

### Description

The GC20N65T uses advanced super junction technology ar design to provide excellent  $R_{DS(ON)}$  and low gate charge. This device is suitable for industry AC-DC SMPS requirement of PFC, AC/DC power conversion, and other industrial power applications.

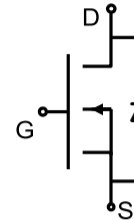
### General Features

- Optimized body diode reverse recovery performance
- Low on-resistance and low conduction losses
- Small Package
- Ultra Low Gate Charge cause lower driving requirement
- 100% Avalanche Tested
- RoHS Compliant

### Application

- Power Factor Correction (PFC)
- Switched Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- LLC Half-bridge

$V_{DS}$	$R_{DS(ON)}$ @ 10V (Typ)	$I_D$
650V	150m $\Omega$	20 A



Schematic Diagram



### Ordering Information

Part Number	Marking	Case	Packaging
GC20N65T	GC20N65	TO-220	50pcs/Tube

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current-Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	20	A
Drain Current-Continuous ( $T_C=100^\circ\text{C}$ )	$I_D$	12	A
Drain Current-Pulsed (Note 1)	$I_{DM}$	60	A
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	484	mJ
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	0.7	mJ
Avalanche Current (Note 1)	$I_{AR}$	3.5	A
Maximum Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	151	W
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 480\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} = 0 \dots 480\text{V}$ , $I_{SD} \leq I_D$	di <sub>F</sub> /dt	15	V/ $\mu\text{s}$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ\text{C}$

### Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance,Junction-to-Case	$R_{thJC}$	0.83	$^{\circ}C/W$
Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{thJA}$	62	$^{\circ}C/W$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/ Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
Zero Gate Voltage Drain Current ( $T_C=25^{\circ}C$ )	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	-	-	1	$\mu A$
Zero Gate Voltage Drain Current ( $T_C=125^{\circ}C$ )	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	-	-	100	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	-	4.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	-	150	170	m $\Omega$
Gate resistance	$R_G$	f = 1.0MHz open drain	-	12	-	$\Omega$
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=100V, V_{GS}=0$ V, F=1.0MHz	-	1724	-	PF
Output Capacitance	$C_{oss}$		-	61	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	6	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=20A$ $V_{GS}=10V, R_{GEN}=25\Omega$	-	15	-	ns
Turn-on Rise Time	$t_r$		-	59	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	121	-	ns
Turn-Off Fall Time	$t_f$		-	44	-	ns
Total Gate Charge	$Q_g$	$V_{DD}=520V, I_D=20A, V_{GS}=10V$	-	39	-	nC
Gate-Source Charge	$Q_{gs}$		-	8	-	nC
Gate-Drain Charge	$Q_{gd}$		-	15	-	nC
<b>Drain-Source Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C=25^{\circ}C$	-	-	20	A
Pulsed Diode Forward Current	$I_{SM}$	$T_C=25^{\circ}C$	-	-	60	A
Diode Forward Voltage	$V_{SD}$	$T_J=25^{\circ}C,$ $I_{SD}=20A, V_{GS}=0V$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$V_R=400V, I_F=I_S,$ $di_F/dt = 100A/\mu s$	-	423	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	5.3	-	$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$		-	25	-	A

### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2.  $I_{AS} = 3.5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}C$
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$ .
4. Guaranteed by design, not subject to production

