



# 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

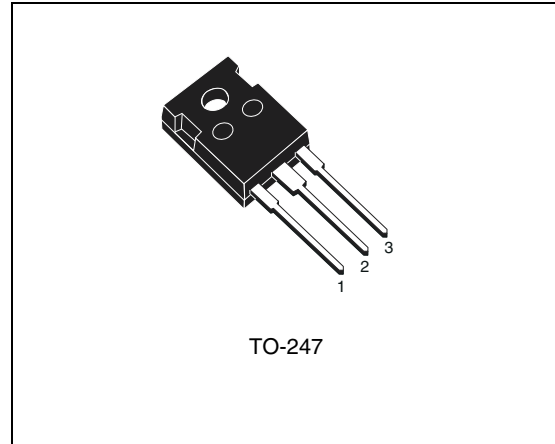


Figure 2. Internal Schematic Diagram

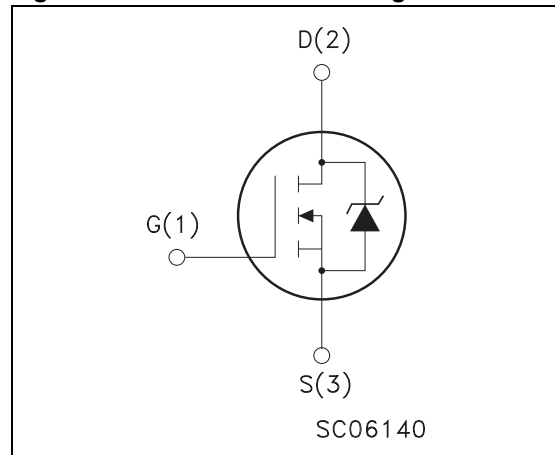


Table 2. Order Codes

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
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ ; $I_{\text{D}} = 250 \mu\text{A}$	3	4	5	V
$R_{\text{DS(on)}}$	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	$V_{\text{DS}} > I_{\text{D(on)}} \times R_{\text{DS(on)max}}$ ; $I_{\text{D}} = 17 \text{ A}$	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
$t_{\text{d(on)}}$	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
$t_{\text{r(voff)}}$	Off-voltage Rise Time	$V_{\text{DD}} = 160 \text{ V}$ ; $I_{\text{D}} = 34 \text{ A}$ ; $R_{\text{G}} = 4.7 \Omega$		17	23	ns
$t_{\text{f}}$	Fall Time	$V_{\text{GS}} = 10 \text{ V}$ (see test circuit, Figure 18)		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 Recovery Charge	$V_{DD} = 50\text{ V}; T_j = 150\text{ }^\circ\text{C}$ (see test circuit, Figure 18)			2.7	$\mu\text{C}$
$I_{RRAM}$	Reverse Recovery Charge				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

