

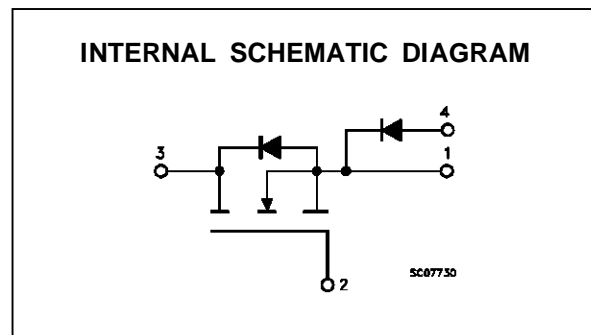
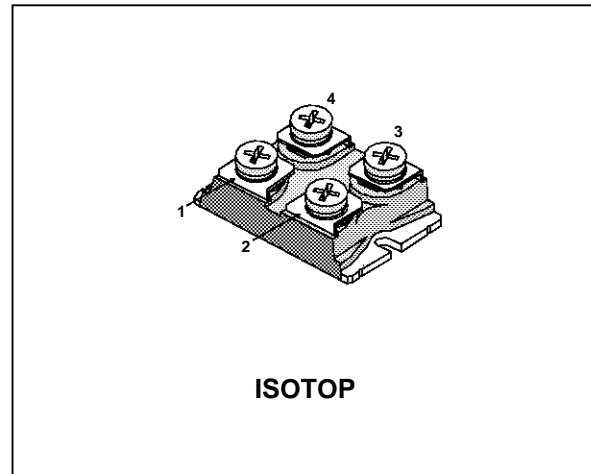
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR AND ULTRA-FAST DIODE IN ISOTOP PACKAGE

TYPE	V _{DSS}	R _{DS(on)}	I _D
STE36N50-DA	500 V	< 0.14 Ω	36 A

- LOW GATE CHARGE MOSFET
- TURBOSWITCH DIODE INCORPORATED
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- ASYMMETRICAL HALF BRIDGE SMPS (WITH COMPLIMENTARY STE36N50-DK)



MOSFET ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-Source Voltage (V _{GS} = 0)	500	V
V _{DGR}	Drain-Gate Voltage (R _{GS} = 20 kΩ)	500	V
V _{GS}	Gate-Source Voltage	± 20	V
I _D	Drain Current (continuous) at T _c = 25 °C	36	A
I _D	Drain Current (continuous) at T _c = 100 °C	24	A
I _{DM} (●)	Drain Current (pulsed)	144	A
P _{tot}	Total Dissipation at T _c = 25 °C	380	W
	Derating Factor	3.3	W/°C
T _{stg}	Storage Temperature	-55 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C
V _{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(●) Pulse width limited by safe operating area

STE36N50-DA

DIODE ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
V_{RSM}	Non Repetitive Peak Reverse Voltage	600	V
$I_{F(RMS)}$	RMS Forward Current	50	A
I_{FRM}	Repet. Peak Forward Current ($t_p = 5 \mu s$, $f = 5KHz$)	300	A
P_{tot}	Total Dissipation at $T_c = 25^\circ C$	70	W
	Derating Factor	0.56	W/ $^\circ C$

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case (MOSFET)	Max	0.3	$^\circ C/W$
$R_{thj-case}$	Thermal Resistance Junction-case (DIODE)	Max	1.78	$^\circ C/W$
R_{thc-h}	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	$^\circ C/W$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ C$, $I_D = I_{AR}$, $V_{DD} = 50 V$)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	40	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100^\circ C$, pulse width limited by T_j max, $\delta < 1\%$)	9	A

MOSFET 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	$I_D = 1 mA$ $V_{GS} = 0$	500			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^\circ C$			300 1500	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20 V$			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1 mA$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 18 A$ $V_{GS} = 10V$ $I_D = 18 A$ $T_c = 100^\circ C$		0.12	0.14 0.28	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	36			A

MOSFET ELECTRICAL CHARACTERISTICS (continued)

