

N - CHANNEL ENHANCEMENT MODE " SINGLE FEATURE SIZE™ " POWER MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
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- TYPICAL R_{DS(on)} = 0.014 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE A 100 °C
- APPLICATION ORIENTED CHARACTERIZATION
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

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

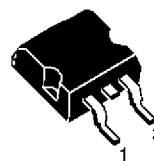
- HIGH CURRENT, HIGH SPEED SWITCHING SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS IN HIGH PERFORMANCE VRMs
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

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	± 15	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

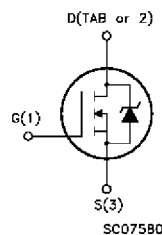
(*) Pulse width limited by safe operating area

(1) I_{SD} ≤ 40 A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}



**D²PAK
TO-263**
(suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.88	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	$^{\circ}C/W$
T_l	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, $\delta < 1\%$)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 15V$)	200	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	$I_D = 250 \mu A$ $V_{GS} = 0$	30			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	1.8	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 20 A$ $V_{GS} = 5V$ $I_D = 20 A$		0.014	0.02 0.023	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	40			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 20 A$	15	20		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		1850 450 160	2400 590 210	pF pF 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

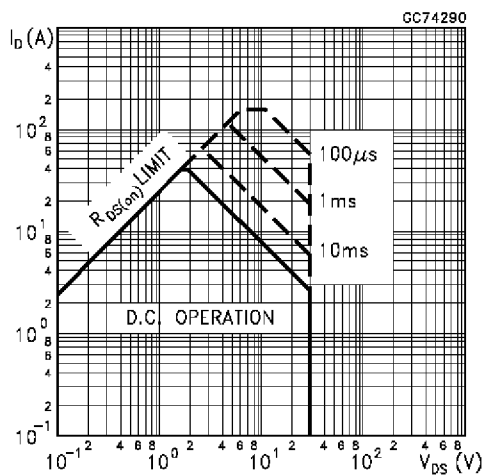
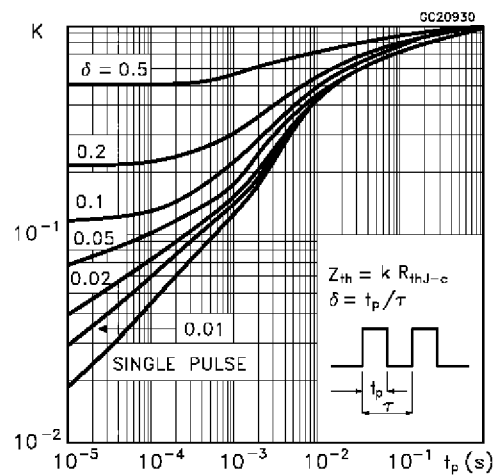
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$		25	33	ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		120	160	ns
t_c	Cross-over Time			155	210	ns

SOURCE DRAIN DIODE

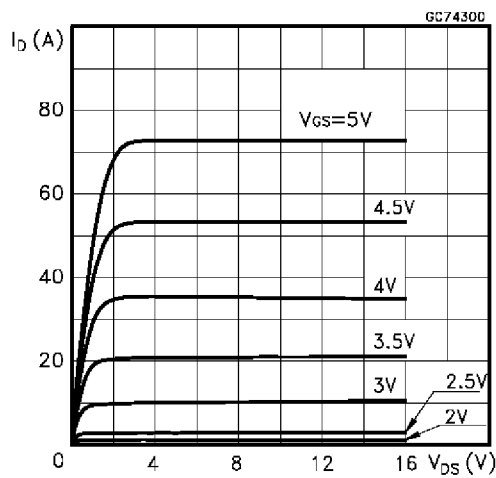
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				40	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				160	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 40\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$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

