

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

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.170
Q_g (nC)	36	

FEATURES

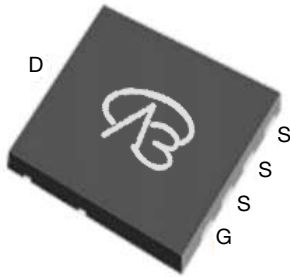
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



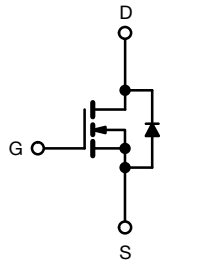
RoHS
COMPLIANT
HALOGEN
FREE

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
- Industrial
 - Welding
 - Induction heating
 - Motor drives
 - Battery chargers
 - Renewable energy
 - Solar (PV inverters)



DFN 8X8



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 ($T_J = 150\text{ }^{\circ}\text{C}$)	V_{GS} at 10 V	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	20	A
		$T_C = 100\text{ }^{\circ}\text{C}$		12	
Pulsed drain current ^a			I_{DM}	84	
Linear derating factor				1.7	W/ $^{\circ}\text{C}$
Single pulse avalanche energy ^b			E_{AS}	440	mJ
Maximum power dissipation			P_D	188	W
Operating junction and storage temperature range			T_J, T_{stg}	-55 to +150	$^{\circ}\text{C}$
Drain-source voltage slope	$T_J = 125\text{ }^{\circ}\text{C}$		dV/dt	50	V/ns
Reverse diode dV/dt ^d		5.1			
Soldering recommendations (peak temperature) ^c	For 10 s			260	$^{\circ}\text{C}$


Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 100$ V, starting $T_J = 25$ °C, $L = 30$ mH, $R_g = 25$ Ω , $I_{AS} = 8.0$ A
- 1.6 mm from case
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C