Typical Electrical And Thermal Characteristics

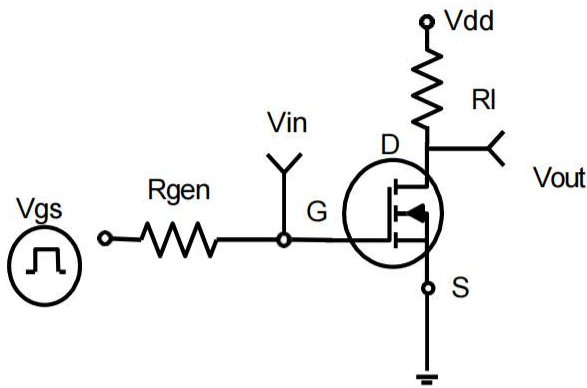


Figure 1. Switching Test Circuit

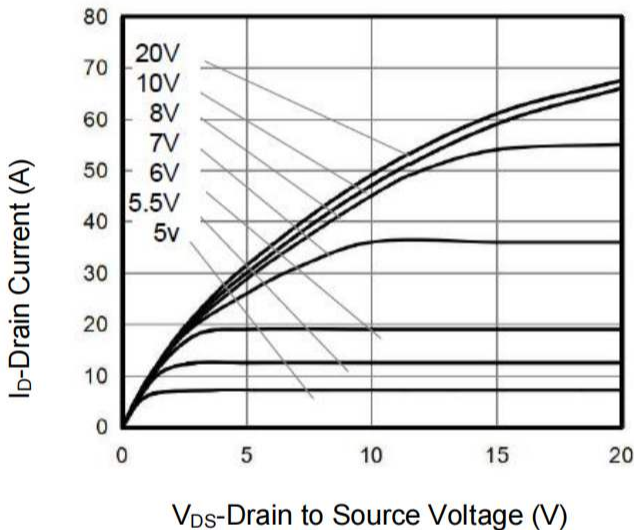


Figure 3. Output Characteristics

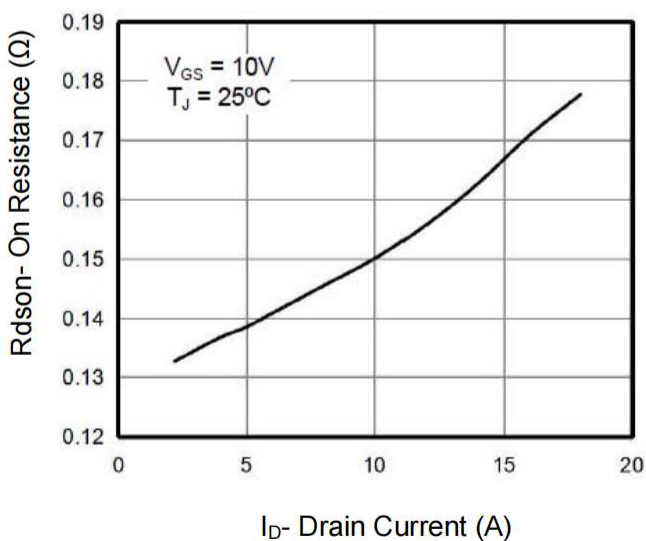


Figure 5. On Resistance vs. Drain Current

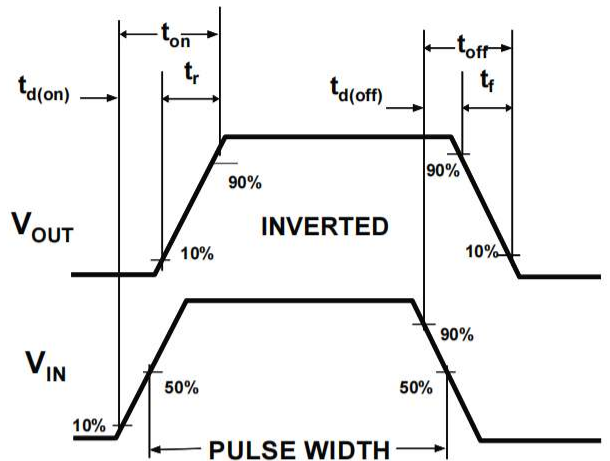


