N-Channel 650V (D-S) Super Junction Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ at 25 °C (Ω)	V_{GS} = 10 V	0.160

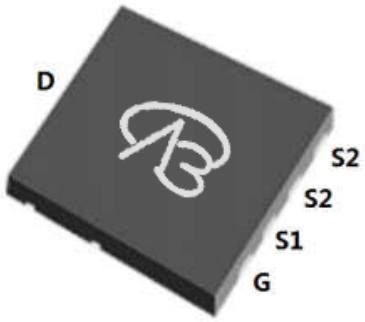
RoHS

FEATURES

- Low figure-of-merit (FOM) R_{on} x Q_g
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)

APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting



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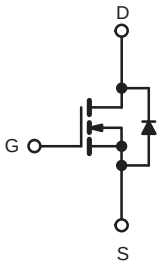


N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	650	V
Gate-Source Voltage			V_{GS}	± 30	
Continuous Drain Current (T_J = 150 °C)	V_{GS} at 10 V	T_C = 25 °C	I_D	20	A
		T_C = 100 °C		12	
Pulsed Drain Current [a]			I_{DM}	60	
Linear Derating Factor				1.67	W/°C
Single Pulse Avalanche Energy [b]			E_{AS}	580	mJ
Maximum Power Dissipation			P_D	90	W
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +150	°C
Drain-Source Voltage Slope	T_J = 125 °C		dV/dt	50	V/ns
Reverse Diode dV/dt [d]				15	
Soldering Recommendations (Peak Temperature) [c]	for 10 s			260	°C

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature.
b. V_{DD} = 100 V, starting T_J = 25 °C, L = 30mH, R_g = 25 Ω, I_{AS} =13A.
c. 1.6 mm from case.
d. $I_{SD} \leq I_D$, dI/dt = 100 A/μs, starting T_J = 25 °C.

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0 . 3 8	

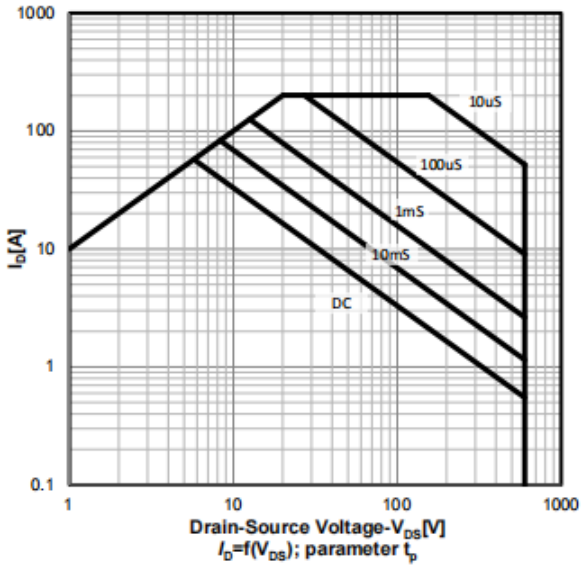
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 1 mA	650	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.5	-	4.5	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
		V_{GS} = ± 30 V	-	-	± 1	µA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 520 V, V_{GS} = 0 V, T_J = 125 °C	-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D =1.5A	-	0.160	-	Ω
Forward Transconductance	g_{fs}	V_{DS} = 30 V, I_D = 1.5A	-	5.6	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 100 V, f = 1 MHz	-	2600	-	pF
Output Capacitance	C_{oss}		-	330	-	
Reverse Transfer Capacitance	C_{rss}		-	4	-	
Effective Output Capacitance, Energy Related [a]	$C_{o(er)}$	V_{DS} = 0 V to 520 V, V_{GS} = 0 V	-	63	-	
Effective Output Capacitance, Time Related [b]	$C_{o(tr)}$		-	213	-	
Total Gate Charge	Q_g	V_{GS} = 10 V; I_D = 20 A, V_{DS} = 520 V	-	60	-	nC
Gate-Source Charge	Q_{gs}		-	39	-	
Gate-Drain Charge	Q_{gd}		-	47	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 520 V, I_D = 20A, V_{GS} = 10 V, R_g = 9.1 Ω	-	18	25	ns
Rise Time	t_r		-	24	55	
Turn-Off Delay Time	$t_{d(off)}$		-	80	-	
Fall Time	t_f		-	12	-	
Gate Input Resistance	R_g	f = 1 MHz, open drain	-	0.8	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	20	A
Pulsed Diode Forward Current	I_{SM}		-	-	60	
Diode Forward Voltage	V_{SD}	T_J = 25 °C, I_S = 8 A, V_{GS} = 0 V	-	-	1.5	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = I_S = 8 A, dI/dt = 100 A/µs, V_R = 400 V	-	520	-	ns
Reverse Recovery Charge	Q_{rr}		-	5.8	-	µC
Reverse Recovery Current	I_{RRM}		-	45	-	A

