

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

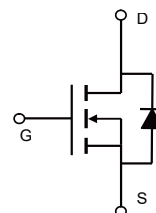
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 60V, I_D = 190A$
 $R_{DS(ON)} = 2.25m\Omega$, typical @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating



TO-220



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST06N020	VST06N020-TC	TO-220	-	-	-

Absolute Maximum Ratings ($T_c = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	190	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D (100^\circ C)$	142	A
Pulsed Drain Current	I_{DM}	760	A
Maximum Power Dissipation	P_D	220	W
Derating factor		1.47	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	672	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.68	$^{\circ}\text{C/W}$
--------------------------------------	-----------------	------	----------------------

Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

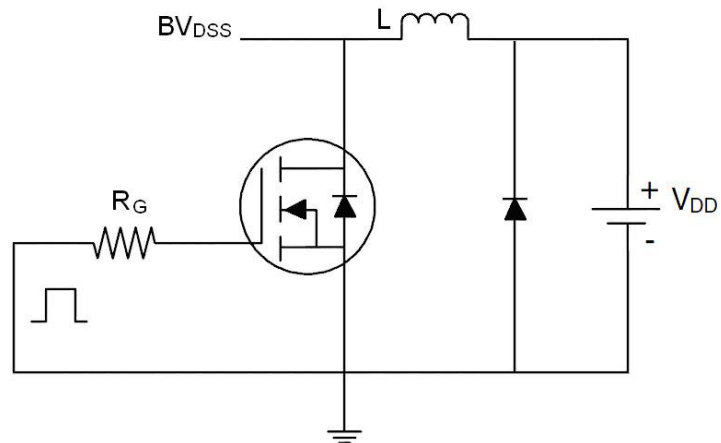
Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Off Characteristics							
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60		-	V	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA	
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA	
On Characteristics							
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.0	3.0	4.0	V	
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	TO-220	-	2.25	2.65	mΩ
			TO-263	-	2.25	2.65	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	45	-	-	S	
Dynamic Characteristics							
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	5190	-	PF	
Output Capacitance	C _{oss}		-	900	-	PF	
Reverse Transfer Capacitance	C _{rss}		-	61.5	-	PF	
Switching Characteristics (Note 2)							
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =20A V _{GS} =10V, R _G =4.7Ω	-	16	-	nS	
Turn-on Rise Time	t _r		-	9	-	nS	
Turn-Off Delay Time	t _{d(off)}		-	58	-	nS	
Turn-Off Fall Time	t _f		-	12	-	nS	
Total Gate Charge	Q _g	V _{DS} =30V, I _D =20A, V _{GS} =10V	-	78		nC	
Gate-Source Charge	Q _{gs}		-	20		nC	
Gate-Drain Charge	Q _{gd}		-	16.5		nC	
Drain-Source Diode Characteristics							
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-		1.2	V	
Diode Forward Current	I _S		-	-	190	A	
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	56		nS	
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	80		nC	

Notes:

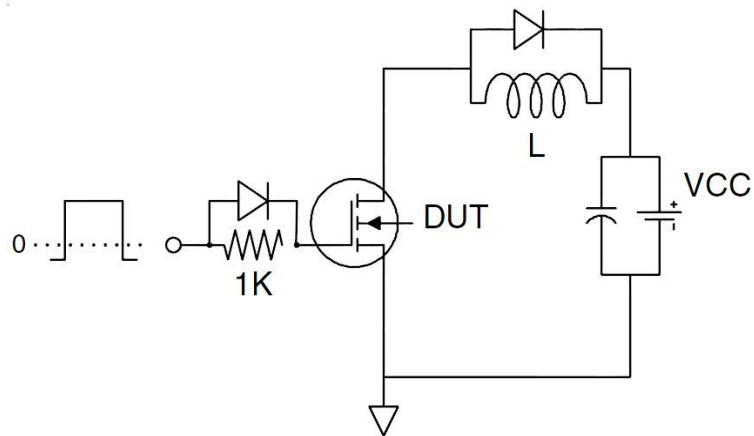
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$
2. Guaranteed by design, not subject to production.
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming a maximum junction temperature of $T_J(\text{MAX})=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test Circuit

