

TK20N60W5-VB Datasheet

N-Channel 600V (D-S) Super Junction Power MOSFET

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	600	
$R_{DS(on)}$ at 25 °C (Ω)	$V_{GS} = 10$ V	0.160

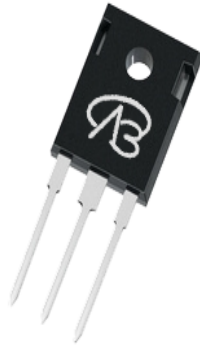
FEATURES

- 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)

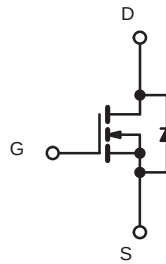
**APPLICATIONS**

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

TO-247



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	600	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}	60	
Linear Derating Factor				1.67	W/ $^{\circ}\text{C}$
Single Pulse Avalanche Energy ^b			E_{AS}	1000	mJ
Maximum Power Dissipation			P_D	160	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		15			
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 , $I_{AS} = 13$ 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}	-	0.38	

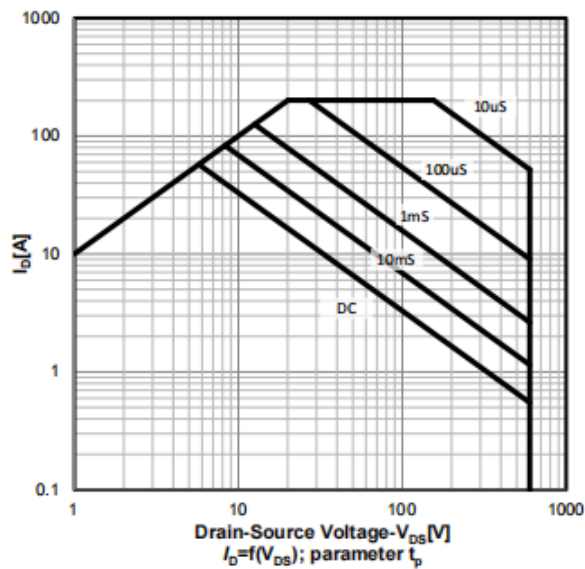
SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 1 mA		600	-	-	V
V _{DS} Temperature Coefficient	ΔV _{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} = 600V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C		-	-	100	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D =7A	-	0.160	-	Ω
Forward Transconductance	g _{fs}	V _{DS} = 30 V, I _D = 7A		-	5.6	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1 MHz		-	2300	-	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	-	pF
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	-	62	-	nC
Gate-Source Charge	Q _{gs}			-	39	-	
Gate-Drain Charge	Q _{gd}			-	4.7	-	
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)}			-	8.0	-	
Fall Time	t _f			-	1.2	-	
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}			-	4.5	-	A

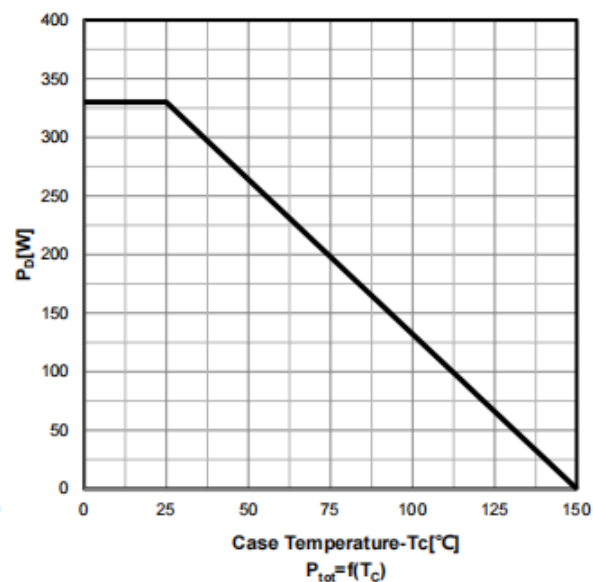
Notes

- 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} .

