



STV40NE03L-20

N - CHANNEL 30V - 0.014Ω - 40A - PowerSO-10 STripFET™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STV40NE03L-20	30 V	< 0.020 Ω	40 A

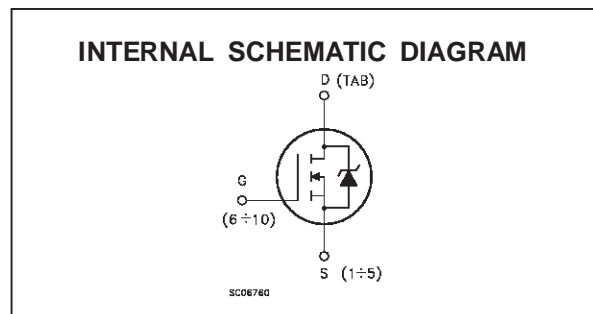
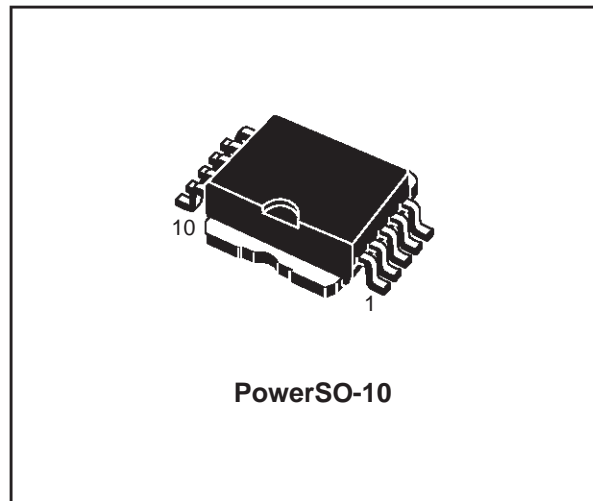
- TYPICAL R_{DS(on)} = 0.014 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE A 100 °C
- APPLICATION ORIENTED CHARACTERIZATION

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
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS IN HIGH PERFORMANCE VRMs
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	30	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	30	V
V _{GS}	Gate-source Voltage	± 20	V
I _D	Drain Current (continuous) at T _c = 25 °C	40	A
I _D	Drain Current (continuous) at T _c = 100 °C	28	A
I _{DM} (•)	Drain Current (pulsed)	160	A
P _{tot}	Total Dissipation at T _c = 25 °C	80	W
	Derating Factor	0.53	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	7	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} ≤ 40 A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

May 2000

1/8

STV40NE03L-20

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	1.88	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R _{thc-sink}	Thermal Resistance Case-sink	Typ	0.5	°C/W
T _J	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _J max, δ < 1%)	40	A
E _{AS}	Single Pulse Avalanche Energy (starting T _J = 25 °C, I _D = I _{AR} , V _{DD} = 15V)	200	mJ

ELECTRICAL CHARACTERISTICS (T_J = -40 to 150 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0 T _c = 25 °C I _D = 250 μA V _{GS} = 0	30 27			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating T _c = 25 °C V _{DS} = Max Rating			1 50	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20 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 μA T _c = 25 °C V _{DS} = V _{GS} I _D = 250 μA	1 0.6	1.8	2.5 3.0	V V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 20 A T _c = 25 °C V _{GS} = 5V I _D = 20 A T _c = 25 °C V _{GS} = 10V I _D = 20 A V _{GS} = 5V I _D = 20 A		0.014	0.02 0.023 0.04 0.046	Ω Ω Ω Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} I _D = 20 A	10			S
C _{iss}	Input Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		1850	2400	pF
C _{oss}	Output Capacitance			450	590	pF
C _{rss}	Reverse Transfer Capacitance			160	210	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 15\text{ V}$ $I_D = 20\text{ A}$		25	33	ns
t_r	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		160	210	ns
Q_g	Total Gate Charge	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 5\text{ V}$		29	38	nC
Q_{gs}	Gate-Source Charge			12		nC
Q_{gd}	Gate-Drain Charge			14		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$		25	33	ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		120	160	ns
t_c	Cross-over Time			155	210	ns

