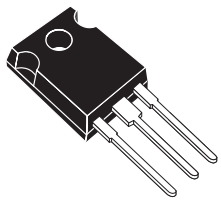
STW30NM60D

N-channel 600V - 0.125Ω - 30A - TO-247
Fast diode MDmesh™ Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STW30NM60D	600V	< 0.145Ω	30A

- High dv/dt and avalanche capabilities
- 100% avalanche rated
- Low input capacitance and gate charge
- Low gate input resistance
- Fast internal recovery diode

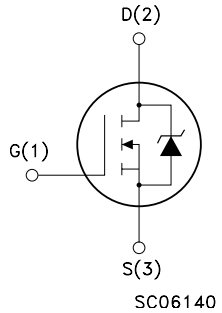


TO-247

Description

The FDmesh™ associates all advantages of reduced on-resistance and fast switching with an intrinsic fast-recovery body diode. It is therefore strongly recommended for bridge topologies, in particular ZVS phase-shift converters.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STW30NM60D	W30NM60D	TO-247	Tube

Obsolete Product(s) - Obsolete Product(s)

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Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20kΩ)	600	V
V_{GS}	Gate- source voltage	± 30	V
I_D	Drain current (continuous) at T_C = 25°C	30	A
I_D	Drain current (continuous) at T_C = 100°C	18.9	A
I_{DM} (1)	Drain current (pulsed)	120	A
P_{TOT}	Total dissipation at T_C = 25°C	312	W
	Derating factor	2.5	W/°C
dv/dt (2)	Peak diode recovery voltage slope	20	V/ns
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 150	°C

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 30A$, $di/dt \leq 400A/\mu s$, $V_{DD} = 80\%V_{(BR)DSS}$

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.4	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	15	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25°C, $I_D = I_{AR}$, V_{DD} = 50V)	740	mJ

Obsolete Product(s) - Obsolete Product(s)

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS} = 0	600			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0) V_{DS} = Max rating, @125°C	V_{DS} = Max rating			10 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20V			± 10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	3	4	5	V
$R_{DS(on}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 15A		0.125	0.145	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15V , I_D = 15A		16		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1MHz, V_{GS} = 0		2520 800 75		pF pF pF
$C_{oss\ eq.}$ (2)	Equivalent output capacitance	V_{GS} = 0V, V_{DS} = 0 to 480V		390		pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 480V, I_D = 30A, V_{GS} = 10V *Figure 15*		82 24 42	115	nC nC nC

1. Pulsed: Pulse duration = 300µs, duty cycle 1.5 %
2. $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Obsolete Product(s) - Obsolete Product(s)

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off-delay time Fall time	V_{DD} = 300V, I_D = 15A, R_G = 4.7Ω, V_{GS} = 10V *Figure 14*		32 33 75 35		ns ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				30 120	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 30A, V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 30A, di/dt=100A/µs V_{DD} = 50V,Tj=25°C *Figure 17*		165 1.1 14		ns nC A

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

Obsolete Product(s) - Obsolete Product(s)