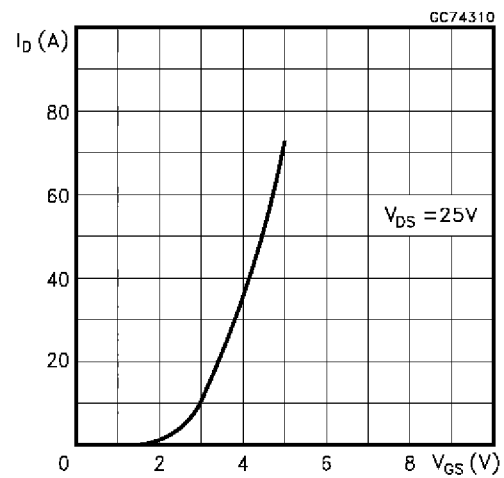
(•) Pulse width limited by safe operating area

Safe Operating Area**Thermal Impedance**

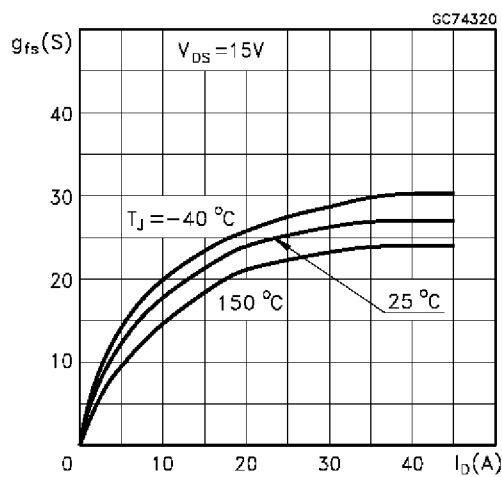
Output Characteristics



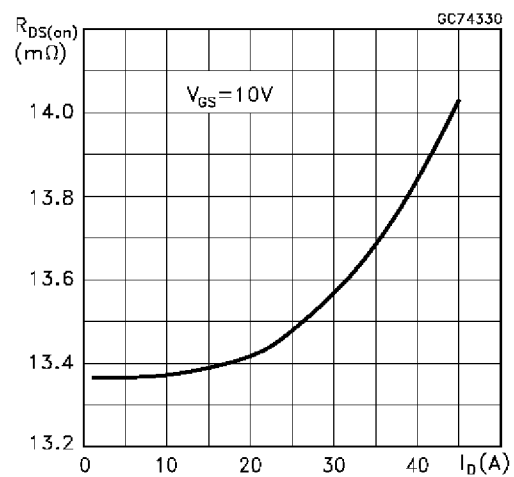
Transfer Characteristics



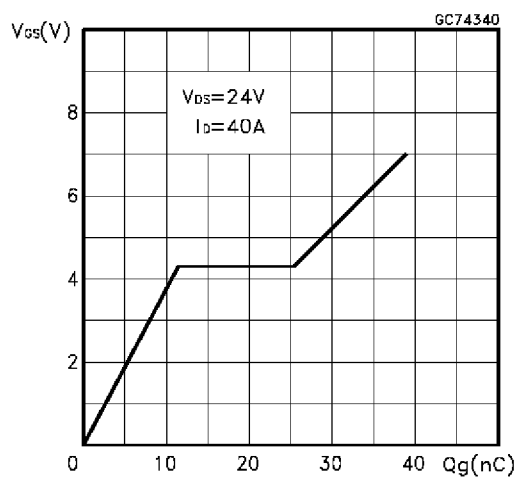
