

N-Channel 500V (D-S) Super Junction Power MOSFET

PRODUCT SUMMARY		
V _{DS} (V) at T _J max.	500	
R _{DS(on)} at 25 °C (Ω)	V _{GS} = 10 V	0.085

FEATURES

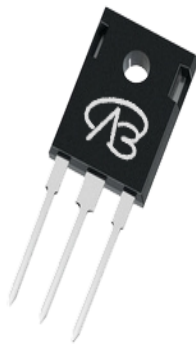
- Low figure-of-merit (FOM) R_{on} x Q_g
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



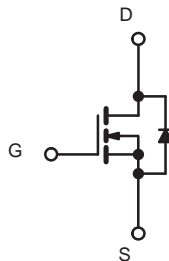
APPLICATIONS

- 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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Top View



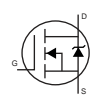
N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V _{DS}	500	V	
Gate-Source Voltage		V _{GS}	± 30		
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 10 V	I _D	T _C = 25 °C	33	A
			T _C = 100 °C	20	
Pulsed Drain Current ^a		I _{DM}	100		
Linear Derating Factor			1.67	W/°C	
Single Pulse Avalanche Energy ^b		E _{AS}	980	mJ	
Maximum Power Dissipation		P _D	310	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

- Repetitive rating; pulse width limited by maximum junction temperature.
- V_{DD} = 100 V, starting T_J = 25 °C, L = 30mH, R_g = 25 Ω, I_{AS} = 16A.
- 1.6 mm from case.
- I_{SD} ≤ I_D, dI/dt = 100 A/μs, starting T_J = 25 °C.

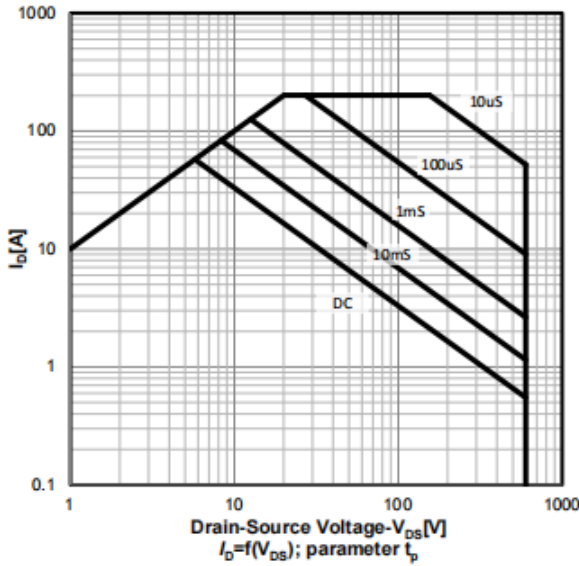
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.38	

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}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$		500	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.5	-	4.5	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}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 11\text{ A}$	-	0.085	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 30\text{ V}, I_D = 11\text{ A}$		-	5.6	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$		-	3600	-	pF
Output Capacitance	C_{oss}			-	330	-	
Reverse Transfer Capacitance	C_{rss}			-	4	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 520\text{ V}, V_{GS} = 0\text{ V}$		-	63	-	
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$			-	213	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, V_{DS} = 520\text{ V}$	-	148	-	nC
Gate-Source Charge	Q_{gs}			-	39	-	
Gate-Drain Charge	Q_{gd}			-	47	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 520\text{ V}, I_D = 20\text{ A}, V_{GS} = 10\text{ V}, R_g = 9.1\text{ }\Omega$		-	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			$f = 1\text{ MHz}, \text{ open drain}$		-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	3.3	A
Pulsed Diode Forward Current	I_{SM}			-	-	100	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 8\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.5	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	520	-	ns
Reverse Recovery Charge	Q_{rr}			-	5.8	-	μC
Reverse Recovery Current	I_{RRM}			-	4.5	-	A

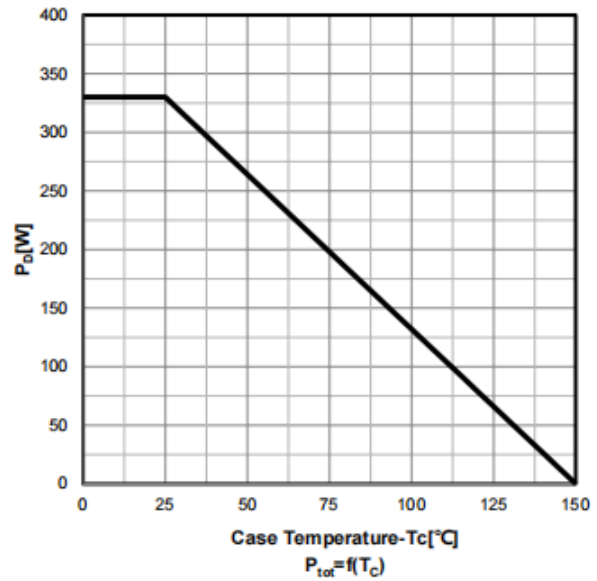
Notes

- 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} .