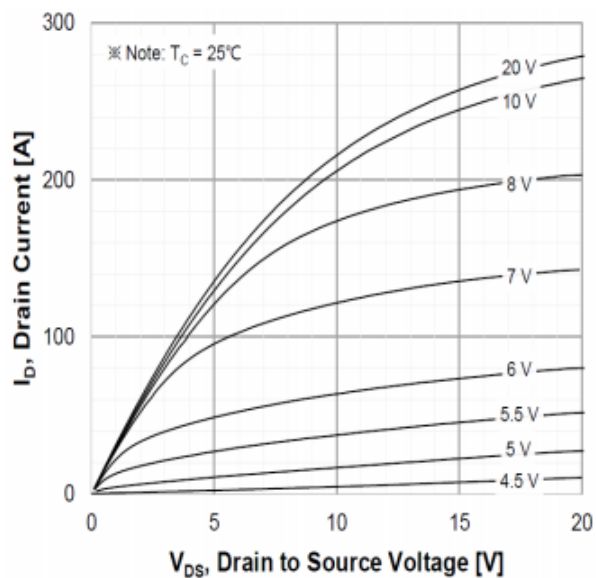
Safe operating area TC=25 °C
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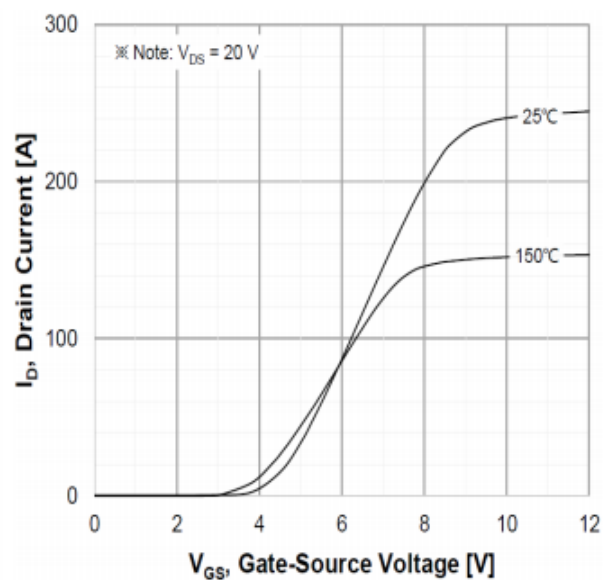
Power dissipation



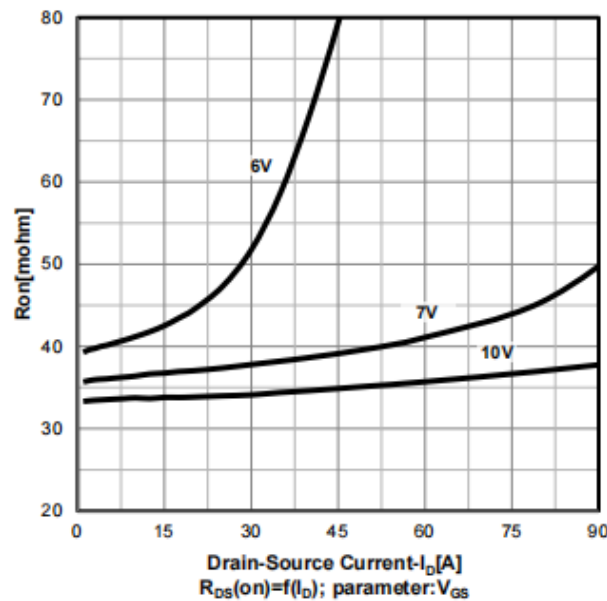
Typ. output characteristics $T_J = 25\text{ °C}$