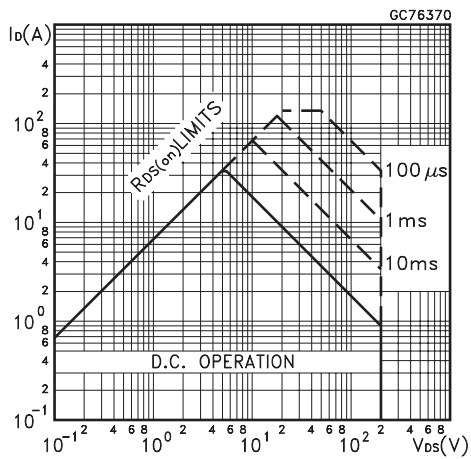


Figure 4. Thermal Impedance

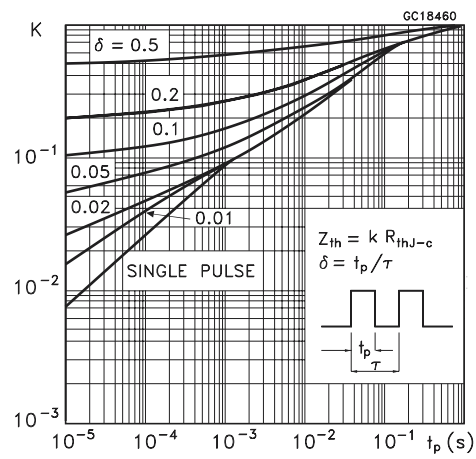


Figure 5. Output Characteristics

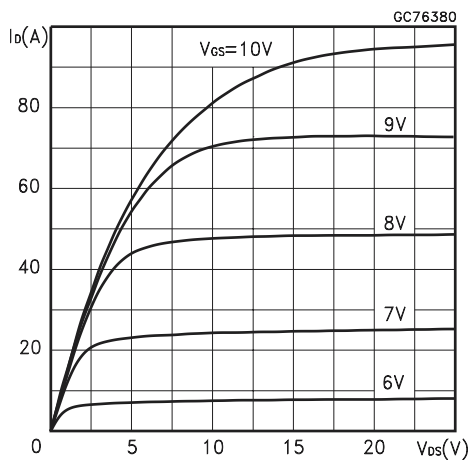


Figure 6. Transfer Characteristics

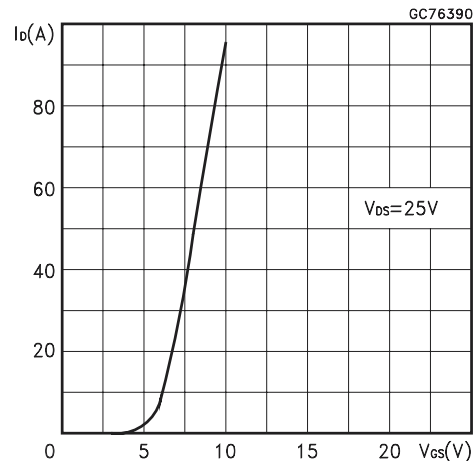


Figure 7. Transconductance

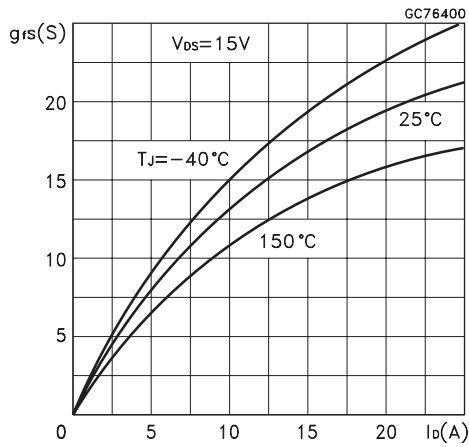


Figure 8. Static Drain-source On Resistance

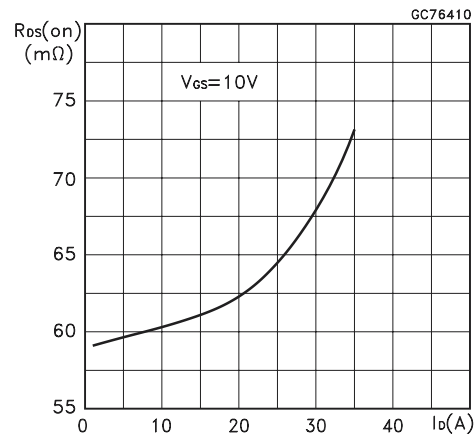


Figure 9. Gate Charge vs Gate-source Voltage

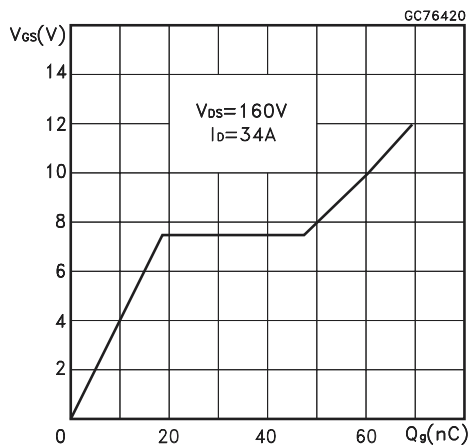


Figure 10. Capacitance Variations

