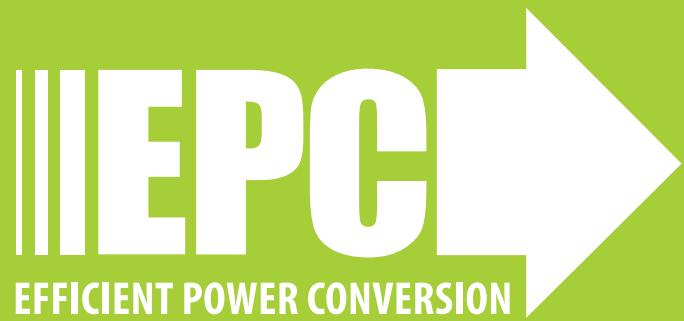


EPC Cross Reference Search Quick Start Guide

User Instructions

Revision 1.0



DESCRIPTION

EPC has partnered with DiscoverEE to expand the tools offered in EPC GaN Power Bench and offer to our customers an easy way to migrate their designs to use GaN devices with an innovative cross reference search tool. The tool is based on an **extensive database of over 20,000 MOSFET**, so designers and purchasers are sure to find the part they need to replace. The database is also regularly kept up to date with the latest releases.

DiscoverEE

The screenshot shows the EPC website's navigation bar at the top. Below it is a large banner for 'GaN POWER BENCH™' featuring a laptop and two smartphones displaying the software interface. To the right is a sidebar with various links under 'Design Support'. A red arrow points from the 'Cross Reference Search' link in the sidebar down to the corresponding search feature on the main page below.

The screenshot shows the EPC website's main content area. It features a blue header with the text 'Design Tools for Redefining Power Conversion'. On the right side, there's a 'GaN POWER BENCH™' logo and an image of a laptop and smartphone. Below the header, the text 'Cross Reference Search' is prominently displayed. A red arrow points from the 'Cross Reference Search' link in the sidebar above down to the search input field on this page.

Cross Reference Search

EPC's GaN Power Bench™ gives you instant access to cross reference and replace many competitors' silicon-based power management devices with eGaN® FETs. Easily compare parametric differences without opening a single datasheet to identify the eGaN FET to increase your design efficiency. Enter a competitor's part number to find a suggested replacement.

Cross reference search:

A B

Important Note:

All information presented in EPC's cross reference search tool is based on the best estimate of other manufacturers' published information at the time this information was collected. This information is for suggestion purposes only and shall in no event be regarded as a guarantee of conditions or characteristics. Customers who are interested in such cross reference should contact the local EPC representative in order to clarify their details of the needs and requests. EPC is not responsible for any incorrect or incomplete information.

EPC Cross Reference Search Powered by DiscoverEE

All that is needed is to type the part number in the search box (A) and click the Search button (B). The following example screens are using competitor's PN#: **BSC320N20NS3 G**

Note: If an exact match is not found several recommendations will be offered.

QUICK START DETAILS

Part Comparison Summary

To be able to offer the best cross reference parts, the tool does not rely on parametric matching, except for voltage classes, but instead focuses on realistic loss calculations based on datasheet parameters. The initial condition for the loss calculations is set based on the device being searched. EPC alternatives are offered based on comparable or lower losses, and showing the smallest device first. The release status is also shown and we always recommend choosing "preferred" devices as they represent the latest technology which will offer customers the most value.

Clicking on the EPC part numbers (**A**) will open a new tab with the specific product page where all relevant information like datasheet can be found.

The default conditions are shown on the top of the page (**B**), and the losses can be recalculated by updating these parameters based on customer needs. This page can be shared with co-workers since it is a perma-link: both the parts and the conditions will be saved in the link.

The first table shows the main summary of the comparison (**C**), and the numbers are graphically shown in a bar chart as % of the original searched device as default (**D**), but this can be changed to show the actual values. If needed the chart can be simplified by unchecking the corresponding legend (**E**).

The screenshot shows the EPC Cross Reference search interface. At the top left is the EPC logo. In the center is the title "EPC Cross Reference". On the right is a close button ("X"). Below the title is a message: "The objective of this cross-reference tool is to help you find the best GaN FETs to fit your design needs. Data is for reference only, for design support contact us via Ask a GaN Expert". To the right of the message is a "ASK a GaN Expert" button.