Notes

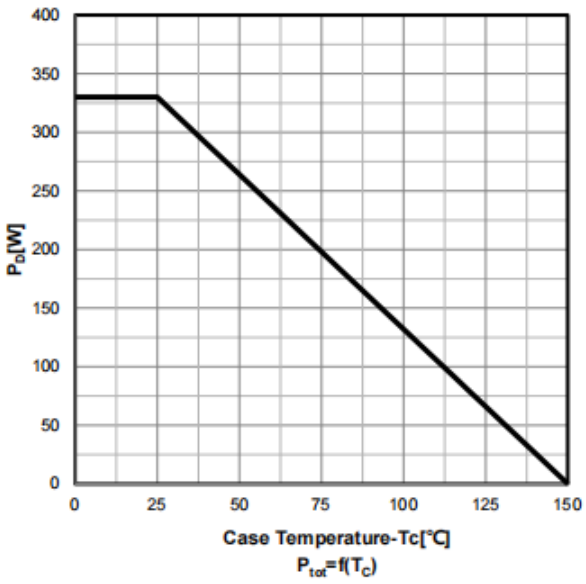
a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}.

b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}.

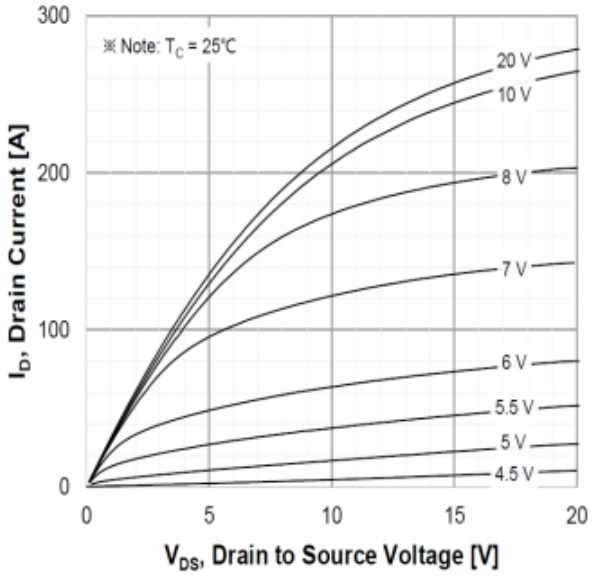
Safe operating area TC=25 ℃
TO-247



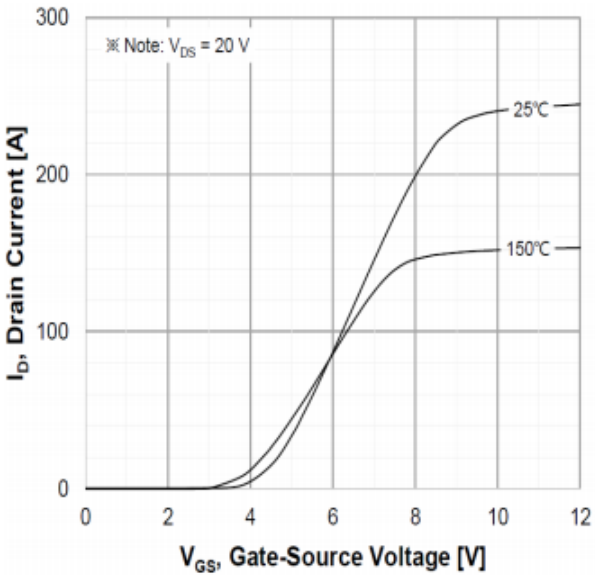
Power dissipation



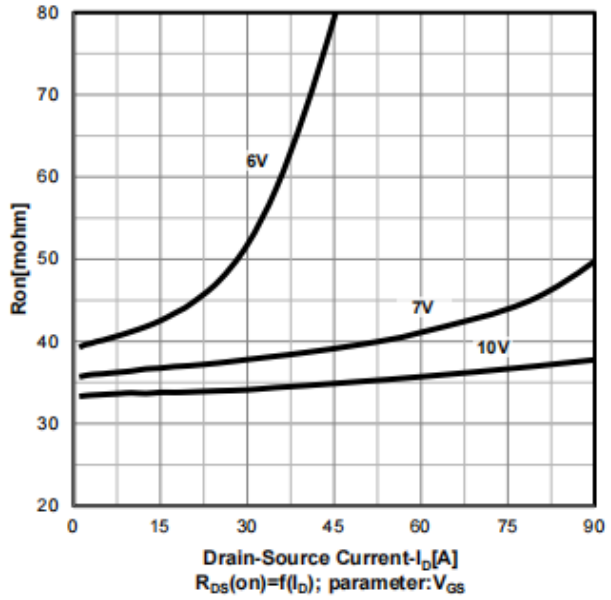
