

Description

The VST04P040 uses **Super Trench** 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

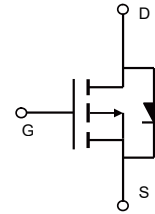
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = -40V, I_D = -120A$
- $R_{DS(ON)} = 4.55m\Omega$ (typical) @ $V_{GS} = -10V$
- $R_{DS(ON)} = 7.0m\Omega$ (typical) @ $V_{GS} = -4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS Tested
- 100% ΔV_{ds} Tested



TO-252



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST04P040	VST04P040-T2	TO-252	Ø330mm	16mm	2500units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-120	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	-84	A
Pulsed Drain Current	I_{DM}	-480	A
Maximum Power Dissipation	P_D	220	W
Derating factor		1.47	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	1155	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	$^\circ C/W$
--------------------------------------	-----------------	------	--------------

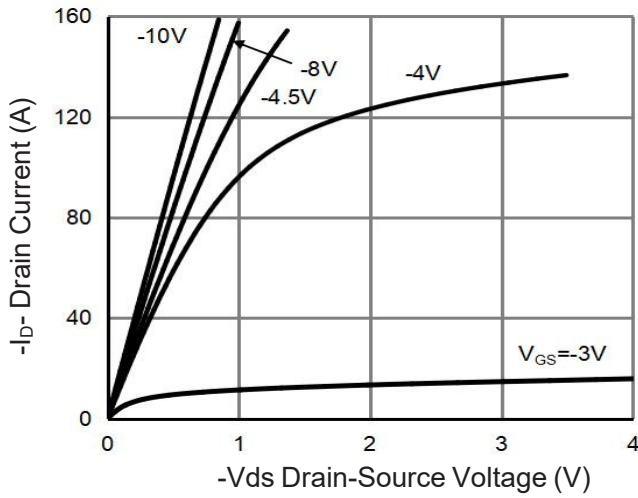
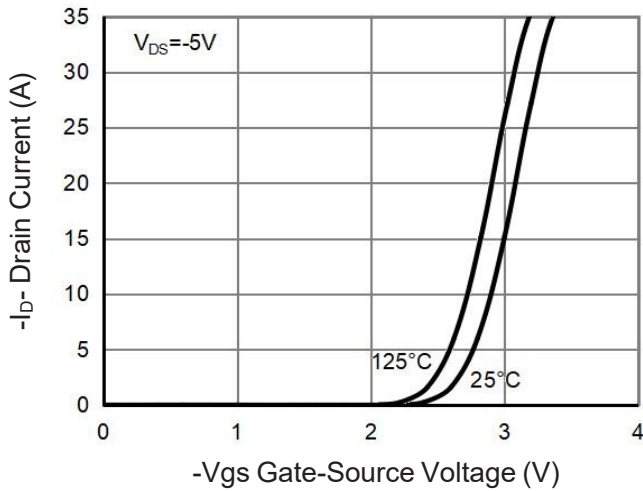
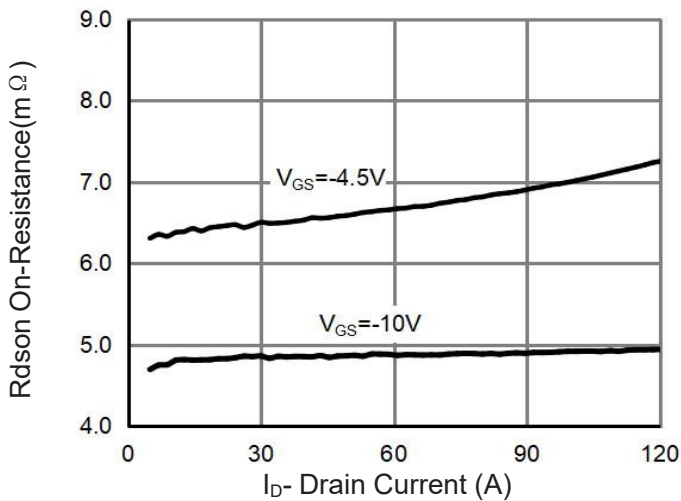
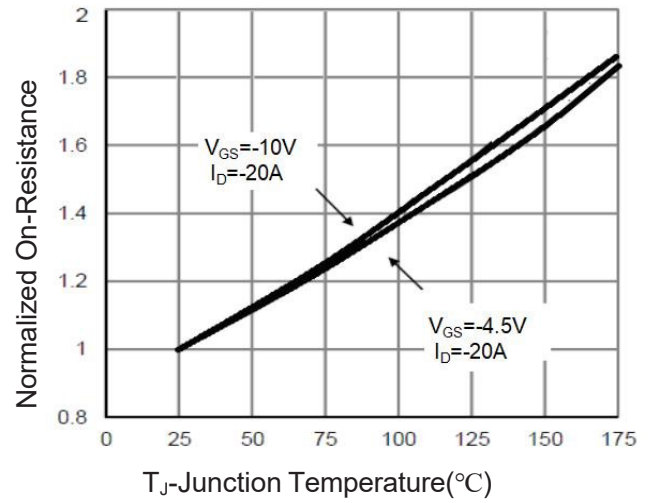
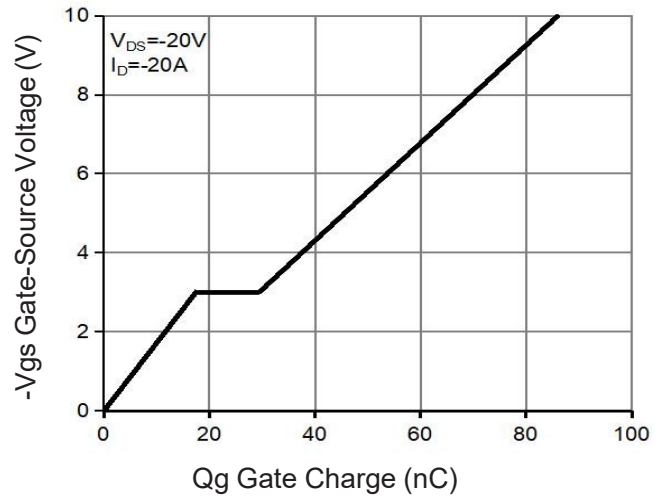
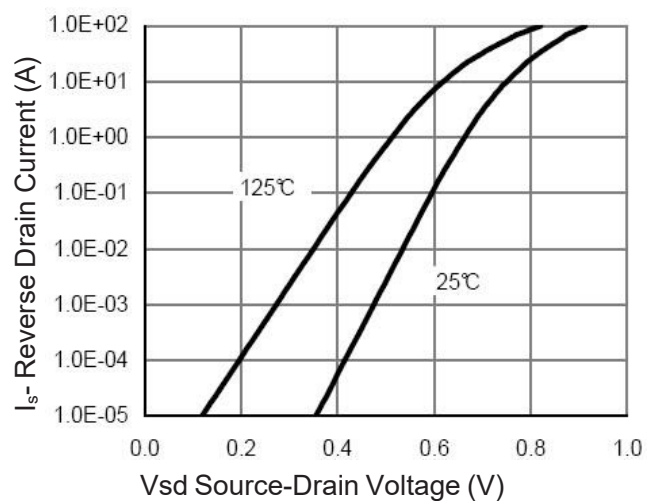
Electrical Characteristics (T_c=25°C unless otherwise noted)

