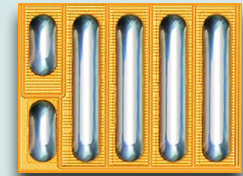
| PARAMETER | | TYP | UNIT |
|-----------------|--------------------------------------------------|-----|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 2 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JB}$ | Thermal Resistance, Junction-to-Board | 4 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1) | 69 | |

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

Static Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------|---------------------------------------------|------------------------------------------------|-----|-------|------|---------------|
| BV_{DSS} | Drain-to-Source Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 100 | | | V |
| I_{DSS} | Drain-Source Leakage | $V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$ | | 10 | 250 | μA |
| I_{GSS} | Gate-to-Source Forward Leakage | $V_{GS} = 6\text{ V}, T_J = 25^\circ\text{C}$ | | 0.005 | 1.8 | mA |
| | Gate-to-Source Forward Leakage [#] | $V_{GS} = 6\text{ V}, T_J = 125^\circ\text{C}$ | | 0.015 | 3 | mA |
| | Gate-to-Source Reverse Leakage | $V_{GS} = -4\text{ V}$ | | 10 | 250 | μA |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 3\text{ mA}$ | 0.7 | 1 | 2.5 | V |
| $R_{DS(on)}$ | Drain-Source On Resistance | $V_{GS} = 5\text{ V}, I_D = 11\text{ A}$ | | 10 | 13.5 | m Ω |
| V_{SD} | Source-Drain Forward Voltage | $I_S = 0.5\text{ A}, V_{GS} = 0\text{ V}$ | | 1.5 | | V |

All measurements were done with substrate connected to source.
[#] Defined by design. Not subject to production test.



EPC2212 eGaN® FETs are supplied only in passivated die form with solder bars. Die size: 2.1 x 1.6 mm

Applications

- Lidar/Pulsed Power Applications
- High Power Density DC-DC Converters
- Class-D Audio
- High Intensity Headlamps

Benefits

- Ultra High Efficiency
- Ultra Low $R_{DS(on)}$
- Ultra Low Q_G
- Ultra Small Footprint



Dynamic Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise stated)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------|-------------------------------------------------------|----------------------------------------------------------------|-----|------|-----|----------|
| C_{ISS} | Input Capacitance [#] | $V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$ | | 339 | 407 | pF |
| C_{RSS} | Reverse Transfer Capacitance | | | 3 | | |
| C_{OSS} | Output Capacitance [#] | | | 238 | 357 | |
| $C_{OSS(ER)}$ | Effective Output Capacitance, Energy Related (Note 2) | $V_{DS} = 0\text{ to }50\text{ V}, V_{GS} = 0\text{ V}$ | | 292 | | |
| $C_{OSS(TR)}$ | Effective Output Capacitance, Time Related (Note 3) | | | 359 | | |
| R_G | Gate Resistance | | | 0.4 | | Ω |
| Q_G | Total Gate Charge [#] | $V_{DS} = 50\text{ V}, V_{GS} = 5\text{ V}, I_D = 11\text{ A}$ | | 3.2 | 4 | nC |
| Q_{GS} | Gate-to-Source Charge | $V_{DS} = 50\text{ V}, I_D = 11\text{ A}$ | | 0.9 | | |
| Q_{GD} | Gate-to-Drain Charge | | | 0.6 | | |
| $Q_{G(TH)}$ | Gate Charge at Threshold | | | 0.55 | | |
| Q_{OSS} | Output Charge [#] | $V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$ | | 18 | 27 | |
| Q_{RR} | Source-Drain Recovery Charge | | | 0 | | |

All measurements were done with substrate connected to source.

[#] Defined by design. Not subject to production test.

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} .

