



# STW34NB20

N-CHANNEL 200V - 0.062  $\Omega$  - 34A TO-247

PowerMESH™ MOSFET

Table 1. General Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STW34NB20	200 V	< 0.075 $\Omega$	34 A

### FEATURES SUMMARY

- TYPICAL R<sub>DS(on)</sub> = 0.062  $\Omega$
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

### DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R<sub>DS(on)</sub> per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

### APPLICATIONS

- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE
- HIGH CURRENT, HIGH SPEED SWITCHING

Figure 1. Package

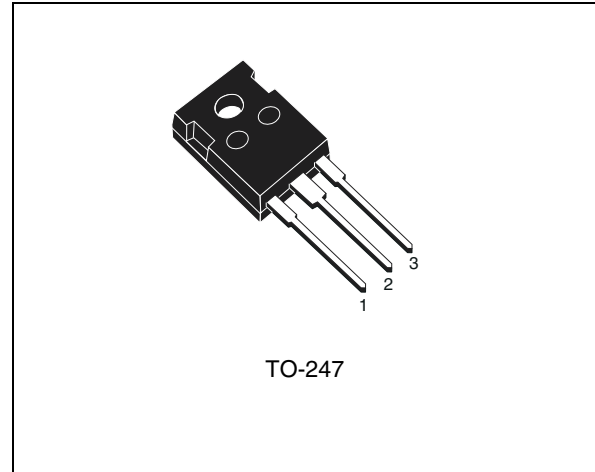


Figure 2. Internal Schematic Diagram

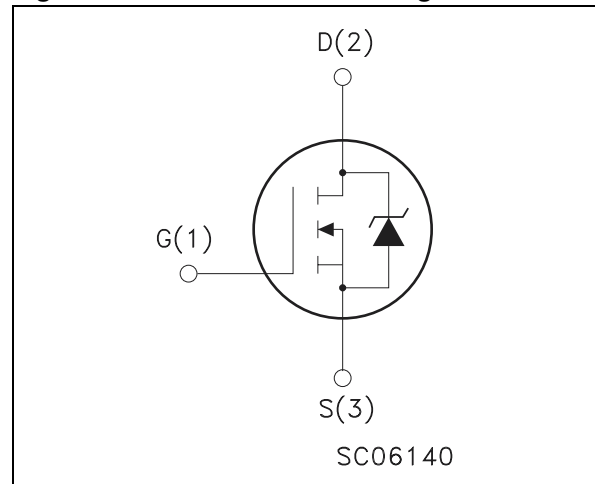


Table 2. Order Codes

Part Number	Marking	Package	Packaging
STW34NB20	W34NB20	TO-247	TUBE

**Table 3. Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source Voltage ( $V_{GS} = 0$ )	200	V
$V_{DGR}$	Drain- gate Voltage ( $R_{GS} = 20\text{ k}\Omega$ )	200	V
$V_{GS}$	Gate-source Voltage	$\pm 30$	V
$I_D$	Drain Current (cont.) at $T_C = 25\text{ }^\circ\text{C}$	34	A
$I_D$	Drain Current (cont.) at $T_C = 100\text{ }^\circ\text{C}$	21	A
$I_{DM}^{(1)}$	Drain Current (pulsed)	136	A
$P_{tot}$	Total Dissipation at $T_C = 25\text{ }^\circ\text{C}$	180	W
	Derating Factor	1.44	W/ $^\circ\text{C}$
$T_{stg}$	Storage Temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150	$^\circ\text{C}$

Note: 1. Pulse width limited by safe operating area

**Table 4. Thermal Data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.69	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30	$^\circ\text{C}/\text{W}$
$T_l$	Maximum Lead Temperature For Soldering Purpose	300	$^\circ\text{C}$

**Table 5. Avalanche Characteristics**

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max, $\delta < 1\%$ )	34	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25\text{ }^\circ\text{C}$ ; $I_D = I_{AR}$ ; $V_{DD} = 50\text{ V}$ )	650	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	$I_{\text{D}} = 250 \mu\text{A}$ $V_{\text{GS}} = 0$	200			V
$I_{\text{DSS}}$	Zero Gate Voltage	$V_{\text{DS}} = \text{Max Rating}$			1	$\mu\text{A}$
	Drain Current ( $V_{\text{GS}} = 0$ )	$V_{\text{DS}} = \text{Max Rating}$ $T_{\text{c}} = 125^{\circ}\text{C}$			10	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-body Leakage Current ( $V_{\text{DS}} = 0$ )	$V_{\text{GS}} = \pm 30 \text{ V}$			$\pm 100$	nA