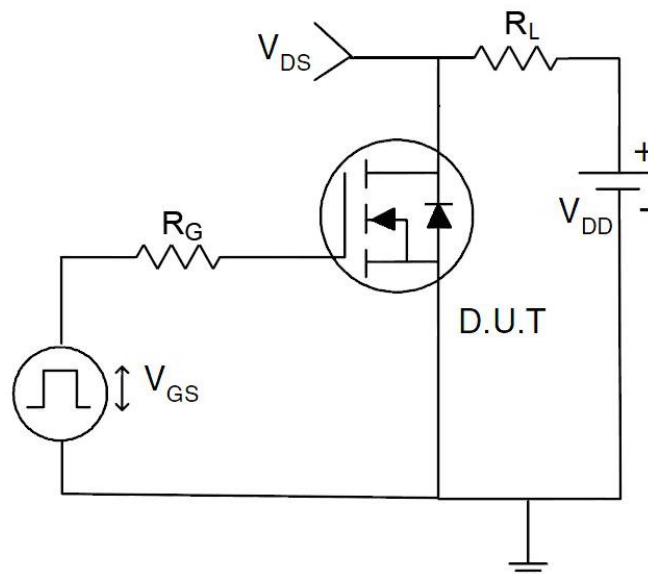
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

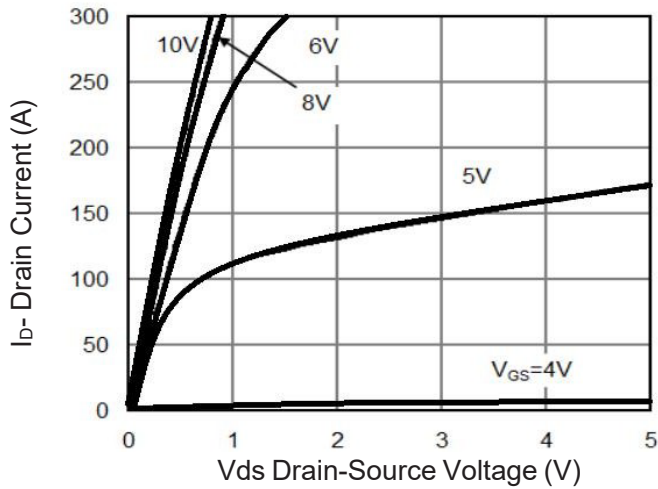


Figure 1 Output Characteristics

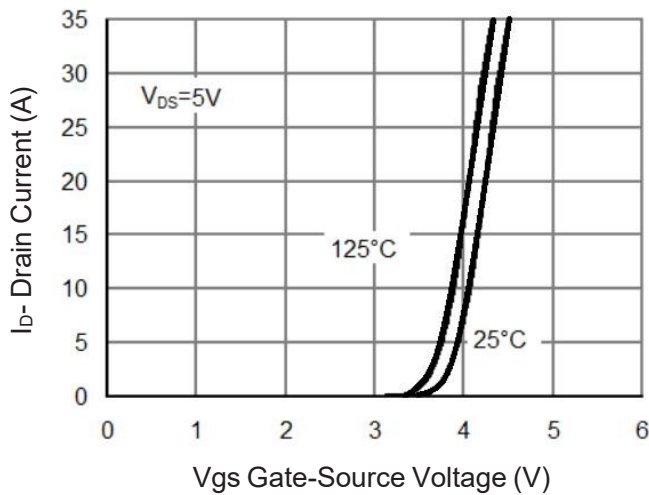


Figure 2 Transfer Characteristics

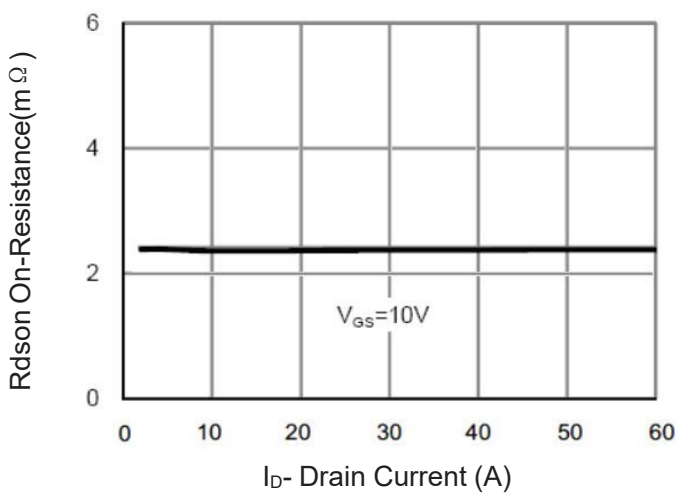