Typ. output characteristics T_j=25 ℃



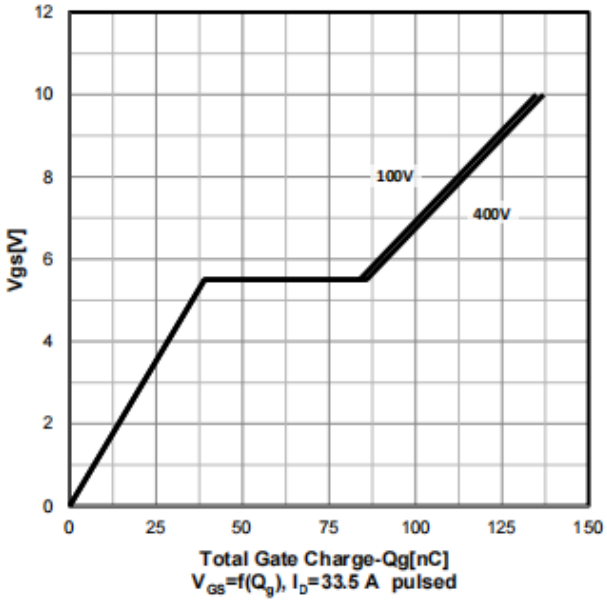
Transfer characteristics



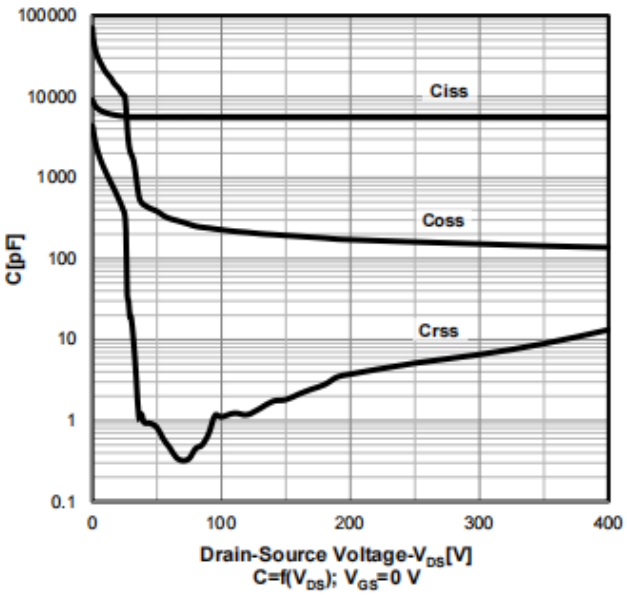
Typ. drain-source on-state resistance



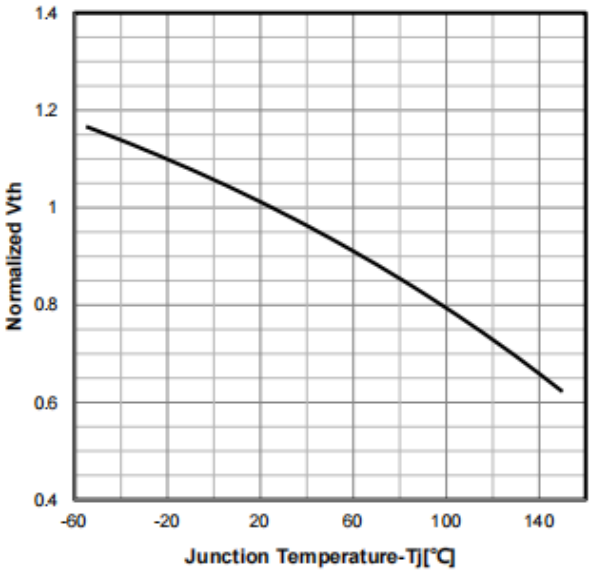
Typ. gate charge characteristics



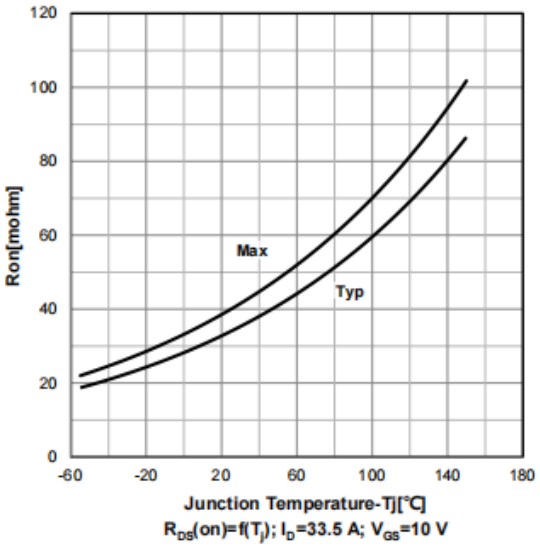
Typ. capacitances



Normalized $V_{GS(th)}$ characteristics