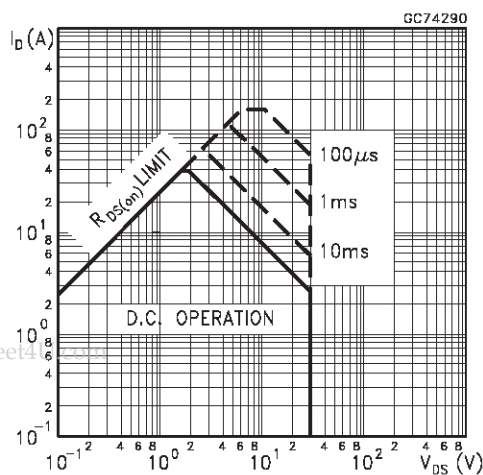
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				40	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				160	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 40\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$		50		ns
Q_{rr}	Reverse Recovery Charge			0.9		μC
I_{RRM}	Reverse Recovery Current			3.5		A

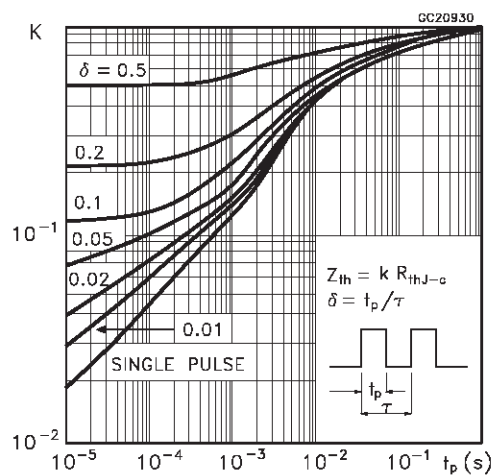
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