**Table 7. On** <sup>(1)</sup>

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ ; $I_{\text{D}} = 250 \mu\text{A}$	3	4	5	V
$R_{\text{DS}(\text{on})}$	Static Drain-source On Resistance	$V_{\text{GS}} = 10\text{V}$ ; $I_{\text{D}} = 17 \text{ A}$		0.062	0.075	$\Omega$

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %**Table 8. Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{\text{fs}}$ <sup>(1)</sup>	Forward Transconductance	$V_{\text{DS}} > I_{\text{D}(\text{on})} \times R_{\text{DS}(\text{on})\text{max}}$ ; $I_{\text{D}} = 17 \text{ A}$	8	17		S
$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{\text{GS}} = 0$		2400	3300	pF
$C_{\text{oss}}$	Output Capacitance			650	900	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			90	130	pF

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %**Table 9. Switching On**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{\text{d}(\text{on})}$	Turn-on Time	$V_{\text{DD}} = 100 \text{ V}$ ; $I_{\text{D}} = 17 \text{ A}$ ; $R_{\text{G}} = 4.7 \Omega$		30	40	ns
$t_{\text{r}}$	Rise Time	$V_{\text{GS}} = 10 \text{ V}$ (see test circuit, Figure 16)		40	55	ns
$Q_{\text{g}}$	Total Gate Charge	$V_{\text{DD}} = 160 \text{ V}$ ; $I_{\text{D}} = 34 \text{ A}$ ; $V_{\text{GS}} = 10 \text{ V}$		60	80	nC
$Q_{\text{gs}}$	Gate-Source Charge			19		nC
$Q_{\text{gd}}$	Gate-Drain Charge			29		nC

**Table 10. Switching Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{\text{r}(\text{Voff})}$	Off-voltage Rise Time	$V_{\text{DD}} = 160 \text{ V}$ ; $I_{\text{D}} = 34 \text{ A}$ ; $R_{\text{G}} = 4.7 \Omega$ $V_{\text{GS}} = 10 \text{ V}$ (see test circuit, Figure 18)		17	23	ns
$t_{\text{f}}$	Fall Time			18	24	ns
$t_{\text{c}}$	Cross-over Time			35	47	ns

Table 11. Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				34	A
$I_{SDM}^{(1)}$	Source-drain Current (pulsed)				136	A
$V_{SD}^{(2)}$	Forward On Voltage	$I_{SD} = 34\text{ A}; V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 34\text{ A}; di/dt = 100\text{ A}/\mu\text{s}$			290	ns
$Q_{rr}$	Reverse RecoveryCharge	$V_{DD} = 50\text{ V}; T_j = 150\text{ }^\circ\text{C}$ (see test circuit, Figure 18)			2.7	$\mu\text{C}$
$I_{RRAM}$	Reverse RecoveryCharge				18.5	A

Note: 1. Pulse width limited by safe operating area  
 2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

