



# STE180N10

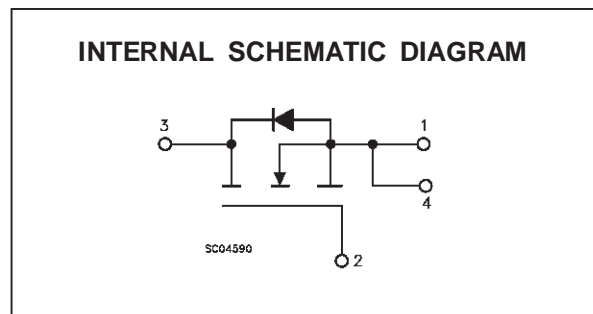
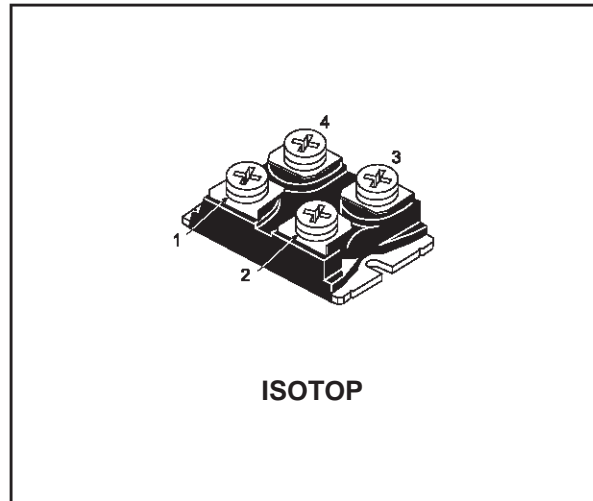
## N - CHANNEL 100V - 5.5 mΩ - 180A - ISOTOP POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STE180N10	100 V	< 7 mΩ	180 A

- TYPICAL R<sub>DS(on)</sub> = 5.5 mΩ
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

### INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



### 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	180	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	119	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	540	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	450	W
	Derating Factor	3.6	W/°C
V <sub>ISO</sub>	Insulation Withstand Voltage (AC-RMS)	2500	V
T <sub>stg</sub>	Storage Temperature	-55 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 180 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

## STE180N10

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.27	$^{\circ}\text{C}/\text{W}$
$R_{thc-h}$	Thermal Resistance Case-heatsink With conductive Grease Applied	Max	0.05	$^{\circ}\text{C}/\text{W}$

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)	60	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 25\text{ V}$ )	720	mJ

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 1\text{ mA}$ $V_{GS} = 0$	100			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}\text{C}$			50 500	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 400$	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 90\text{ A}$		5.5	7	$\text{m}\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	180			A

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 90\text{ A}$	70			S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		18		nF
$C_{oss}$	Output Capacitance			4		nF
$C_{rss}$	Reverse Transfer Capacitance			0.5		nF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 50\text{ V}$ $I_D = 90\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		65		ns
$t_r$	Rise Time			230		ns
$Q_g$	Total Gate Charge	$V_{DD} = 80\text{ V}$ $I_D = 180\text{ A}$ $V_{GS} = 10\text{ V}$		485	680	nC
$Q_{gs}$	Gate-Source Charge			90		nC
$Q_{gd}$	Gate-Drain Charge			210		nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off Delay Time	$V_{DD} = 50\text{ V}$ $I_D = 90\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		280		ns
$t_f$	Fall Time			100		ns
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 80\text{ V}$ $I_D = 180\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Inductive Load, see fig. 5)		100		ns
$t_f$	Fall Time			170		ns
$t_c$	Cross-over Time			260		ns

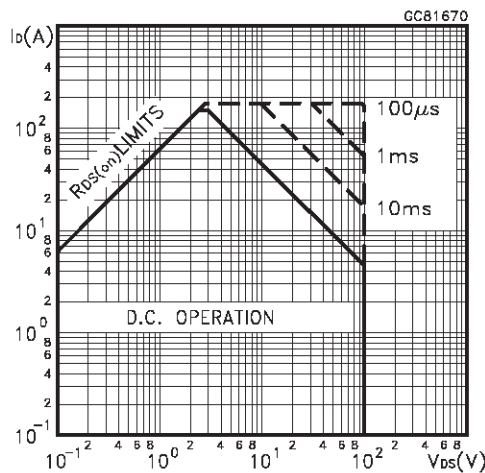
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				180	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				540	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 180\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 180\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5)		250		ns
$Q_{rr}$	Reverse Recovery Charge			1875		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			15		A

