GaNPower International Inc.

GP65R95T2P

N-MOS Compatible 650V R95mΩ GaN Power HEMT in TO220F FullPackage

Preliminary Datasheet version: 1.0

Features

BV_{dss}	R_{dson}	I_{ds}
700 V	95 mΩ	15 A

- Ultra-low R_{DSON}
- High dv/dt capability
- Extremely low input capacitance
- Zero Qrr
- Monolithic integrated ESD protection
- Outstanding switching performance
- Pin-to-pin compatible with MOSFET

Applications

- Switching Power Applications
- Adapters, Quick Chargers

Description

These devices are N-channel 650V Power GaN HEMTs based on proprietary E-mode GaN on silicon technology. The resulting product has extremely low on-state resistance, very low input capacitance and zero reverse recovery charge, making it especially suitable for applications which require superior power density, ultra-high switching frequency and outstanding efficiency.

Table 1 Key Performance Parameters at $T_j = 25\ °C$

Parameters	Values	Units
$V_{DS,\ max}$	700	V
$R_{DS(on),\ typ}$	95	mΩ
Q_G	3.5	nC
$I_{D,\ Pulse}$	34	A
Q_{OSS} @ 400 V	32	nC
Q_{rr}	0	nC

Table2 Ordering Information

Ordering Code	Package	Product code
GP65R95T2P	TO220	GP65R95T2P

Table of contents

1 Maximum ratings

at $T_j = 25$ °C unless otherwise specified. Continuous application of maximum ratings can deteriorate transistor lifetime.

Table 3 Maximum rating

Parameters	Symbols	Values	Units	Notes/Test Conditions
Drain-source voltage	$V_{DS, max}$	900	V	V_{GS} = 0 V Tj = -55℃ to 150℃
Drain-source voltage transient [1]	$V_{DS, transient}$	900	V	V_{GS} = 0 V
Continuous current, drain-source	I_D	16	A	T_c = 25 °C
Pulsed current, drain-source [2]	$I_{D, pulse}$	34	A	T_c = 25 °C; V_G = 6 V
Pulsed current, drain-source [2]	$I_{D, pulse}$	18	A	T_c = 125 °C; V_G = 6 V
Gate-source voltage, continuous	V_{GS}	-1 to +12	V	T_j = -55 °C to 150 °C
Gate-source voltage, pulsed	$V_{GS, pulse}$	-20 to +20	V	T_j = -55 °C to 150 °C; t_{Pulse} = 50 ns, f = 100 kHz; open drain
Power dissipation	P_{tot}	105	W	T_c = 25 °C
Operating temperature	T_j	-55 to +150	C	
Storage temperature	T_{stg}	-55 to +150	C	

1. $V_{DS, transient}$ is intended for surge rating during non-repetitive events, t_{Pulse} < 1 μs.

2. Pulse width = 10 μs.

2 Electrical characteristics

at T_j = 25 °C, unless specified otherwise.

Table 4 Static characteristics

Parameters	Symbols	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		

Gate threshold voltage	$V_{GS(TH)}$		2.5		V	I_D = 16 mA; V_{DS} = V_{GS}; T_j = 25 °C
		-	2.8	-		I_D = 16 mA; V_{DS} = V_{GS}; T_j = 150 °C
Drain-source leakage current	I_{DSS}	-	0.02	1.6	μA	V_{DS} = 700 V; V_{GS} = 0 V; T_j = 25 °C
		-	2	-		V_{DS} = 700 V; V_{GS} = 0 V; T_j = 150 °C
Gate-source leakage current	I_{GSS}	-	1		mA	V_{GS} = 8 V; V_{DS} = 0 V
Drain-source on-state Resistance	$R_{DS(on)}$	-	95	110	mΩ	V_{GS} = 8 V; I_D = 5 A; T_j = 25 °C
		-	220	-	mΩ	V_{GS} = 6 V; I_D = 5 A; T_j = 150 °C
Gate resistance	R_G	-	5.5	-	Ω	f = 5 MHz; open drain

