



# STP20NE10

## N - CHANNEL 100V - 0.07Ω - 20A - TO-220 STripFET™ MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP20NE10	100 V	< 0.1 Ω	20 A

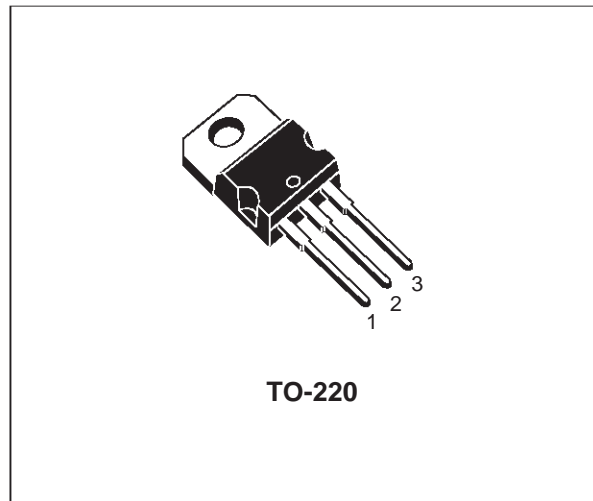
- TYPICAL R<sub>DS(on)</sub> = 0.07 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

### DESCRIPTION

This Power MOSFET is the latest development of SGS-THOMSON unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### APPLICATIONS

- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC CONVERTERS
- AUTOMOTIVE ENVIRONMENT



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	100	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	100	V
V <sub>GS</sub>	Gate-source Voltage	± 20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	20	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	14	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	80	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	90	W
	Derating Factor	0.6	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	7	V/ns
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 20 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

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## THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.67	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.5	°C/W
T <sub>J</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

## AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>J</sub> max, δ < 1%)	20	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>J</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 30 V)	170	mJ

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0	100			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating T <sub>c</sub> = 125 °C			1 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			± 100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 10 A		0.07	0.1	Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	20			A

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> I <sub>D</sub> = 10 A	6			S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		1600	2100	pF
C <sub>oss</sub>	Output Capacitance			180	250	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			50	70	pF

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 30\text{ V}$ $I_D = 10\text{ A}$		17	23	ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		37	50	ns
$Q_g$	Total Gate Charge	$V_{DD} = 80\text{ V}$ $I_D = 20\text{ A}$ $V_{GS} = 10\text{ V}$		38	50	nC
$Q_{gs}$	Gate-Source Charge			10		nC
$Q_{gd}$	Gate-Drain Charge			12		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 80\text{ V}$ $I_D = 20\text{ A}$		11	15	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		18	25	ns
$t_c$	Cross-over Time			32	44	ns

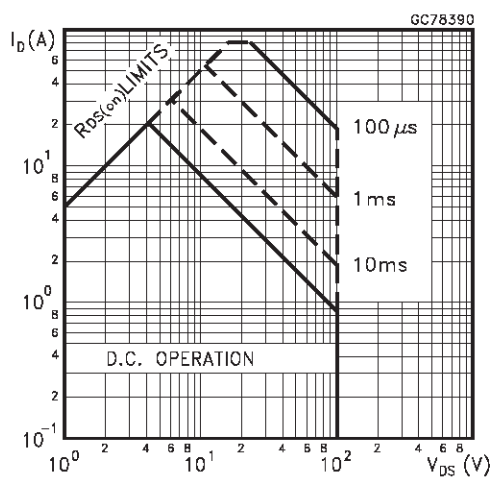
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				16	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				64	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 20\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 20\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		110		ns
$Q_{rr}$	Reverse Recovery Charge			440		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			8		A

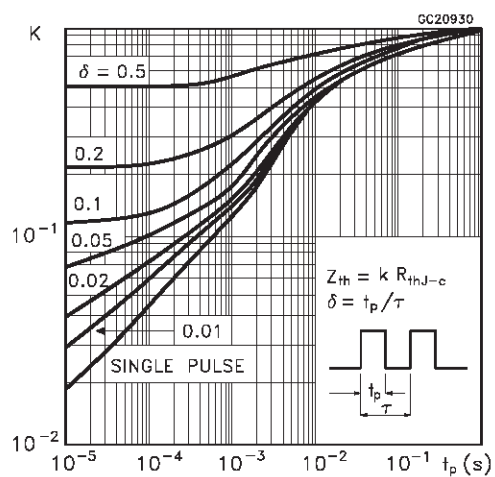
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