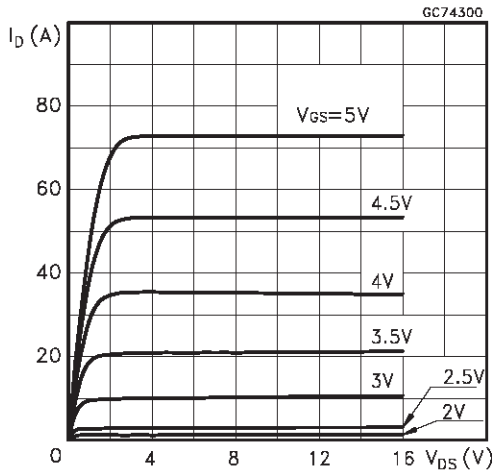
Safe Operating Area



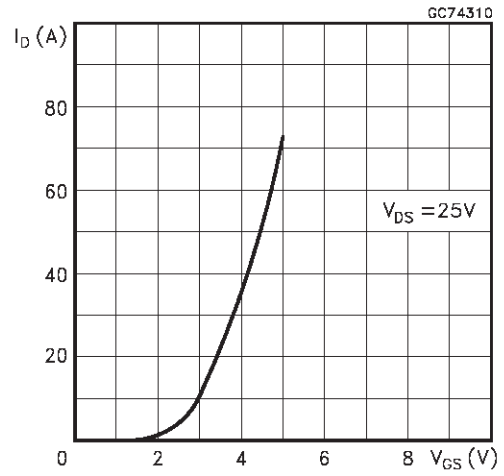
Thermal Impedance



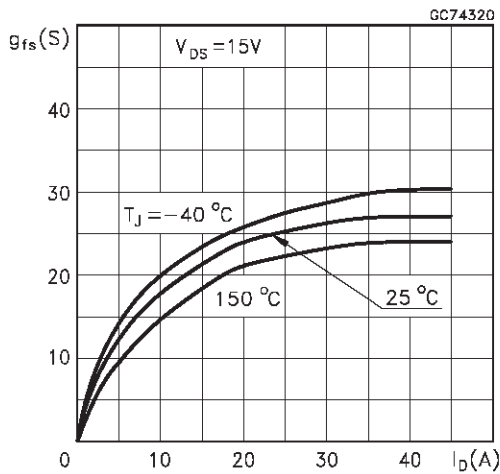
Output Characteristics



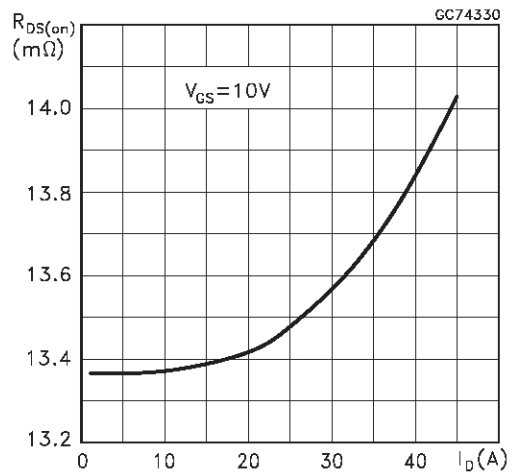
Transfer Characteristics



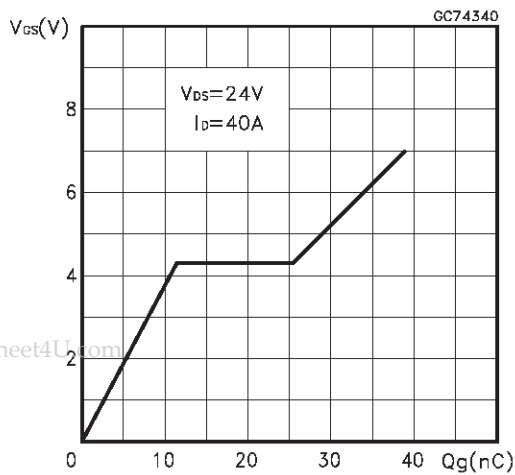
Transconductance



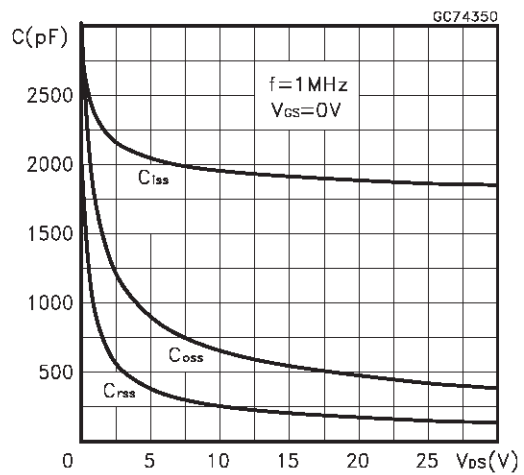
Static Drain-source On Resistance



Gate Charge vs Gate-source Voltage



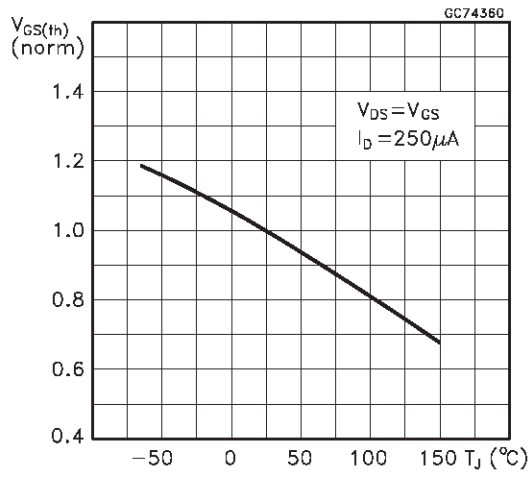
Capacitance Variations



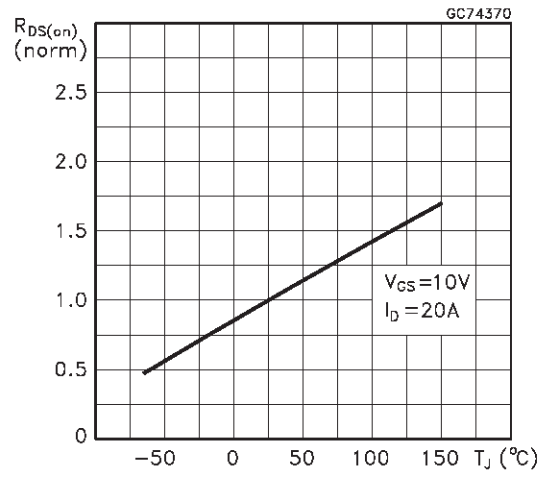
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Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

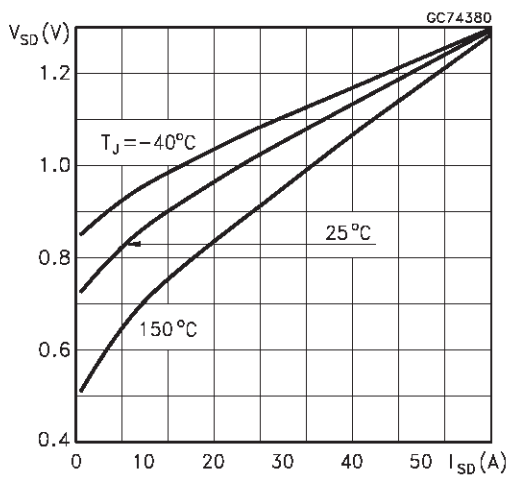


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



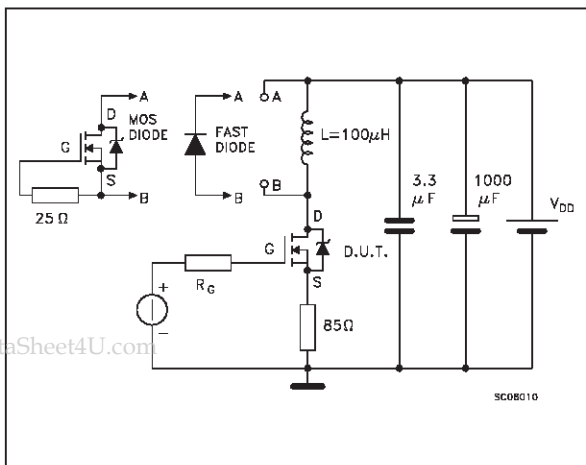
Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit



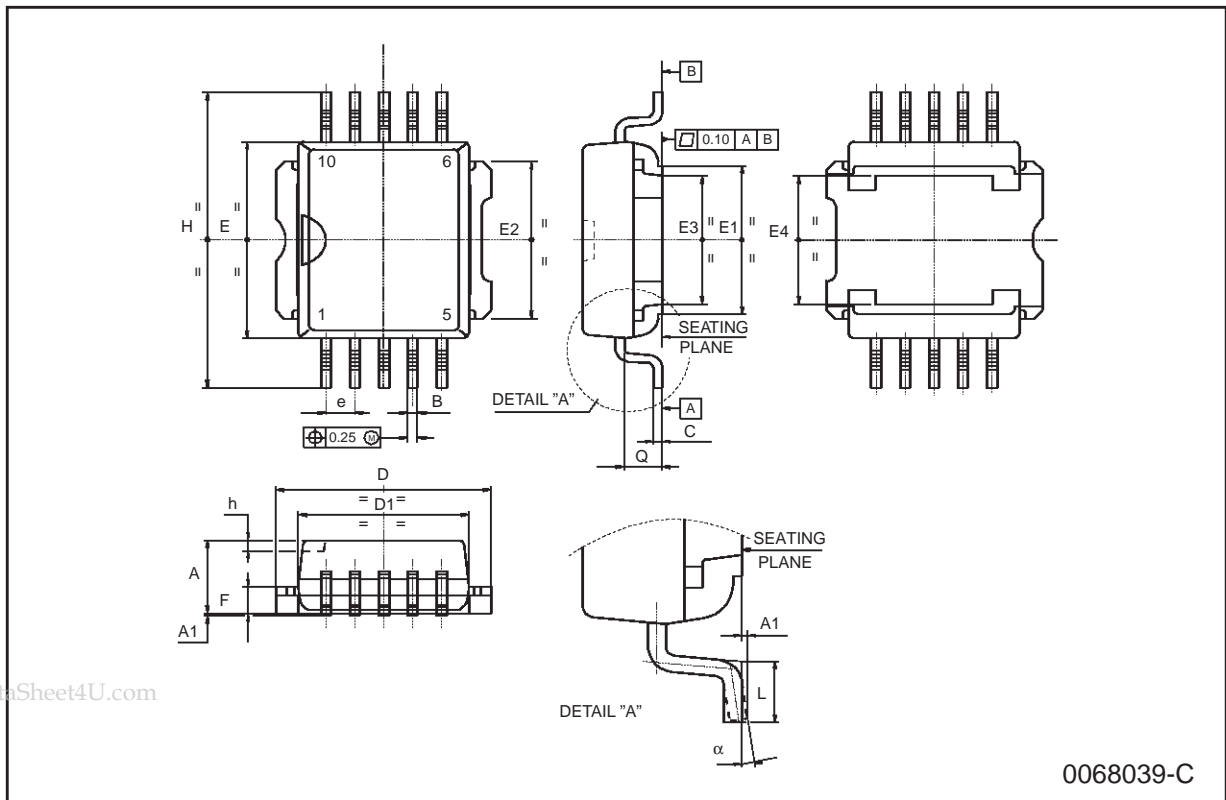
Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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PowerSO-10 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.35		3.65	0.132		0.144
A1	0.00		0.10	0.000		0.004
B	0.40		0.60	0.016		0.024
c	0.35		0.55	0.013		0.022
D	9.40		9.60	0.370		0.378
D1	7.40		7.60	0.291		0.300
E	9.30		9.50	0.366		0.374
E1	7.20		7.40	0.283		0.291
E2	7.20		7.60	0.283		0.300
E3	6.10		6.35	0.240		0.250
E4	5.90		6.10	0.232		0.240
e		1.27			0.050	
F	1.25		1.35	0.049		0.053
H	13.80		14.40	0.543		0.567
h		0.50			0.002	
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
α	0°		8°			



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