



STB60NE06L-16

N - CHANNEL 60V - 0.014 Ω - 60A D²PAK
STripFET™ POWER MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STB60NE06L-16	60 V	< 0.16 Ω	60 A

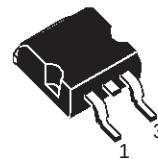
- TYPICAL R_{DS(on)} = 0.014 Ω
- AVALANCHE RUGGED TECHNOLOGY
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175 °C OPERATING TEMPERATURE
- LOW THRESHOLD DRIVE
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics 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.

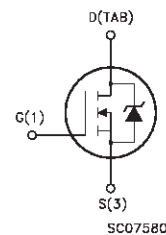
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT



D²PAK
TO-263
(suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	60	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 k Ω)	60	V
V _{GS}	Gate-source Voltage	± 15	V
I _D	Drain Current (continuous) at T _c = 25 °C	60	A
I _D	Drain Current (continuous) at T _c = 100 °C	42	A
I _{DM} (•)	Drain Current (pulsed)	240	A
P _{tot}	Total Dissipation at T _c = 25 °C	150	W
	Derating Factor	1	W/°C
dv/dt	Peak Diode Recovery voltage slope	1	V/ns
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

(1) I_{SD} $\leq$ 60 A, di/dt $\leq$ 300 A/ μ s, V_{DD} $\leq$ V_{(BR)DSS}, T_j $\leq$ T_{JMAX}

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	$^{\circ}C/W$
T_I	Maximum Lead Temperature For Soldering Purpose		300	$^{\circ}C$

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 $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	400	mJ

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 30$ A $V_{GS} = 10$ V $I_D = 30$ A		0.014 0.012	0.016 0.014	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	60			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30$ A		30		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		4150 590 150		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30\text{ V}$ $I_D = 30\text{ A}$		50		ns
t_r	Rise Time	$R_G = 4.7\text{ }\Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 3)		155		ns
Q_g	Total Gate Charge	$V_{DD} = 40\text{ V}$ $I_D = 60\text{ A}$ $V_{GS} = 5\text{ V}$		55	70	nC
Q_{gs}	Gate-Source Charge			15		nC
Q_{gd}	Gate-Drain Charge			30		nC

SWITCHING OFF

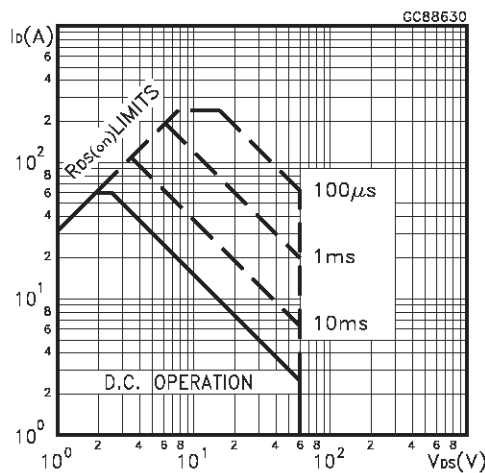
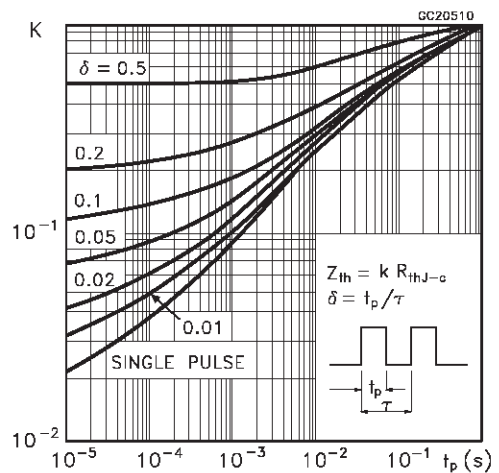
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 48\text{ V}$ $I_D = 20\text{ A}$		45		ns
t_f	Fall Time	$R_G = 4.7\text{ }\Omega$ $V_{GS} = 5\text{ V}$		220		ns
t_c	Cross-over Time	(see test circuit, figure 5)		280		ns

SOURCE DRAIN DIODE

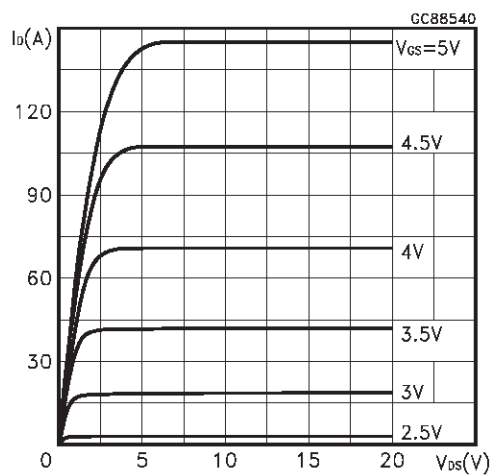
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				60	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				240	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 60\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 60\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		85		ns
Q_{rr}	Reverse Recovery Charge			300		nC
I_{RRM}	Reverse Recovery Current			7		A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