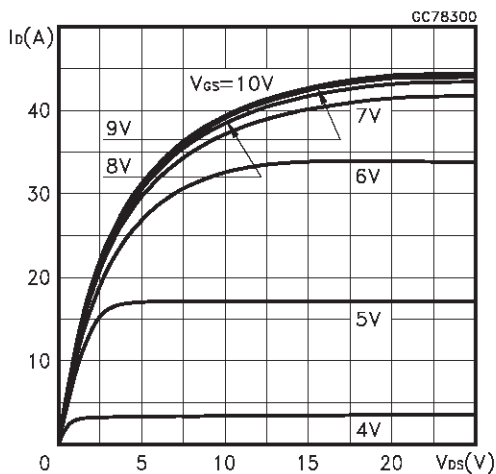
Safe Operating Area



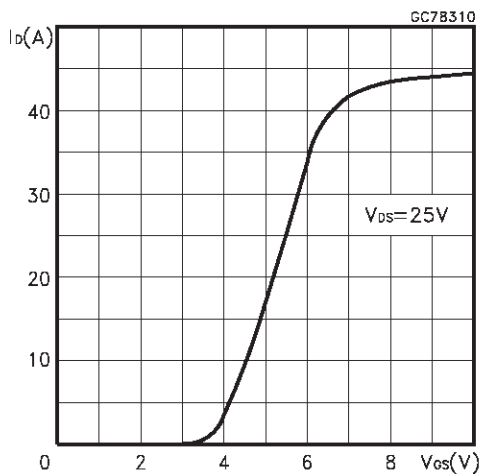
Thermal Impedance



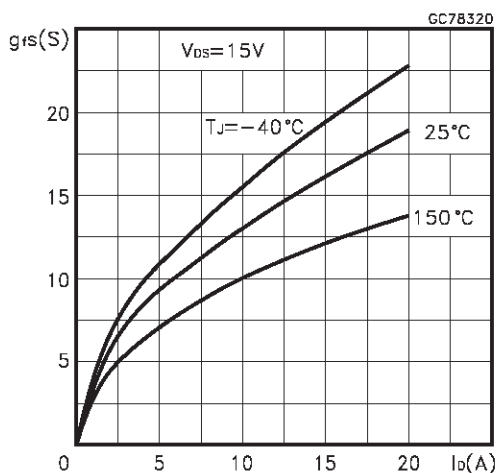
Output Characteristics



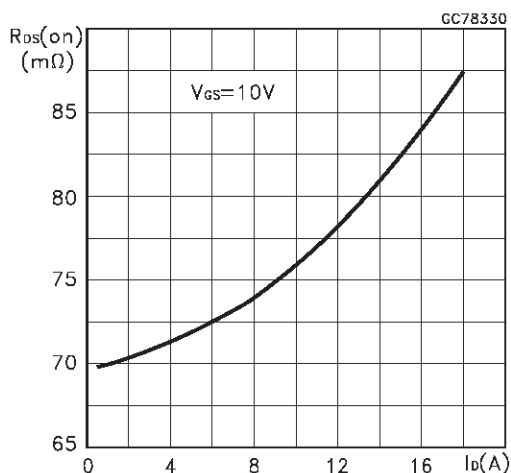
Transfer Characteristics



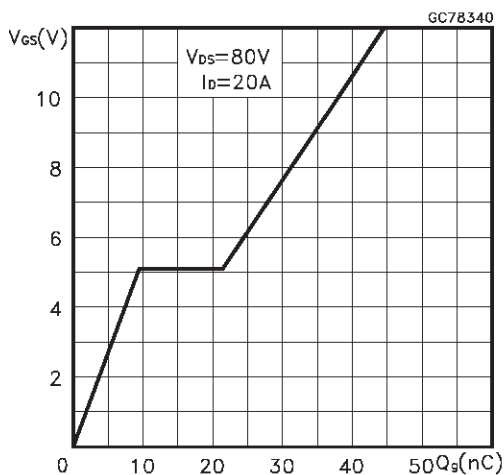
