

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

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD20NE03L	30 V	< 0.020 Ω	20 A

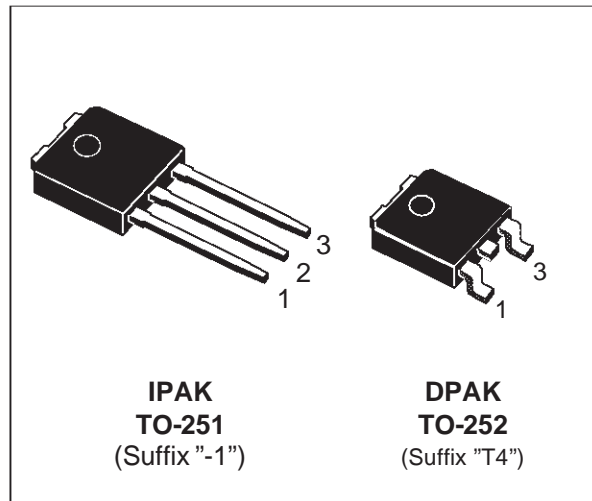
- TYPICAL R<sub>DS(on)</sub> = 0.016 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE A 100 °C
- APPLICATION ORIENTED CHARACTERIZATION

### DESCRIPTION

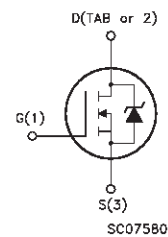
This Power MOSFET is the latest development of SGS-THOMSON unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### 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.)



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate-source Voltage	± 15	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	20**	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	20**	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	100	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	50	W
	Derating Factor	0.33	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	7	V/ns
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area

(\*\*) Value limited only by the package

(1) I<sub>SD</sub> ≤ 40 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

## STD20NE03L

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	100	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	1.5	$^{\circ}C/W$
$T_j$	Maximum Lead Temperature For Soldering Purpose		275	$^{\circ}C$

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max, $\delta < 1\%$ )	20	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 25V$ )	140	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	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 15 V$			$\pm 100$	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	$V_{GS} = 10V$ $I_D = 10 A$ $V_{GS} = 5V$ $I_D = 10 A$		0.016	0.02 0.026	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	20			A

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 10 A$	12	18		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**

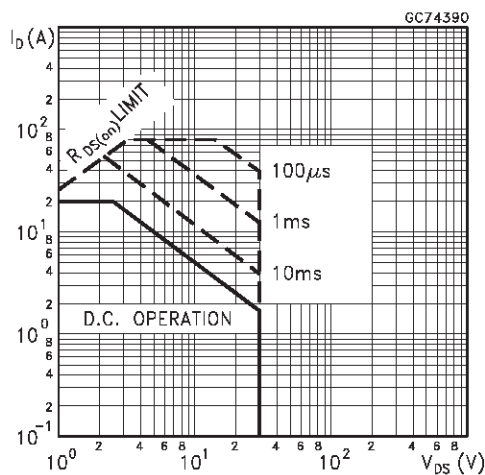
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$		25	33	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		120	160	ns
$t_c$	Cross-over Time			155	210	ns

**SOURCE DRAIN DIODE**

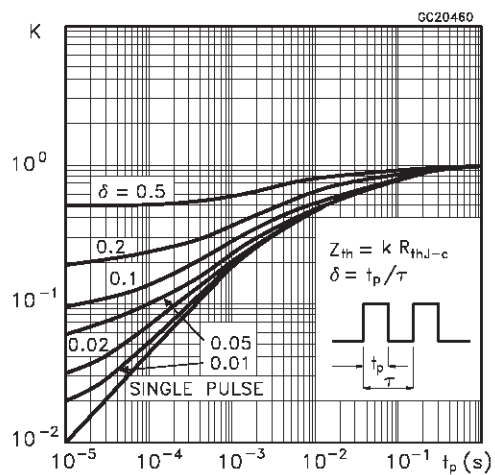
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				20	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				100	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 20\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$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

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %  
 (•) Pulse width limited by safe operating area