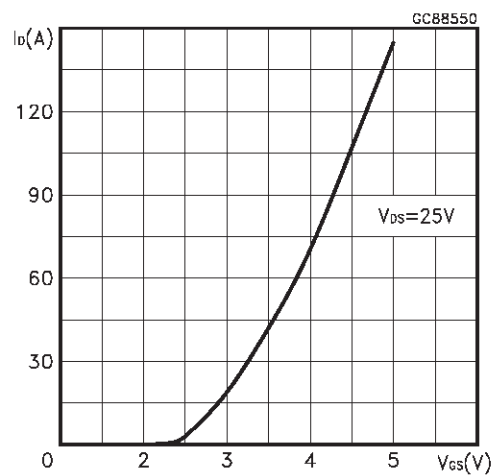
(\bullet) Pulse width limited by safe operating area

Safe Operating Area**Thermal Impedance**

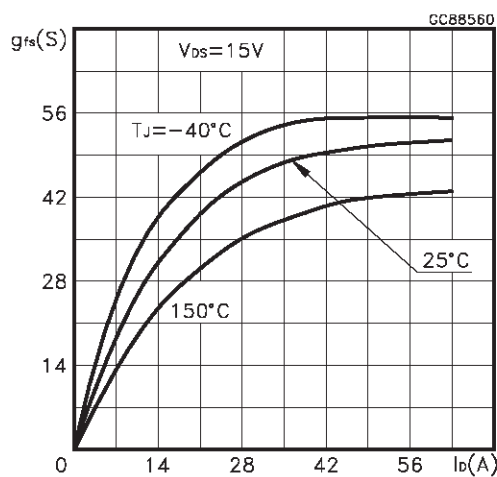
Output Characteristics



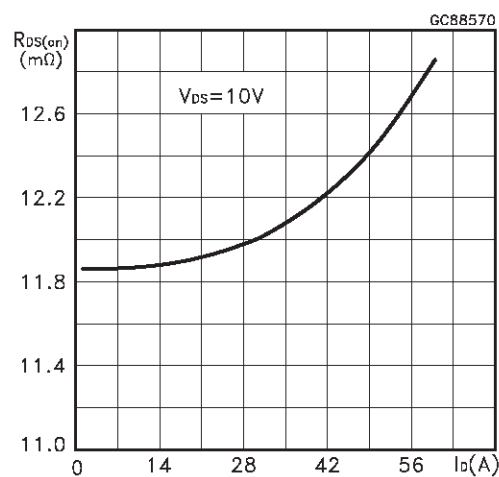
Transfer Characteristics



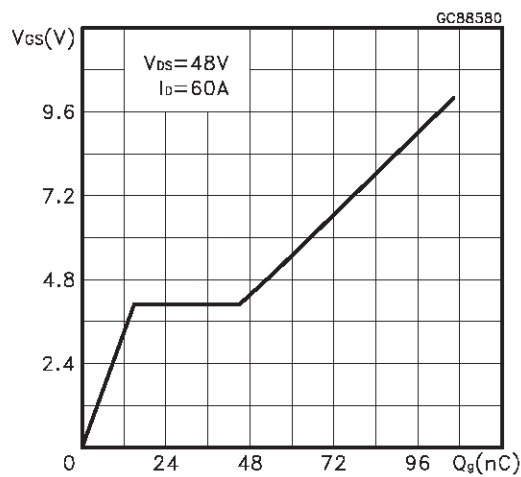
Transconductance



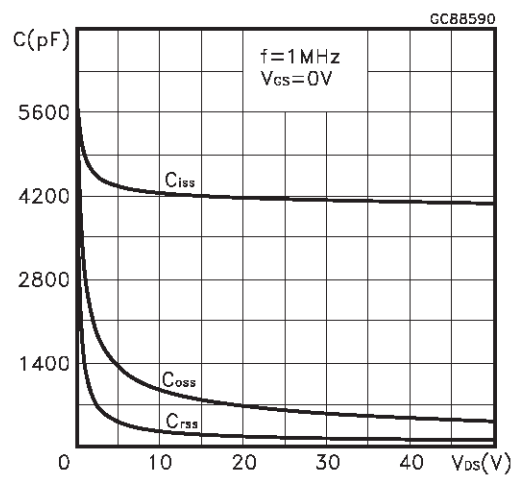
Static Drain-source On Resistance



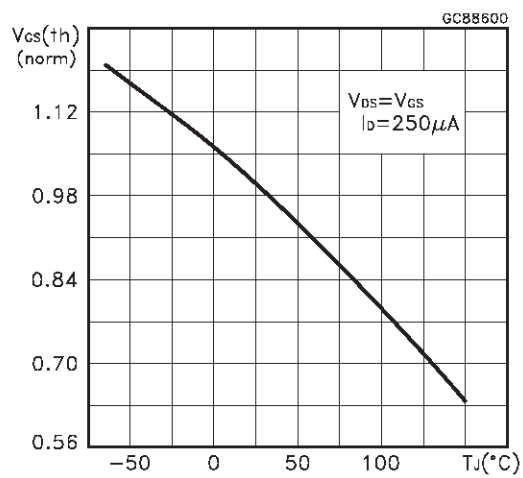
Gate Charge vs Gate-source Voltage



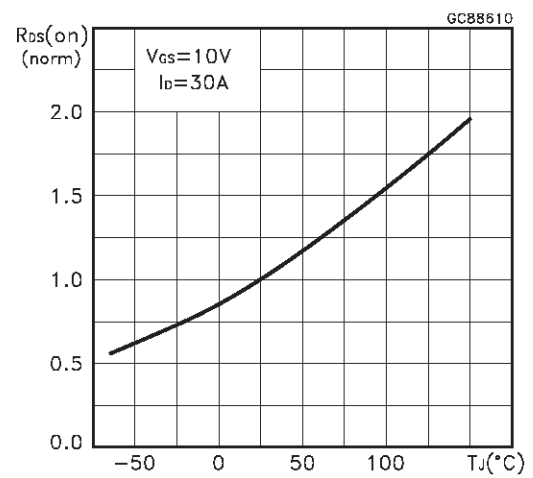
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

