



STD20NE06

N-CHANNEL 60V - 0.032 Ω - 20A DPAK "SINGLE FEATURE SIZE™" POWER MOSFET

Table 1. General Features

Type	V _{DSS}	R _{DS(on)}	I _D
STD20NE06	60 V	< 0.040 Ω	20 A

FEATURES SUMMARY

- TYPICAL R_{DS(on)} = 0.032 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

DESCRIPTION

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

APPLICATIONS

- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC CONVERTERS
- AUTOMOTIVE ENVIRONMENT

Figure 1. Package

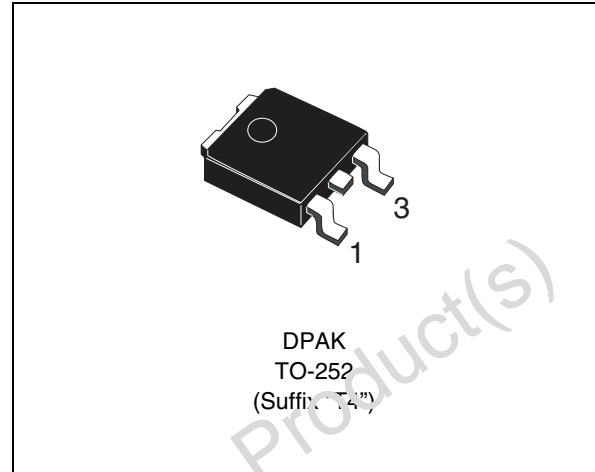


Figure 2. Internal Schematic Diagram

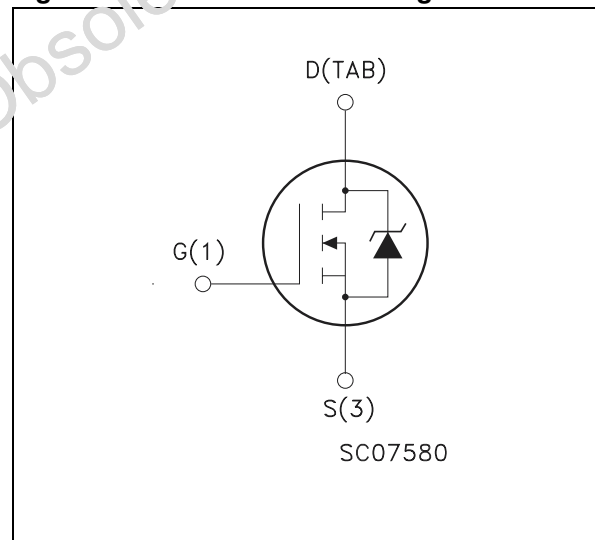


Table 2. Order Codes

Part Number	Marking	Package	Packaging
STD20NE06T4	D20NE06	DPAK	TUBE

STD20NE06

Table 3. Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	60	V
V_{DGR}	Drain- gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)	60	V
V_{GS}	Gate-source Voltage	± 20	V
$I_D^{(1)}$	Drain Current (cont.) at $T_C = 25 \text{ }^\circ\text{C}$	20	A
I_D	Drain Current (cont.) at $T_C = 100 \text{ }^\circ\text{C}$	17	A
$I_{DM}^{(2)}$	Drain Current (pulsed)	80	A
P_{tot}	Total Dissipation at $T_C = 25 \text{ }^\circ\text{C}$	50	W
	Derating Factor	0.33	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak Diode Recovery voltage slope	7	V/ns
T_{stg}	Storage Temperature	-65 to 175	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	175	$^\circ\text{C}$

Note: 1. Value limited only by the package.
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 36 \text{ A}$, $di/dt \leq 300 \text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$

Table 4. Thermal Data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal Resistance Junction-case Max	3.0	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	100	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose	275	$^\circ\text{C}$

Table 5. 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 $T_j = 25 \text{ }^\circ\text{C}$; $I_D = I_{AR}$; $V_{DD} = 25 \text{ V}$)	80	mJ

ELECTRICAL CHARACTERISTICS ($T_{\text{case}} = 25^{\circ}\text{C}$ unless otherwise specified)**Table 6. Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source Breakdown Voltage	$I_{\text{D}} = 250 \text{ mA}; V_{\text{GS}} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{\text{GS}} = 0$)	$V_{\text{DS}} = \text{Max Rating}$ $V_{\text{DS}} = \text{Max Rating} \times 0.8; T_{\text{c}} = 125^{\circ}\text{C}$			1 10	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{\text{DS}} = 0$)	$V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA

Table 7. On ⁽¹⁾

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}; I_{\text{D}} = 250 \mu\text{A}$	2	3	4	V
$R_{\text{DS}(\text{on})}$	Static Drain-source On Resistance	$V_{\text{GS}} = 10\text{V}; I_{\text{D}} = 10 \text{ A}$		0.032	0.04	Ω

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

Table 8. Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} ⁽¹⁾	Forward Transconductance	$V_{\text{DS}} > I_{\text{D}(\text{on})} \times R_{\text{DS}(\text{on})\text{max}}; I_{\text{D}} = 10 \text{ A}$	7	13		S
C_{iSS}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}; f = 1 \text{ MHz}; V_{\text{GS}} = 0$		2115	2800	pF
C_{oSS}	Output Capacitance			260	350	pF
C_{rSS}	Reverse Transfer Capacitance			65	90	pF

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

Table 9. Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on Time	$V_{\text{DD}} = 30 \text{ V}; I_{\text{D}} = 18 \text{ A};$ $R_{\text{G}} = 4.7 \Omega; V_{\text{GS}} = 10 \text{ V}$		28	40	ns
t_{r}	Rise Time			85	115	ns
$(\text{di}/\text{dt})_{\text{on}}$	Turn-on Current Slope	$V_{\text{DD}} = 48 \text{ V}; I_{\text{D}} = 36 \text{ A};$ $R_{\text{G}} = 4.7 \Omega; V_{\text{GS}} = 10 \text{ V}$		250		A/ μs
Q_{g}	Total Gate Charge	$V_{\text{DD}} = 48 \text{ V}; I_{\text{D}} = 36 \text{ A}; V_{\text{GS}} = 10 \text{ V}$		50	70	nC
Q_{gS}	Gate-Source Charge			13		nC
Q_{gD}	Gate-Drain Charge			18		nC

Table 10. Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{\text{r}(\text{Voff})}$	Off-voltage Rise Time	$V_{\text{DD}} = 48 \text{ V}; I_{\text{D}} = 36 \text{ A};$ $R_{\text{G}} = 4.7 \Omega; V_{\text{GS}} = 10 \text{ V}$		12	16	ns
t_{f}	Fall Time			25	35	ns
t_{c}	Cross-over Time			40	55	ns

Table 11. Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				20	A
$I_{SDM}^{(1)}$	Source-drain Current (pulsed)				80	A
$V_{SD}^{(2)}$	Forward On Voltage	$I_{SD} = 20\text{ A}; V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 36\text{ A}; di/dt = 100\text{ A}/\mu\text{s}$		75		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 30\text{ V}; T_j = 150\text{ }^\circ\text{C}$		245		nC
I_{rrm}	Reverse Recovery Current			6.5		A

Note: 1. Pulse width limited by safe operating area
 2. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