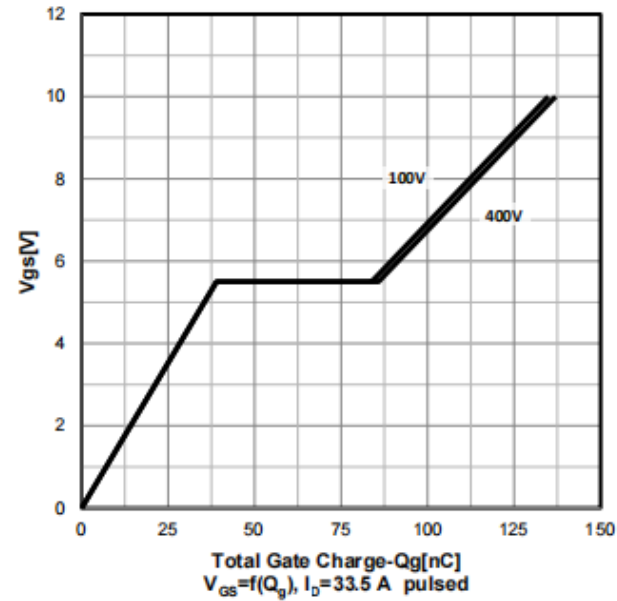
Transfer characteristics



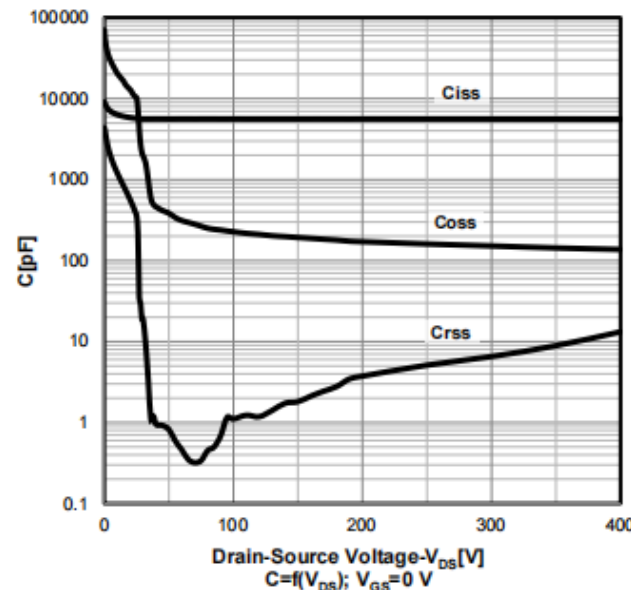
Typ. drain-source on-state resistance



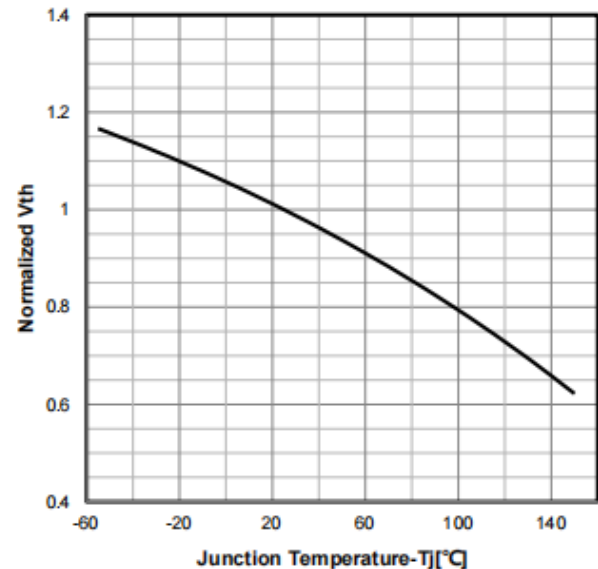
Typ. gate charge characteristics



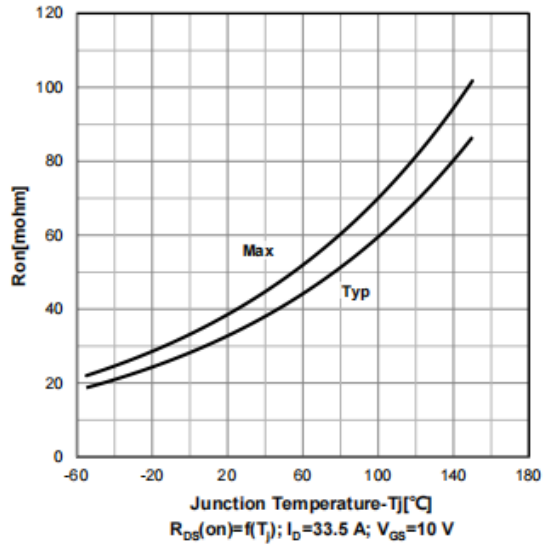
Typ. capacitances



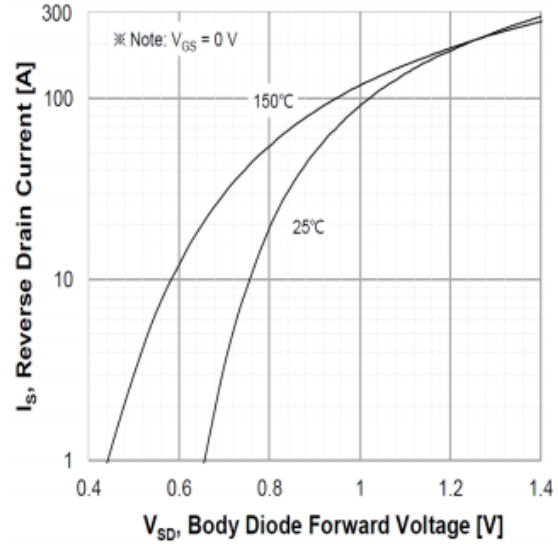