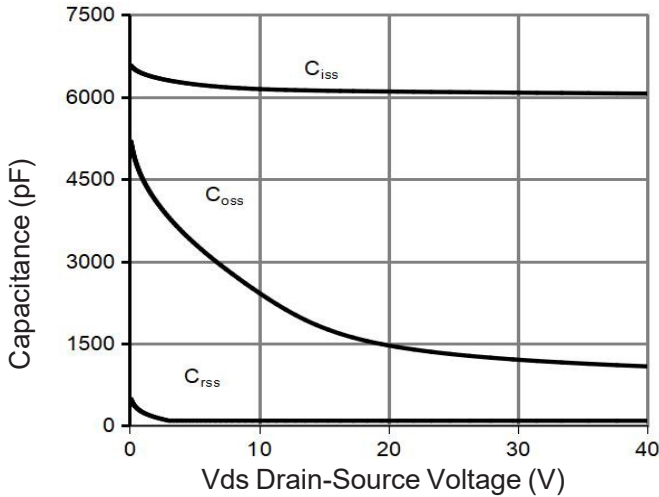
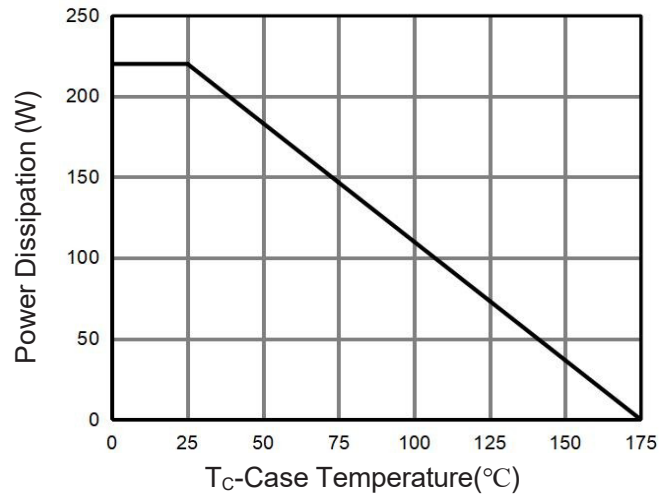
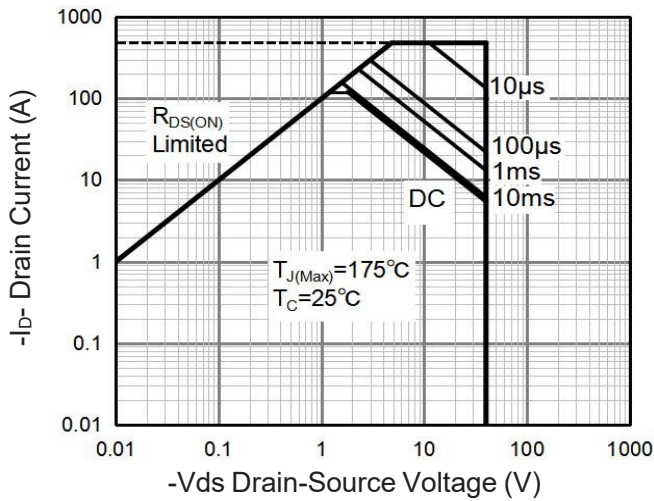
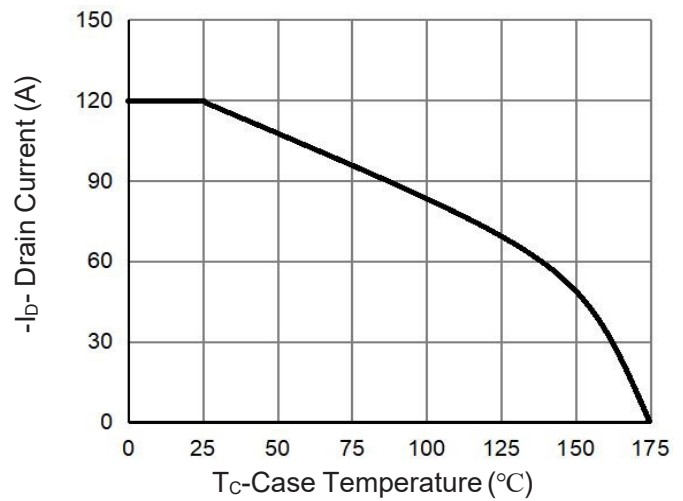
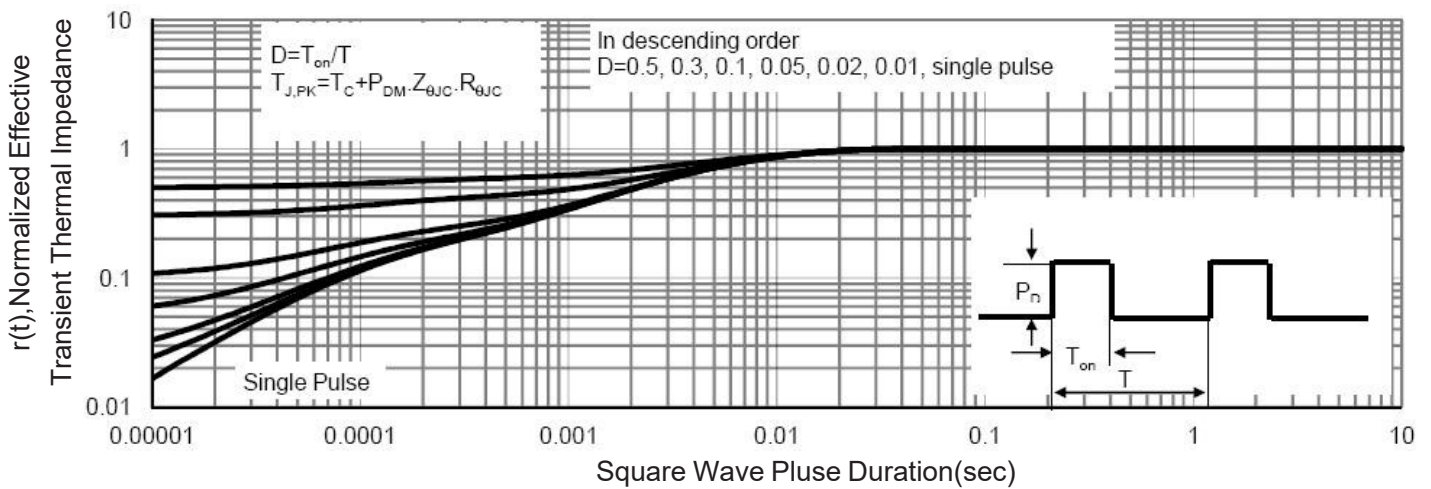
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-40		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-40V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =-250μA	-1.0	-1.6	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-20A	-	4.55	5.45	mΩ
		V _{GS} =-4.5V, I _D =-20A	-	7.0	8.5	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V,I _D =-40A	-	50	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-20V,V _{GS} =0V, F=1.0MHz	-	6100	-	PF
Output Capacitance	C _{oss}		-	1500	-	PF
Reverse Transfer Capacitance	C _{rss}		-	95	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-20V,I _D =-20A V _{GS} =-10V,R _G =1.6Ω	-	13	-	nS
Turn-on Rise Time	t _r		-	30	-	nS
Turn-Off Delay Time	t _{d(off)}		-	75	-	nS
Turn-Off Fall Time	t _f		-	14	-	nS
Total Gate Charge	Q _g	V _{DS} =-20V,I _D =-20A, V _{GS} =-10V	-	86	-	nC
Gate-Source Charge	Q _{gs}		-	17.5		nC
Gate-Drain Charge	Q _{gd}		-	10.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _S =-20A	-		-1.2	V
Diode Forward Current	I _S		-	-	-120	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =-60A	-	55	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	75	-	nC

Notes:

1. EAS condition : T_J=25°C, V_{DD}=-20V, V_G=-10V, L=0.5mH, R_G=25Ω
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 heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. The SOA curve provides a single pulse rating.

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