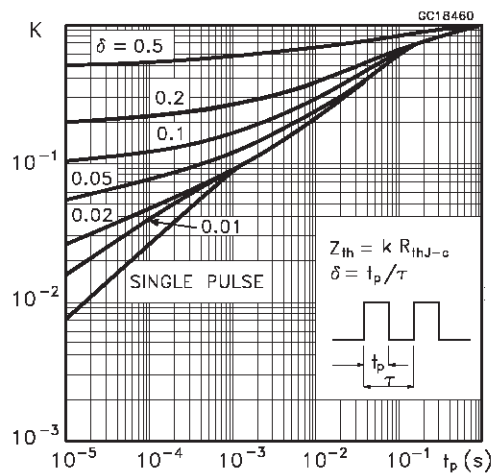
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

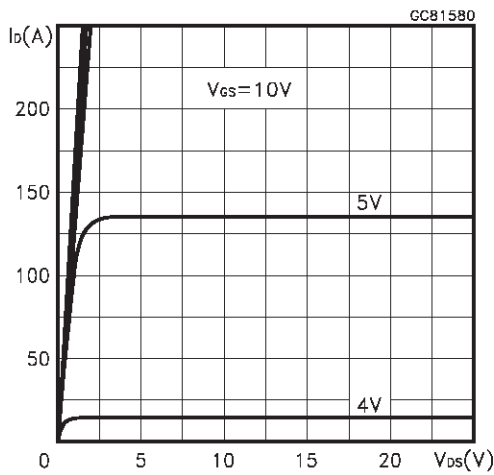
**Safe Operating Area**



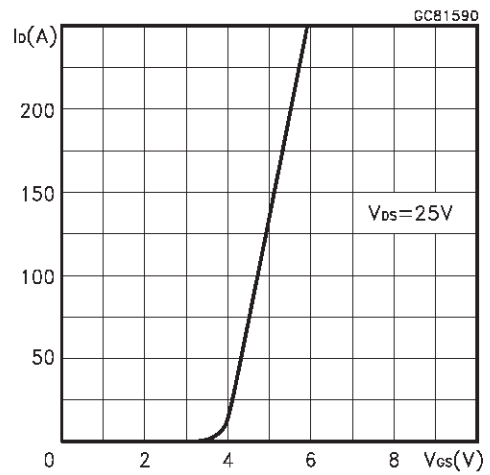
**Thermal Impedance**



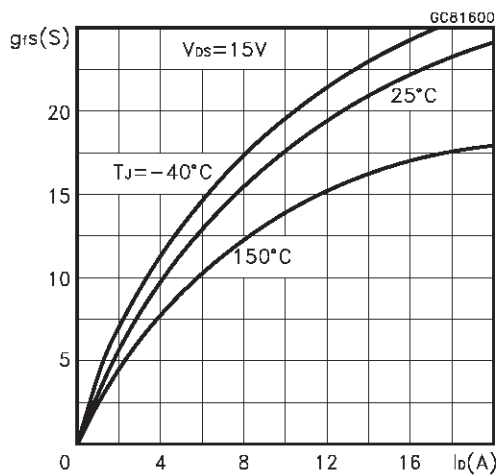
Output Characteristics



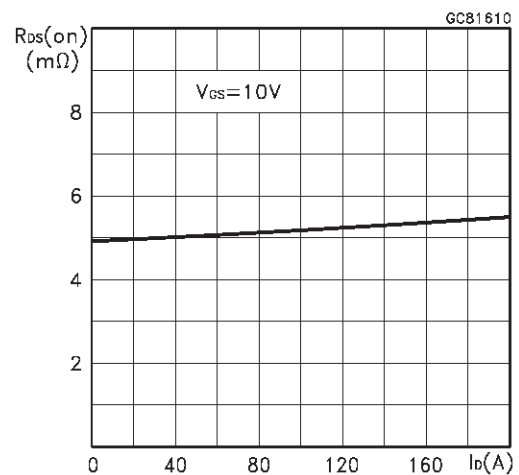