Part Comparison Summary:

FET Operating Conditions	BSC320N20NS3 G	EPC2054	EPC2207	EPC2019	EPC2010C	EPC2215
Vbus [V]	100	200	200	200	200	200
R _{DS(ON)} [mohm] [Max]	2.0	2.0	2.0	2.0	2.0	2.0
Gate Drive [V]	-4, 6	-4, 6	-4, 6	-4, 6	-4, 6	-4, 6
Q _G Max [nC]	15	15	15	15	15	15
Packaging Area [mm ²]	150	150	150	150	150	150
Calculated Total Power Loss [W]	10.78	5.08	2.83	5.85	3.29	1.95
Status	Preferred	Preferred	Active	Active	Active	Preferred

Below the table is a "Powered By DiscoverEE. Visit us at www.discoveree.io" link. A "Copy URL" button is located below the table.

Legend:

- BSC320N20NS3 G
- EPC2054
- EPC2207
- EPC2019
- EPC2010C
- EPC2215

Graph: A bar chart showing the percentage of the original device's calculated total power loss for each part across different categories. The categories are: Calculated Total Power Loss [W], BV_{DSS} [V], V_{GS} [V], Q_G Max [nC], R_{DS(ON)} [mohm] [Max], and Package Area [mm²]. The Y-axis ranges from 0% to 160%.

Most optimized device displayed in first comparison column (**F**) based on:

- Comparable or lower losses
- Smallest size

"Copy URL" button (**G**) generates a permanent link for this search results (including updated application conditions) that can be emailed to customers)

QUICK START DETAILS (continued)**Detail Parts Specifications And Power Loss Calculations**

This first table shows a detailed parametric comparison directly captured from the datasheet. When conditions are different between devices they are shown below the value itself.

Detail Parts Specifications And Power Loss Calculations:							
Parameter	Value Type	BSC320N20NS3 G	EPC2054	EPC2207	EPC2019	EPC2010C	EPC2215
Package By Manufacturer		PG-TDSON-8	BARE DIE(1.3 mm x 1.3 mm)	LGA 2.8 x 0.925	LGA 2.77 x 0.95	LGA 3.6 x 1.6	LGA 4.6 x 1.6
Package Mounting		SMD	SMD	DIE	DIE	DIE	DIE
Material		Silicon	Gallium Nitride	Gallium Nitride	Gallium Nitride	Gallium Nitride	Gallium Nitride
Configuration		Single	Single	Single	Single	Single	Single
Auto Qualified		No	No	No	No	No	No
V _{GS} [V]	Max	-20, 20	-4, 6	-4, 6	-4, 6	-4, 6	-4, 6
BV _{DSS} [V]	Max	200	200	200	200	200	200
V _{TH} [V]	Min,Typ,Max	2, 3, 4	0.8, 1.2, 2.5	0.8, 1.1, 2.5	0.8, 1.4, 2.5	0.8, 1.4, 2.5	0.8, 1.1, 2.5
R _{DS(ON)} [mohm]	Typ,Max	27.00, 32.00 AT VGS = 10V ID = 36A TJ = 25C	32.00, 43.00 AT VGS = 5V ID = 1A TJ = 25C	15.00, 22.00 AT VGS = 5V ID = 14A TJ = 25C	36.00, 50.00 AT VGS = 5V ID = 7A TJ = 25C	18.00, 25.00 AT VGS = 5V ID = 12A TJ = 25C	6.00, 8.00 AT VGS = 5V ID = 20A TJ = 25C
Q _G [nC]	Typ,Max	22, 29 AT VGS = 10V ID = 18A	2.9, 4.3 AT VGS = 5V ID = 1A	-, 5.9 AT VGS = 5V ID = 14A	1.8, 2.5 AT VGS = 5V ID = 7A	-, 5.3 AT VGS = 5V ID = 12A	-, 17.7 AT VGS = 5V ID = 20A
Q _{GS} [nC]	Typ	8	0.9	1.3	0.6	1.3	3.3
Q _{GD} [nC]	Typ	3	0.3	0.7	0.35	0.7	2.1
C _{ISS} [pF]	Typ	1770	358	454	200	380	1356
C _{OSS} [pF]	Typ	135	89	130	110	240	390
C _{RSS} [pF]	Typ	4	0.3	0.7	0.7	1.8	2
V _{SD} [V]	Typ,Max	0.9, 1.2	1.5, -	1.7, -	1.8, -	1.7, -	1.6, -
T _{RR} [ns]	Typ	105	0	0	0	0	0
Q _{RR} [nC]	Typ	429	0	0	0	0	0
R _G Internal [Ohm]	Typ	2.5	0.8	0.3	0.4	0.4	0.4
R _{THJC} [K/W]	Max	1	2.9	1.4	2.7	1.1	0.5
R _{THJA} [K/W]	Max	50	83	72	72	56	52
I _D [A]	Typ	36 AT TC = 25C	3	14	8.5	22	32
I _D [A]	Typ	24 AT TC = 100C	-	-	-	-	-
I _{D(pulse)} [A]	Typ	144	32	54	42	90	162
P _D [W]	Typ	125 AT TC = 25C	-	-	-	-	-