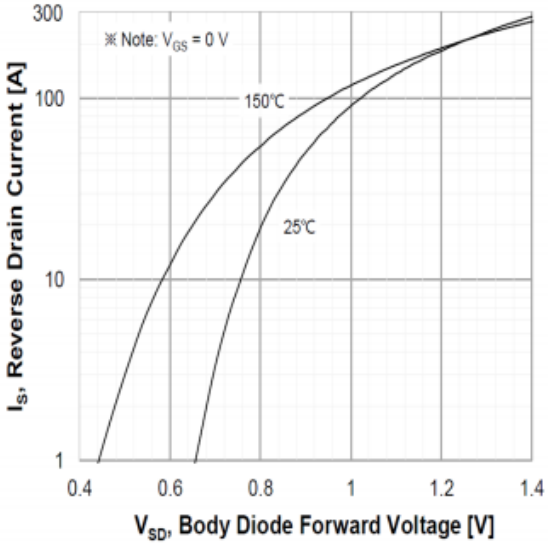


On-resistance vs temperature

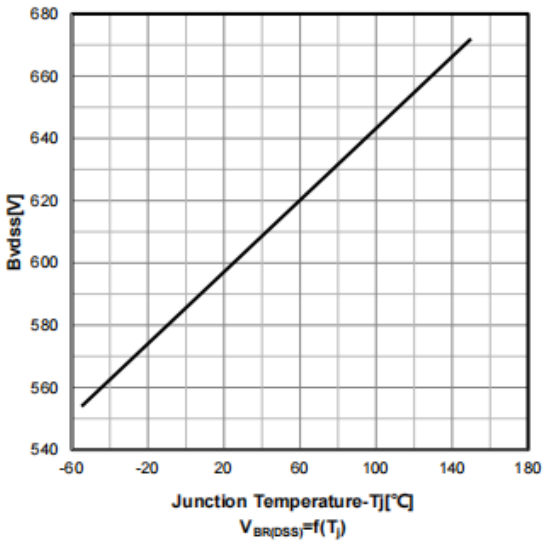


$R_{DS}(on)=f(T_j)$; I_D=33.5 A; V_{GS}=10 V

Forward characteristics of reverse diode

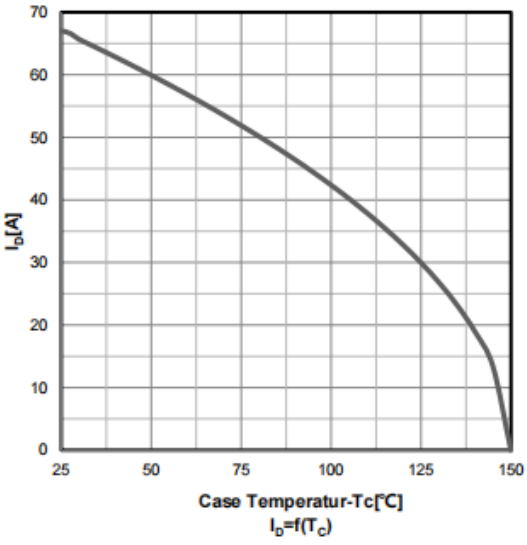


Drain-source breakdown voltage



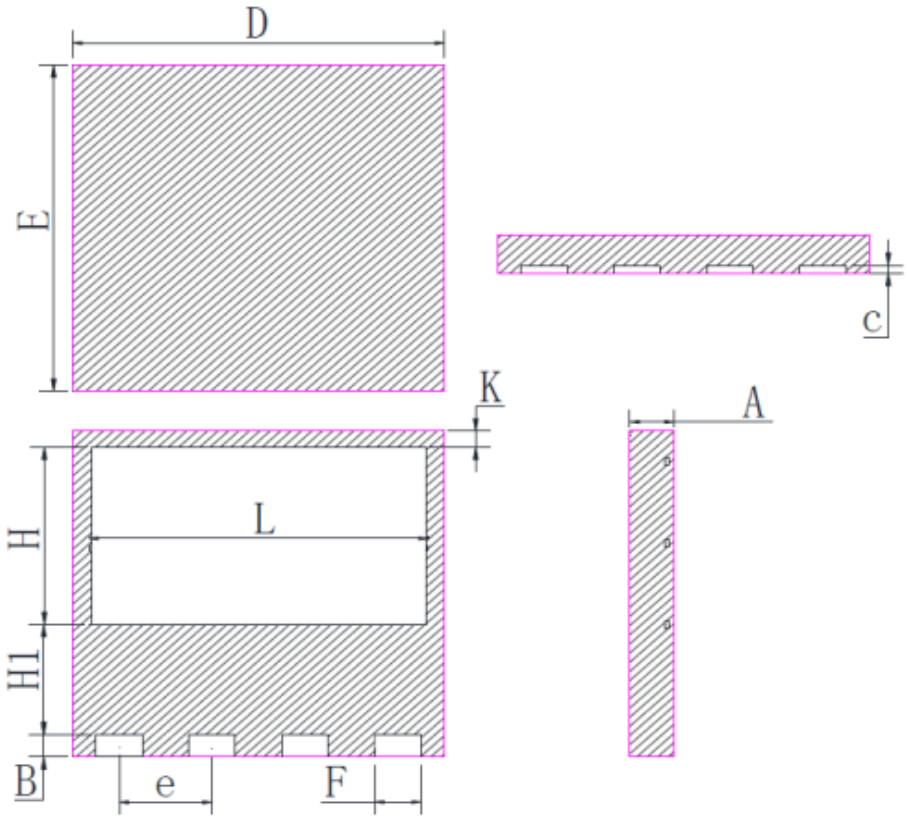
$V_{BR(DSS)}=f(T_j)$

Drain current vs temperature



$I_D=f(T_C)$

Package Outline ：D F N 8 X 8



Symbol	Min	Typ	Max
A	0.90	0.95	1.00
B	0.45	0.55	0.65
C	0.153	0.203	0.253
D	7.90	8.00	8.10
E	7.90	8.00	8.10
e	1.90	2.00	2.10
F	0.90	1.00	1.10
H	4.20	4.35	4.45
H1	2.60	2.70	2.80
K	0.30	0.40	0.50
L	7.10	7.20	7.30

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