Figure 3. Safe Operating Area

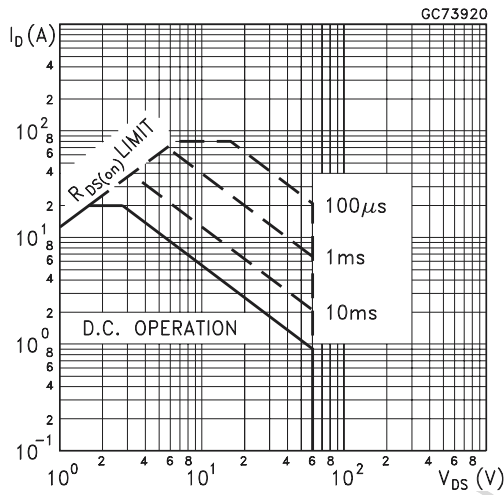


Figure 4. Thermal Impedance

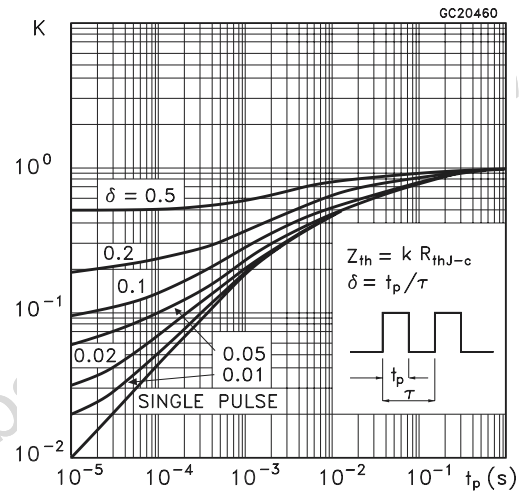


Figure 5. Output Characteristics

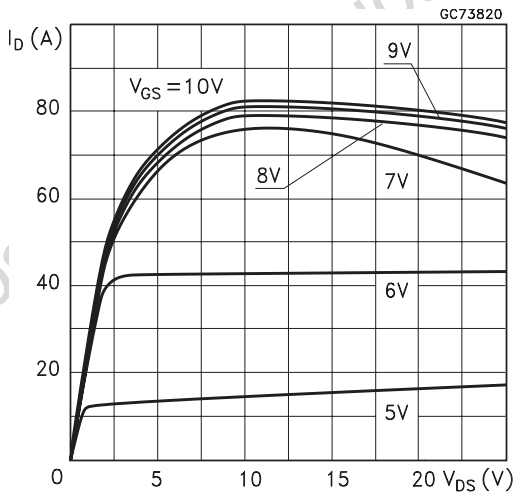


Figure 6. Transfer Characteristics

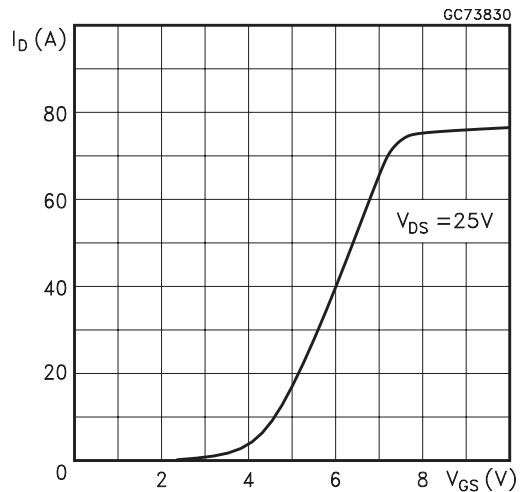


Figure 7. Transconductance

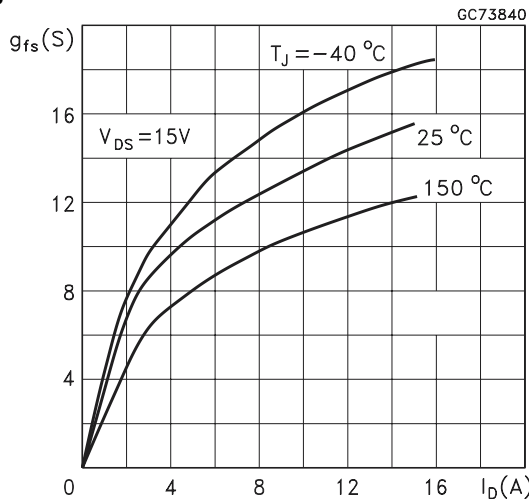


Figure 8. Static Drain-source On Resistance

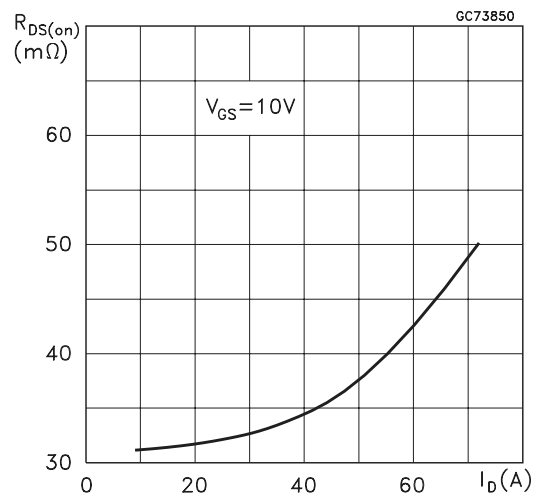