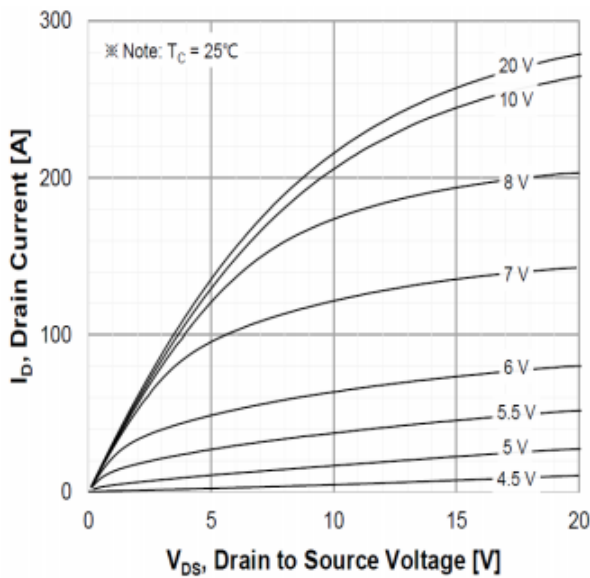
Safe operating area TC=25 °C
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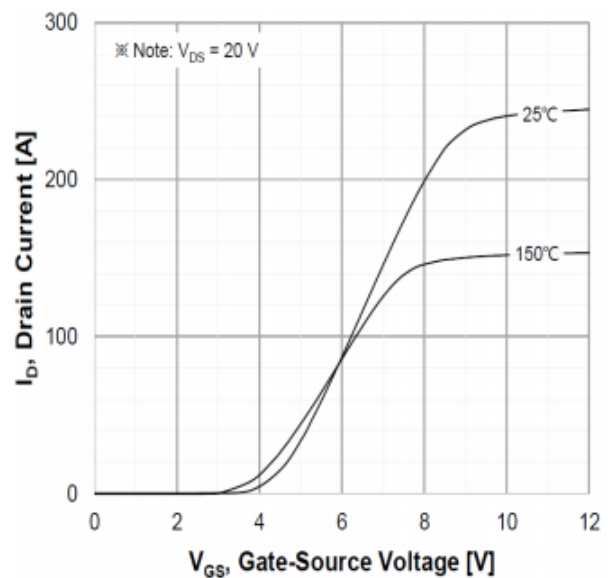
Power dissipation



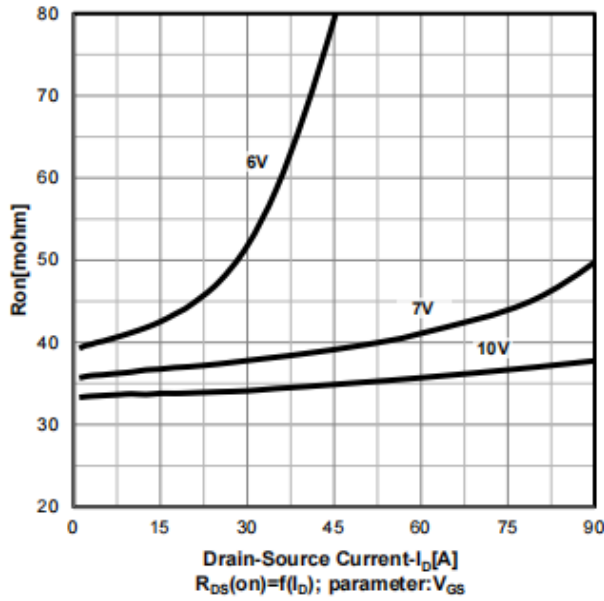
Typ. output characteristics $T_J=25\text{ }^\circ\text{C}$