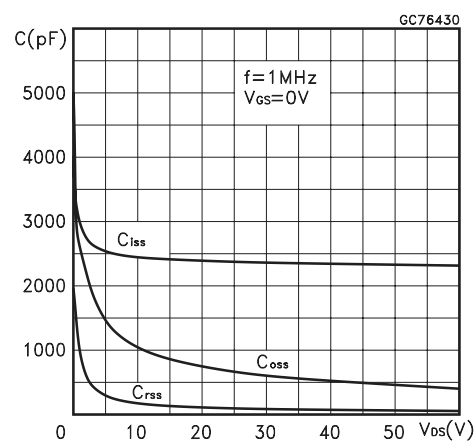


Figure 11. Normalized Gate Threshold Voltage vs Temperature

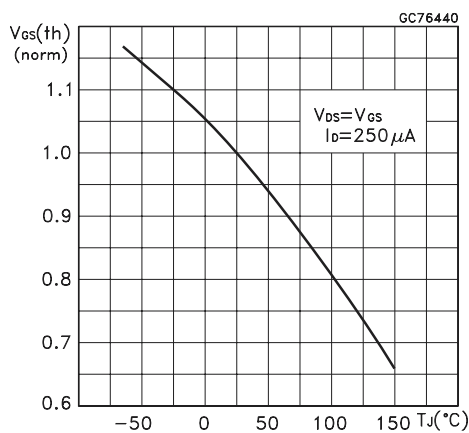
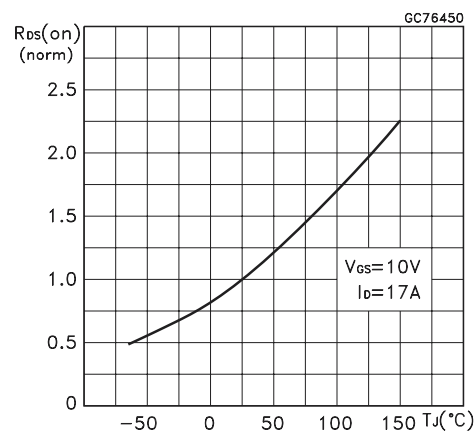
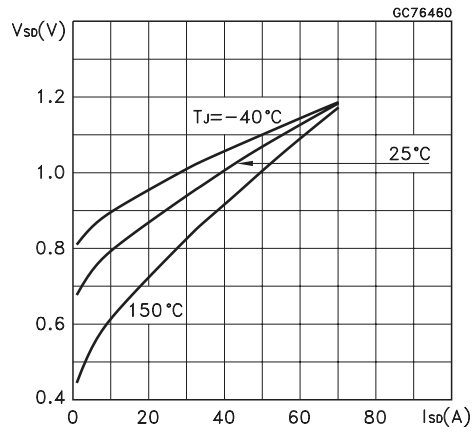


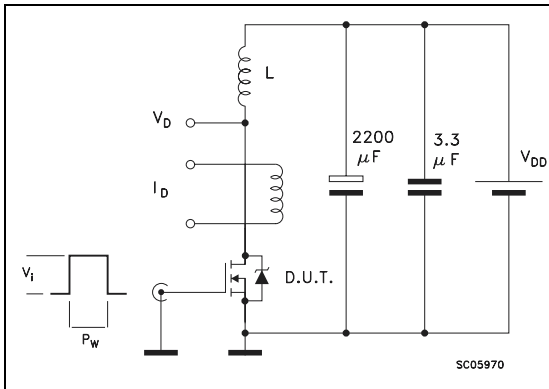
Figure 12. Normalized On Resistance vs Temperature



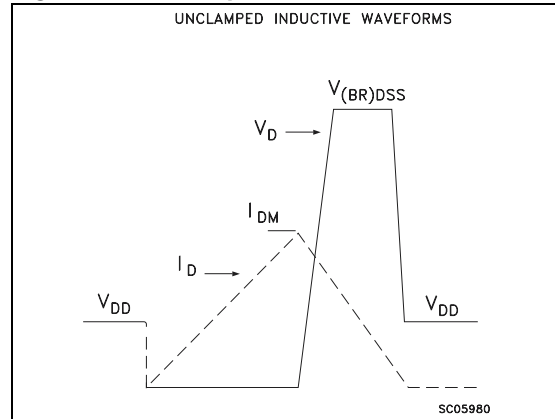
**Figure 13. Source-drain Diode Forward Characteristics**



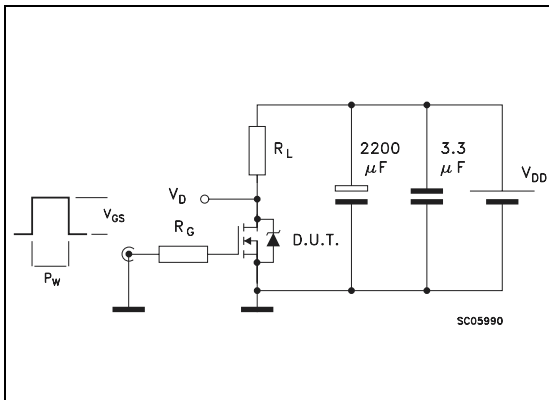
**Figure 14. Unclamped Inductive Load Test Circuit**