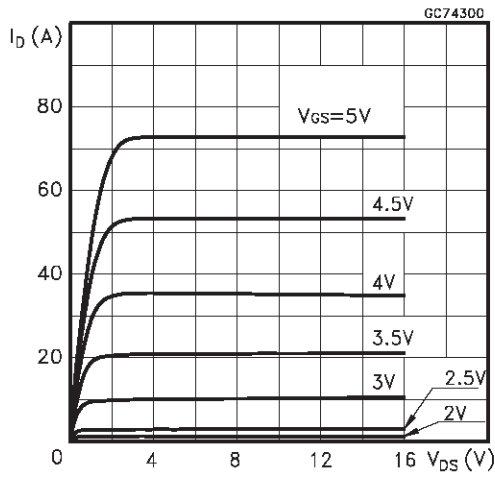
**Safe Operating Area**



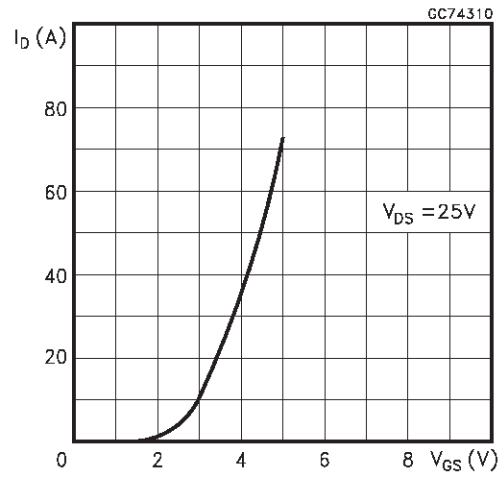
**Thermal Impedance**



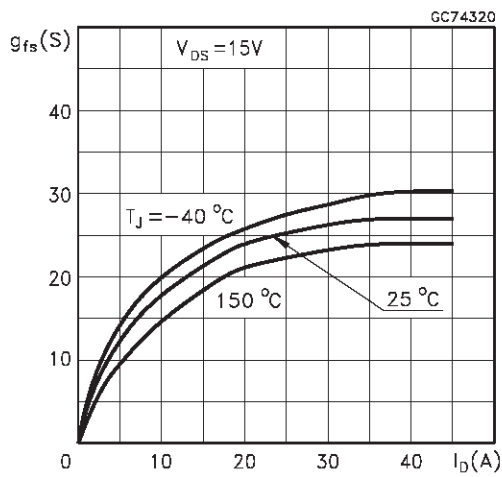
**Output Characteristics**



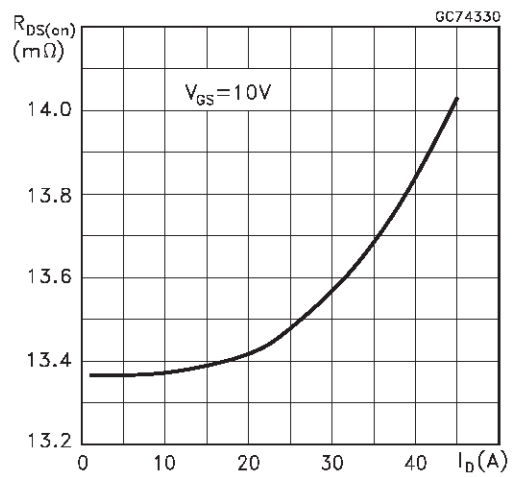
**Transfer Characteristics**



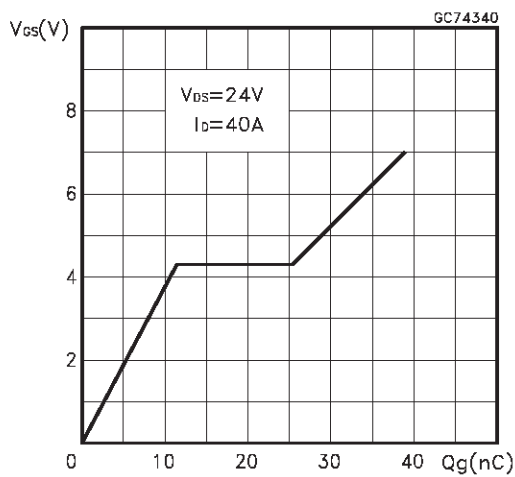
**Transconductance**



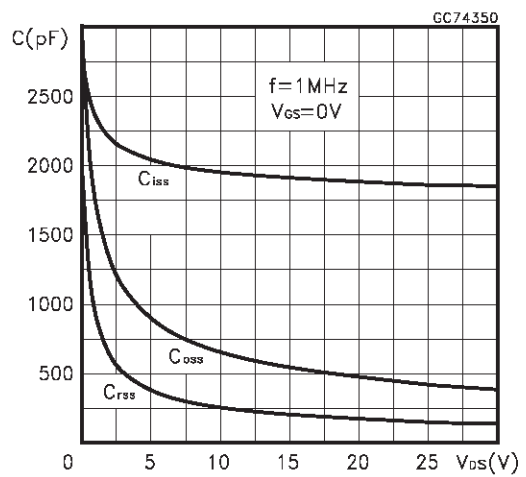