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 18$ A	16			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$			8000 1300 350	pF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 250$ V $I_D = 18$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 1)		45 85	65 120	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 400$ V $I_D = 36$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 3)		700		A/ μ s
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 400$ V $I_D = 36$ A $V_{GS} = 10$ V		295 35 145		nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 400$ V $I_D = 36$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 3)		100 45 160	140 65 225	ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} (*)	Forward On Voltage	$I_{SD} = 36$ A $V_{GS} = 0$			1.4	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 36$ A $di/dt = 100$ A/ μ s $V_{DD} = 100$ V $T_j = 150$ °C (see test circuit, figure 3)		1 29 58		μ s μ C A

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

(\bullet) Pulse width limited by safe operating area

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DIODE ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

STATIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _F (#)	Forward Voltage Drop	I _F = 20 A T _j = 25 °C			1.75	V
		I _F = 20 A T _j = 125 °C			1.5	V
I _R (##)	Reverse Leakage Current	V _R = V _{RRM} × 0.8 T _j = 25 °C			100	μA
		V _R = V _{RRM} × 0.8 T _j = 125 °C			6	mA

DINAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{rr}	Reverse Recovery Time	I _F = 0.5 A I _R = 1 A I _{rr} = 0.25 A T _j = 25 °C		30		ns
		I _F = 1 A di _F /dt = -50 A/μs V _R = 30 V T _j = 25 °C			60	ns
I _{RM}	Maximum Reverse Recovery Current	V _R = 400 V I _F = 20 A T _j = 125 °C di _F /dt = -160 A/μs di _F /dt = -500 A/μs		17.5	12.5	A A

TURN-ON SWITCHING

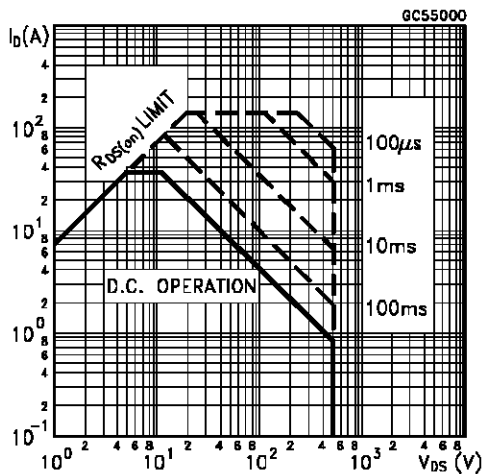
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{fr}	Forward Recovery Time	I _F = 20 A di _F /dt = 160 A/μs Measured at: 1.1 x V _{f(MAX)}			600	ns
V _{FP}	Peak Forward Voltage	T _j = 25 °C			12	V

(#) Pulsed: Pulse duration = 380 μs, duty cycle < 2 %

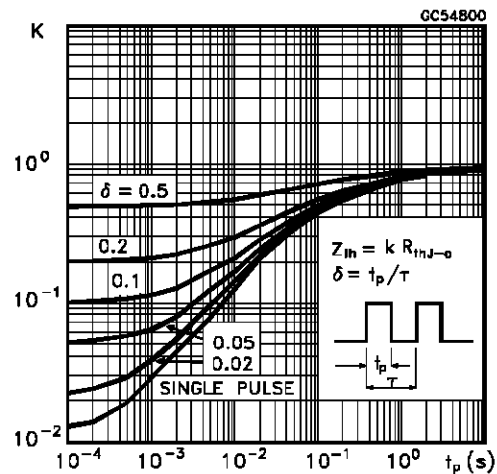
(##) Pulsed: Pulse duration = 5 μs, duty cycle < 2 %

