

Description

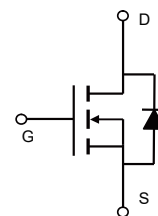
The series of devices uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency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

Application

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

General Features

- $V_{DS}=150V, I_D=180A$
 $R_{DS(ON)}=4.45m\Omega$, 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



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST15N040	VST15N040-T7	TO-247	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous ($T_c=25^\circ\text{C}$)	$I_D (T_c=25^\circ\text{C})$	180	A
Drain Current-Continuous($T_c=100^\circ\text{C}$)	$I_D (T_c=100^\circ\text{C})$	126	A
Pulsed Drain Current	I_{DM}	720	A
Maximum Power Dissipation ($T_c=25^\circ\text{C}$)	$P_D (T_c=25^\circ\text{C})$	360	W
Derating factor		2.4	W/°C
Single pulse avalanche energy (Note 1)	E_{AS}	1750	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.42	°C/W
Thermal Resistance, Junction-to-Ambient (Note 4)	$R_{\theta JA}$	40	°C/W

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

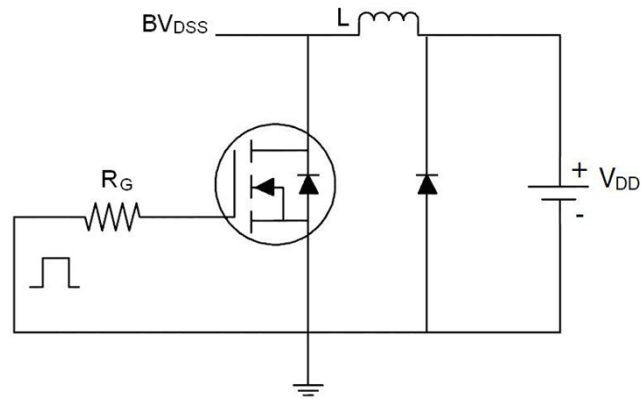
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	150		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =150V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
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	-	4.45	5.0	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =20A	70	-	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =75V, V _{GS} =0V, F=1.0MHz	-	7100	-	pF
Output Capacitance	C _{oss}		-	890	-	pF
Reverse Transfer Capacitance	C _{rss}		-	30	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =75V, I _D =20A V _{GS} =10V, R _G =4.7Ω	-	36	-	nS
Turn-on Rise Time	t _r		-	40	-	nS
Turn-Off Delay Time	t _{d(off)}		-	60	-	nS
Turn-Off Fall Time	t _f		-	30	-	nS
Total Gate Charge	Q _g	V _{DS} =75V, I _D =20A, V _{GS} =10V	-	97	-	nC
Gate-Source Charge	Q _{gs}		-	32.5	-	nC
Gate-Drain Charge	Q _{gd}		-	22.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _F =20A	-		1.2	V
Diode Forward Current	I _S		-	-	180	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs	-	160		nS
Reverse Recovery Charge	Q _{rr}		-	720		nC

Notes:

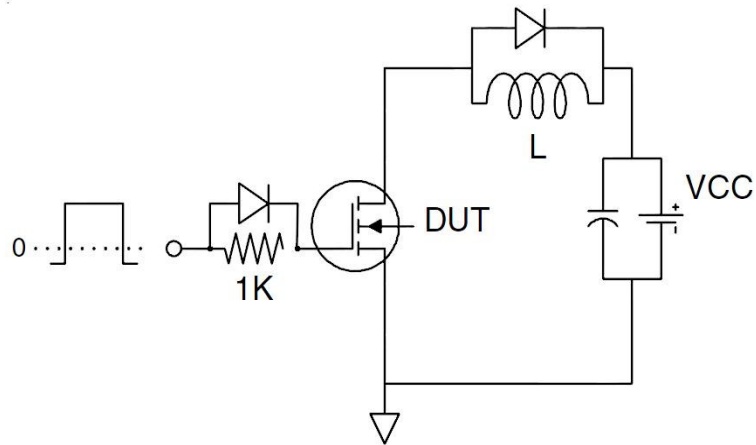
1. EAS condition : T_J=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. The SOA curve provides a single pulse rating.
4. The value of R_{θJA} is measured in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

Test Circuit

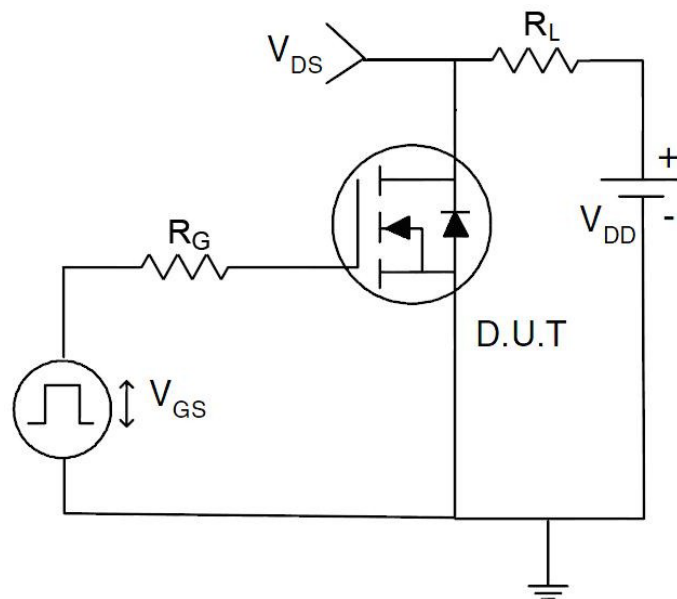
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

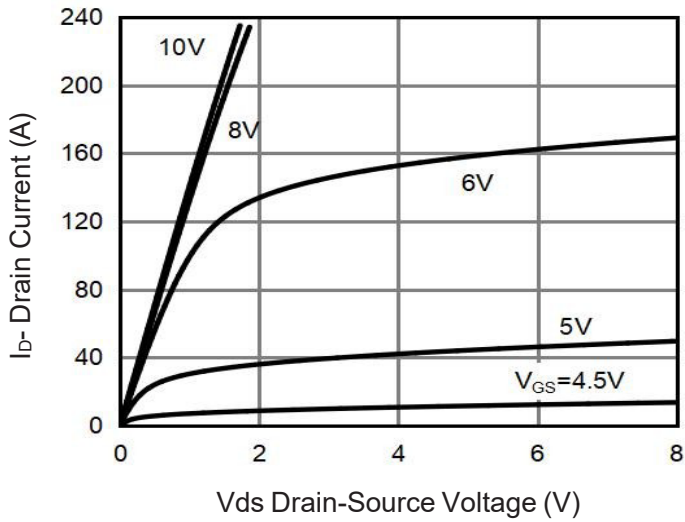


Figure 1 Output Characteristics

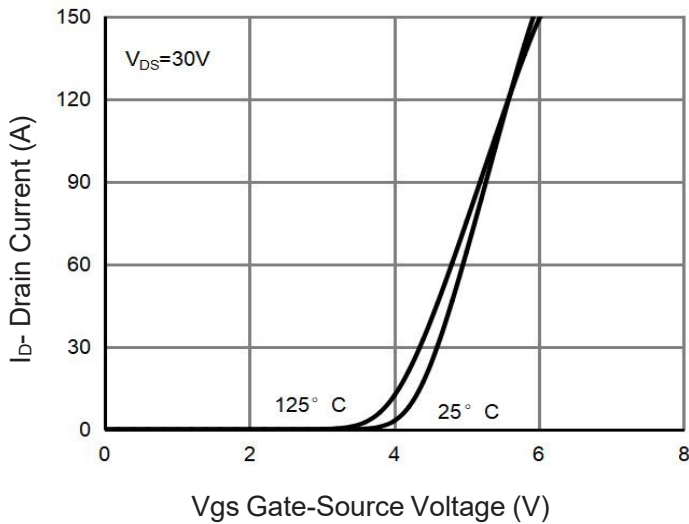


Figure 2 Transfer Characteristics

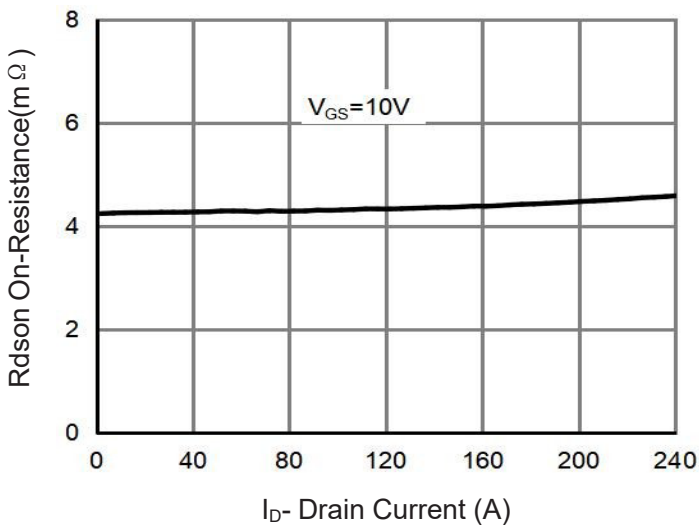


Figure 3 Rdson- Drain Current

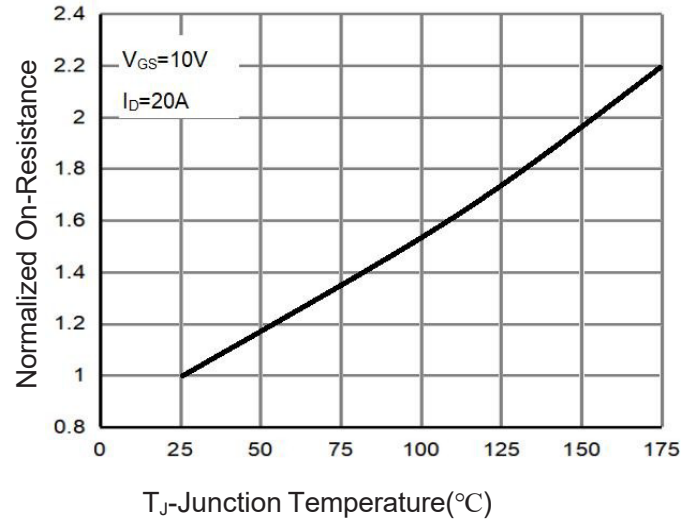


Figure 4 Rdson-Junction Temperature

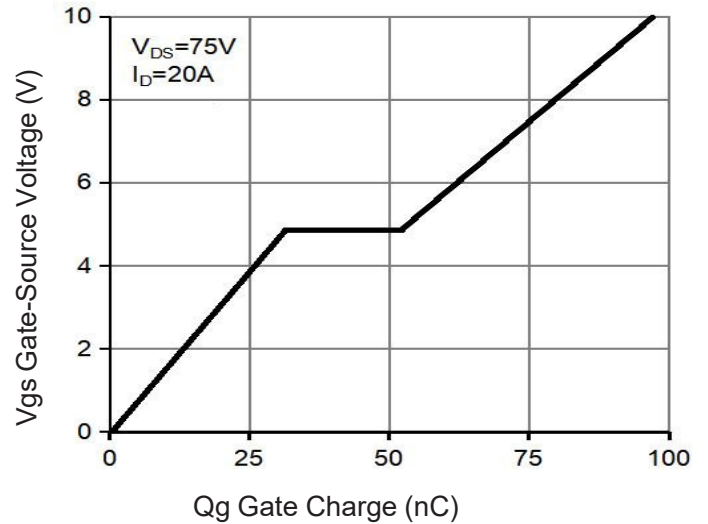


Figure 5 Gate Charge

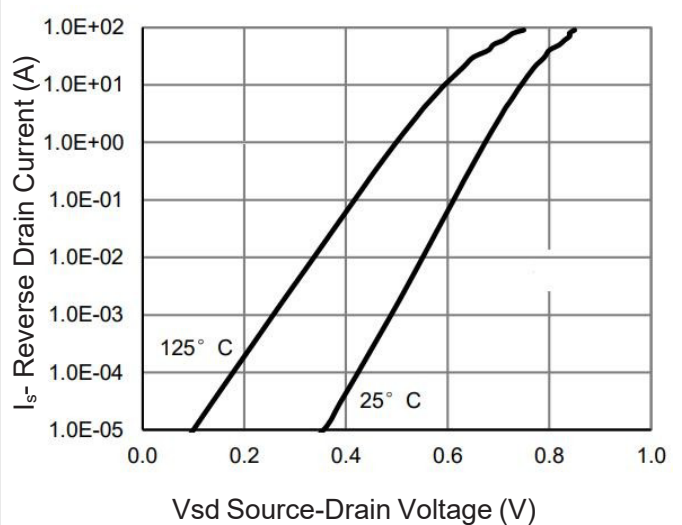
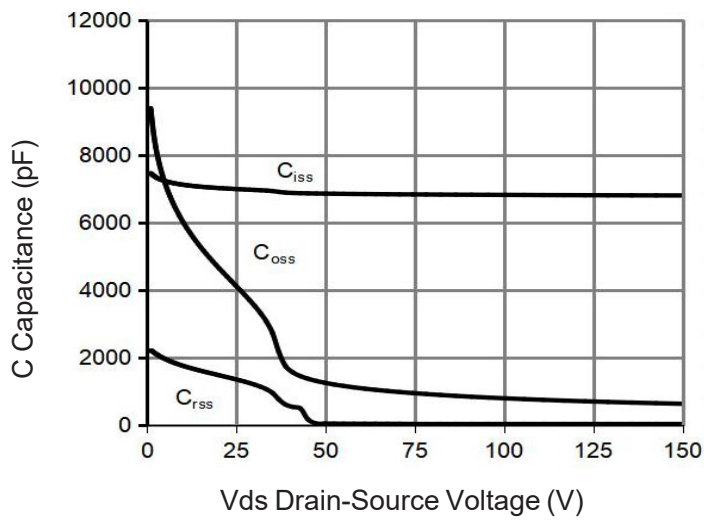
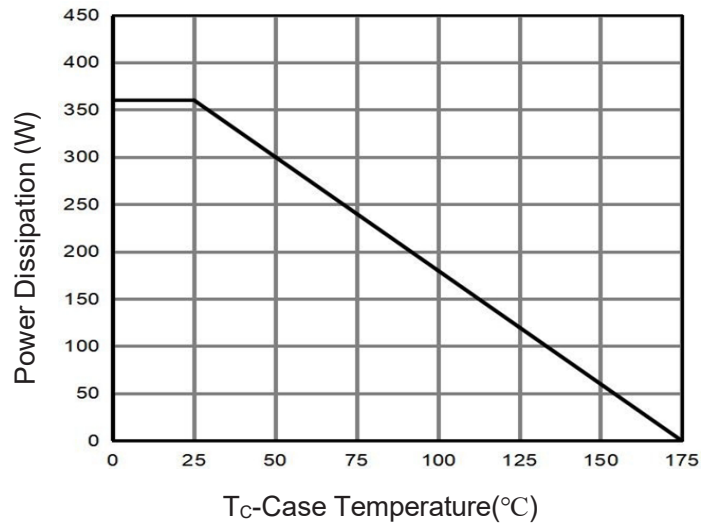
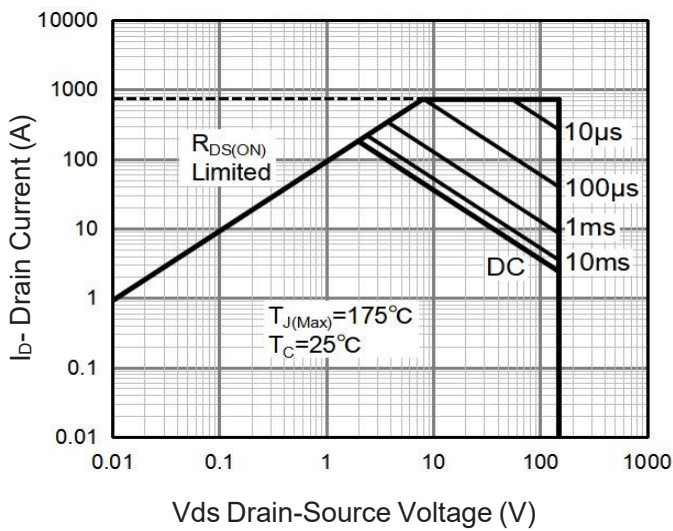
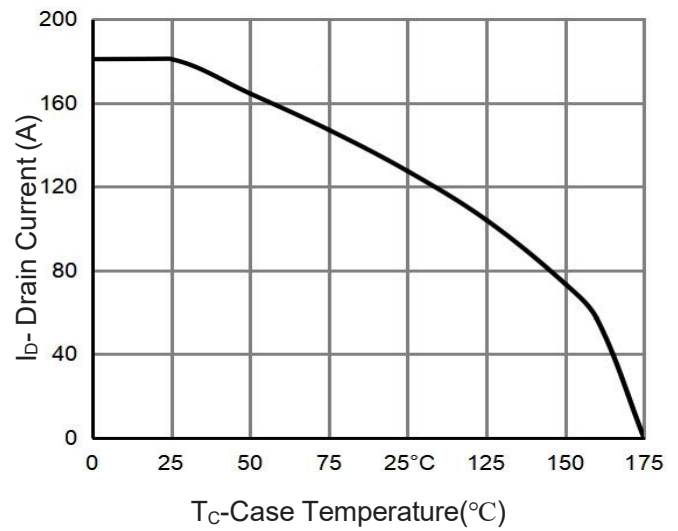
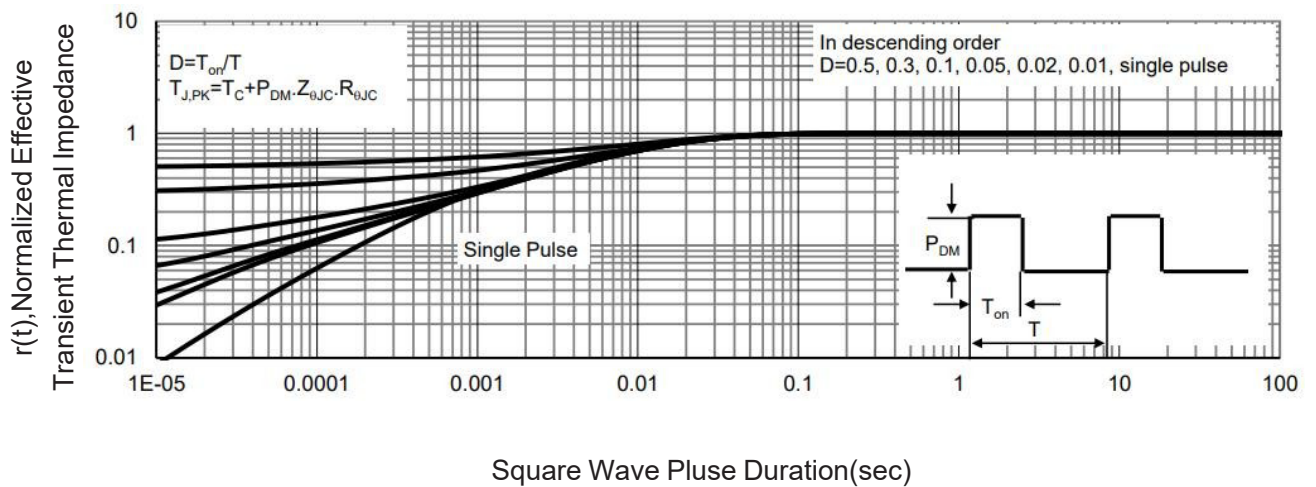


Figure 6 Source- Drain Diode Forward


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