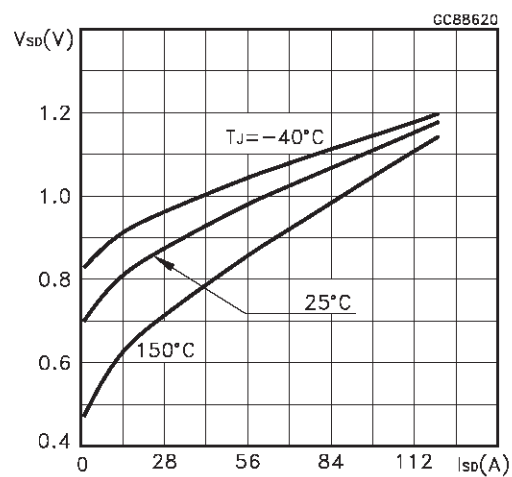


Fig. 1: Unclamped Inductive Load Test Circuit

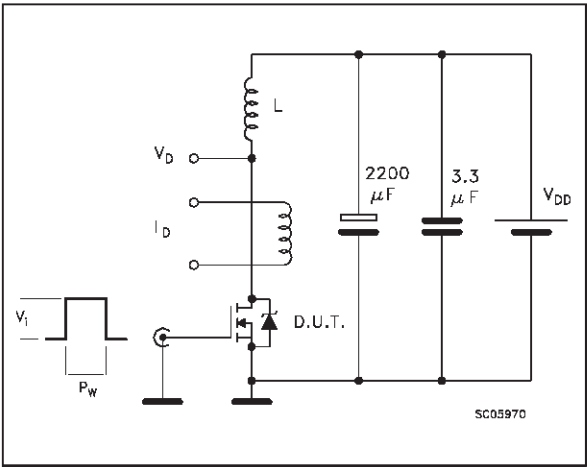


Fig. 2: Unclamped Inductive Waveform

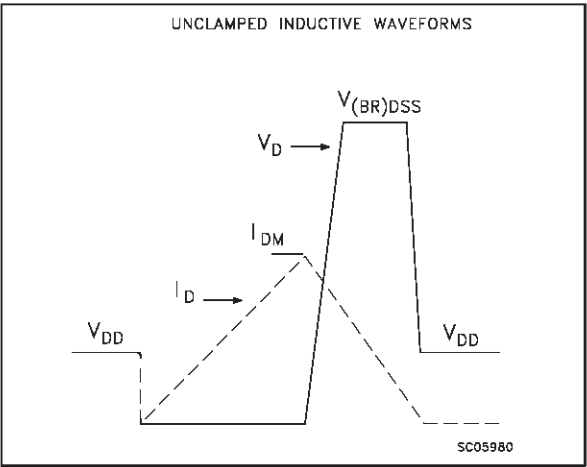


Fig. 3: Switching Times Test Circuits For Resistive Load

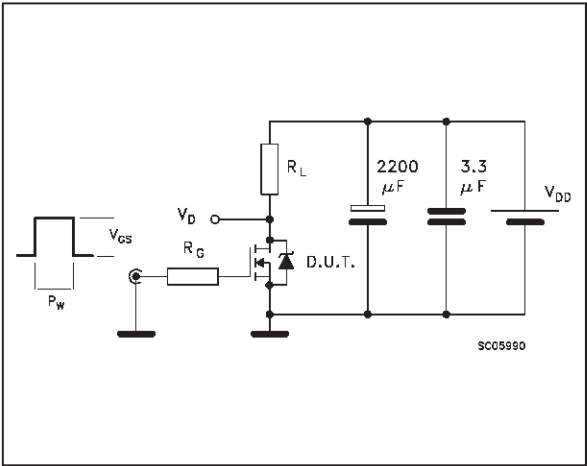


Fig. 4: Gate Charge test Circuit