NOTE: For the complete DIODE characterization refer to STTA2006P datasheet

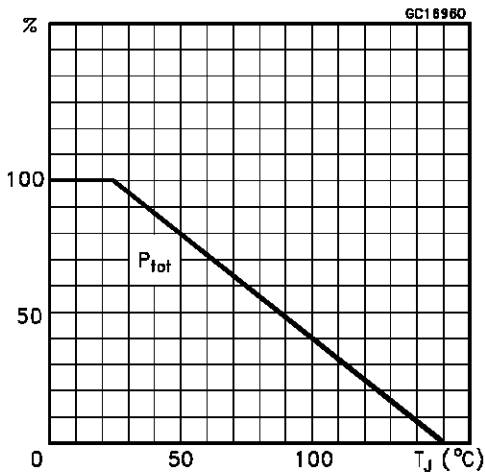
Safe Operating Areas



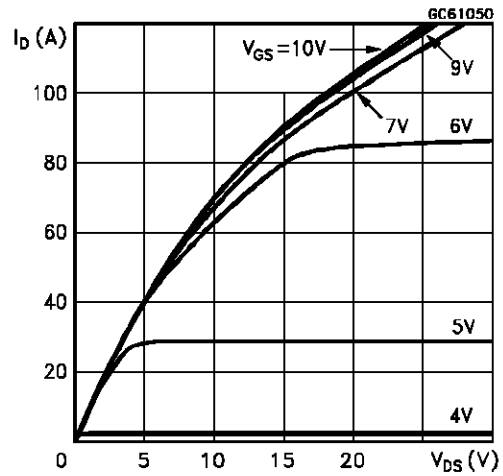
Thermal Impedance



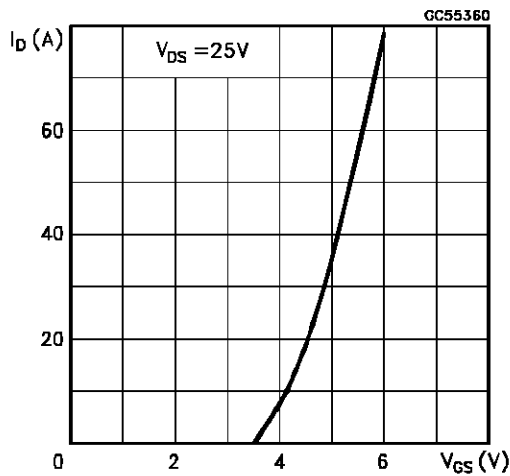
Derating Curve



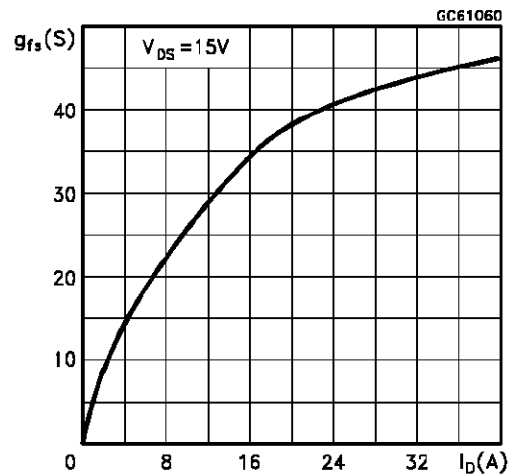
Output Characteristics



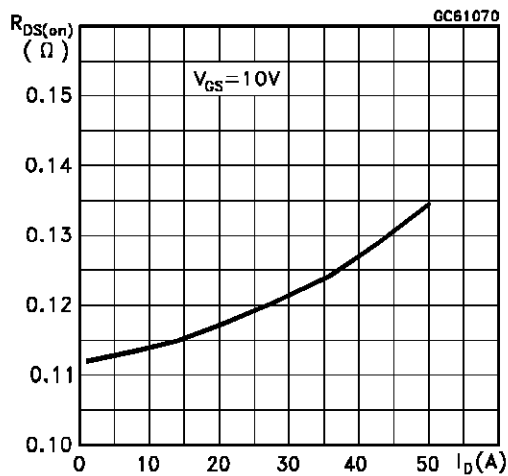
Transfer Characteristics



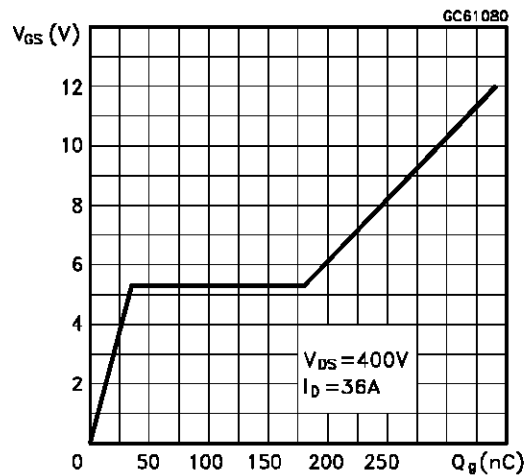