Figure 1: Typical Output Characteristics at 25°C

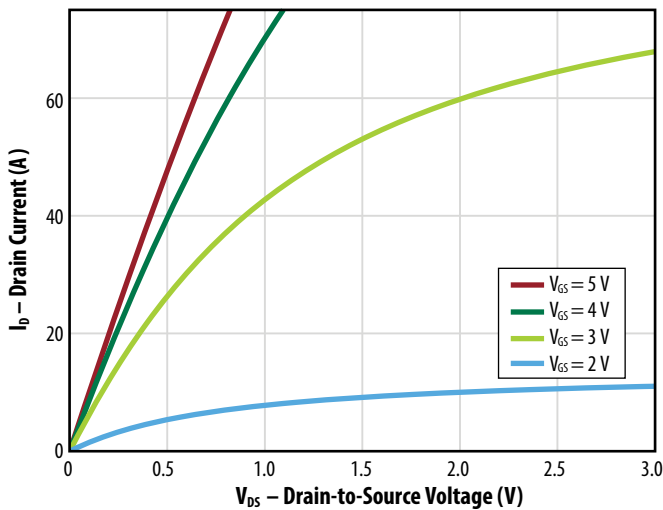


Figure 2: Transfer Characteristics

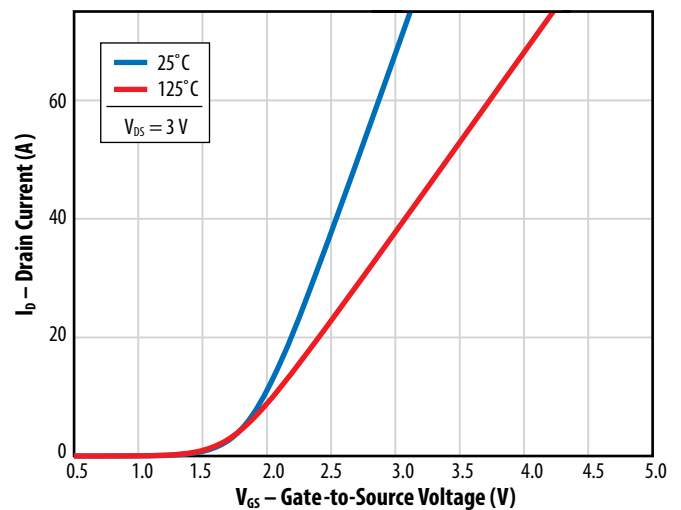


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

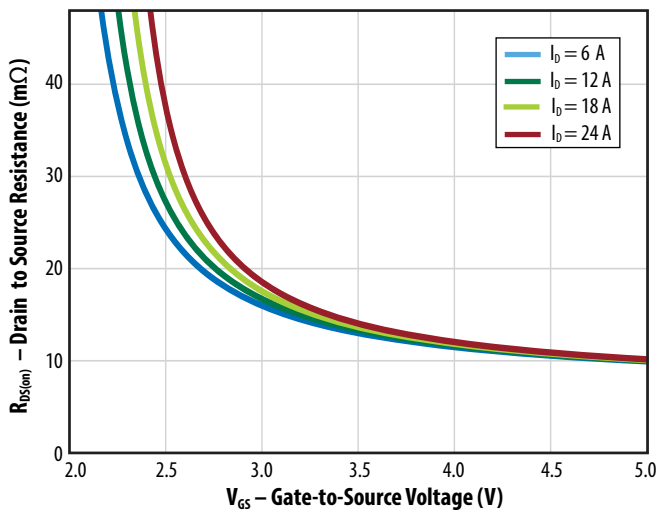


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

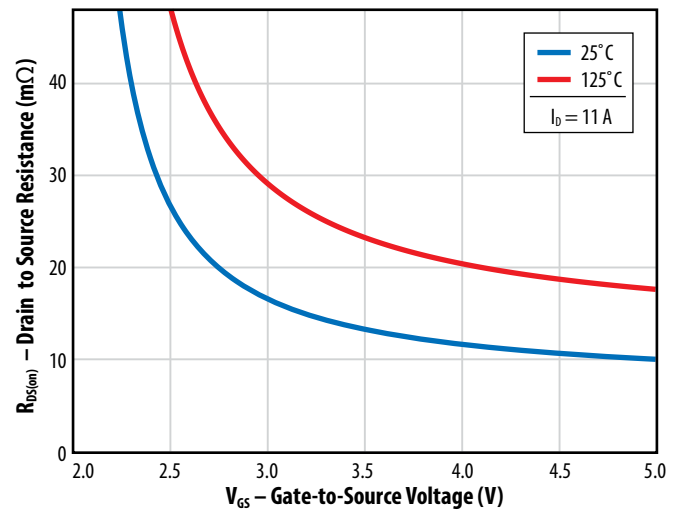


Figure 5a: Capacitance (Linear Scale)