Figure 3 Rdson- Drain Current

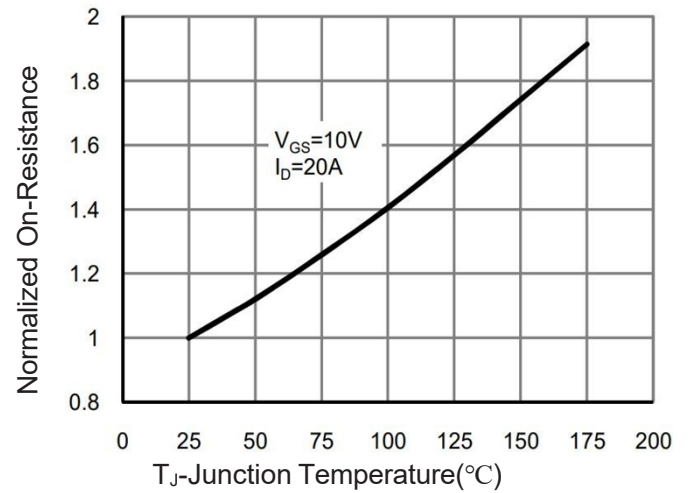


Figure 4 Rdson-Junction Temperature

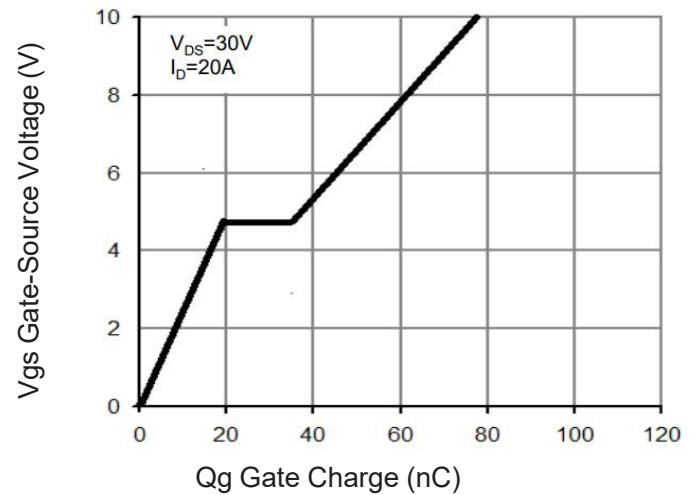


Figure 5 Gate Charge

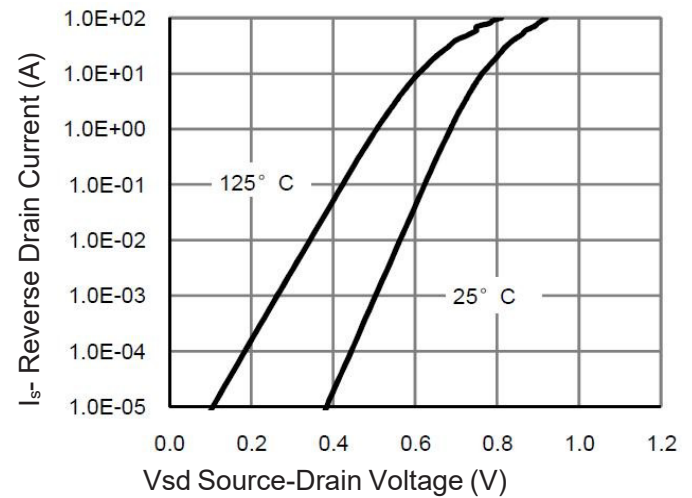
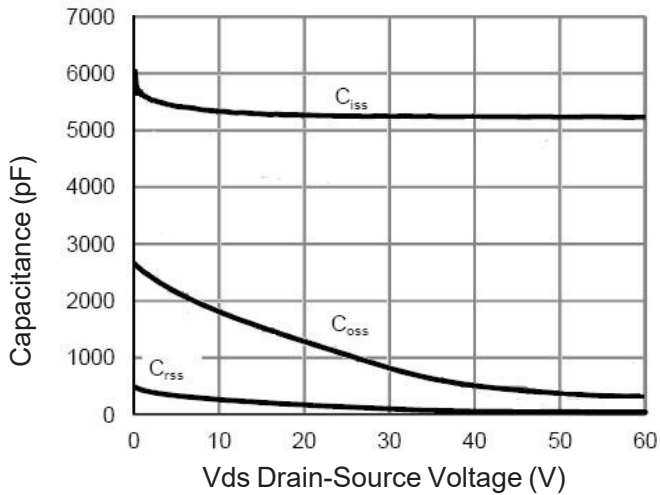