Transconductance



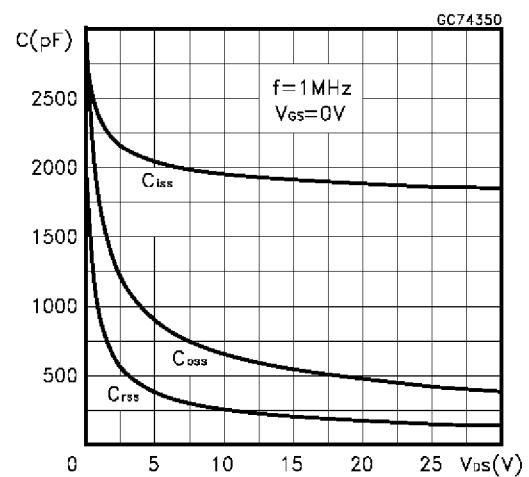
Static Drain-source On Resistance



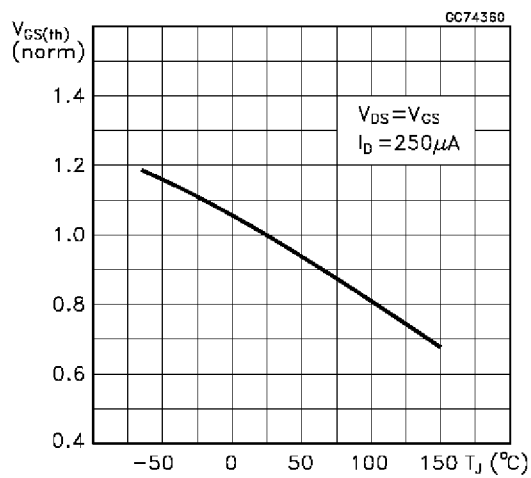
Gate Charge vs Gate-source Voltage



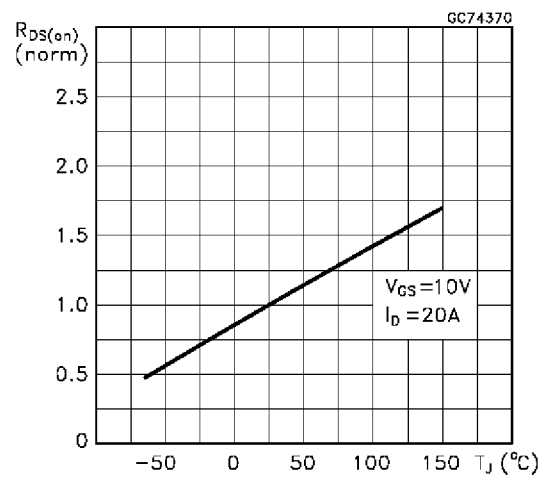
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