Figure 9. Gate Charge vs Gate-source Voltage

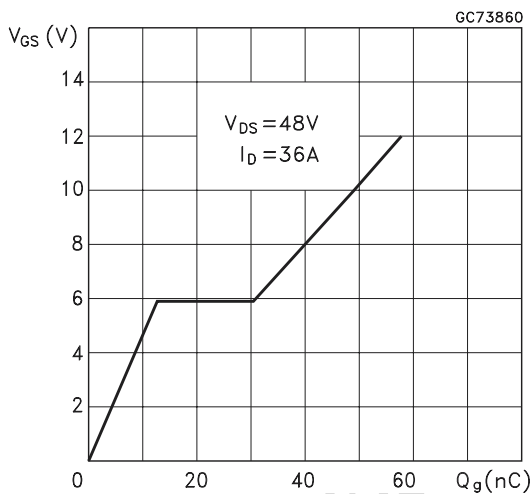


Figure 10. Capacitance Variations

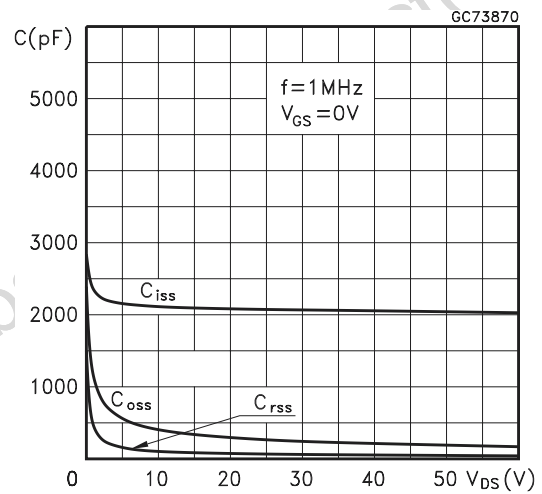


Figure 11. Normalized Gate Threshold Voltage vs Temperature

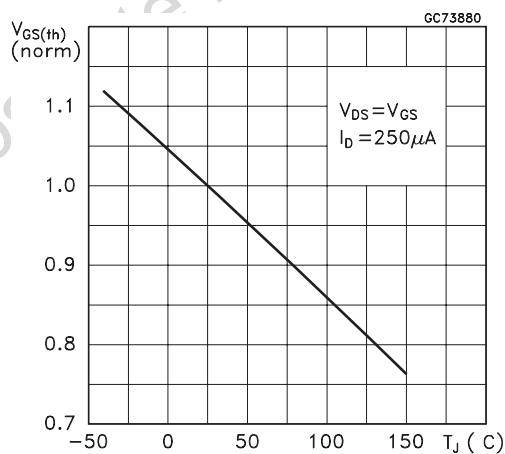


Figure 12. Normalized on Resistance vs Temperature

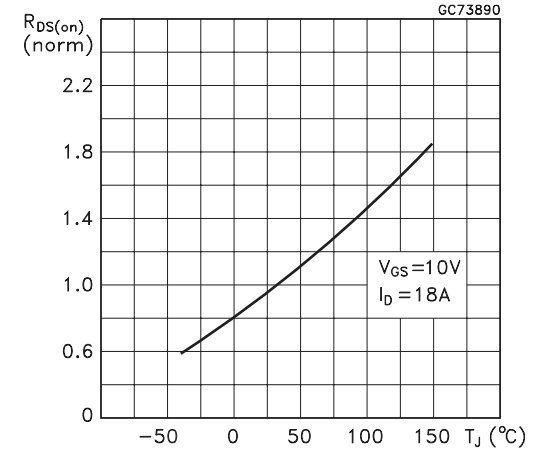
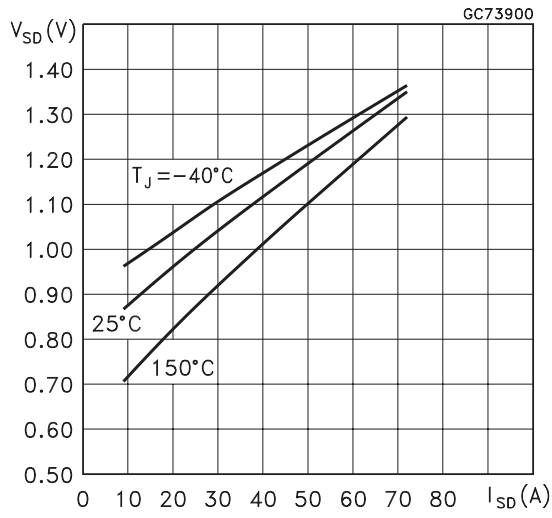


Figure 13. Source-drain Diode Forward Characteristics



Obsolete Product(s) - Obsolete Product(s)

Figure 14. Unclamped Inductive Load Test Circuit

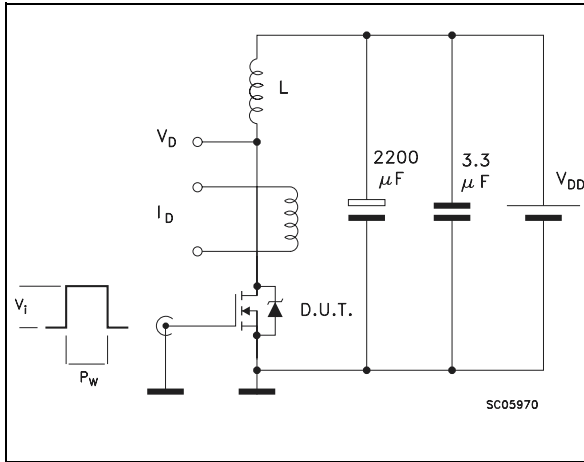


Figure 15. Unclamped Inductive Waveforms

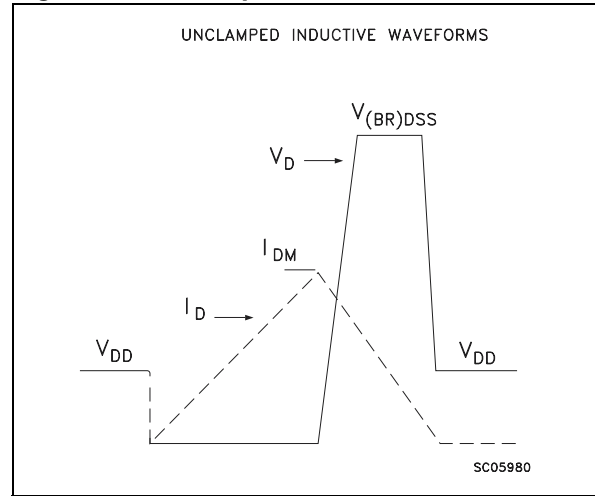


Figure 16. Switching Time Test Circuit For Resistive Load

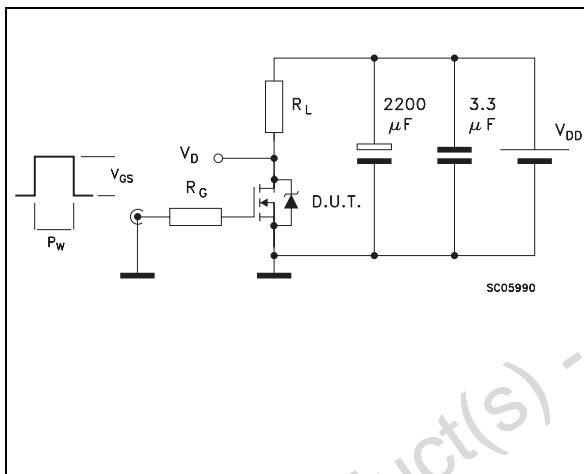


Figure 17. Gate Charge Test Circuit

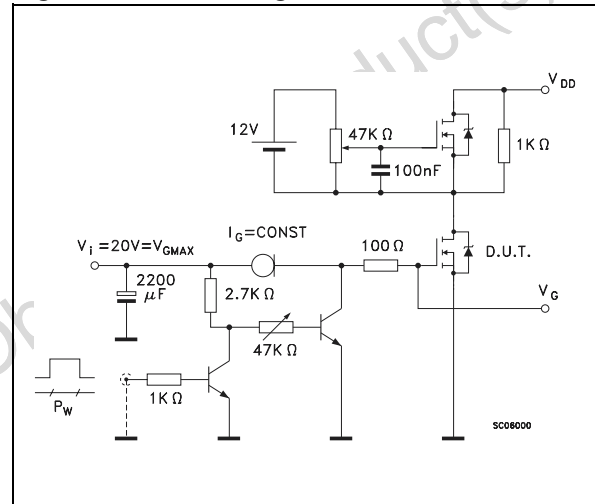
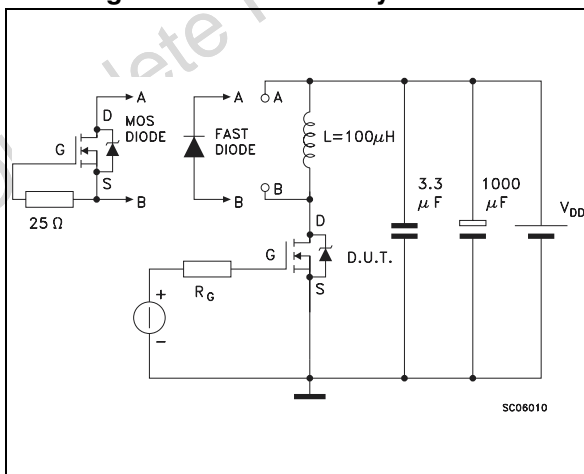


Figure 18. Test Circuit For Inductive Load Switching And Diode Recovery Times



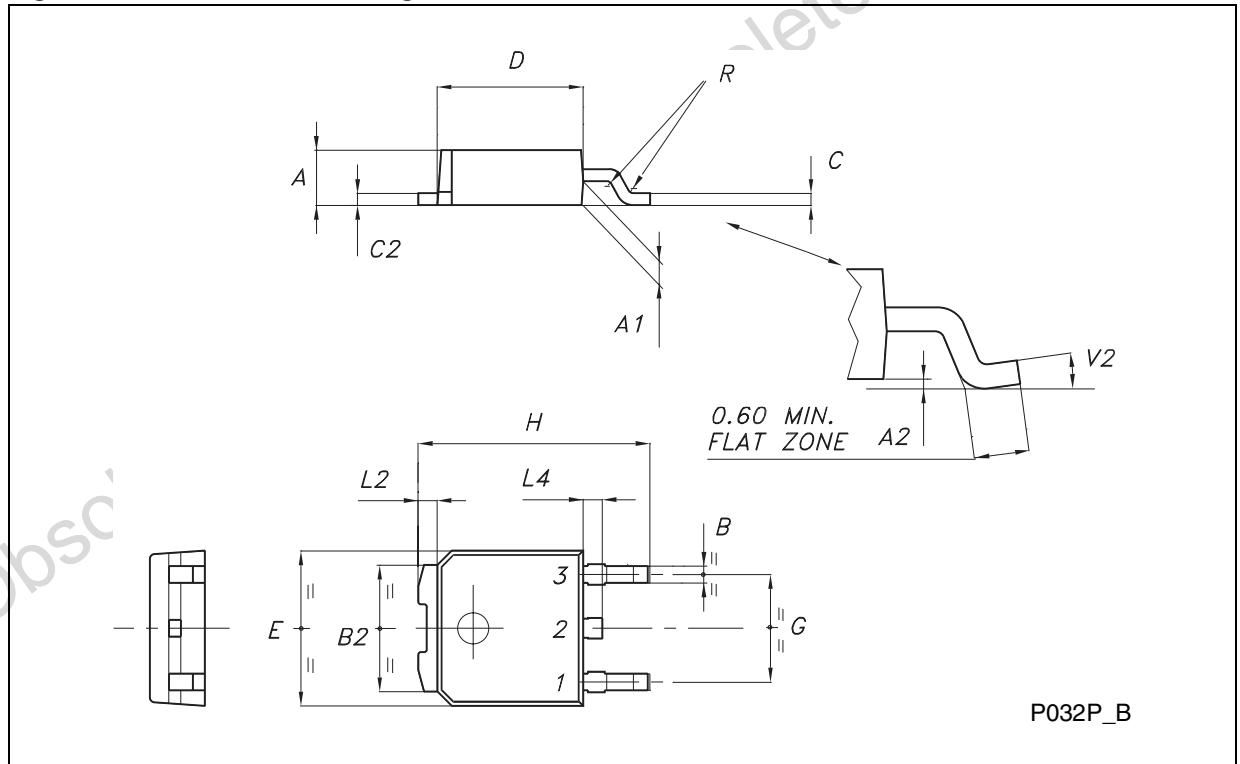
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PACKAGE MECHANICAL

Table 12. DPAK TO-252 Mechanical Data

Symbol	millimeters			inches		
	Min	Typ	Max	Min	Typ	Max
A	2.20		2.40	0.087	0.094	
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.0014		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°

Figure 19. DPAK TO-252 Package Dimensions



Note: Drawing is not to scale.

REVISION HISTORY**Table 13. Revision History**

Date	Revision	Description of Changes
January-1998	1	First Issue
14-Apr-2004	2	Stylesheet update. No content change.

Obsolete Product(s) - Obsolete Product(s)

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