Table 5 Dynamic characteristics

Parameters	Symbols	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	115	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100KHZ
Output capacitance	C_{oss}	-	46	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100KHZ
Reverse transfer capacitance	C_{rss}	-	0.05	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100KHZ
Effective output capacitance, energy related [1]	$C_{o(er)}$	-	63	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Effective output capacitance, time related [2]	$C_{o(tr)}$	-	85	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Output charge	Q_{OSS}	-	32	-	nC	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Turn-on delay time	$t_{d(on)}$	-	4	-	ns	V_{DS} = 400 V; I_D = 10 A; L = 318 μH; V_{GS} = 12 V; R_{on} = 10 Ω; R_{off} = 2 Ω
Turn-off delay time	$t_{d(off)}$	-	3	-	ns	
Rise time	t_r	-	5	-	ns	
Fall time	t_f	-	3	-	ns	

1. $C_{o(er)}$ is the fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 400 V.

$C_{o(tr)}$ is the fixed capacitance that gives the same charging time

Table 6 Gate charge characteristics

Parameters	Symbols	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Gate charge	Q_G	-	3.5	-	nC	V_{GS} = 0 to 6 V; V_{DS} = 400 V; I_D = 5 A
Gate-source charge	Q_{GS}	-	0.4	-	nC	
Gate-drain charge	Q_{GD}	-	1.6	-	nC	
Gate plateau voltage	V_{plat}	-	2.5	-	V	V_{DS} = 400 V; I_D = 5 A

Table 7 Reverse conduction characteristics

Parameters	Symbols	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Source-drain reverse voltage	V_{SD}	-	3.8	-	V	V_{GS} = 0 V; I_{SD} = 5 A
Pulsed current, reverse	$I_{S,\ pulse}$	-	-	34	A	V_{GS} = 6 V
Reverse recovery charge [1]	Q_{rr}	-	0	-	nC	I_{SD} = 5 A; V_{DS} = 400 V
Reverse recovery time	t_{rr}	-	0	-	ns	
Peak reverse recovery current	I_{rrm}	-	0	-	A	

1. Excluding Q_{OSS}

3 Electrical characteristics diagrams

at $T_j = 25$ °C, unless specified otherwise.

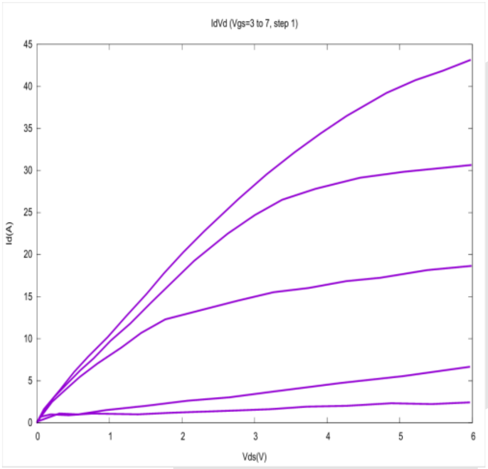
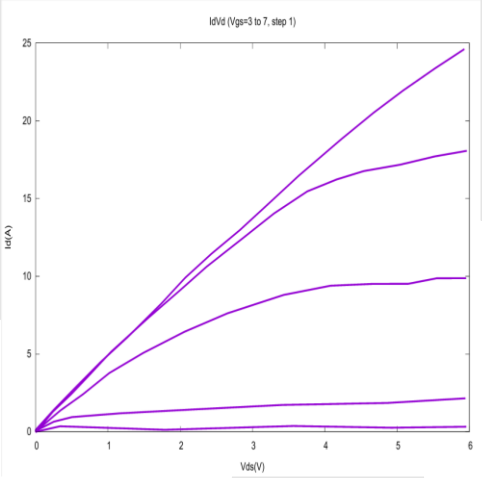
Figure 1 Typ. output characteristics	**Figure 2 Typ. output characteristics**
	