THERMAL RESISTANCE RATINGS

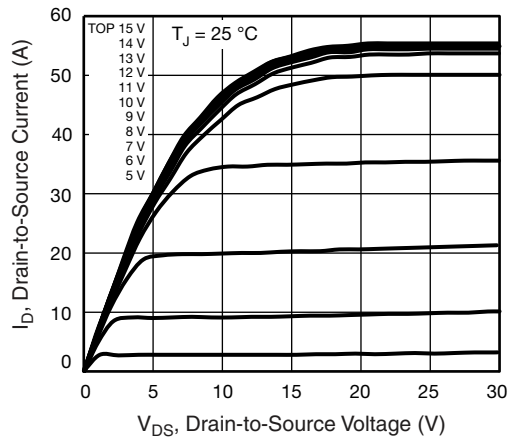
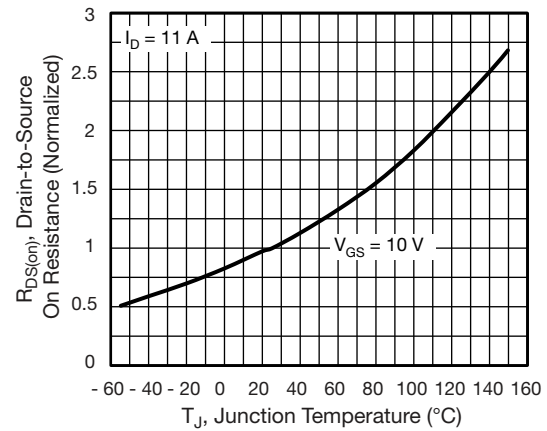
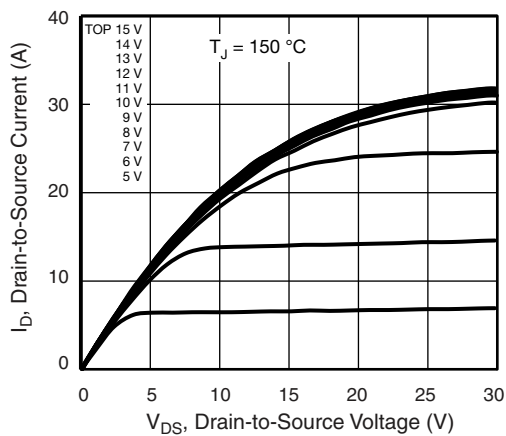
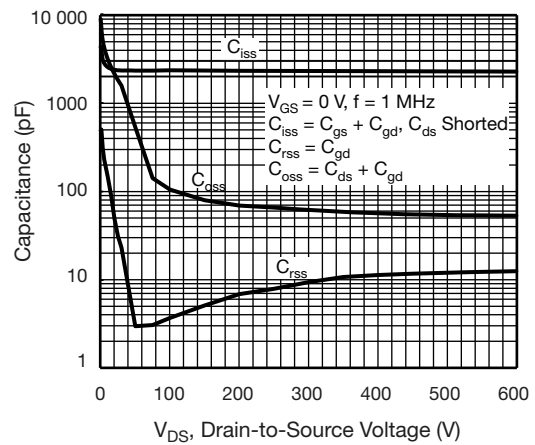
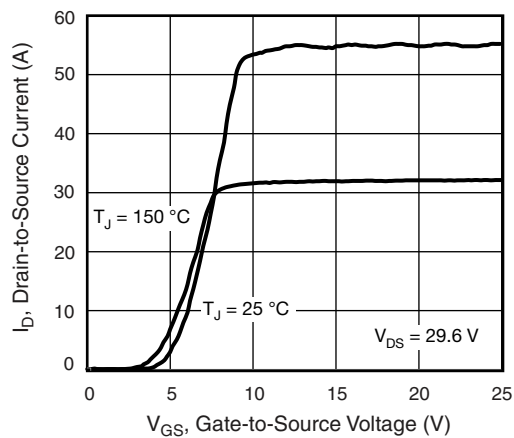
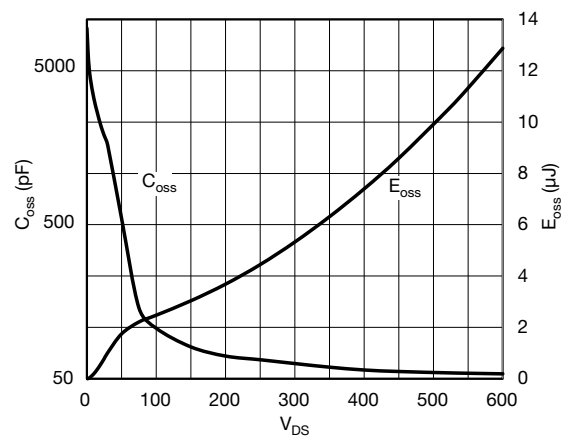
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.66	

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		650	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	1.08	-	$\text{V}/^\circ\text{C}$
Gate-source threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		3.0	-	5.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30\text{ V}$		-	-	± 1	μA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 640\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}$	-	0.170	-	Ω
Forward transconductance	g_{fs}	$V_{DS} = 30\text{ V}$, $I_D = 10\text{ A}$		-	8.7	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$		-	2200	-	pF
Output capacitance	C_{oss}			-	51	-	
Reverse transfer capacitance	C_{rss}			-	12	-	
Effective output capacitance, energy related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 480\text{ V}$, $V_{GS} = 0\text{ V}$		-	48	-	
Effective output capacitance, time related ^b	$C_{o(tr)}$			-	205	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 8.5\text{ A}$, $V_{DS} = 480\text{ V}$	-	36	-	nC
Gate-source charge	Q_{gs}			-	8	-	
Gate-drain charge	Q_{gd}			-	10	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480\text{ V}$, $I_D = 8.5\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 9.1\text{ }\Omega$		-	12	24	ns
Rise time	t_r			-	14	23	
Turn-off delay time	$t_{d(off)}$			-	61	110	
Fall time	t_f			-	16	-	
Gate input resistance	R_g	$f = 1\text{ MHz}$, open drain		0.3	0.7	1.4	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}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 8.5\text{ A}$, $V_{GS} = 0\text{ V}$		-	-	1.2	V
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = I_S = 8.5\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $V_R = 25\text{ V}$		-	416	832	ns
Reverse recovery charge	Q_{rr}			-	6.4	12.8	μC
Reverse recovery current	I_{RRM}			-	27	-	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}