Figure 3. Safe Operating Area

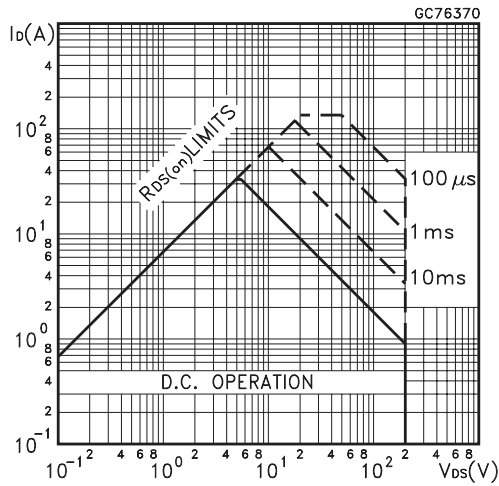


Figure 4. Thermal Impedance

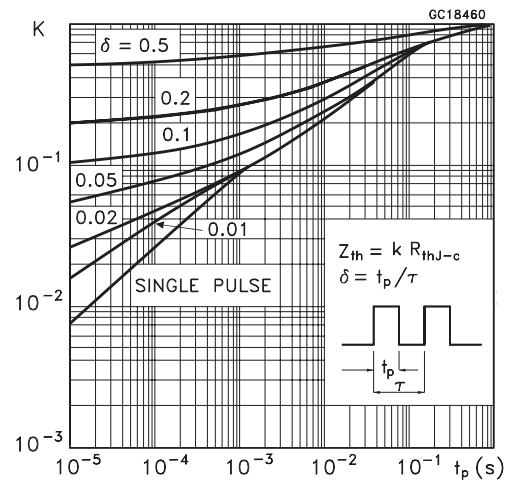


Figure 5. Output Characteristics

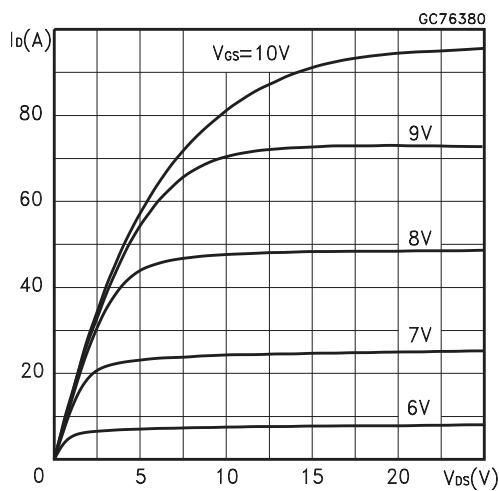


Figure 6. Transfer Characteristics

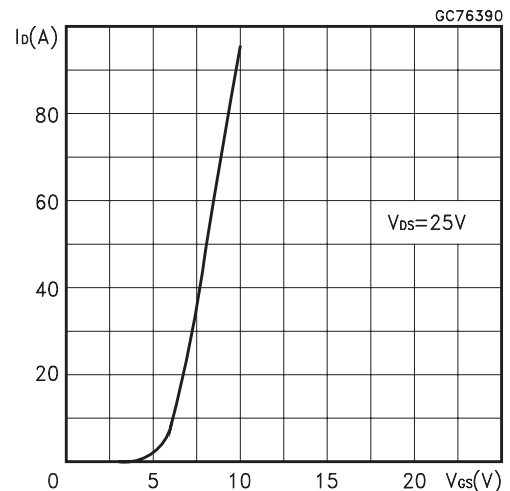


Figure 7. Transconductance

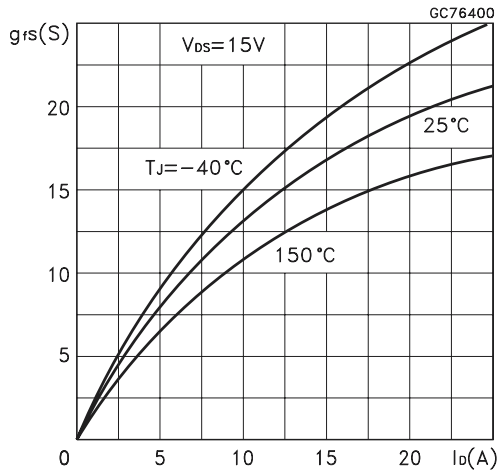