$I_D = f(V_{DS}, V_{GS})$; $T_j = 25$ °C	$I_D = f(V_{DS}, V_{GS})$; $T_j = 125$ °C

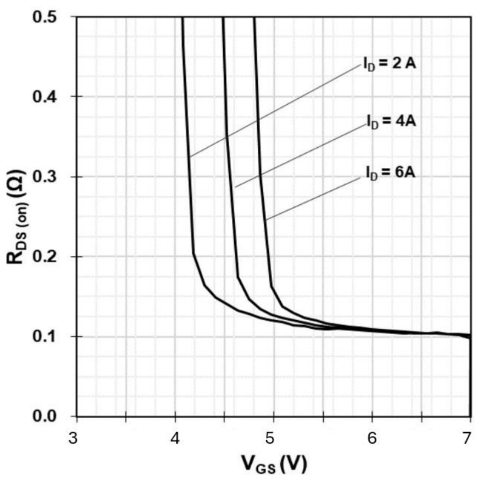
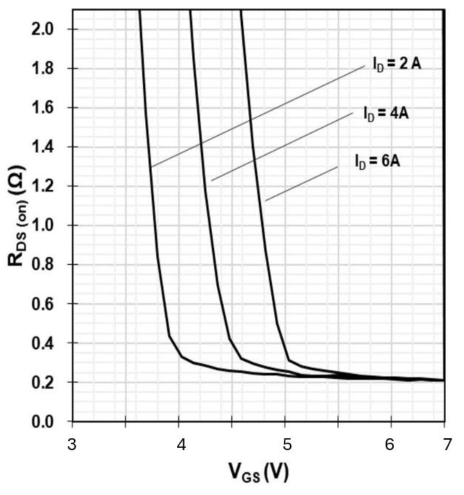
Figure 3 Typ. drain-source on-state resistance	**Figure 4 Typ. drain-source on-state resistance**
	
$R_{DS(on)} = f(I_D, V_{GS})$; $T_j = 25$ $_o$C	$R_{DS(on)} = f(I_D, V_{GS})$; $T_j = 125$ $_o$C

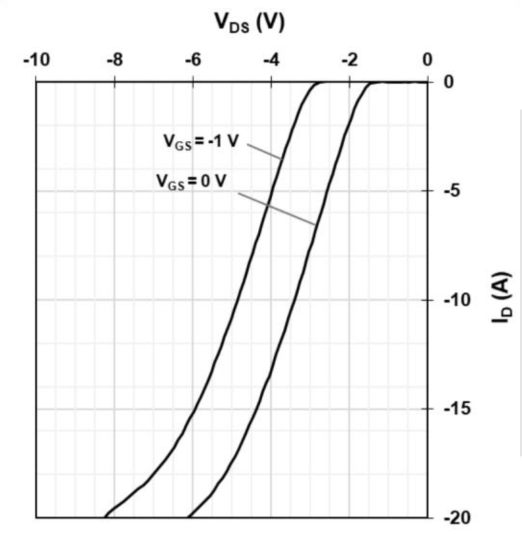
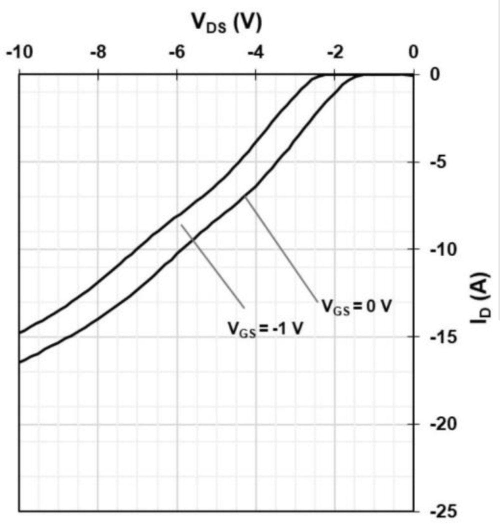
Figure 5 Typ. channel reverse characteristics	**Figure 6 Typ. channel reverse characteristics**
	