Transconductance



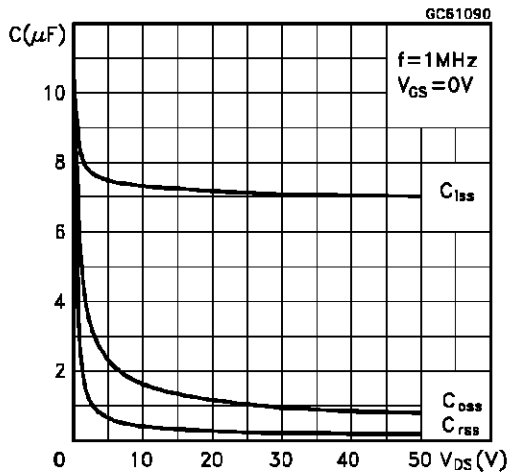
Static Drain-source On Resistance



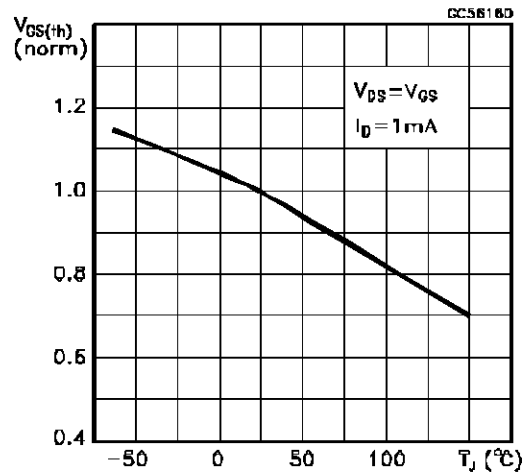
Gate Charge vs Gate-source Voltage



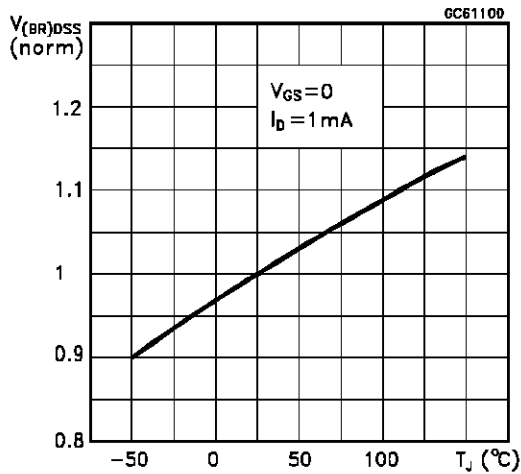
Capacitance Variations



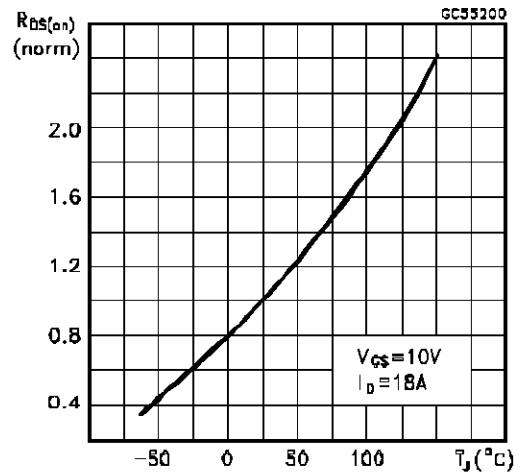
Normalized Gate Threshold Voltage vs Temperature



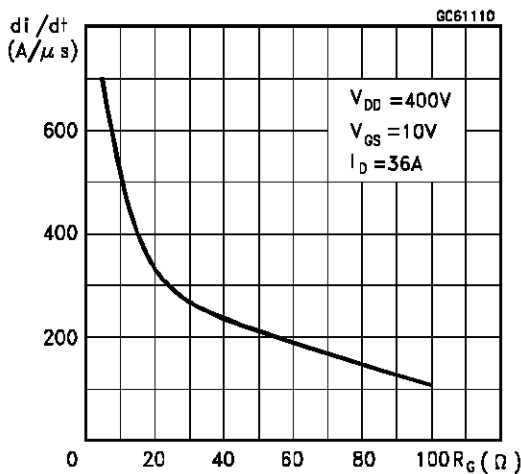
Normalized Breakdown Voltage vs Temperature