Figure 8. Static Drain-source On Resistance

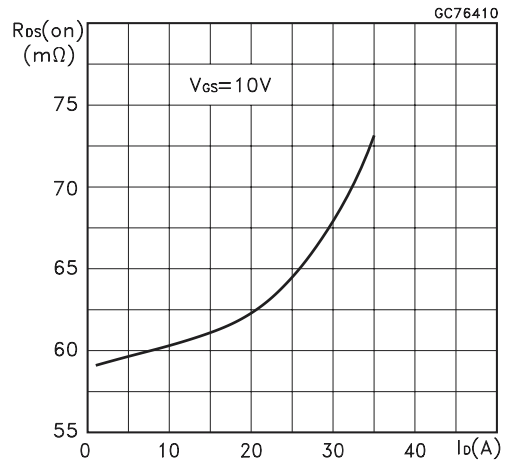


Figure 9. Gate Charge vs Gate-source Voltage

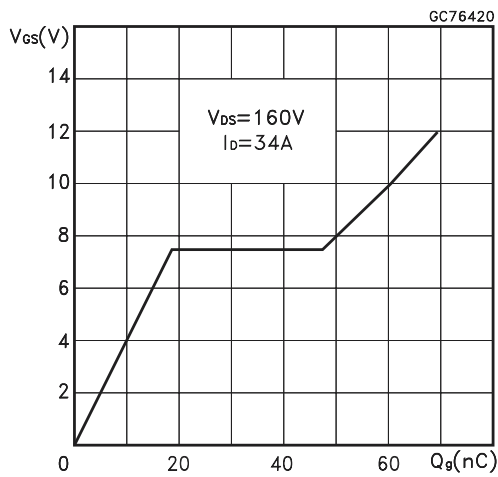


Figure 10. Capacitance Variations

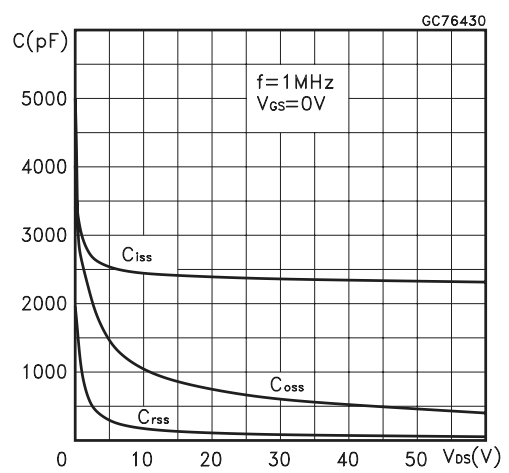


Figure 11. Normalized Gate Threshold Voltage vs Temperature

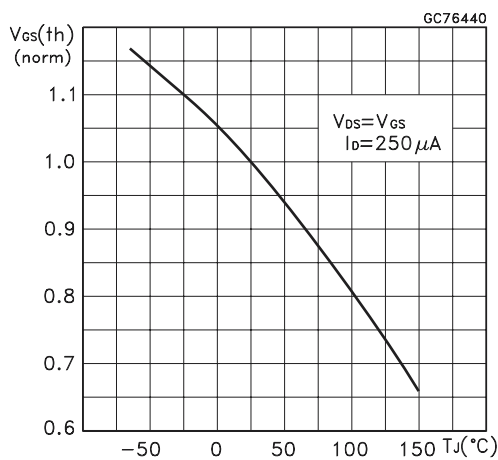
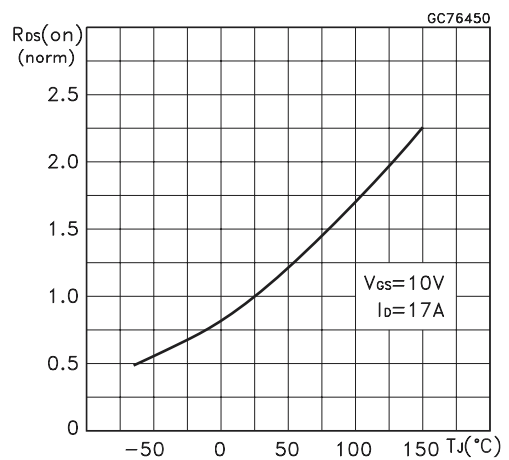