$I_D = f(V_{DS}, V_{GS})$; T_j = 25 °C	$I_D = f(V_{DS}, V_{GS})$; T_j = 125 °C

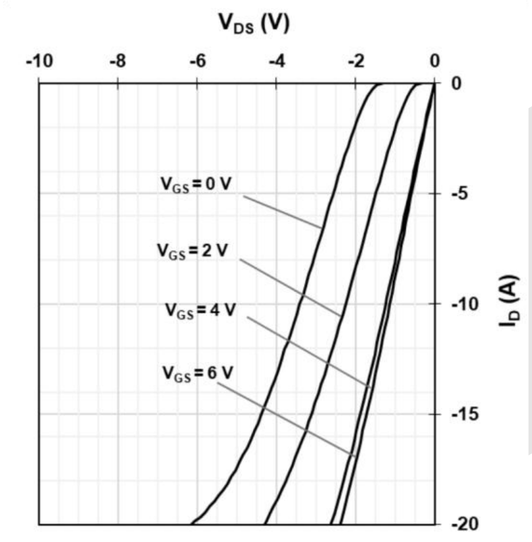
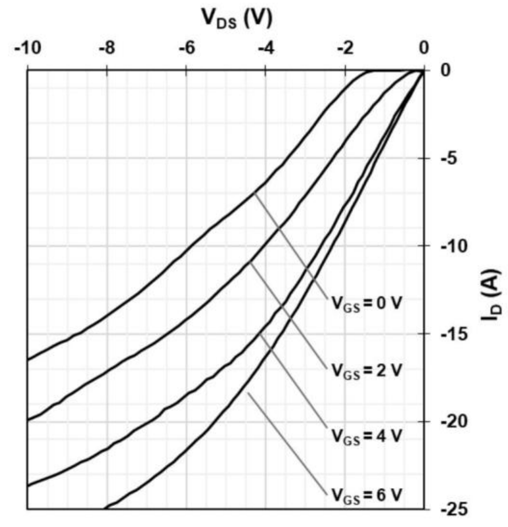
Figure 7 Typ. channel reverse characteristics	**Figure 8 Typ. channel reverse characteristics**
	
$I_D = f(V_{GS})$; V_{DS} = 3 V	$I_G = f(V_{GS})$; V_D = open

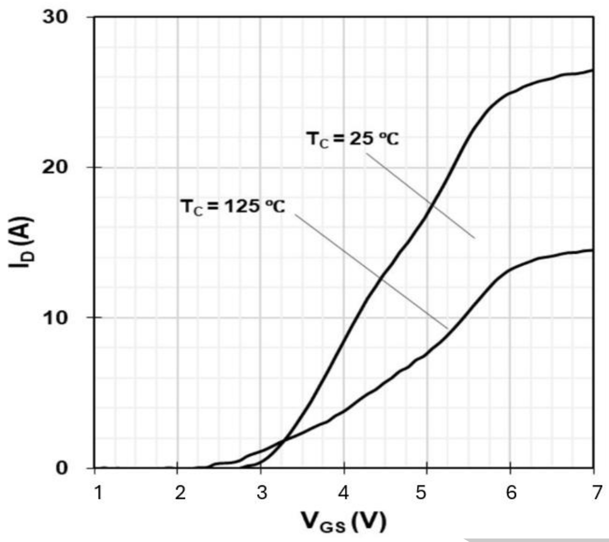
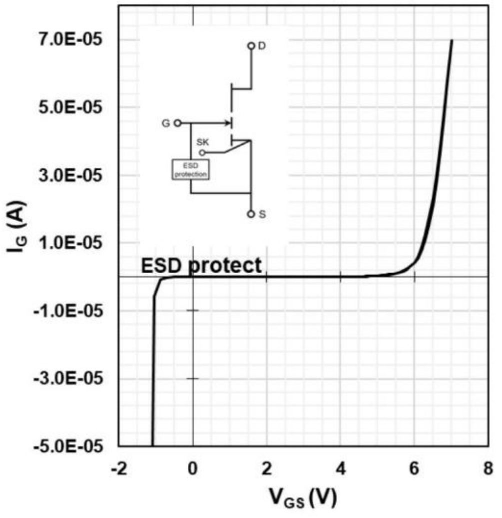
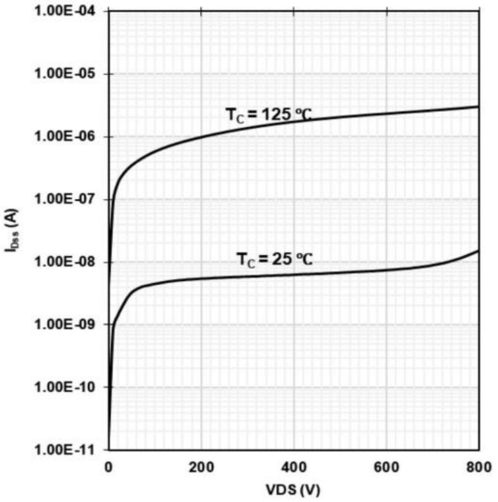
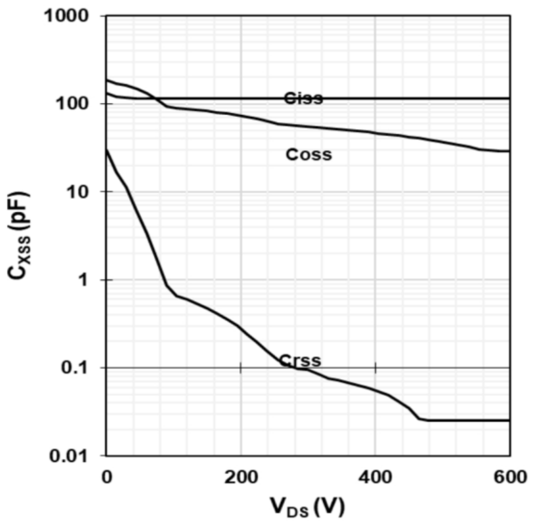
Figure 9 Typ. transfer characteristics	**Figure 10 Typ. gate-to-source leakage**
	