Transconductance



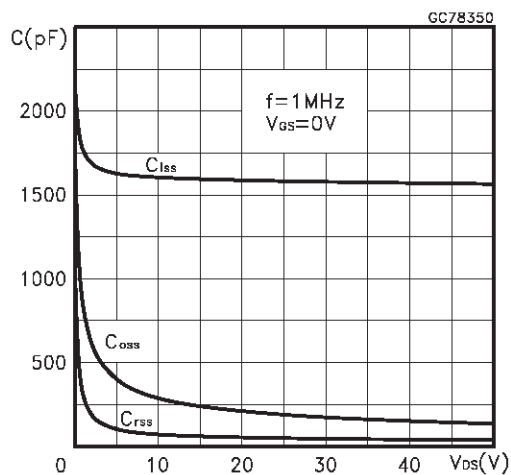
Static Drain-source On Resistance



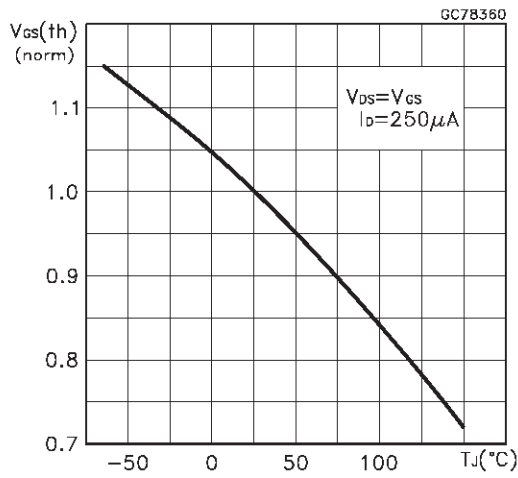
Gate Charge vs Gate-source Voltage



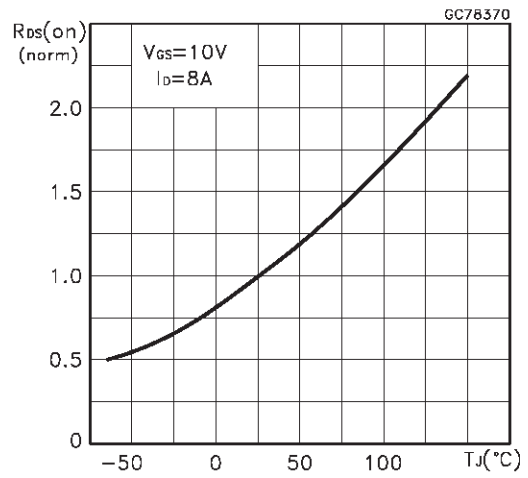
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