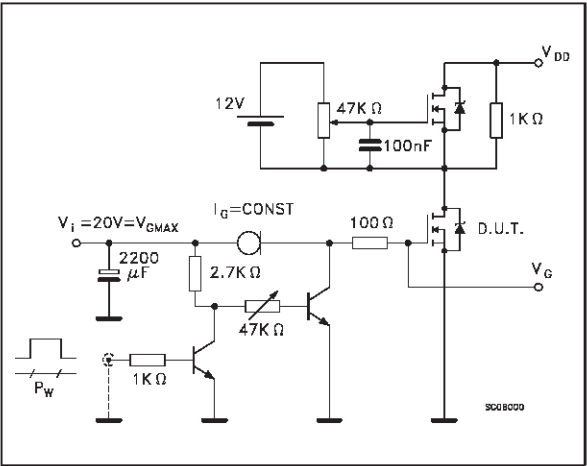
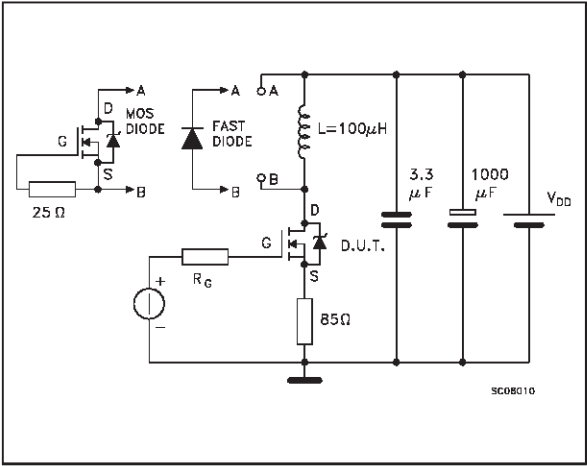
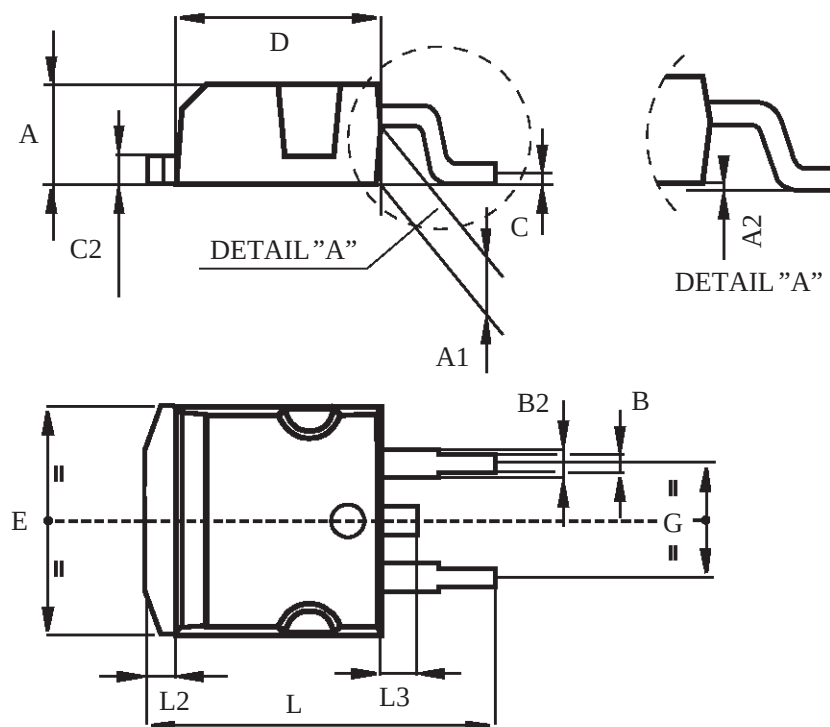


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	8.95		9.35	0.352		0.368
E	10		10.4	0.393		0.409
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068



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