QUICK START DETAILS (continued)**Figure of Merit (A)**

This table shows the calculated figure of merit that characterize the performance of a device: $R_{DS(on)} \cdot Q_G$ and $R_{DS(on)} \cdot C_{OSS}$.

Note: The smaller the number the better the performance.

Calculated Values For Current & Power Rating (B)

This table is the DC current rating table. These are all calculated in the same conditions so as to make easier the comparison, and therefore the values might be different from the datasheet since the conditions might be different.

Calculated Switching Turn-On and Turn-Off Times (C)

This table similarly calculates transition times in the specified application conditions, and therefore also these values might be different than datasheet values.

Detail Parts Specifications And Power Loss Calculations:							
Parameter	Value Type	BSC320N20NS3 G	EPC2054	EPC2207	EPC2019	EPC2010C	EPC2215
A Figure of Merit							
Gate Drive [V]		10	5	5	5	5	5
$R_{DS(ON)} \cdot Q_G$ [mohm*nC]	Typ,Max	594, 928	93, 185	-, 130	65, 125	-, 133	-, 142
$R_{DS(ON)} \cdot C_{OSS}$ [mohm*pF]	Typ,Max	3645, 5760	2848, 5762	1950, 4290	3960, 7500	4320, 8000	2340, 4680
B Calculated Values For Current & Power Rating							
ID [A] Calc. @RthJA max	TJ=150°C, TA=25°C	6.3	4.2	6.3	4.2	6.7	12.3
ID [A] Calc. @ RthJA=5°C/W	TJ=150°C, TA=25°C	19.8	17.0	23.8	15.8	22.4	39.5
ID [A] Calc. @RthJC max	TJ=150°C, TA=25°C	44.2	22.4	45.0	21.5	47.7	125.0
PD [A] Calc. @RthJA max	TJ=150°C, TA=25°C	2.5	1.5	1.7	1.7	2.2	2.4
PD [A] Calc. @ System	RthJA=5°C/W, TJ=150°C, TA=25°C	25.0	25.0	25.0	25.0	25.0	25.0
PD [A] Calc. @RthJC max	TJ=150°C, TA=25°C	125.0	43.1	89.3	46.3	113.6	250.0
C Calculated Switching Turn-On and Turn-Off Times							
FET Operating Conditions	Vbus [V] = <input type="text" value="100"/> , RgTotal = <input type="text" value="2"/> , ID [A] = <input type="text" value="15"/> , Duty Cycle = <input type="text" value="0.5"/> , TA [C] = <input type="text" value="25"/> , fsw [kHz] = <input type="text" value="150"/> Update						
td(on) [ns]	Typ	2.7	0.9	1.0	0.4	0.9	2.9
tr [ns]	Typ	1.3	0.3	0.8	0.5	1.2	2.4
td(off) [ns]	Typ	2.3	0.4	0.4	0.2	0.4	1.2
tf [ns]	Typ	1.1	0.2	0.4	0.3	0.6	1.3

QUICK START DETAILS (continued)

Calculated Power Loss

This table shows the detailed loss breakdown used to propose the EPC GaN FETs. The conditions of the calculations can be changed from the default conditions. The losses considered are conduction losses, switching losses, output capacitance losses and reverse recovery losses for the Si MOSFET. In particular, reverse recovery losses of Si MOSFET are typically underestimated because of the lack of data from datasheet.