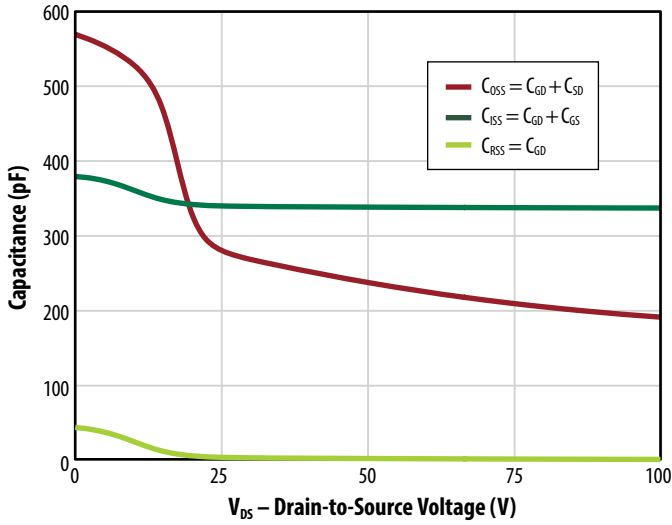


Figure 5b: Capacitance (Log Scale)

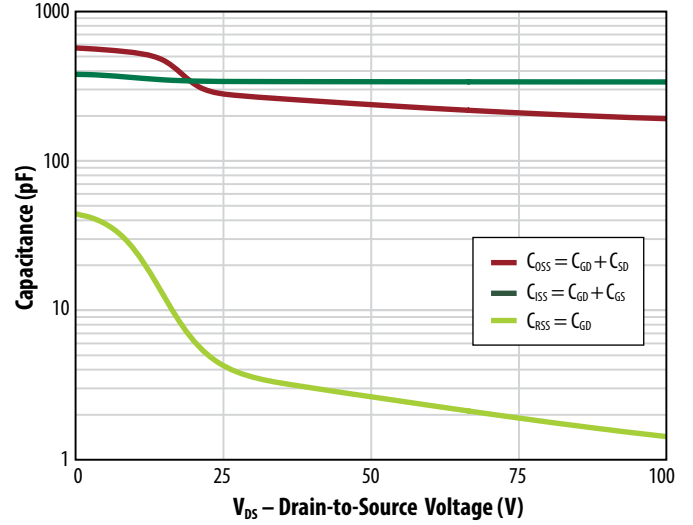


Figure 6: Output Charge and C_{OSS} Stored Energy

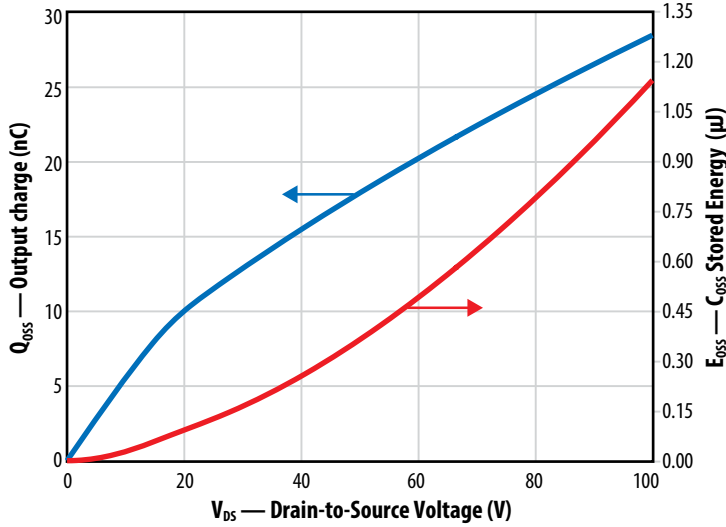


Figure 7: Gate Charge

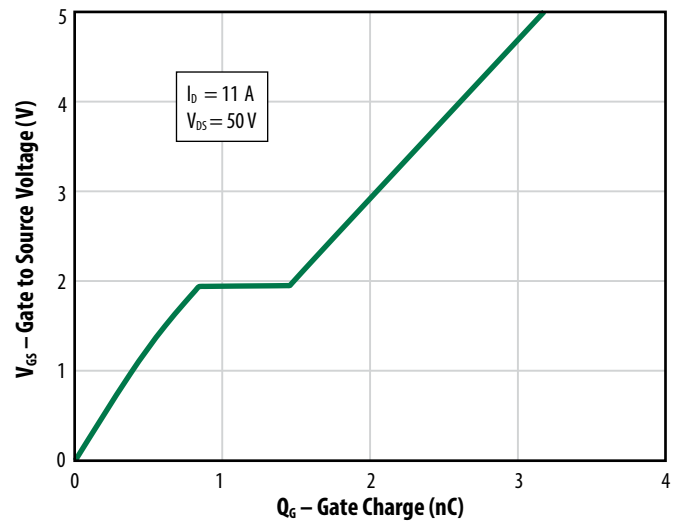


Figure 8: Reverse Drain-Source Characteristics