Normalized $V_{GS(th)}$ characteristics



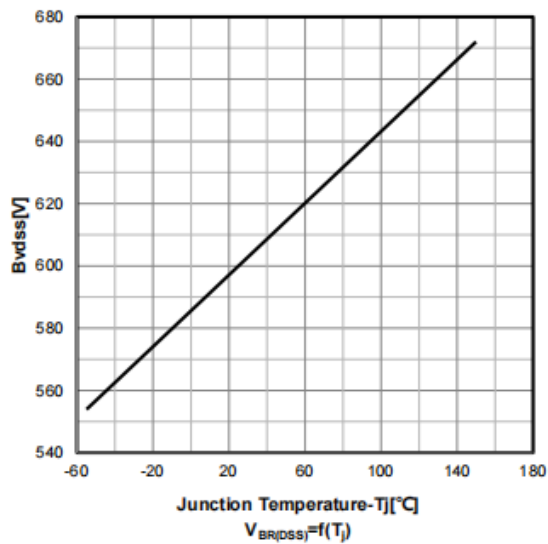
On-resistance vs temperature



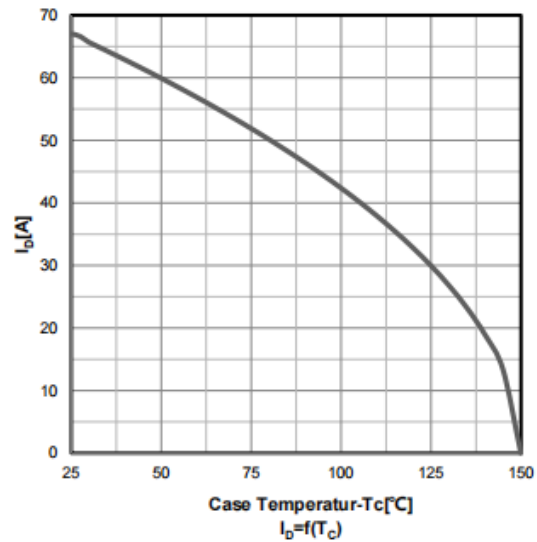
Forward characteristics of reverse diode



Drain-source breakdown voltage



Drain current vs temperature



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