**Static Drain-source On Resistance**



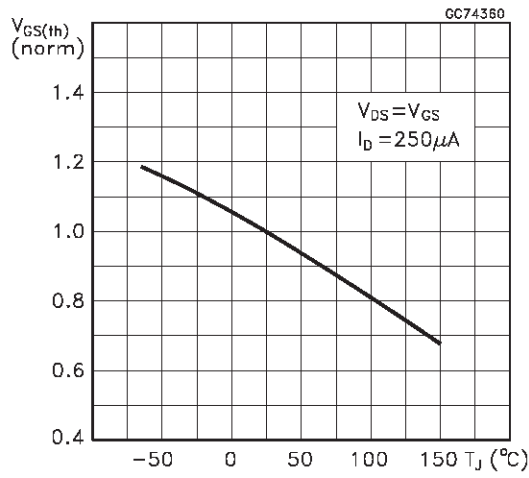
**Gate Charge vs Gate-source Voltage**



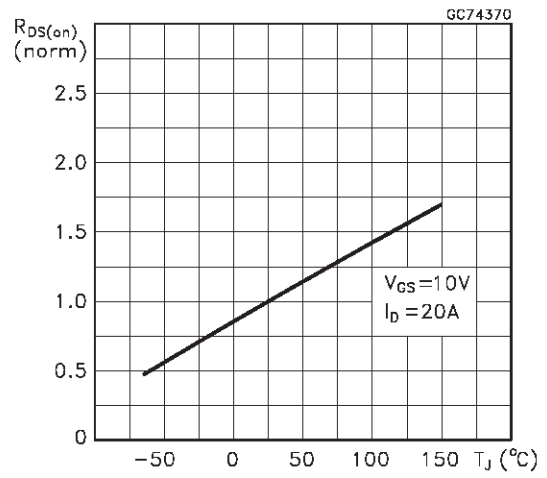
**Capacitance Variations**



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

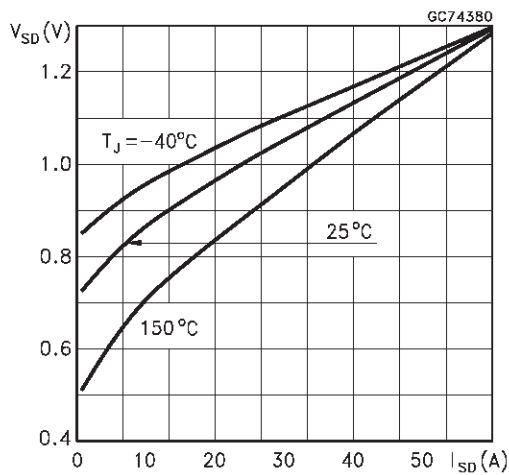


Fig. 1: Unclamped Inductive Load Test Circuit