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Fig. 1 - Typical Output Characteristics****Fig. 4 - Normalized On-Resistance vs. Temperature****Fig. 2 - Typical Output Characteristics****Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage****Fig. 3 - Typical Transfer Characteristics****Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}**

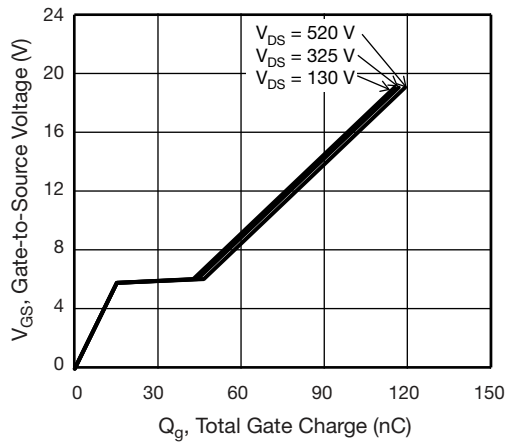


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

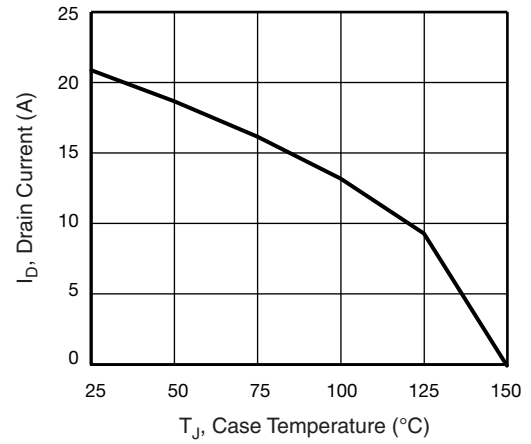