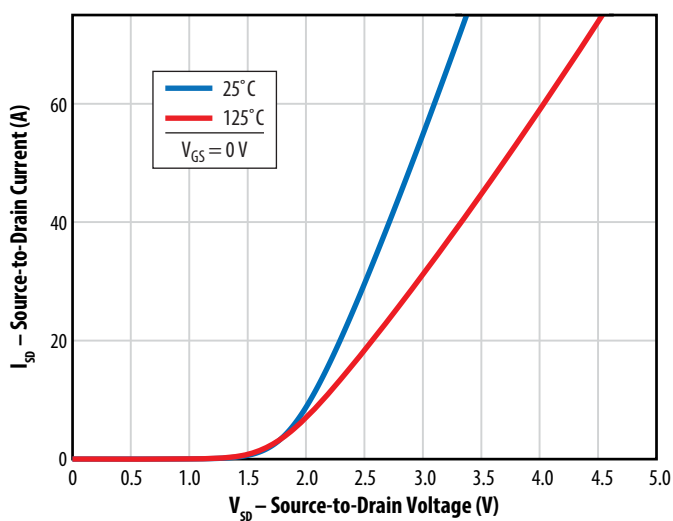


Figure 9: Normalized On-State Resistance vs. Temperature

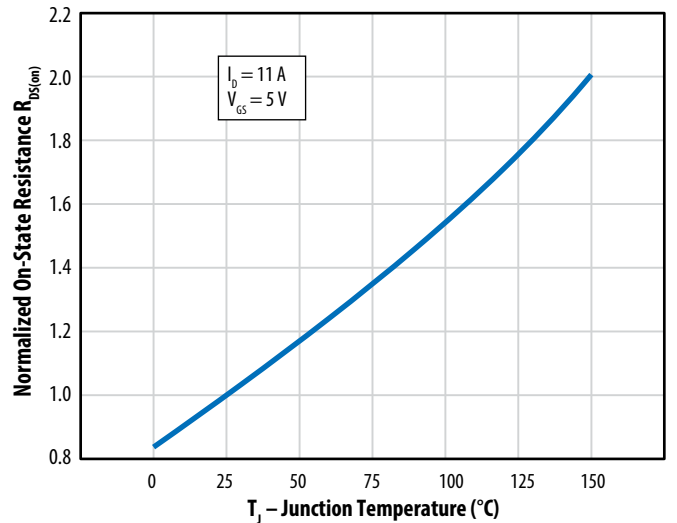


Figure 10: Normalized Threshold Voltage vs. Temperature

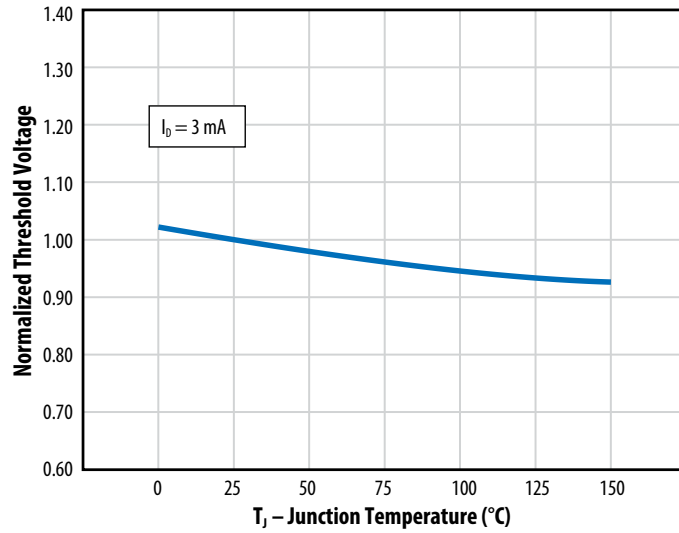


Figure 11: Transient Thermal Response Curves

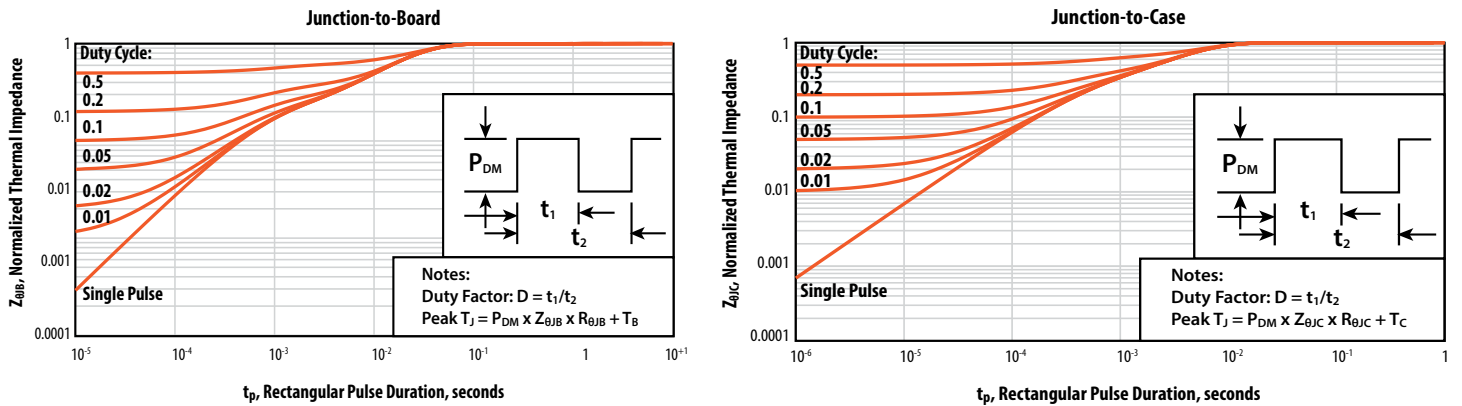
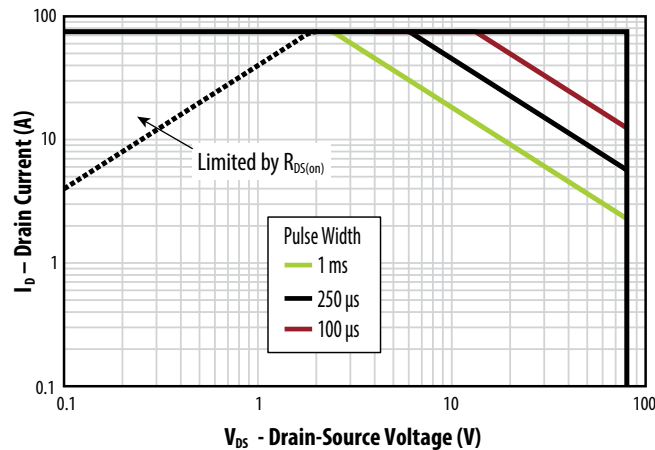