Figure 2. Switching Waveforms

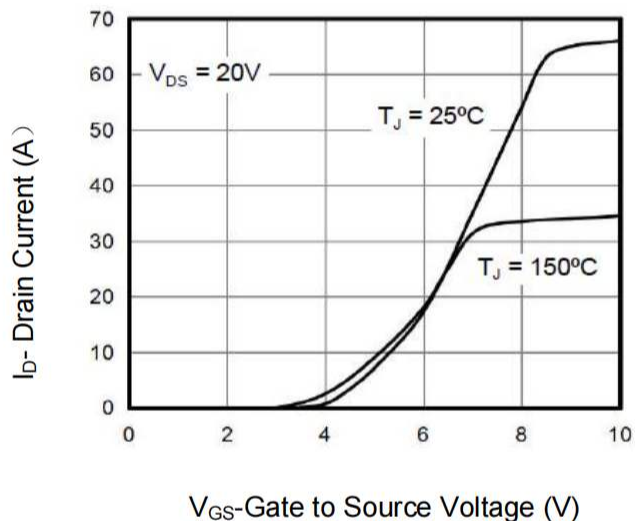


Figure 4. Transfer Characteristics

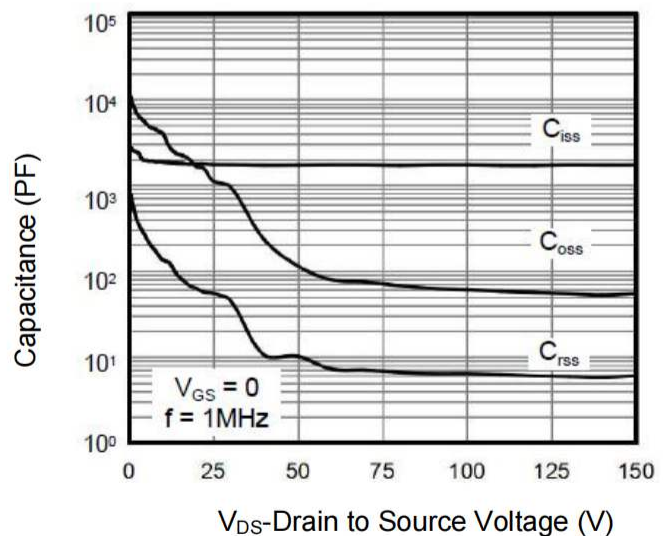


Figure 6. Capacitance

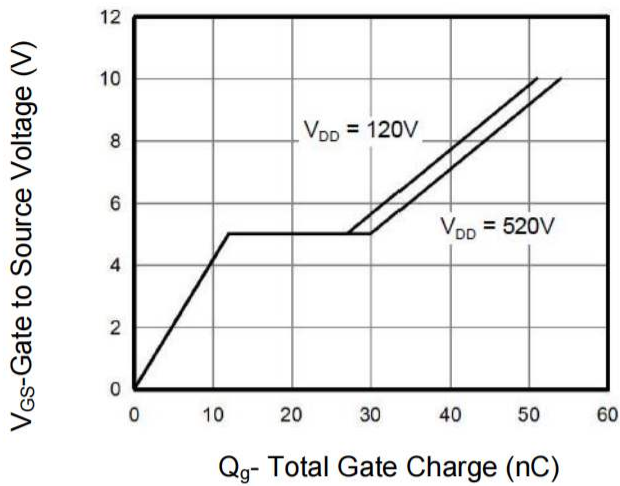


Figure 7. Gate Charge

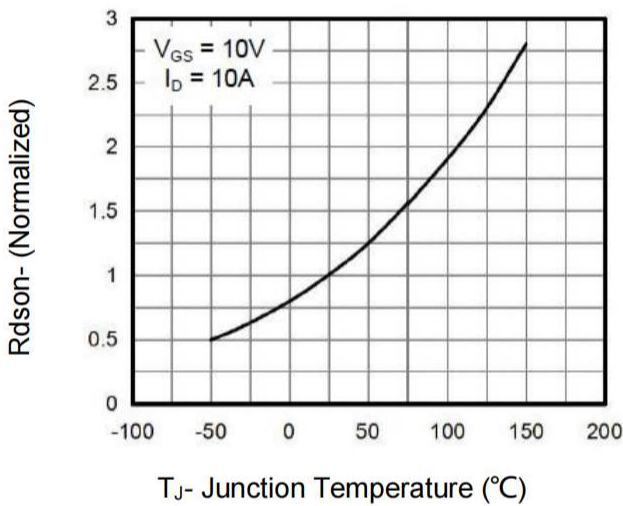


Figure 9. On- Resistance vs. Junction Temperature