Fig. 10 - Maximum Drain Current vs. Case Temperature

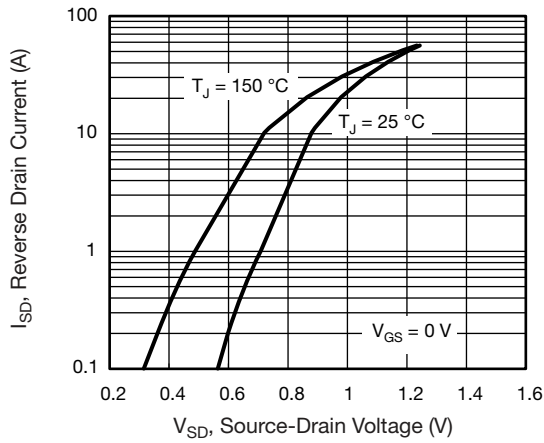


Fig. 8 - Typical Source-Drain Diode Forward Voltage

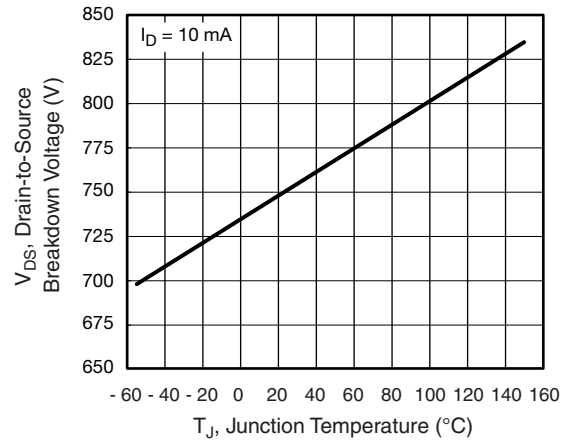


Fig. 11 - Temperature vs. Drain-to-Source Voltage

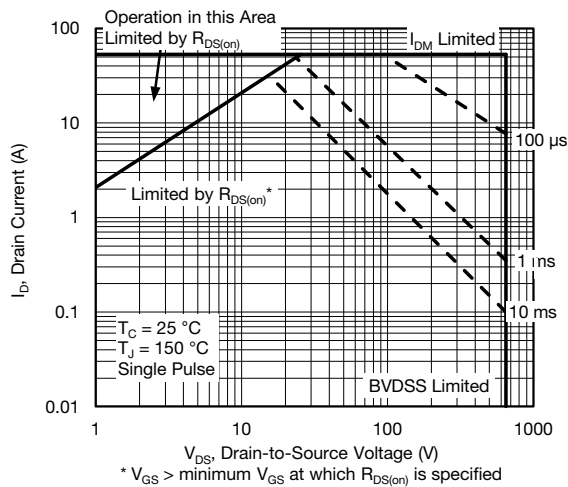
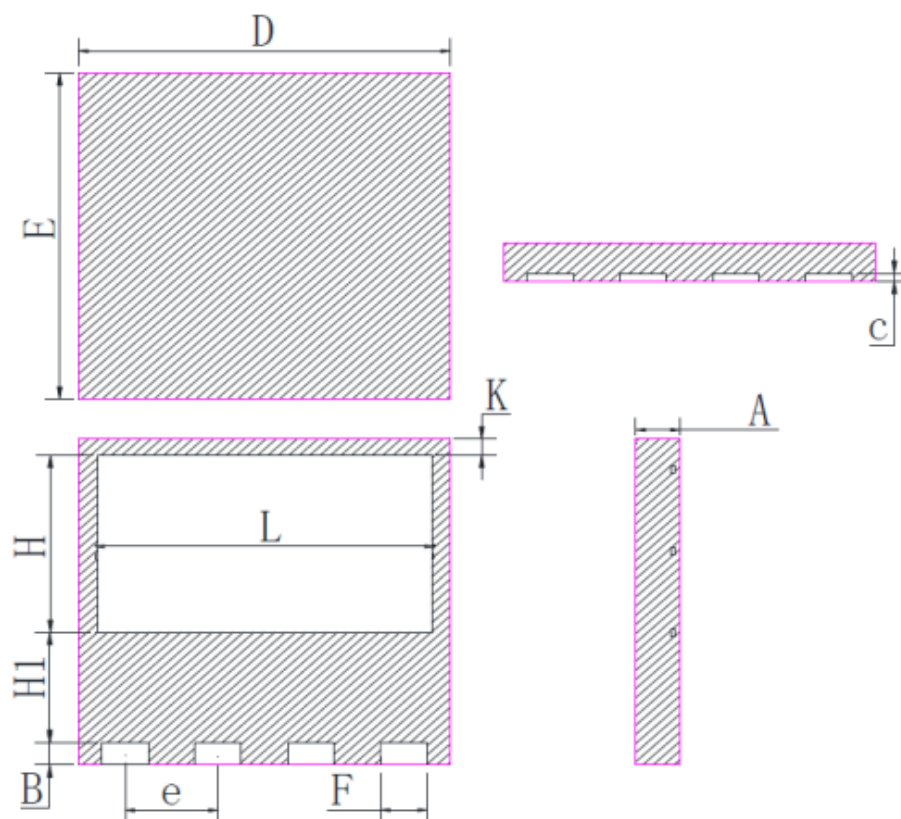


Fig. 9 - Maximum Safe Operating Area

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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