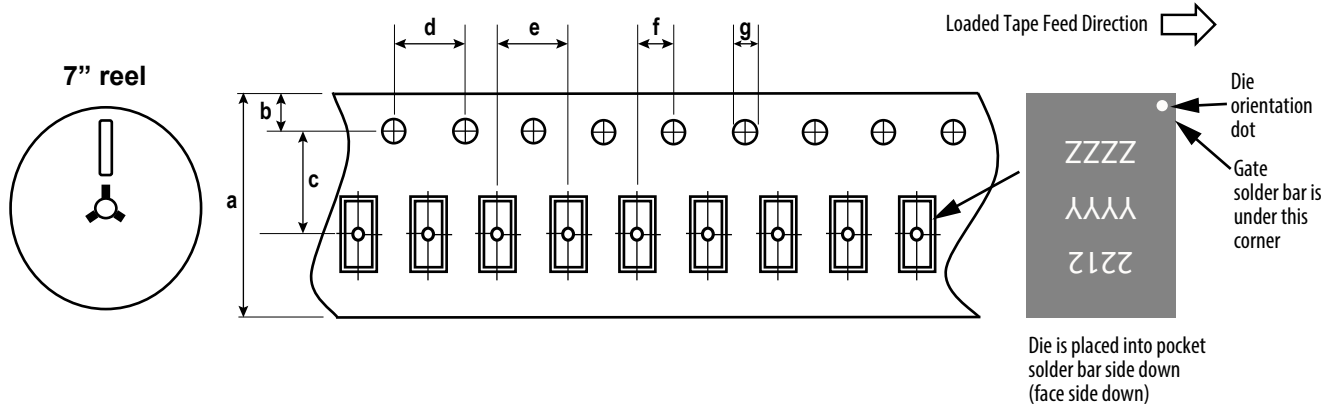


Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

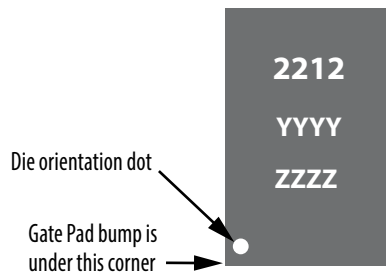
4mm pitch, 8mm wide tape on 7" reel



| Dimension (mm) | EPC2212 (note 1) | | |
|----------------|------------------|------|------|
| | 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.