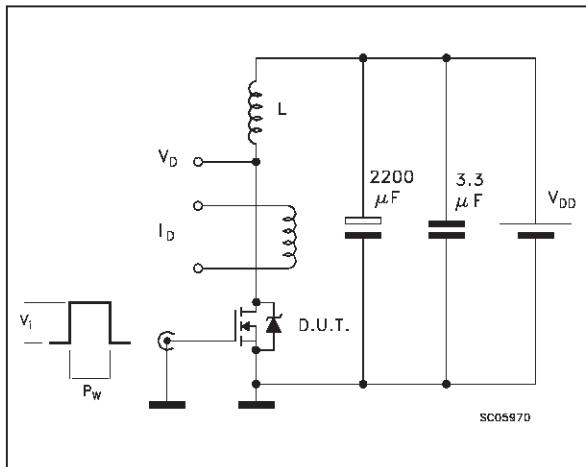


Fig. 2: Unclamped Inductive Waveform

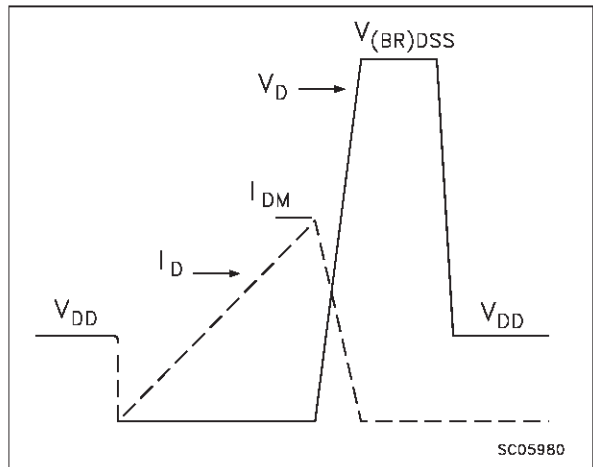


Fig. 3: Switching Times Test Circuits For Resistive Load

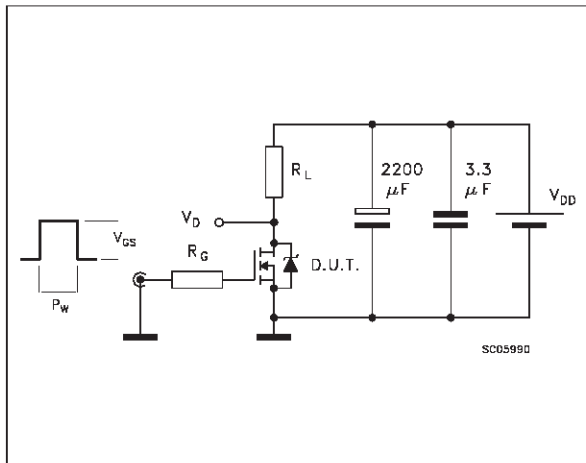


Fig. 4: Gate Charge test Circuit

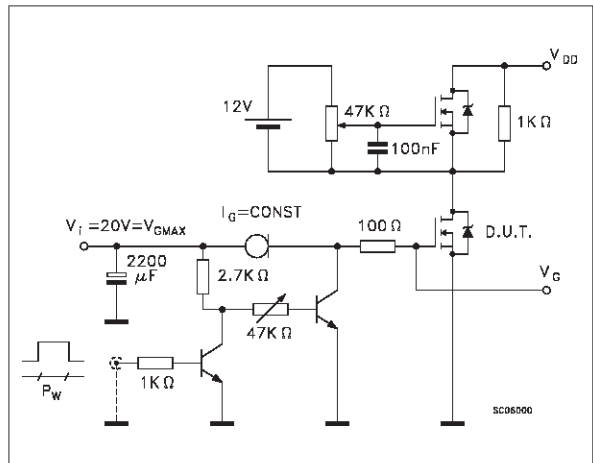
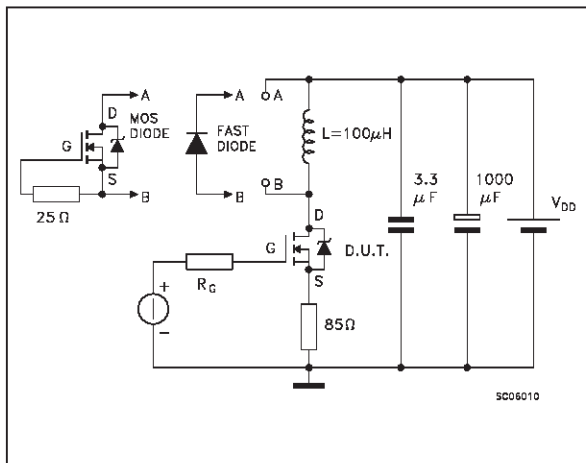
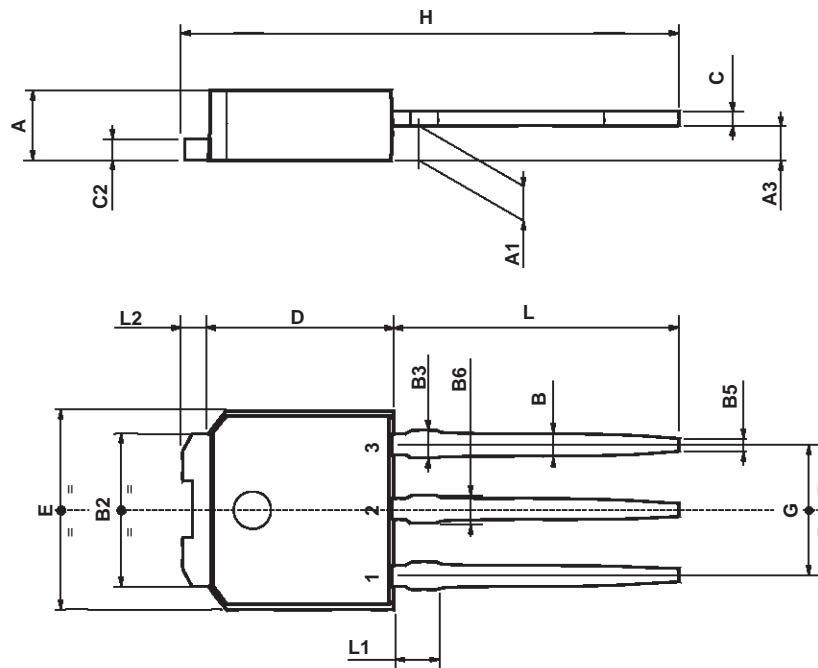