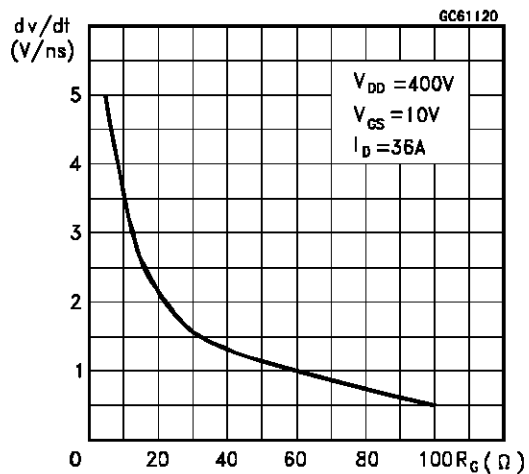
Normalized On Resistance vs Temperature



Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time

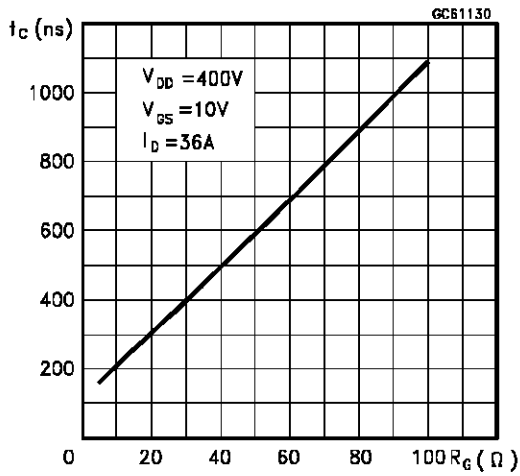
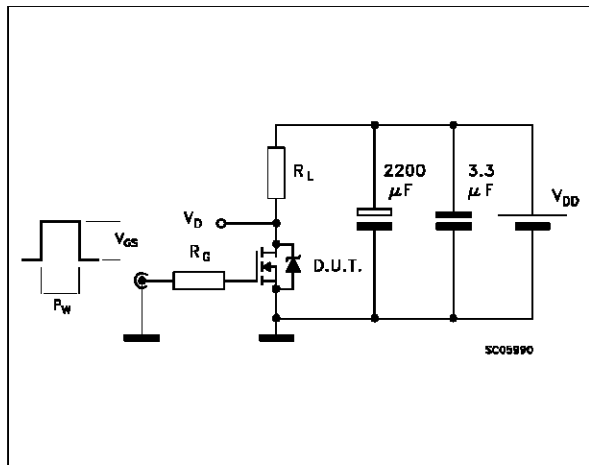