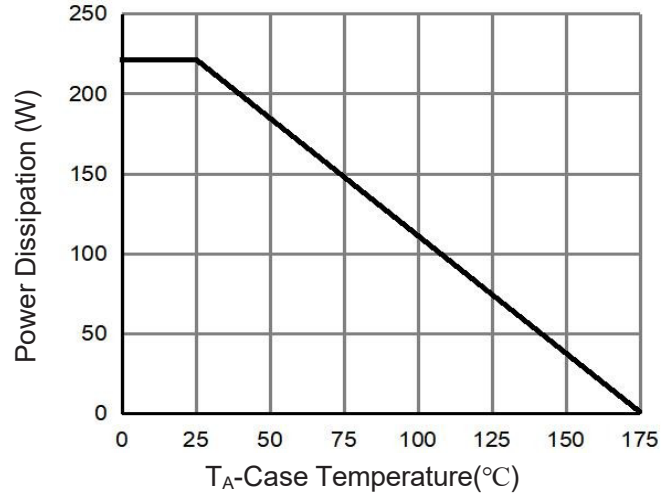
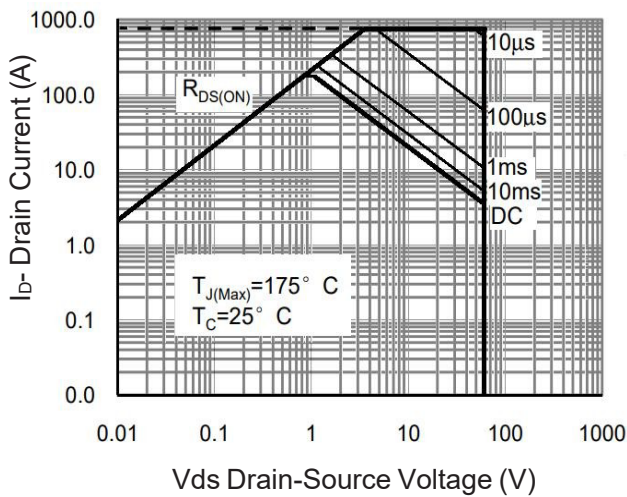
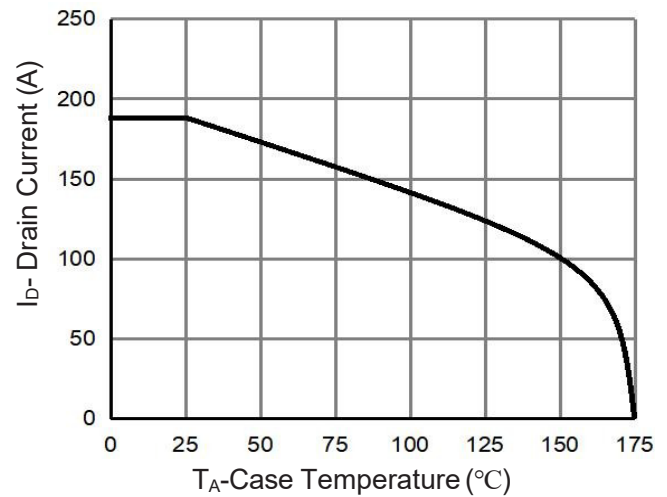
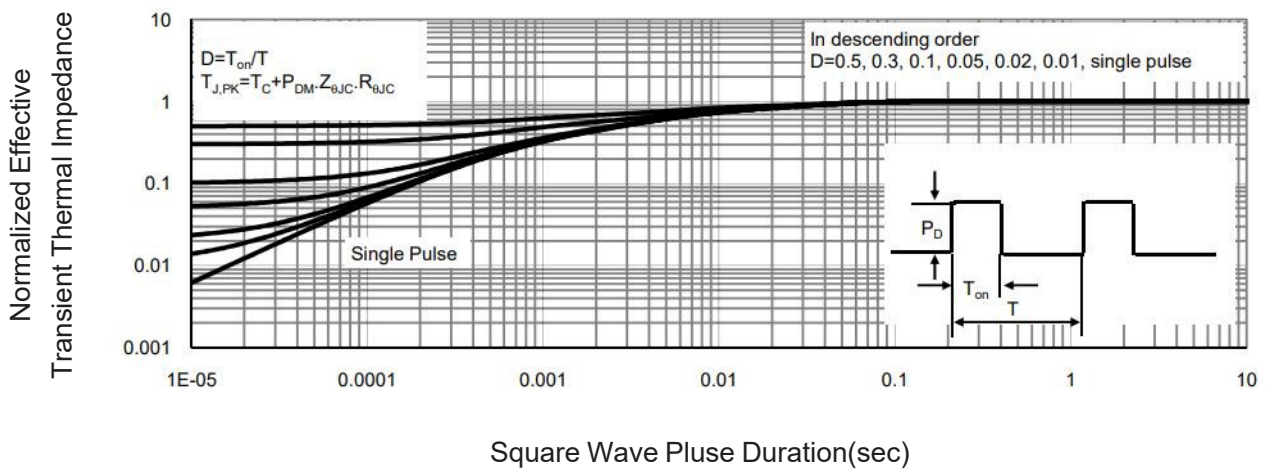


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area (Note3)

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance