

VCRR P-Channel Super Trench Power MOSFET

Description

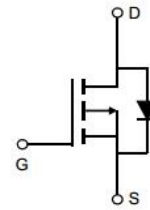
The VCRR01P35A uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(on)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

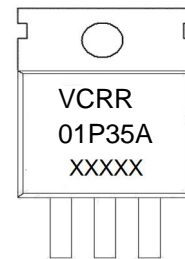
- $V_{DS} = -100V, I_D = -35A$
 $R_{DS(on)} = 35m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(on)} = 40m\Omega$ (typical) @ $V_{GS} = -4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

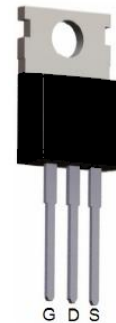
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic Diagram



Marking and pin assignment



TO-220 -3Ltop view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VCRR01P35A		TO-220-3L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-35	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	-24.5	A
Pulsed Drain Current	I_{DM}	140	A
Maximum Power Dissipation	P_D	150	W
Derating factor		1.0	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	320	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.0	$^{\circ}\text{C/W}$
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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}	$V_{GS}=0V, I_D=-250\mu A$	-100		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-100V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.7	-2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A$	-	35	48	m Ω
		$V_{GS}=-4.5V, I_D=-20A$	-	40	56	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	-	20	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	3445	-	PF
Output Capacitance	C_{oss}		-	260	-	PF
Reverse Transfer Capacitance	C_{rss}		-	14	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-50V, I_D=-20A$ $V_{GS}=-10V, R_G=1.6\Omega$	-	12.5	-	nS
Turn-on Rise Time	t_r		-	10	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	45	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	$V_{DS}=-50V, I_D=-20A,$ $V_{GS}=-10V$	-	46	-	nC
Gate-Source Charge	Q_{gs}		-	10.5	-	nC
Gate-Drain Charge	Q_{gd}		-	4.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-20A$	-		-1.2	V
Diode Forward Current	I_S		-	-	-35	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = -20A$ $di/dt = 100A/\mu s$	-	50	-	nS
Reverse Recovery Charge	Q_{rr}		-	90	-	nC

Notes:

1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=-50V, V_G=-10V, L=0.5\text{mH}, R_G=25\Omega$
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 heatsink, assuming a maximum junction temperature of $T_J(\text{MAX})=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

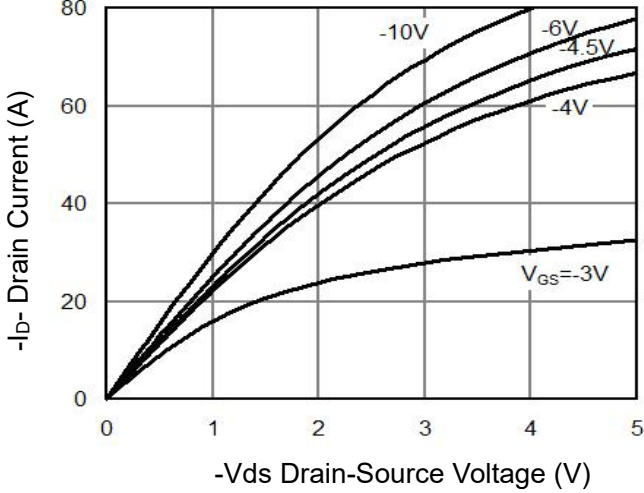


Figure 1 Output Characteristics

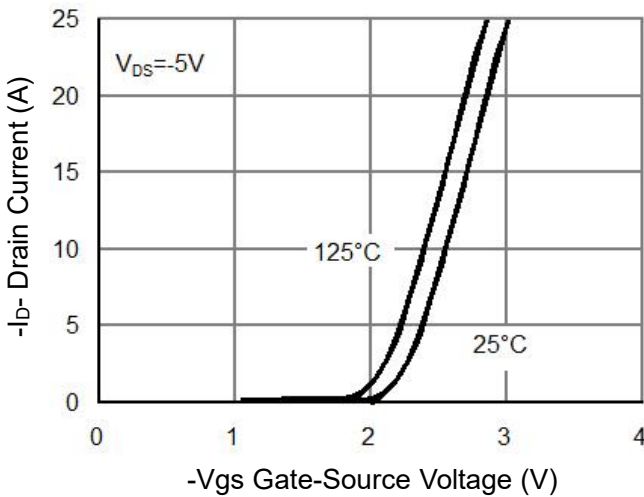


Figure 2 Transfer Characteristics

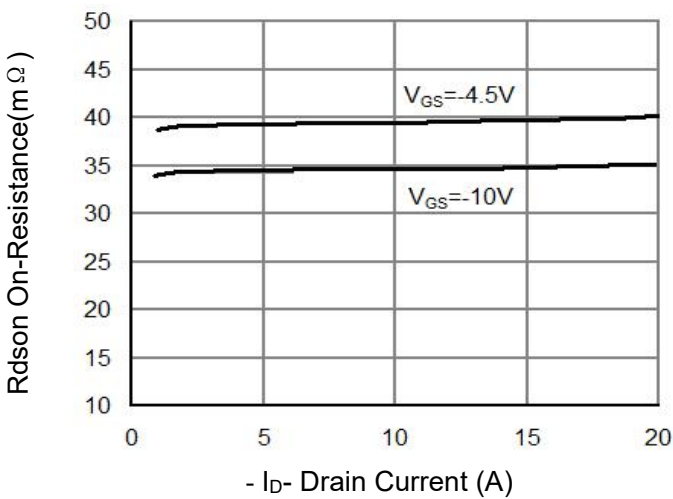


Figure 3 Rdson- Drain Current

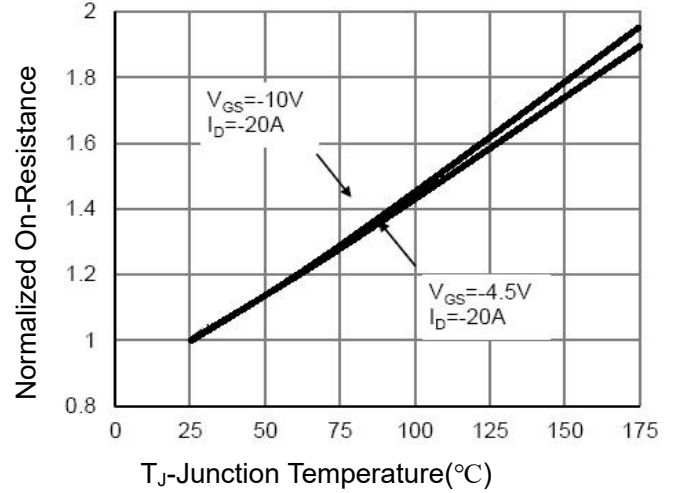


Figure 4 Rdson-Junction Temperature

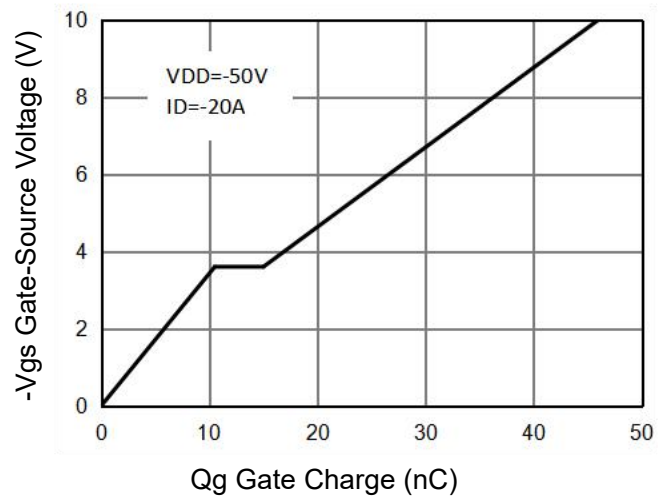


Figure 5 Gate Charge

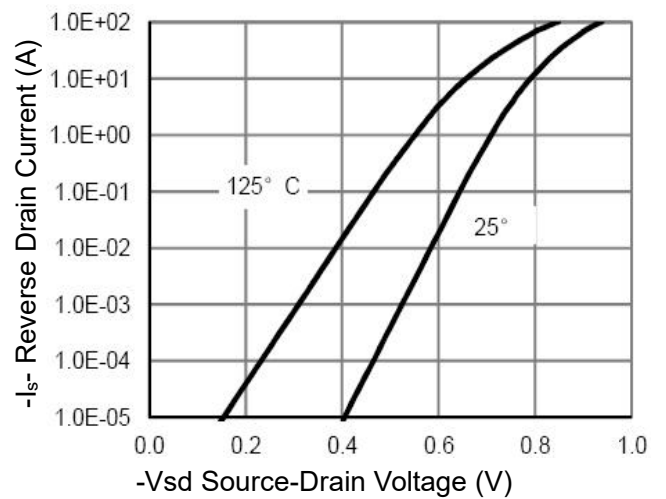


Figure 6 Source- Drain Diode Forward

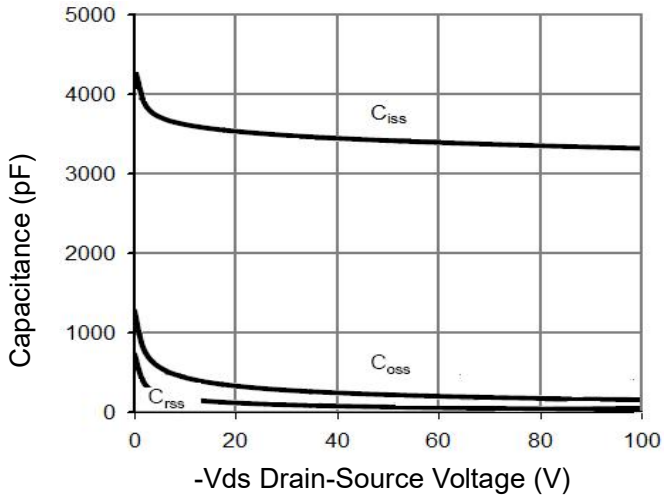


Figure 7 Capacitance vs Vds

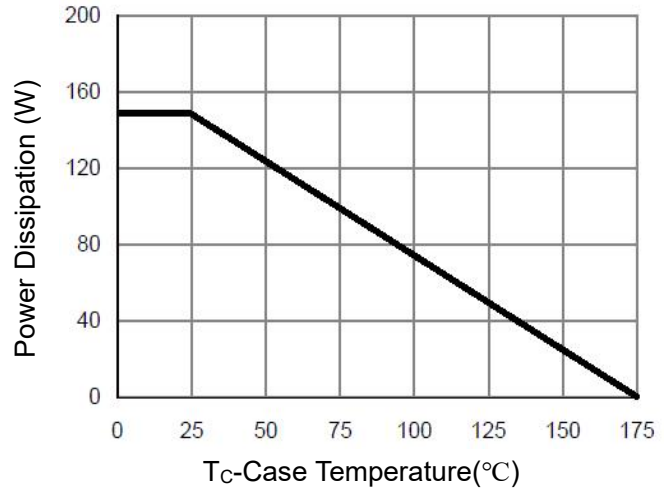


Figure 9 Power De-rating

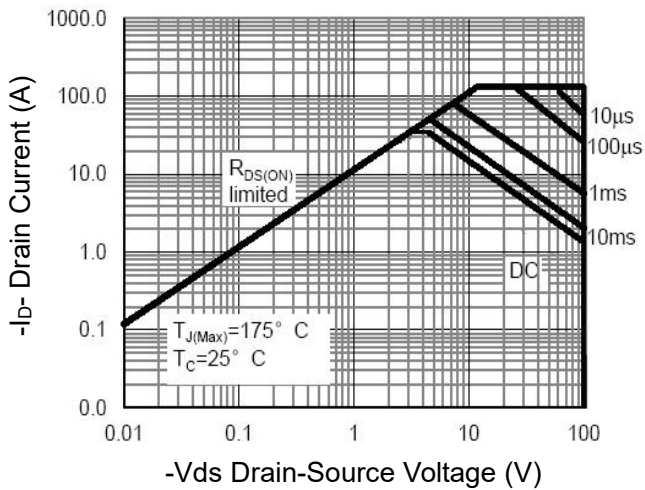


Figure 8 Safe Operation Area (Note 3)

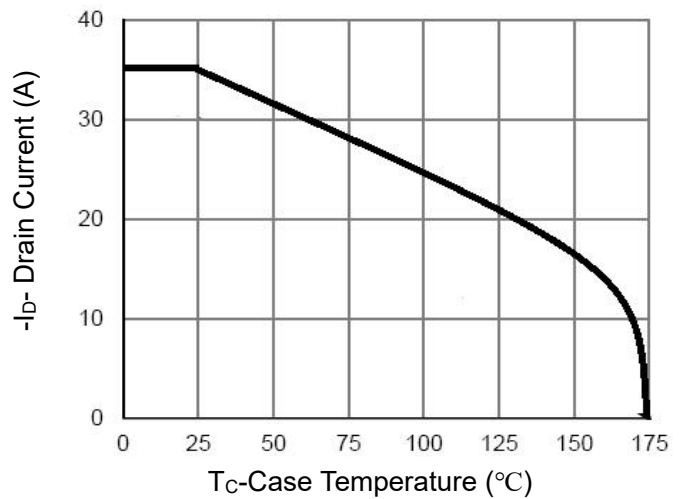


Figure 10 Current De-rating

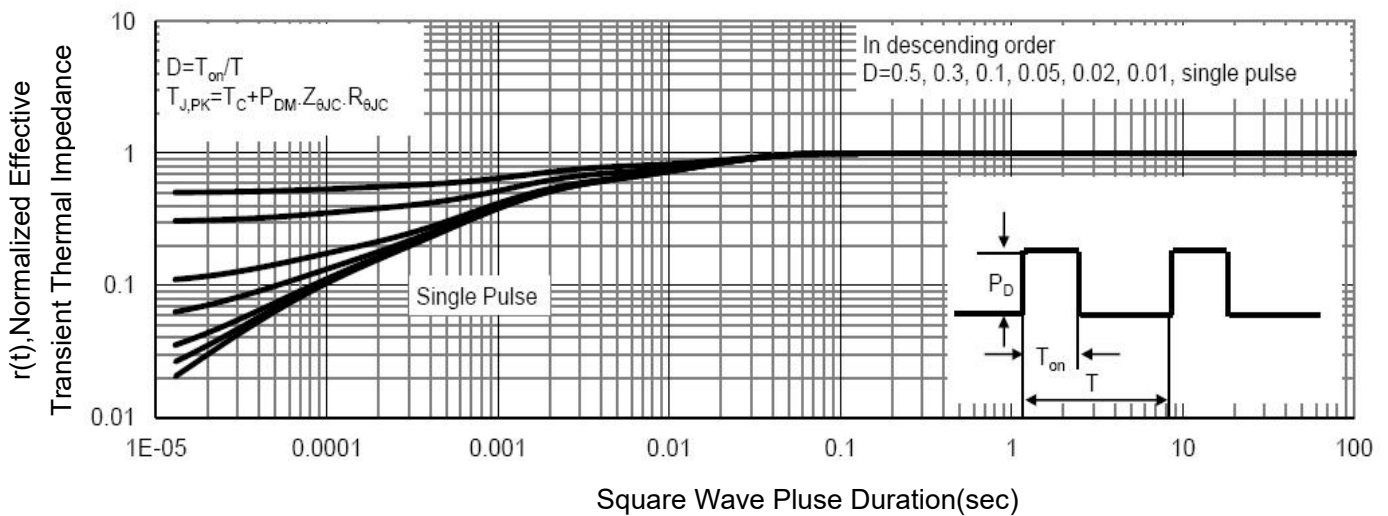
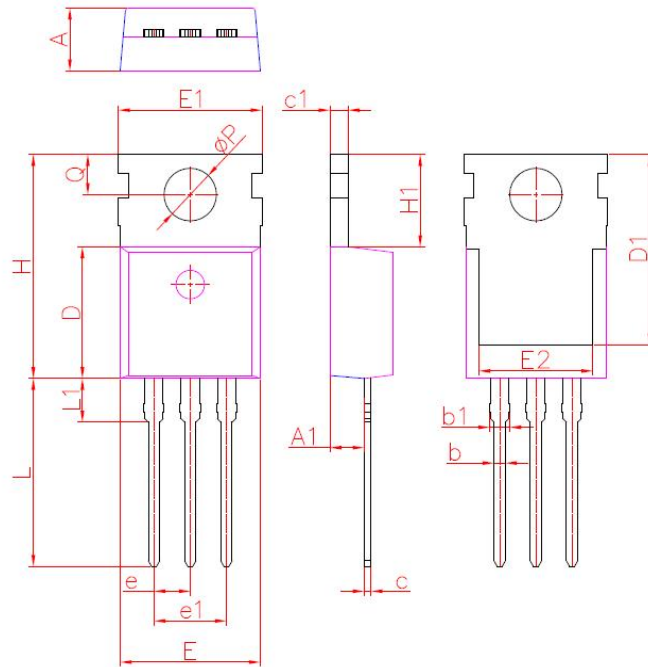


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



T0220			
DIM.	MIN.	NOM.	MAX.
A	4.20	4.40	4.60
A1	2.25	2.40	2.55
b	0.70	0.80	0.90
b1	1.17	1.27	1.37
c	0.33	0.50	0.65
c1	1.20	1.30	1.40
D	8.95	9.20	9.75
D1	13.10	13.30	13.50
E	9.74	9.84	10.04
E1	9.91	10.08	10.25
E2	7.90	8.00	8.10
e	2.54BSC		
e1	5.08BSC		
H	15.45	15.65	15.85
H1	6.30	6.45	6.60
L	12.90	13.13	13.40
L1	2.85	3.05	3.25
Q	2.65	2.80	2.95
ϕP	3.40	3.68	3.80
All dimensions in millimeters			

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