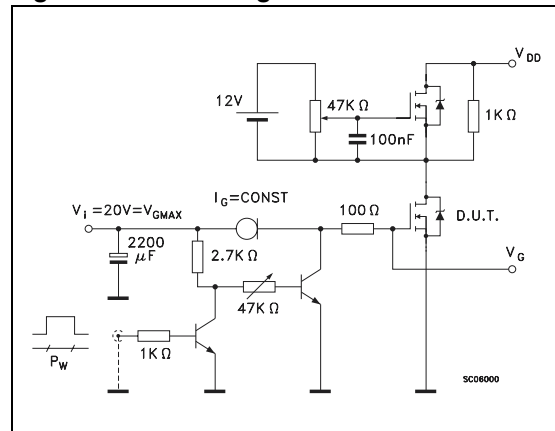
**Figure 15. Unclamped Inductive Waveforms**



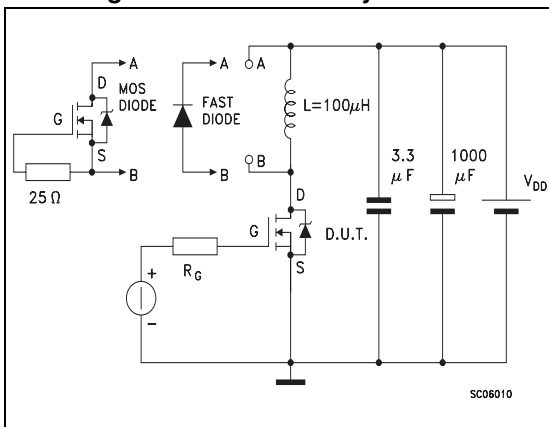
**Figure 16. Switching Times Test Circuits For Resistive Load**



**Figure 17. Gate Charge Test Circuit**



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



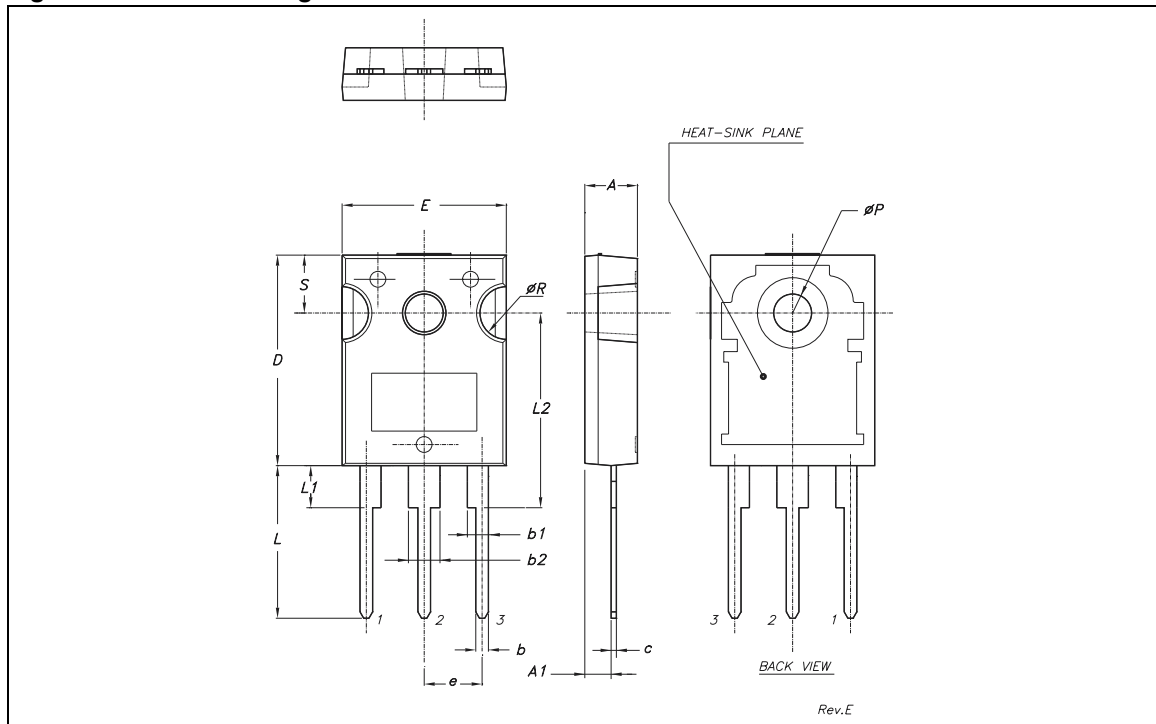
# STW34NB20

## 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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