Figure 12. Normalized On Resistance vs Temperature



**Figure 13. Source-drain Diode Forward Characteristics**

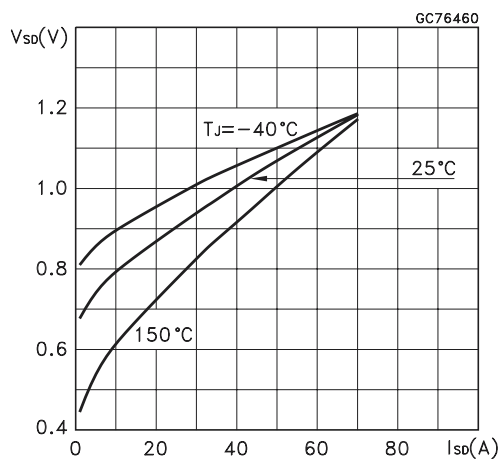


Figure 14. Unclamped Inductive Load Test Circuit

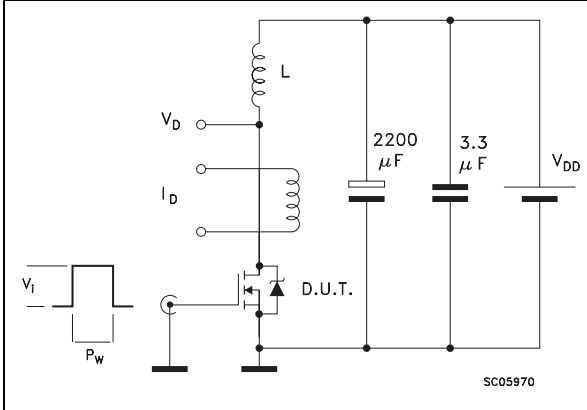


Figure 15. Unclamped Inductive Waveforms

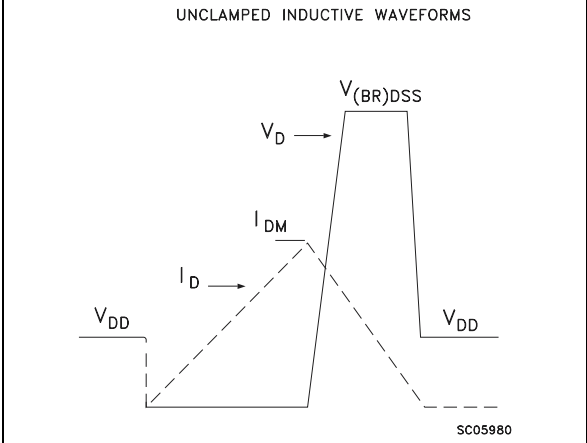


Figure 16. Switching Times Test Circuits For Resistive Load

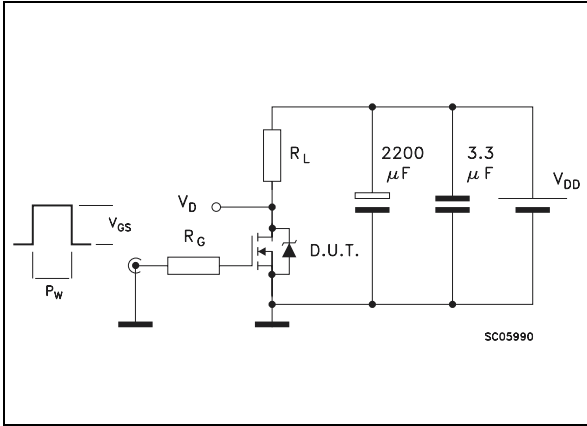


Figure 17. Gate Charge Test Circuit

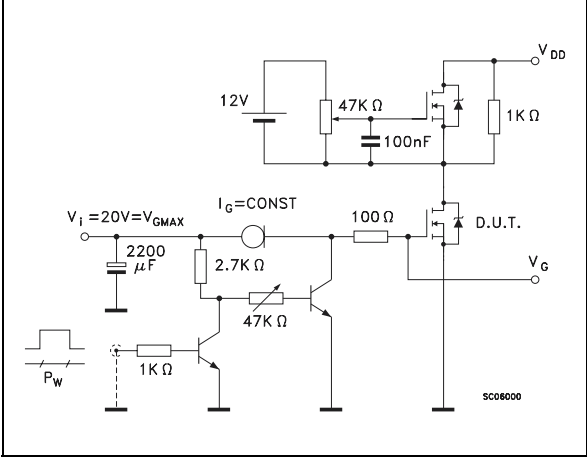
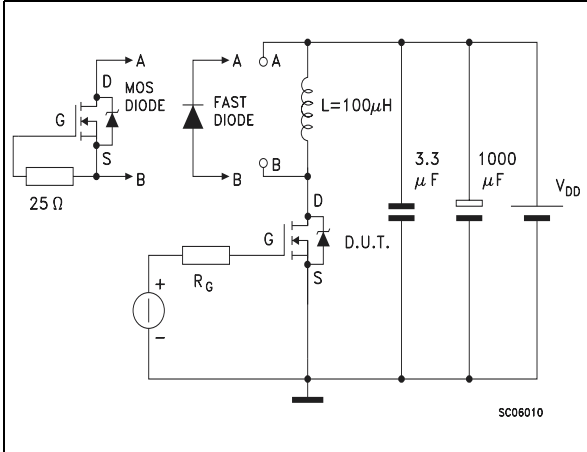


