EPC Cross Reference Search Quick Start Guide

User Instructions

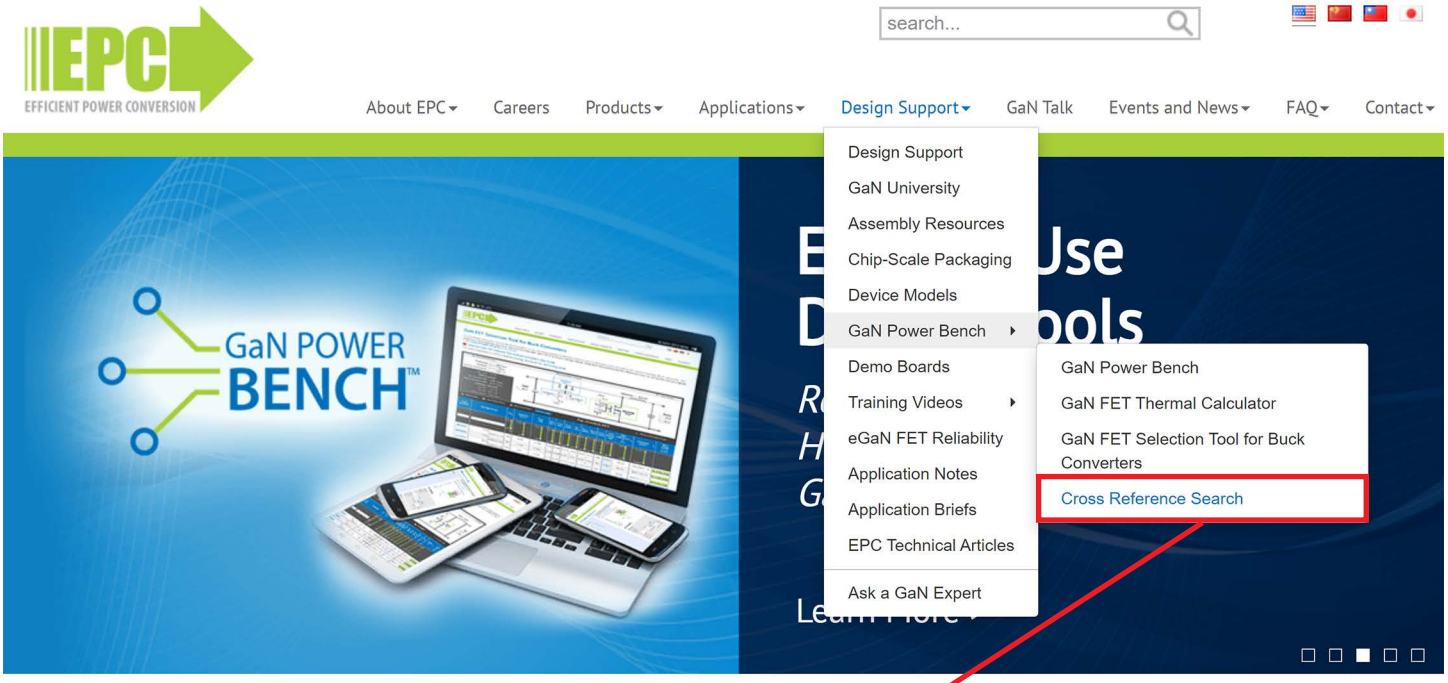
Revision 1.0

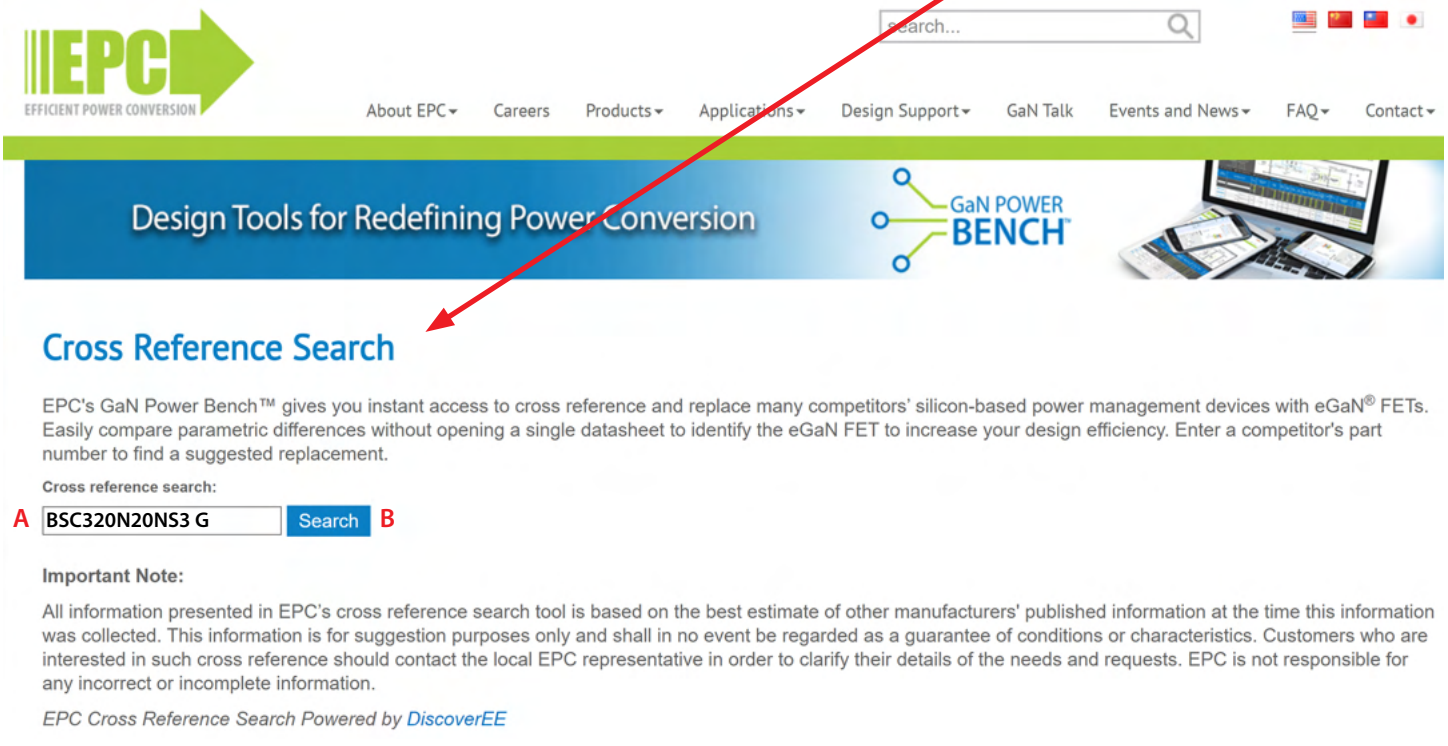
EFFICIENT POWER CONVERSION

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





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

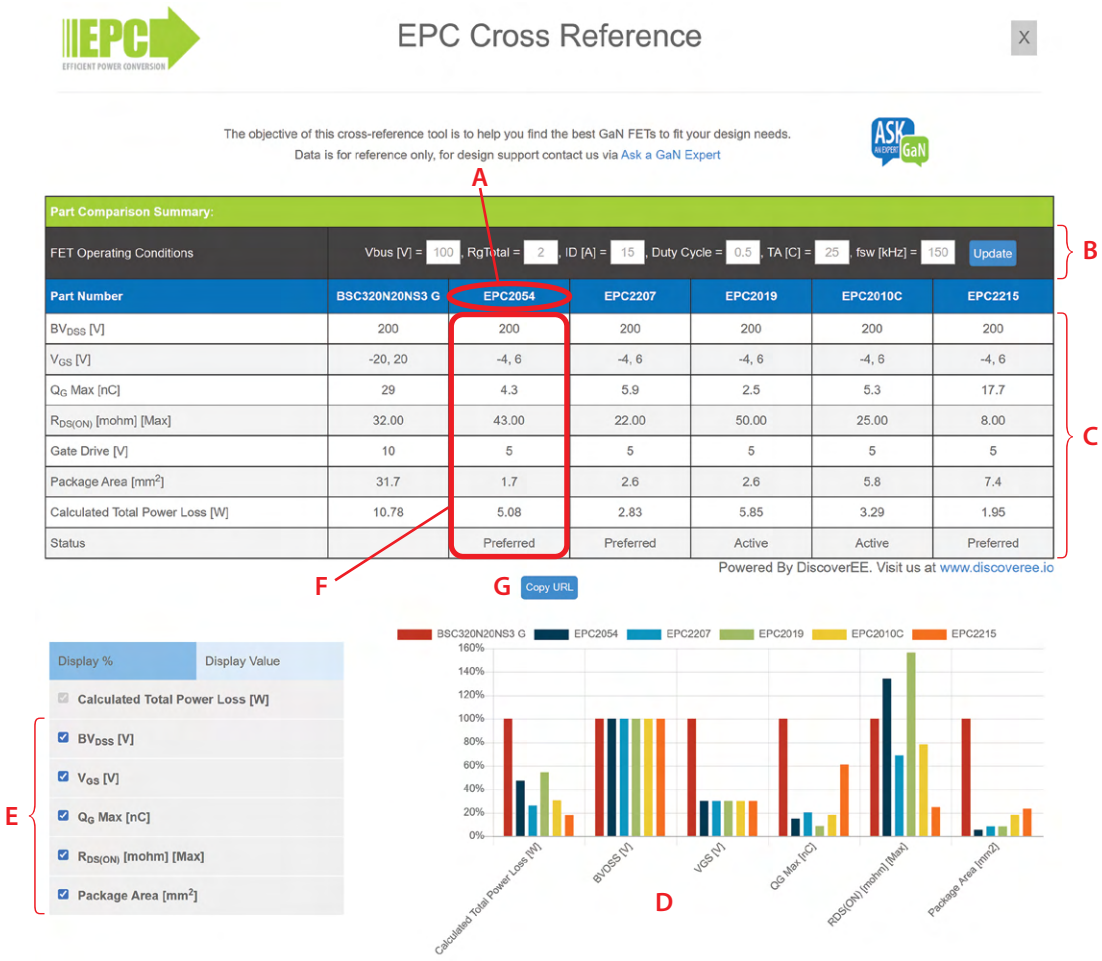
Part Comparison Summary

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**).



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
$R_{DS(ON)}$*Q_G [mohm*nC]	Typ,Max	594, 928	93, 185	-, 130	65, 125	-, 133	-, 142