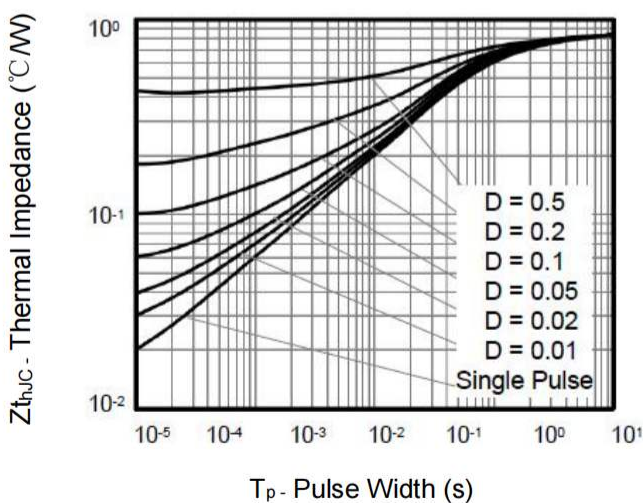


Figure 11. Transient Thermal Impedance

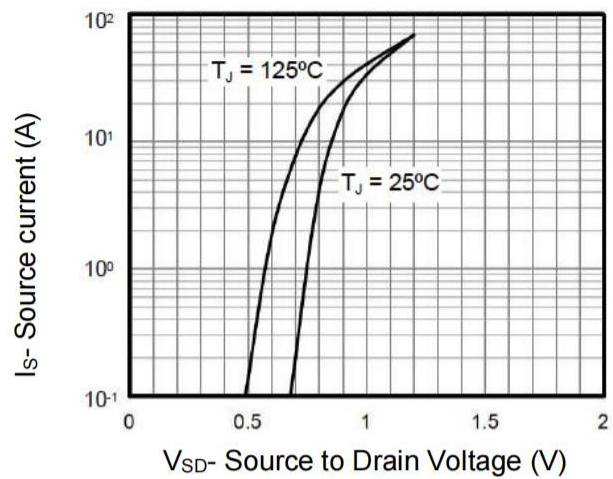


Figure 8. Body Diode Forward Voltage

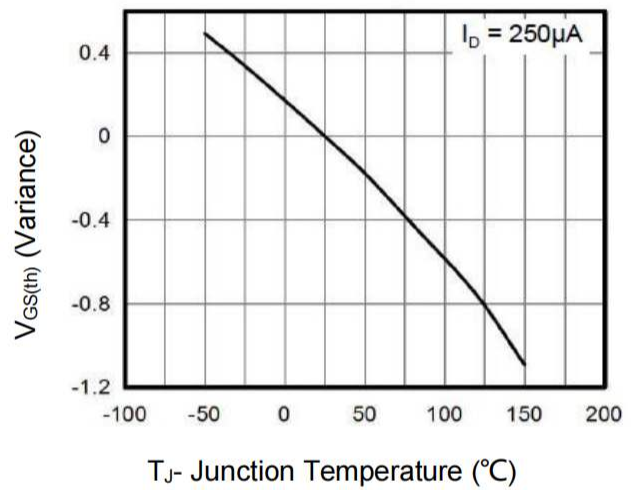


Figure 10. Threshold Voltage vs. Junction Temperature

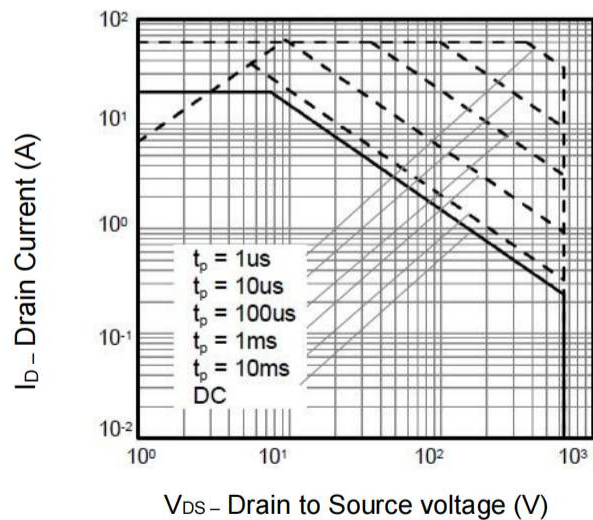


Figure 12. Safe Operation Area