Figure 18. Test Circuit For Inductive Load Switching And Diode Recovery Times

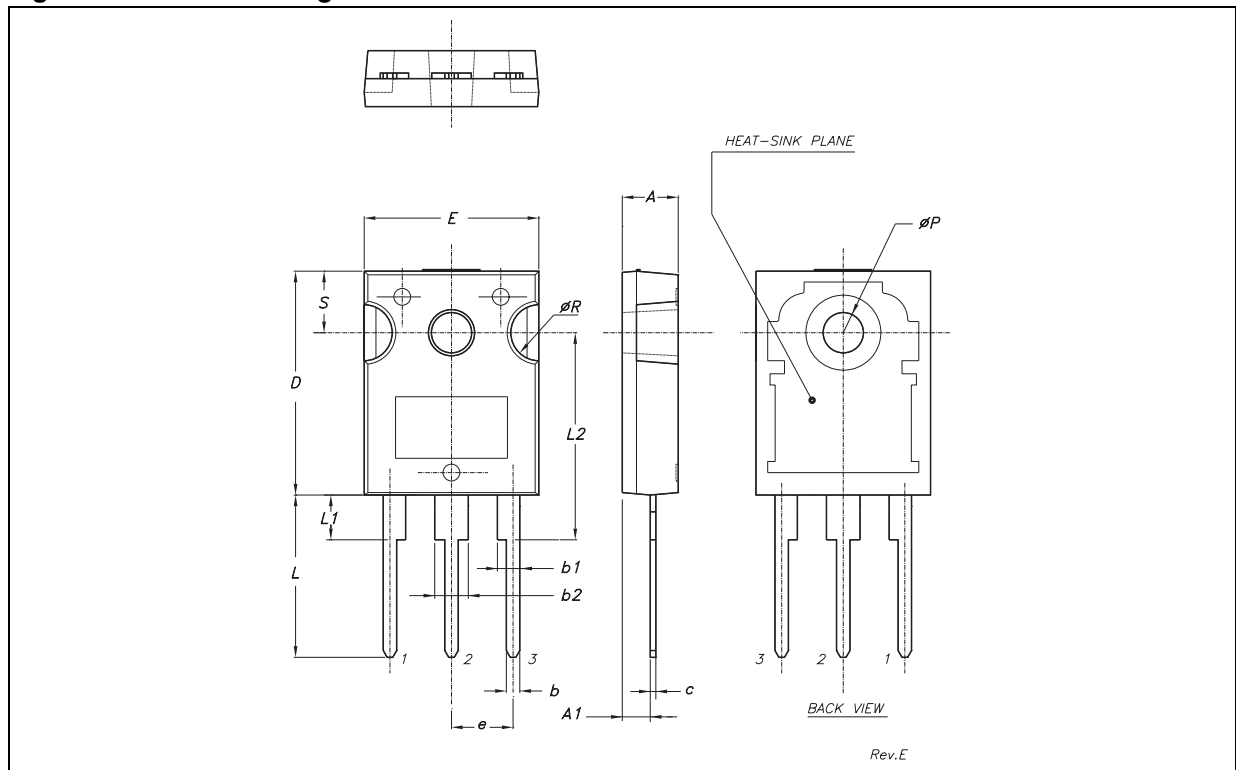


PACKAGE MECHANICAL

Table 12. TO-247 Mechanical Data

Symbol	millimeters			inches		
	Min	Typ	Max	Min	Typ	Max
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
ØP	3.55		3.65	0.140		0.143
ØR	4.50		5.50	0.177		0.216
S		5.50			0.216	

Figure 19. TO-247 Package Dimensions



Note: Drawing is not to scale.



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**REVISION HISTORY****Table 13. Revision History**

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

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