$I_D = f(V_{GS})$; V_{DS} = 3 V	$I_G = f(V_{GS})$; V_D = open

Figure 11 Drain-source leakage characteristics



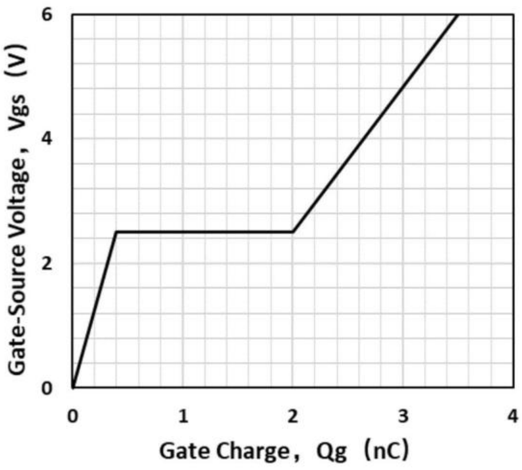
Idss = f(Vds); Vgs = 0V

Figure 12 Typ. capacitances



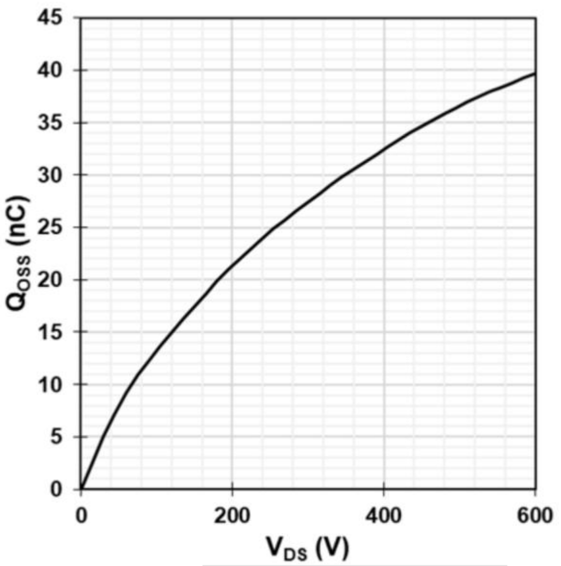
$C_{XSS} = f(V_{DS})$; Freq. = 100kHz

Figure 13 Typ. gate charge



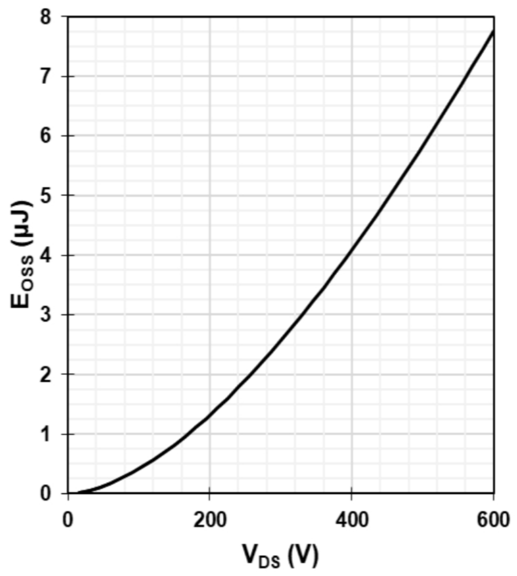
$V_{GS} = f(Q_G)$; V_{DS} = 400 V; I_D = 5 A

Figure 14 Typ. output charge



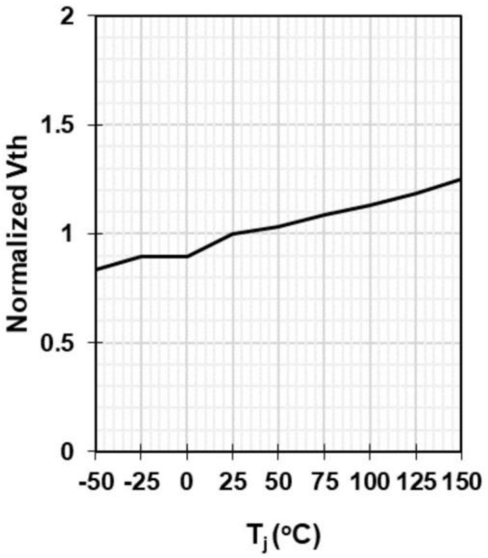