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-251 (IPAK) MECHANICAL DATA

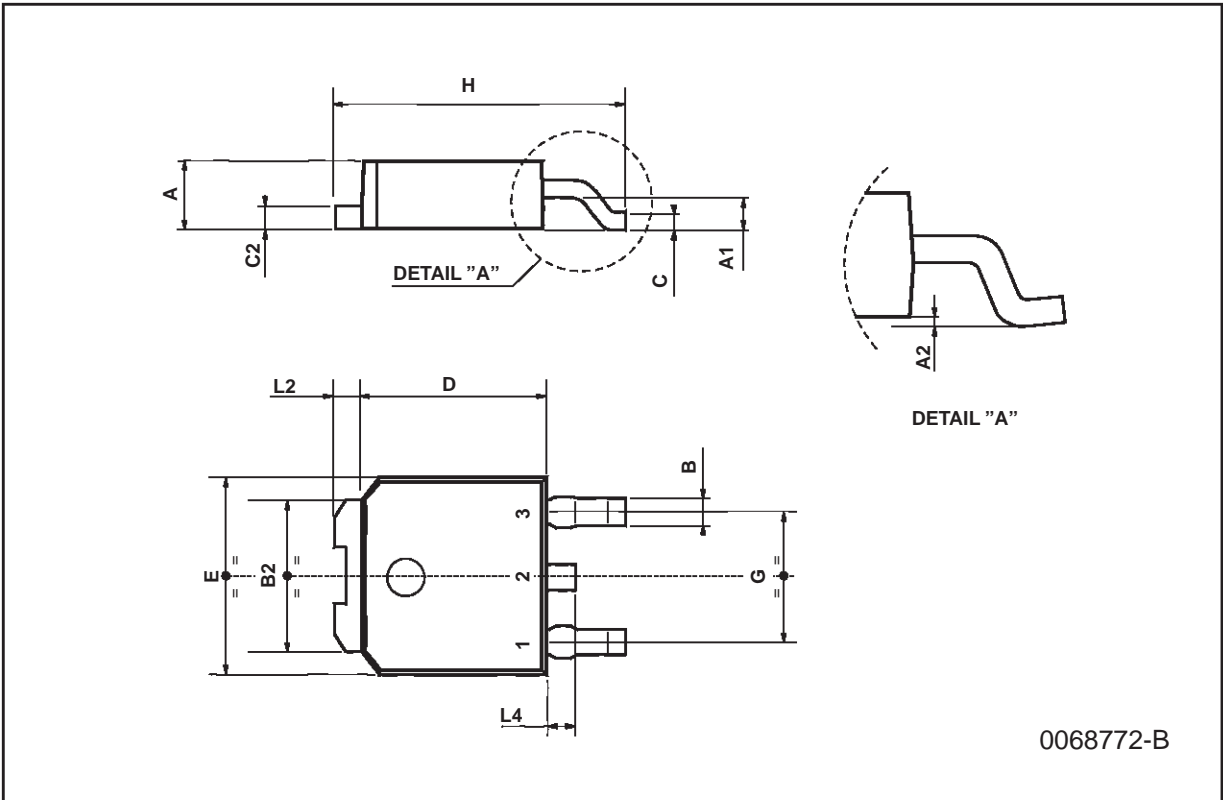
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



0068771-E

**TO-252 (DPAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039





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