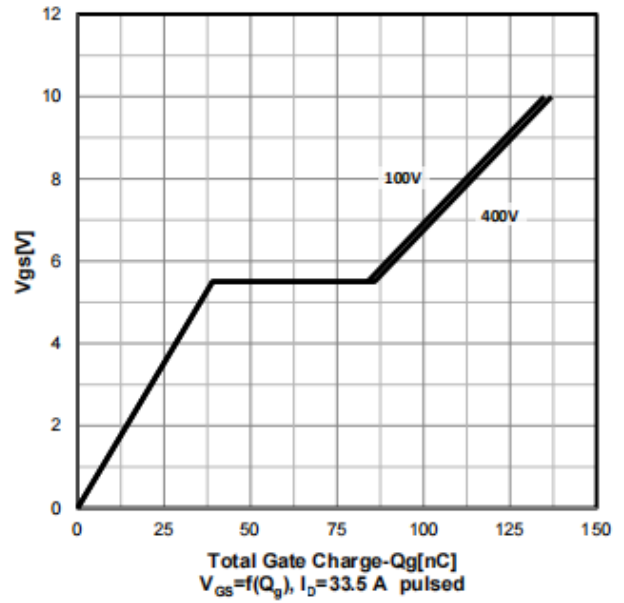
Transfer characteristics



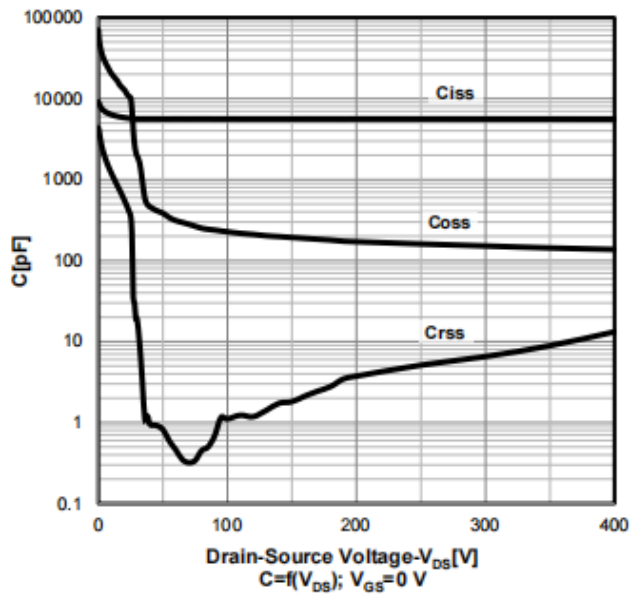
Typ. drain-source on-state resistance



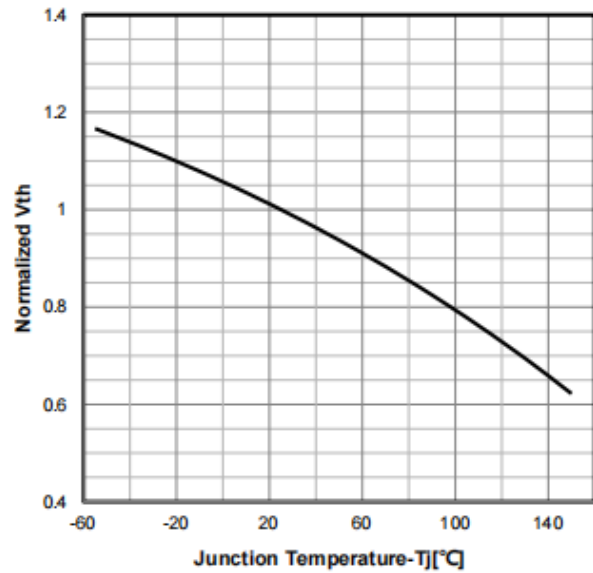
Typ. gate charge characteristics



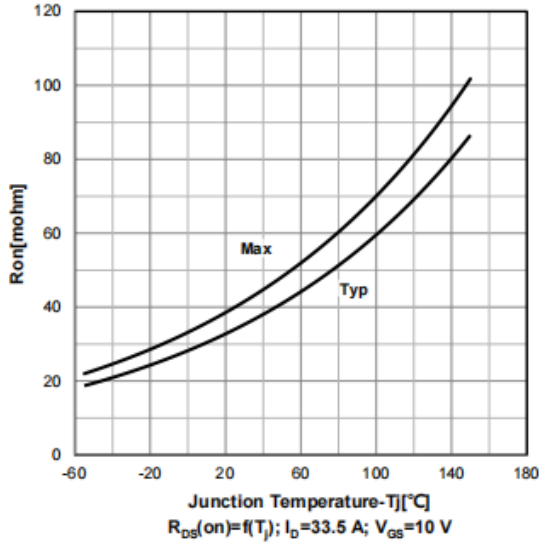
Typ. capacitances



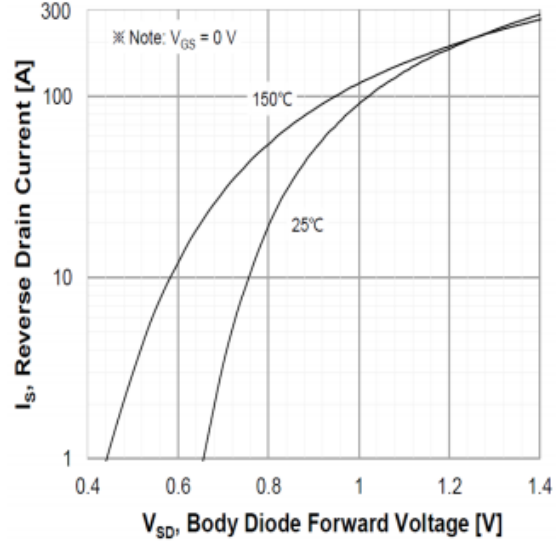
Normalized $V_{GS(th)}$ characteristics



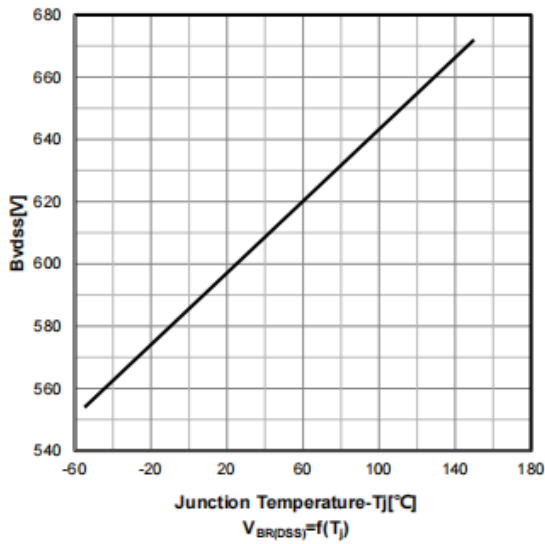
On-resistance vs temperature



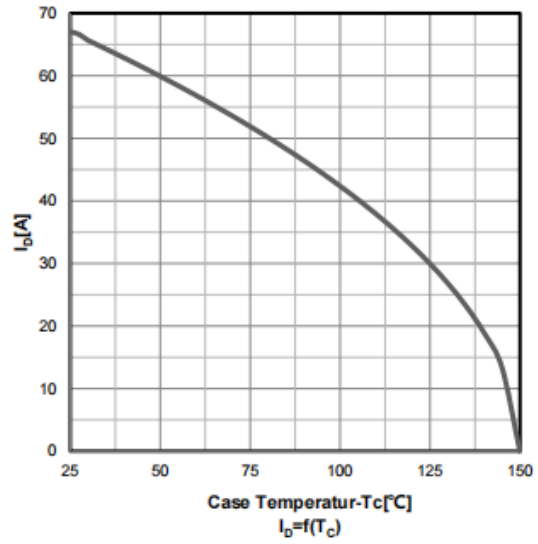
Forward characteristics of reverse diode