$Q_{OSS} = f(V_{DS})$; Freq. = 100khz

Figure 15 Typ. C_{OSS} stored energy



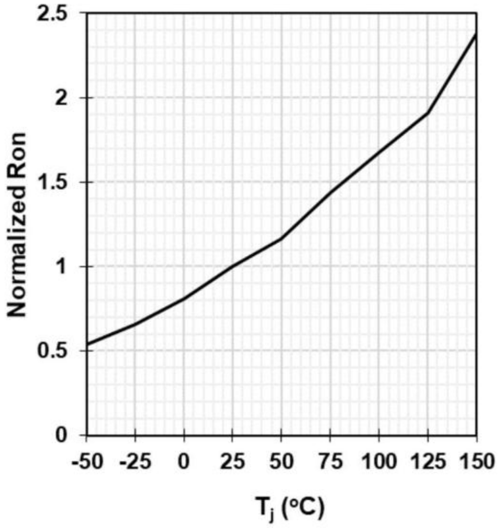
$E_{OSS} = f(V_{DS})$; Freq. = 100khz

Figure 16 Gate threshold voltage



$V_{GS(TH)} = f(T_j)$; $V_{GS} = V_{DS}$; $I_D = 16$ mA

Figure 17 Drain-source on-state resistance



$R_{DS(on)} = f(T_j)$; $I_D = 5$ A; $V_{GS} = 6$ V

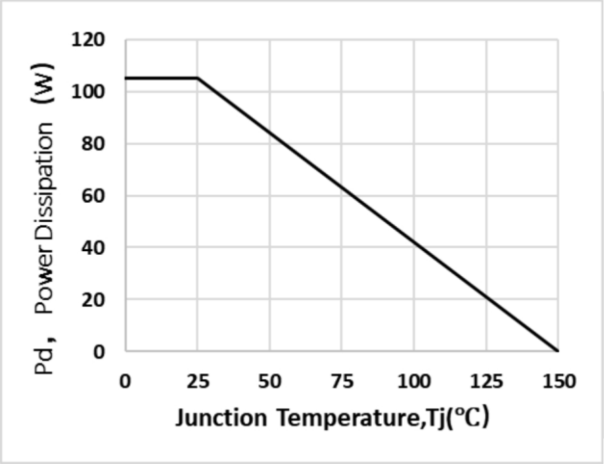
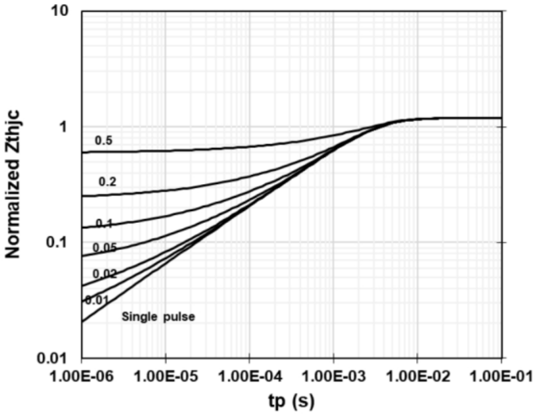
Figure 18 Power dissipation	**Figure 19 Max.transient thermal impedance**
	