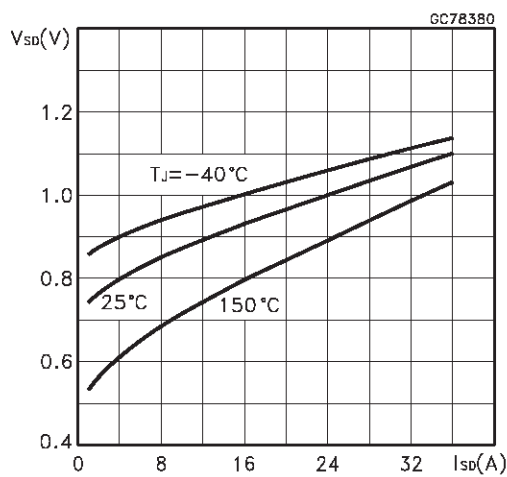


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

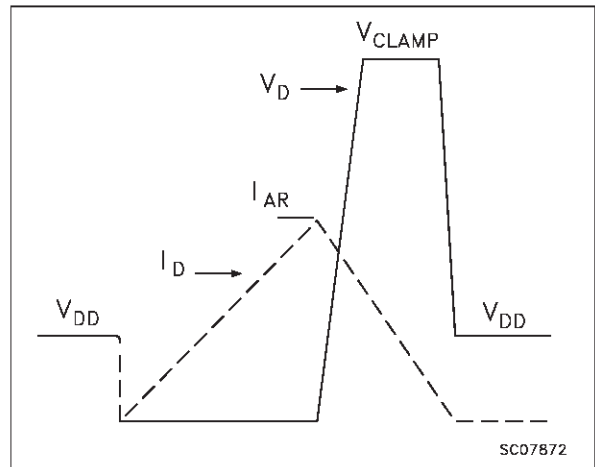


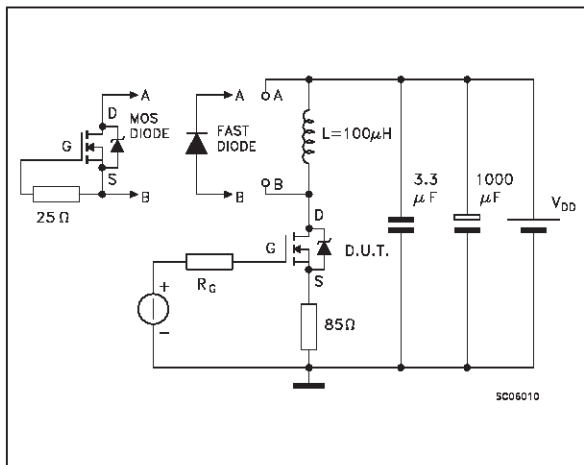
Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

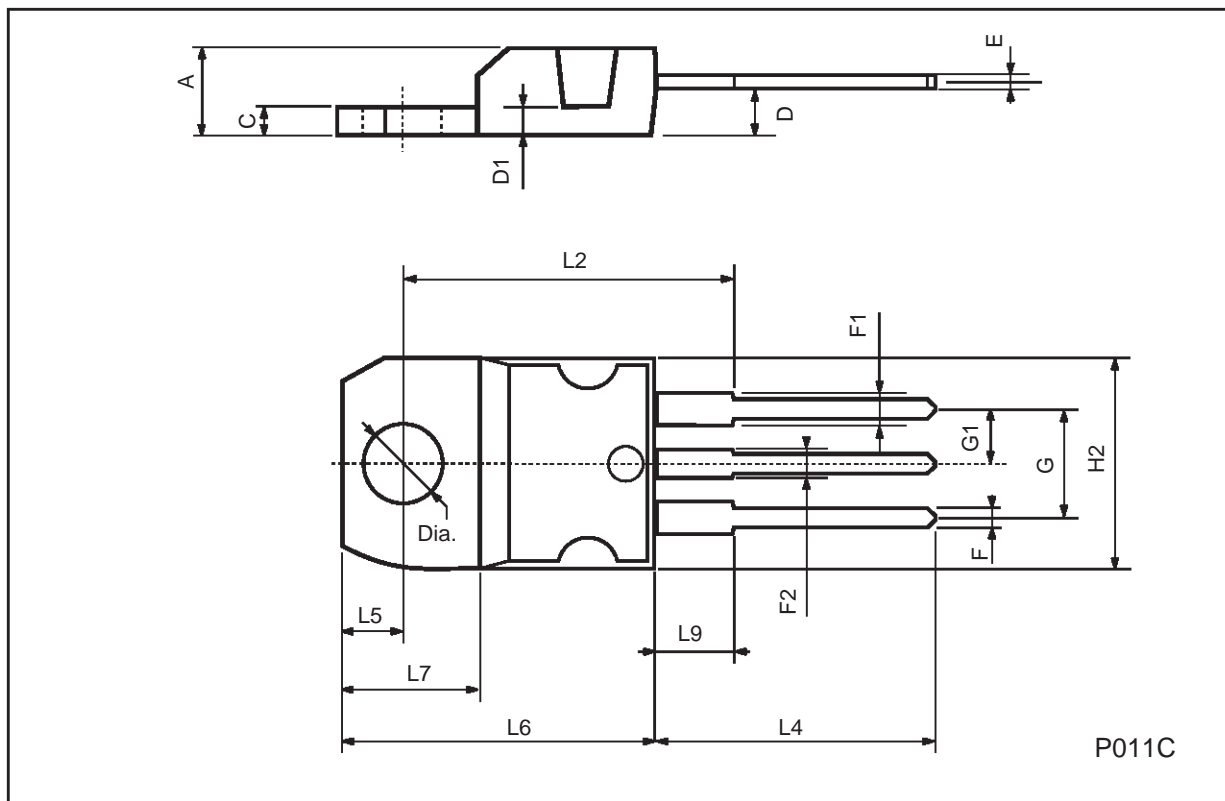


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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