$R_{DS(ON)}$*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] = 100, RgTotal = 2, ID [A] = 15, Duty Cycle = 0.5, TA [C] = 25, fsw [kHz] = 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.

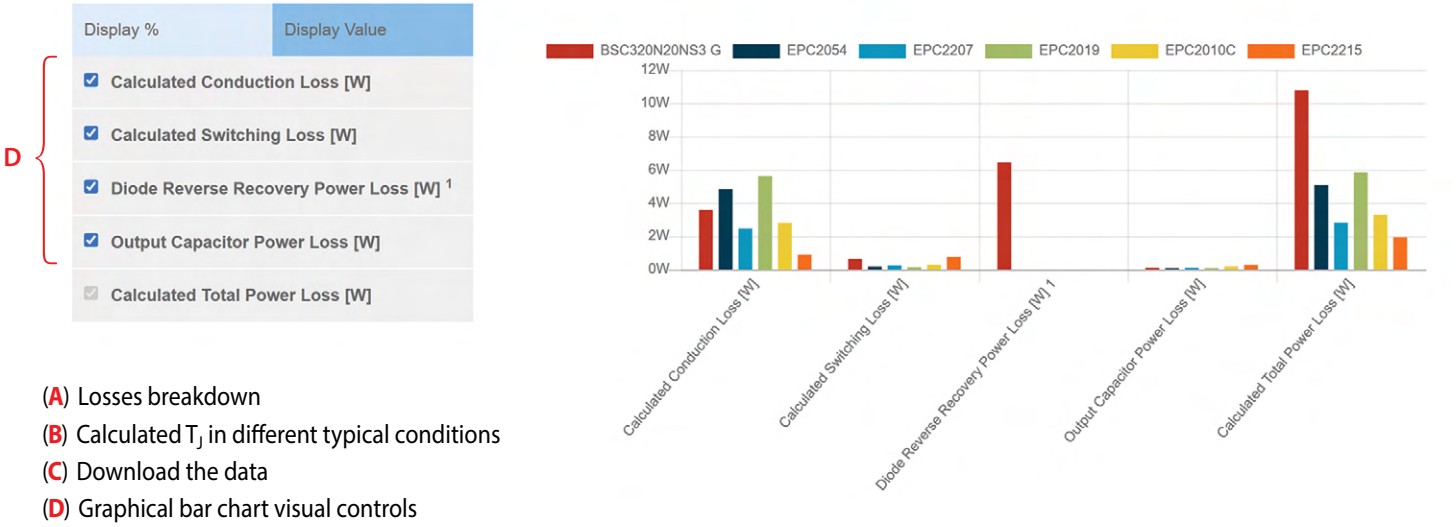
Detail Parts Specifications And Power Loss Calculations:							
Parameter	**Value Type**	**BSC320N20NS3 G**	**EPC2054**	**EPC2207**	**EPC2019**	**EPC2010C**	**EPC2215**
Calculated Power Loss							
Gate Drive [V]		10	5	5	5	5	5
Calculated Conduction Loss [W]	Max	3.60	4.84	2.48	5.63	2.81	0.90
Calculated 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 RthJC [°C]	Max	29	40	29	41	28	26
Estimated TJ at specified RthJA [°C]	Max	237	441	222	440	199	111
Estimated TJ at assumed RthJA of 5 C/W [°C]	Max	46	50	39	54	41	33
Estimated TJ at assumed RthJA of 10 C/W [°C]	Max	67	75	52	83	56	42
Rated Junction Temperature [°C]	Max	150	150	150	150	150	150

A

B

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



D

(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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