Ptot = f(Tc)	Zthjc = f(tp,D)

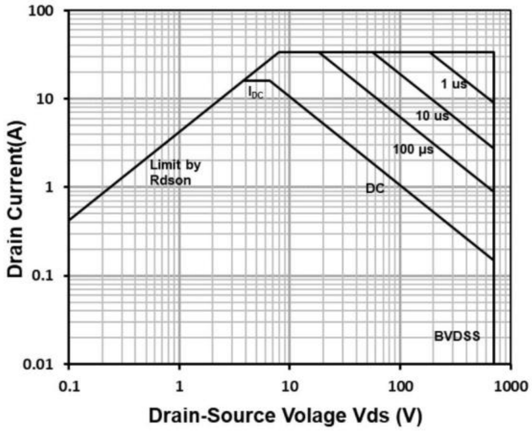
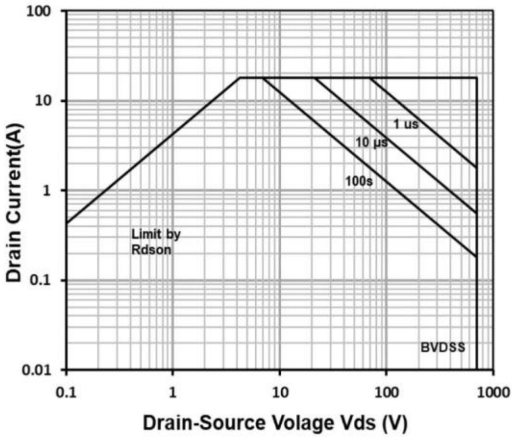
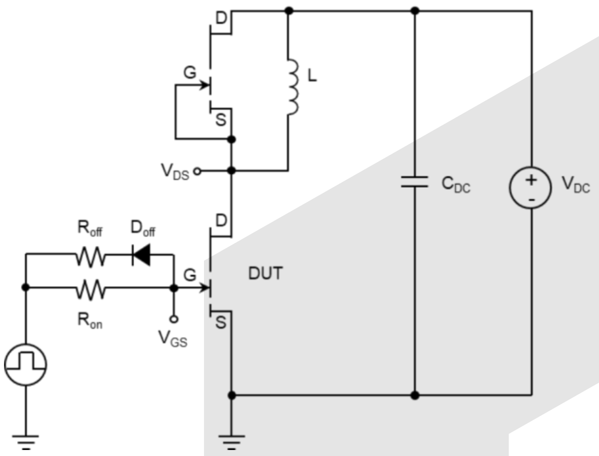
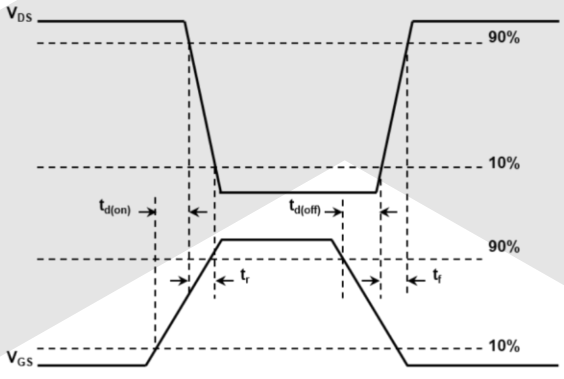
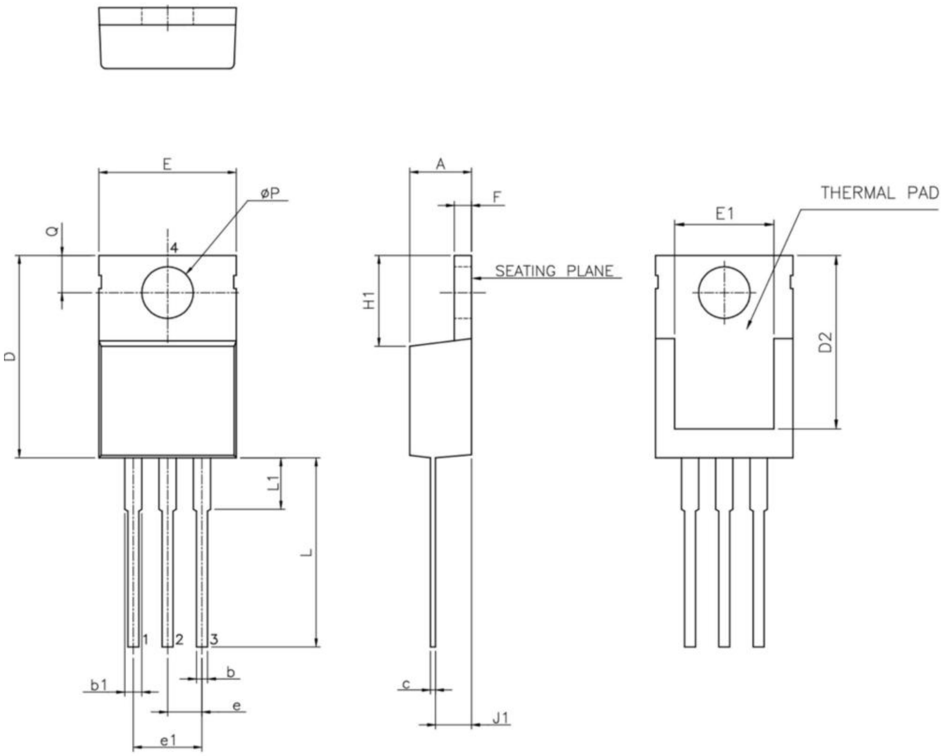
Figure 20 Safe Operation Area	**Figure 21 Safe Operation Area**
	