Fig. 1: Switching Times Test Circuits For Resistive Load



Source-drain Diode Forward Characteristics

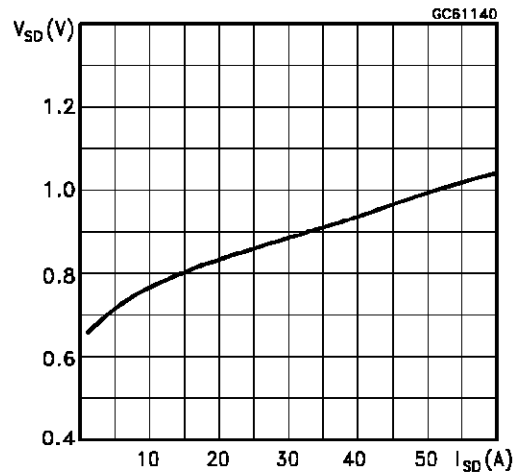


Fig. 2: Gate Charge Test Circuit

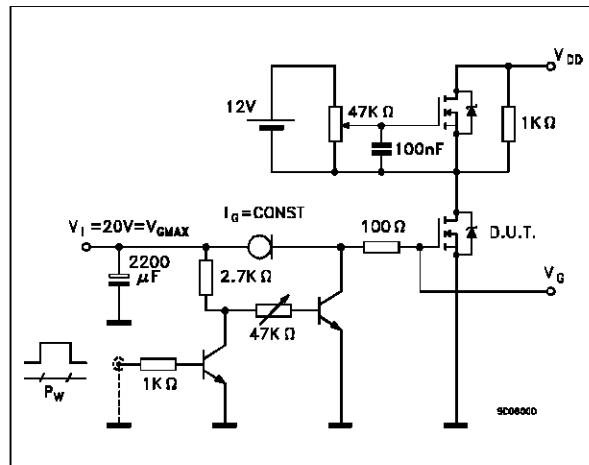
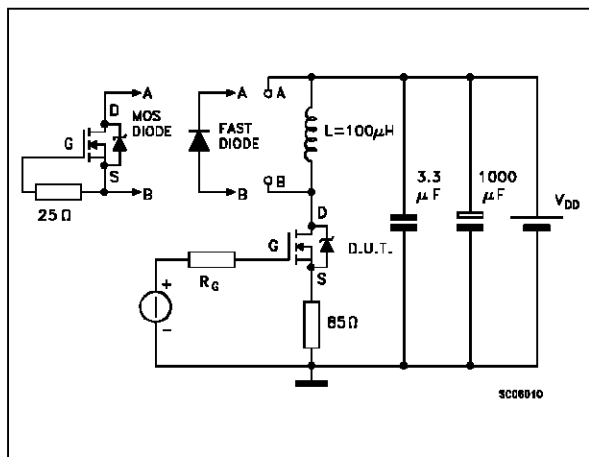
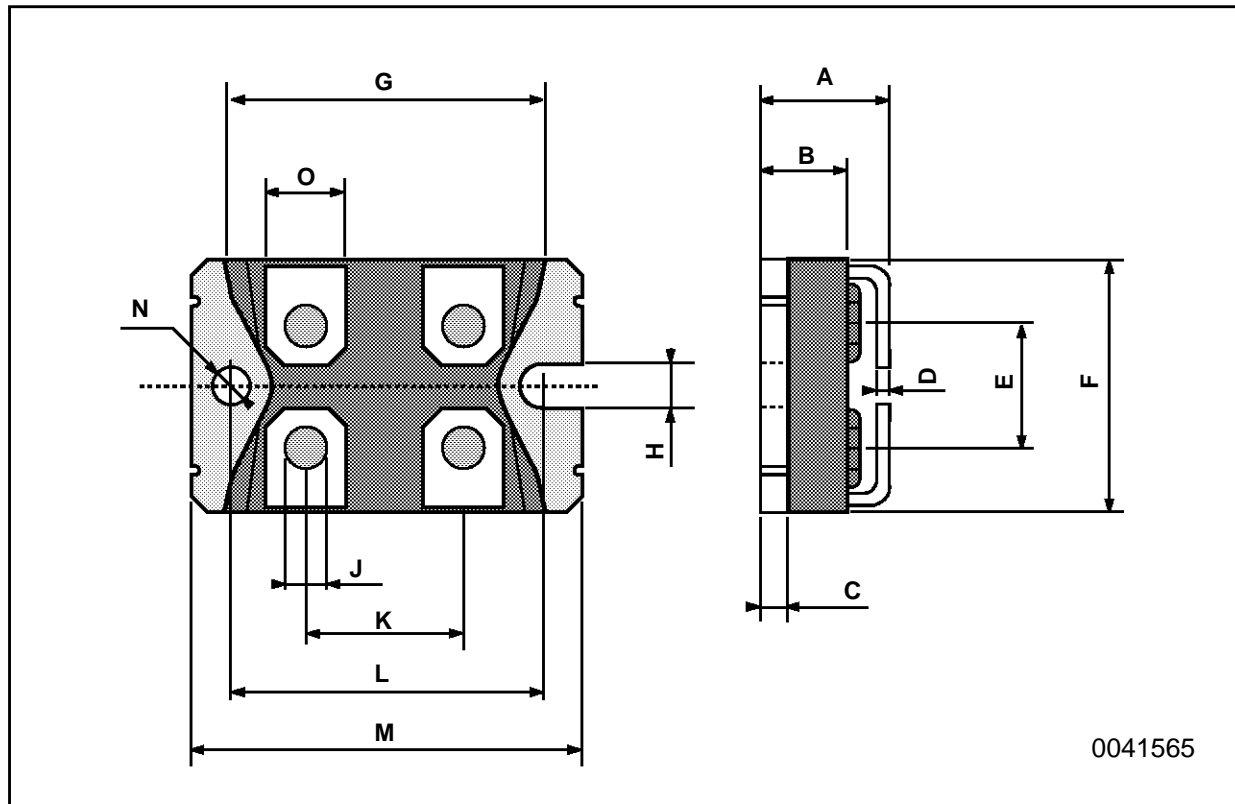


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



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
P	5.5			0.216		



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