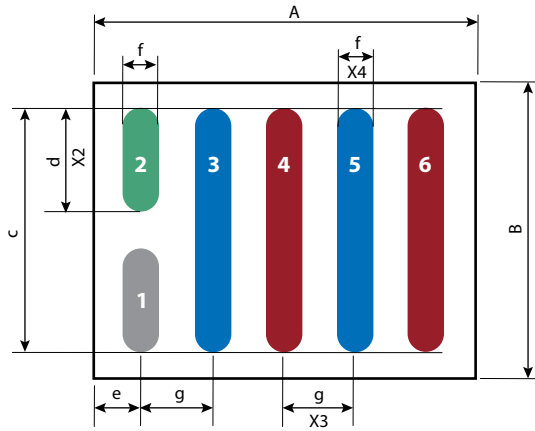
DIE MARKINGS



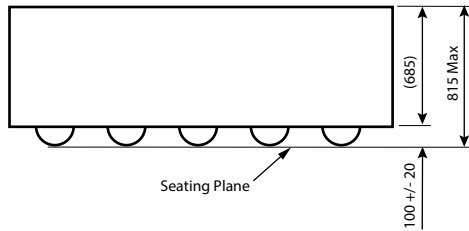
| Part Number | Laser Markings | | |
|-------------|--------------------------|---------------------------------|---------------------------------|
| | Part # Marking Line 1 | Lot_Date Code Marking line 2 | Lot_Date Code Marking Line 3 |
| EPC2212 | 2212 | YYYY | ZZZZ |

DIE OUTLINE

Solder Bar View



Side View



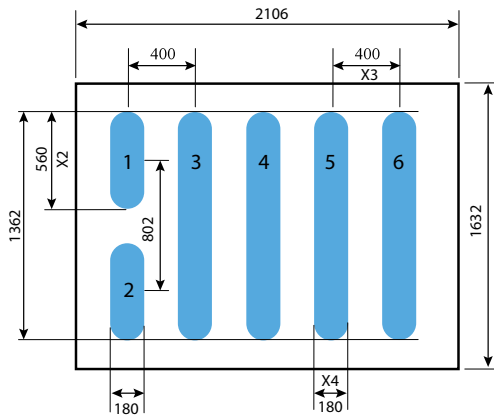
| DIM | MICROMETERS | | |
|-----|-------------|---------|------|
| | MIN | Nominal | MAX |
| A | 2076 | 2106 | 2136 |
| B | 1602 | 1632 | 1662 |
| c | 1379 | 1382 | 1385 |
| d | 577 | 580 | 583 |
| e | 235 | 250 | 265 |
| f | 195 | 200 | 205 |
| g | 400 | 400 | 400 |

Pad no. 1 is Gate;
 Pads no. 3, 5 are Drain;
 Pads no. 4, 6 are Source;
 Pad no. 2 is Substrate.*

*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN

(units in μm)



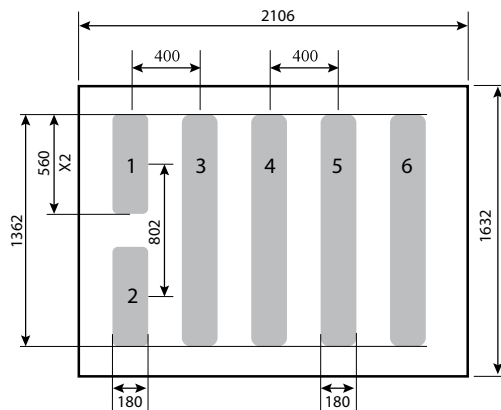
The land pattern is solder mask defined.

Pad no. 1 is Gate;
 Pads no. 3, 5 are Drain;
 Pads no. 4, 6 are Source;
 Pad no. 2 is Substrate.*

*Substrate pin should be connected to Source

RECOMMENDED STENCIL DRAWING

(measurements in μm)



Recommended stencil should be 4mil (100 μm) thick, must be laser cut, opening per drawing. The corner has a radius of R60

Intended for use with SAC305 Type 3 solder, reference 88.5% metals content.

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

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