Id = f(Vds); Tc = 25℃	Id = f(Vds); Tc = 125℃

Figure 22 Switching time test circuit	**Figure 23 Typ. switching time waveforms**
	
V_{DS} = 400 V, I_D = 10 A, L = 318 µH, V_{GS} = 6 V, R_{on} = 10 Ω, R_{off} = 2 Ω	

4 Package Information (TO220F)



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	MAX.
A	3.56	4.82
b1	1.15	1.77
b	0.38	1.01
c	0.35	0.61
D	14.23	16.51
E	9.66	10.66
D2	11.75	11.90
E1	6.86	8.90
e	2.29	2.79
e1	4.83	5.33
F	0.51	1.39
H1	5.85	6.85
J1	2.04	2.92
L	12.70	14.73
øP	3.54	4.08
Q	2.54	3.42
L1	3.65	6.35

NOTES:
1. JEDEC OUTLINE : N/A.

5 Revision history

Major changes since the last revision

Revision	Date	Description of changes
1.0	2026-03-23	Initial release

6 Further Information

Important Notice-Unless expressly approved in writing by an authorized representative of GaNPower, GaNPower components are not designed, authorized or warranted for use in lifesaving, life sustaining, military, aircraft, or space applications, nor in products or systems where failure or malfunction may result in personal injury, death, or property or environmental damage. The information given in this document shall not in any event be regarded as a guarantee of performance. GaNPower hereby disclaims any or all warranties and liabilities of any kind, including but not limited to warranties of non-infringement of intellectual property rights. All other brand and product names are trademarks or registered trademarks of their respective owners. Information provided herein is intended as a guide only and is subject to change without notice. The information contained herein or any use of such information does not grant, explicitly, or implicitly, to any party any patent rights, licenses, or any other intellectual property rights. All rights reserved.

Data Source– Data here are based on recent tests but all parameters may not be up to date. Actual final test data from packaging production are available for selected customers upon request.