Transfer Characteristics



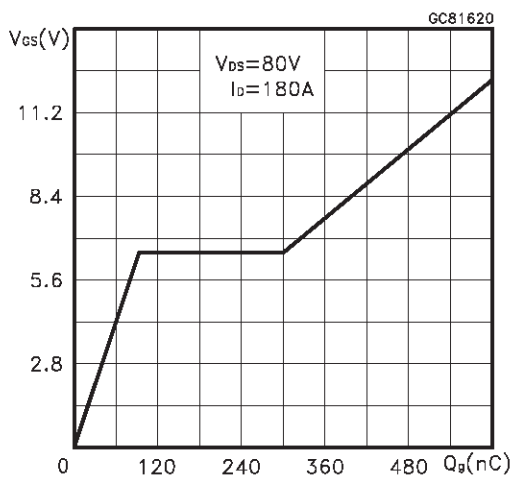
Transconductance



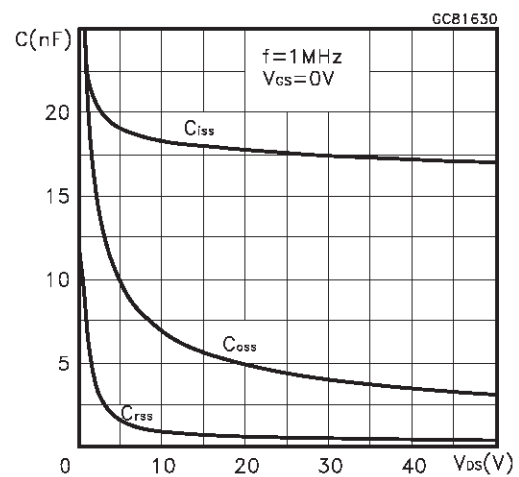
Static Drain-source On Resistance



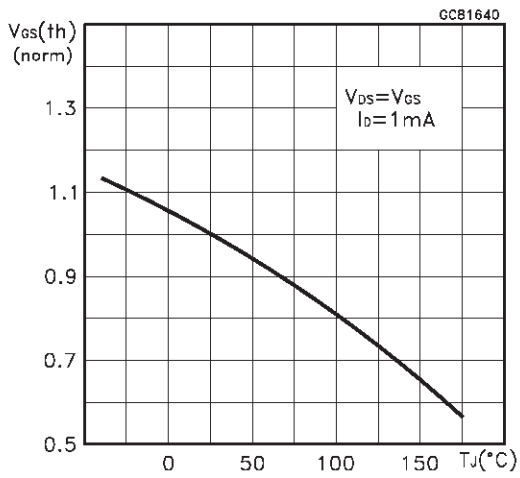
Gate Charge vs Gate-source Voltage



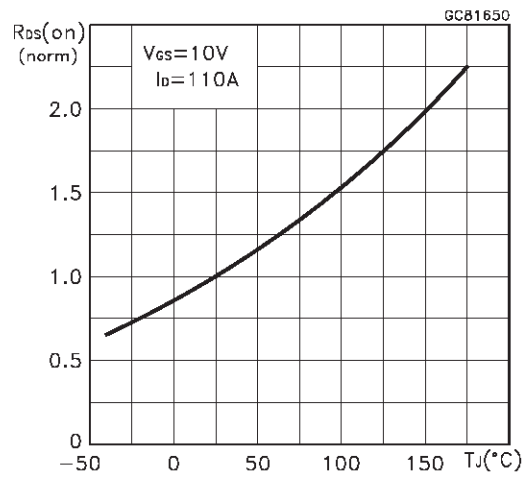
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