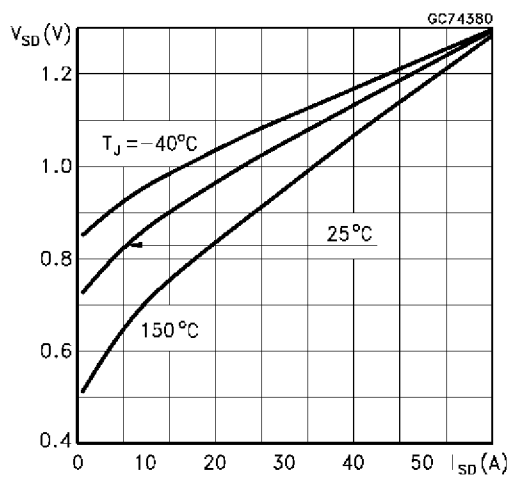


Fig. 1: Unclamped Inductive Load Test Circuit

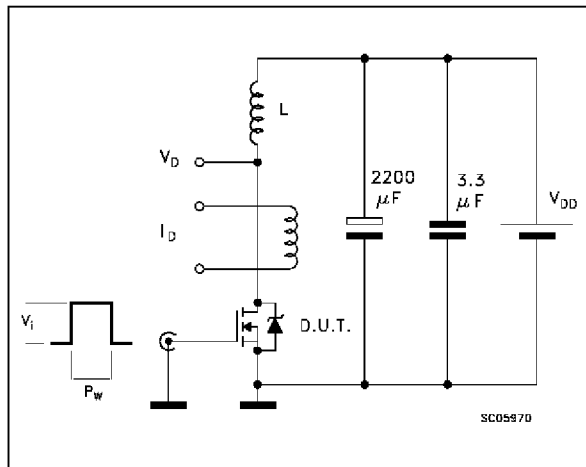


Fig. 2: Unclamped Inductive Waveform

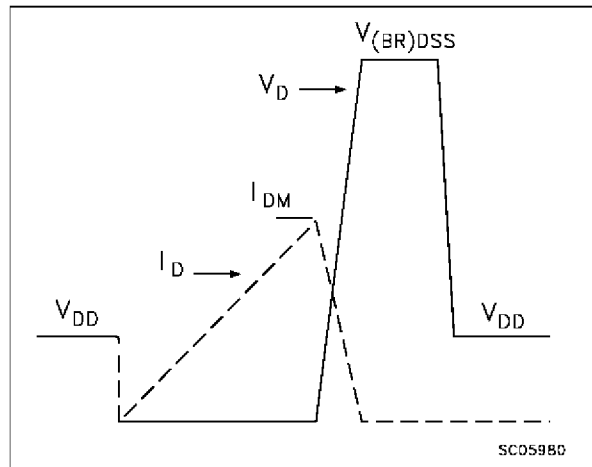


Fig. 3: Switching Times Test Circuits For Resistive Load

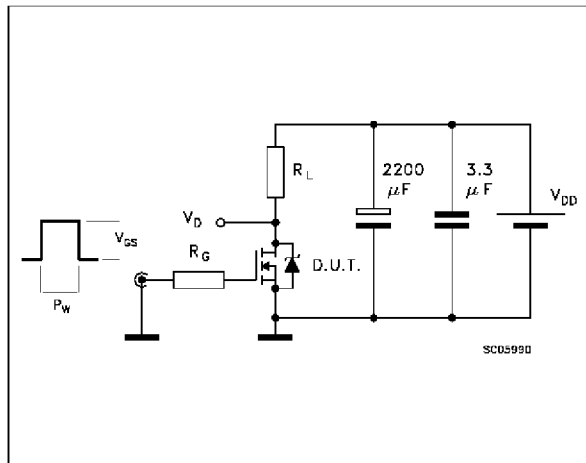


Fig. 4: Gate Charge test Circuit

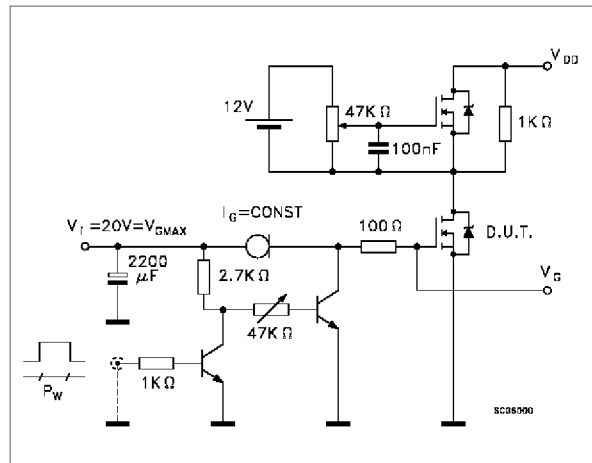
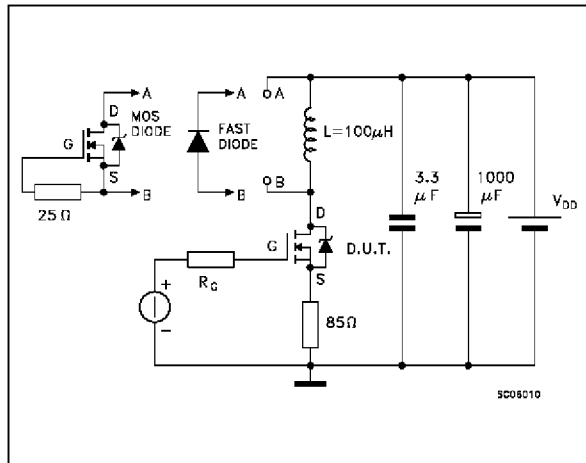


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D2PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.3		4.6	0.169		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.25		1.4	0.049		0.055
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		10.28	0.393		0.404
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