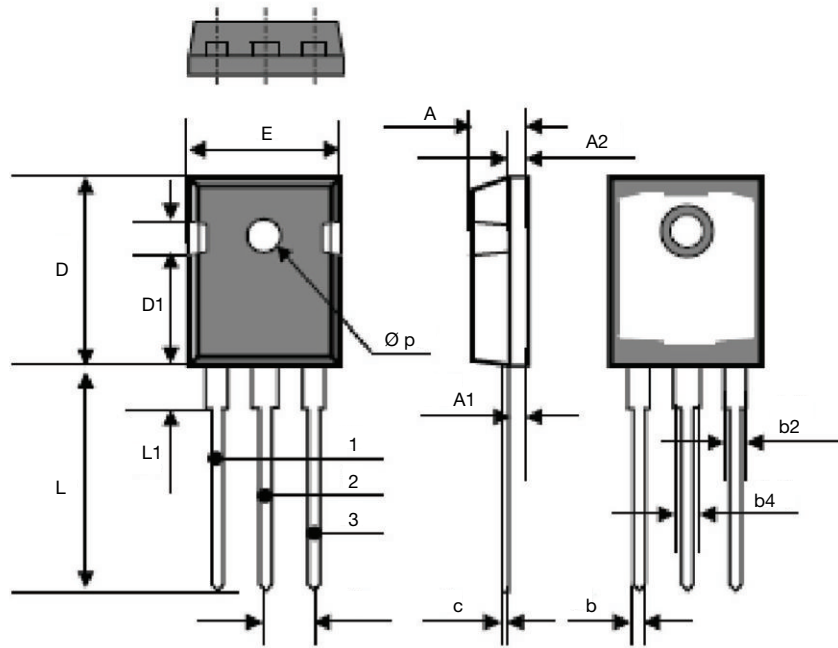
Drain-source breakdown voltage



Drain current vs temperature



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DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.41	0.065	0.095
b4	2.59	3.43	0.102	0.135
c	0.61 BSC		0.024 BSC	
D	20.80	21.46	0.819	0.845
D1	3.68	5.49	0.145	0.216
(e)	5.46 BSC		0.215 BSC	
E	15.49	16.26	0.610	0.640
L	19.81	20.32	0.780	0.800
L1	4.06	4.50	0.160	0.177
Øp	3.51	3.66	0.138	0.144

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