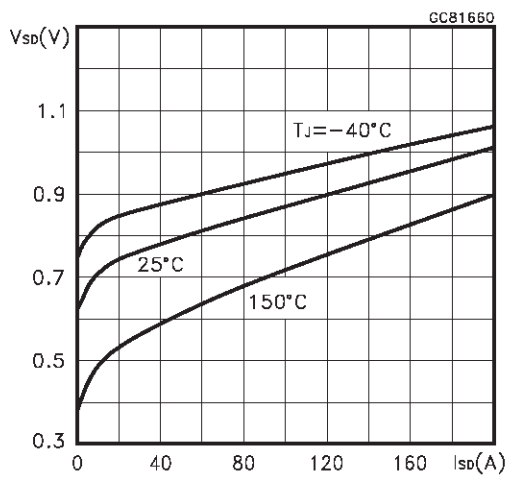


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

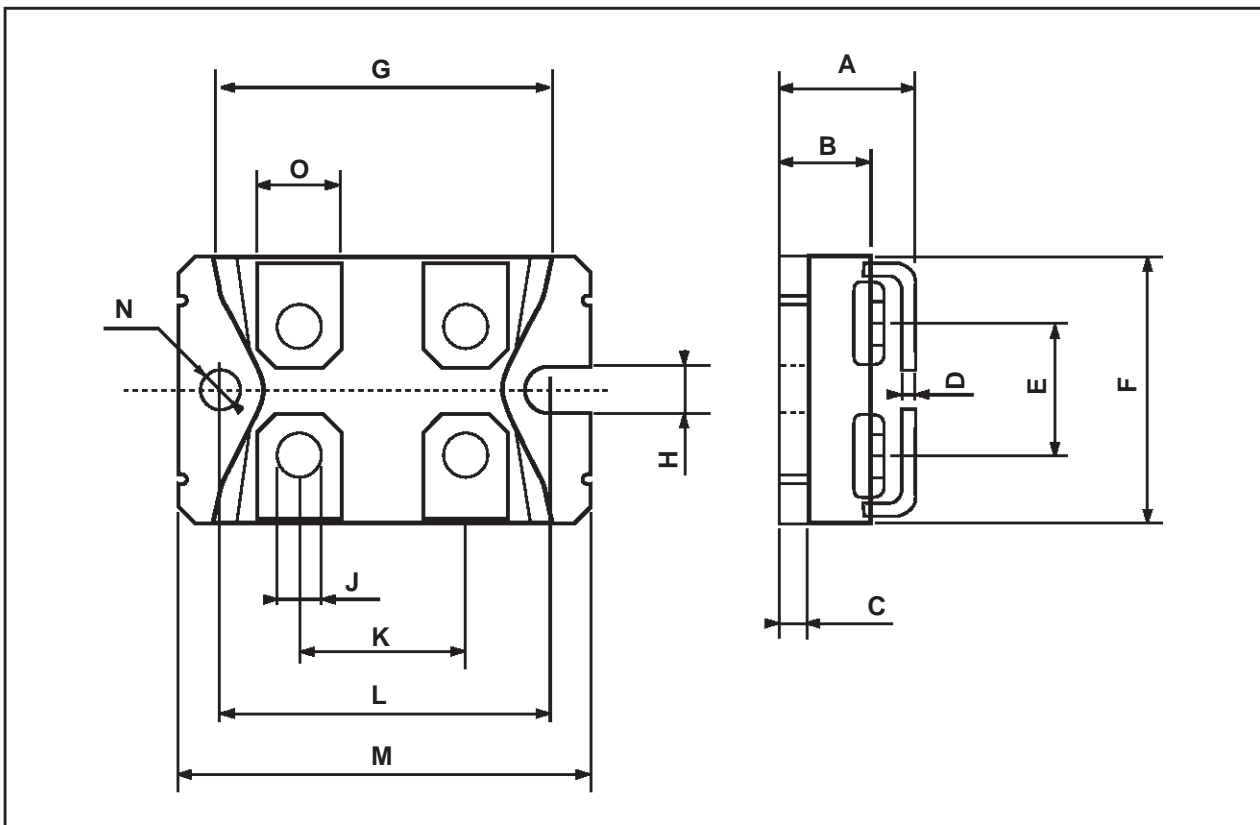


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



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