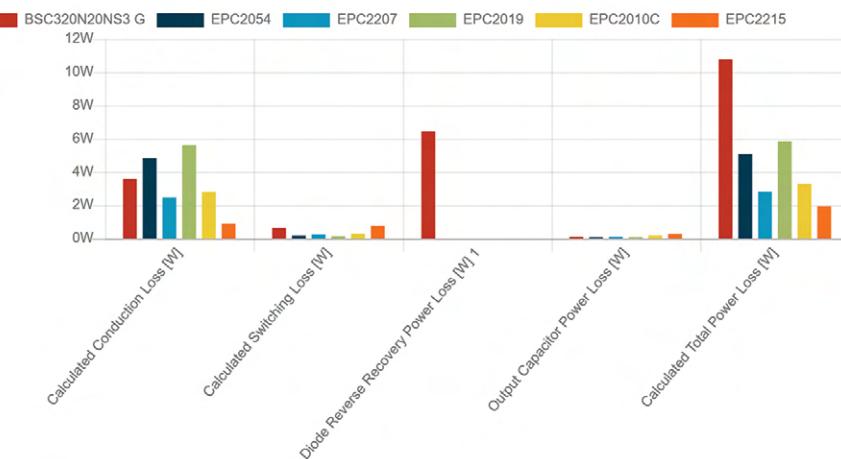
Junction temperatures are also calculated based on 4 different thermal conditions.

Detail Parts Specifications And Power Loss Calculations:							
Parameter	Value Type	BSC320N20NS3 G	EPC2054	EPC2207	EPC2019	EPC2010C	EPC2215
Calculated Power Loss							
Gate Drive [V]		10	5	5	5	5	5
Calculated Conduction Loss [W]	Max	3.60	4.84	2.48	5.63	2.81	0.90
Calculated Switching Loss [W]	Max	0.64	0.17	0.25	0.14	0.3	0.76
Conduction + Switching Power Loss [W]	Max	4.24	5.01	2.73	5.77	3.11	1.66
Diode Reverse Recovery Power Loss [W] ¹	Max	6.44	0	0	0	0	0
Output Capacitor Power Loss [W]	Max	0.10	0.07	0.10	0.08	0.18	0.29
Calculated Total Power Loss [W]	Max	10.78	5.08	2.83	5.85	3.29	1.95
Estimated TJ at specified R _{thJC} [°C]	Max	29	40	29	41	28	26
Estimated TJ at specified R _{thJA} [°C]	Max	237	441	222	440	199	111
Estimated TJ at assumed R _{thJA} of 5 C/W [°C]	Max	46	50	39	54	41	33
Estimated TJ at assumed R _{thJA} of 10 C/W [°C]	Max	67	75	52	83	56	42
Rated Junction Temperature [°C]	Max	150	150	150	150	150	150

1: Reverse Recovery losses are calculated from default datasheet conditions and these losses can be much higher in actual operating conditions.

C Download Data In CSV

Display %	Display Value
<input checked="" type="checkbox"/> Calculated Conduction Loss [W] <input checked="" type="checkbox"/> Calculated Switching Loss [W] <input checked="" type="checkbox"/> Diode Reverse Recovery Power Loss [W] ¹ <input checked="" type="checkbox"/> Output Capacitor Power Loss [W] <input type="checkbox"/> Calculated Total Power Loss [W]	



- (A) Losses breakdown
- (B) Calculated T_j in different typical conditions
- (C) Download the data
- (D) Graphical bar chart visual controls

DiscoverEE

EPC would like to acknowledge DiscoverEE Inc., (www.discoveree.io) for their support of this project.

DiscoverEE is a team of data scientists, device physicists, hardware engineers and business managers with a proven track record in semiconductors and electronics hardware industry. They are focused on providing market insights and technical expertise to our customers so they can design, buy, market and sell the most optimum product.

DiscoverEE's technology enables creation of "standardized product database" and organizes the unstructured product landscape. Such a database offers unprecedented level of product insights to hardware engineers, allows them to estimate product performance and project technology & market trends.

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