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

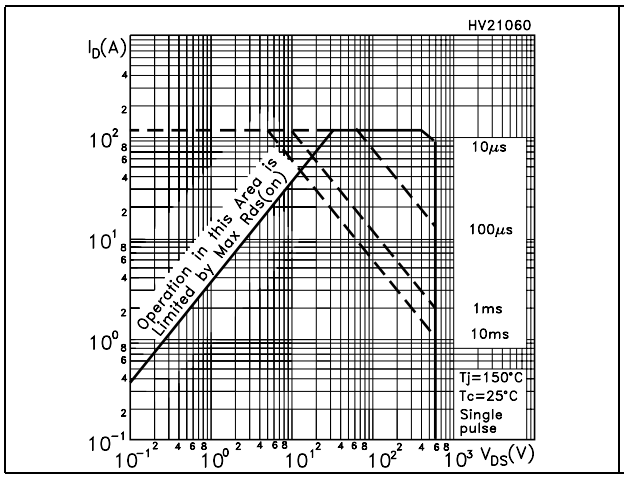


Figure 2. Thermal impedance

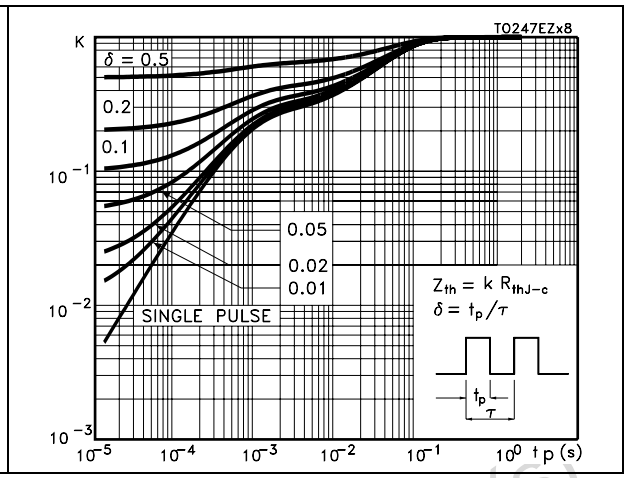


Figure 3. Output characterisics

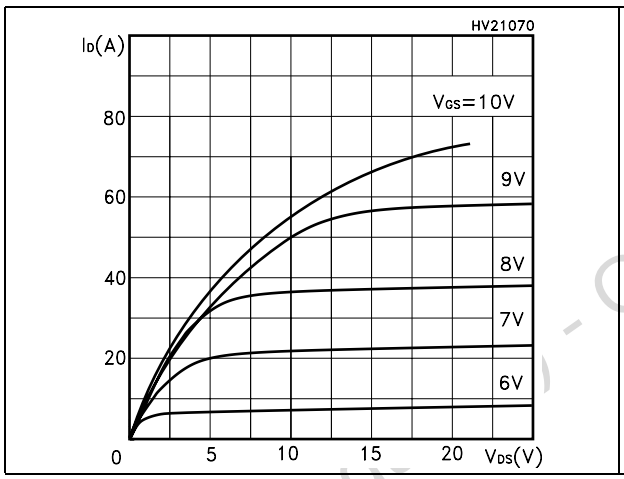


Figure 4. Transfer characteristics

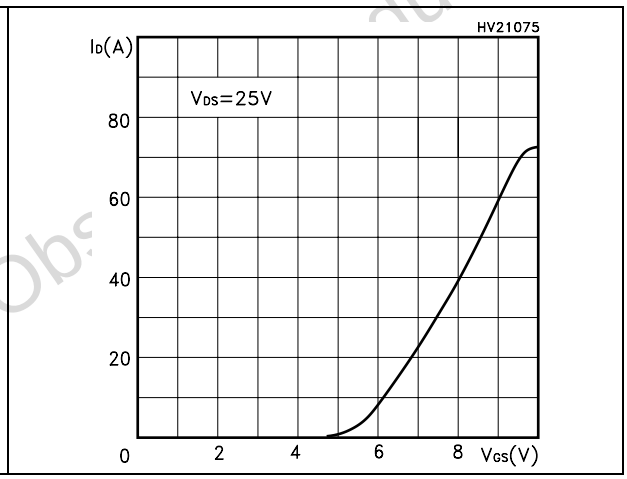


Figure 5. Transconductance

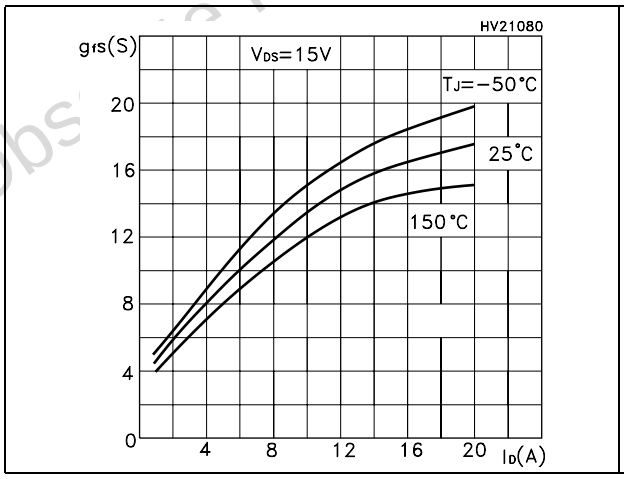


Figure 6. Static drain-source on resistance

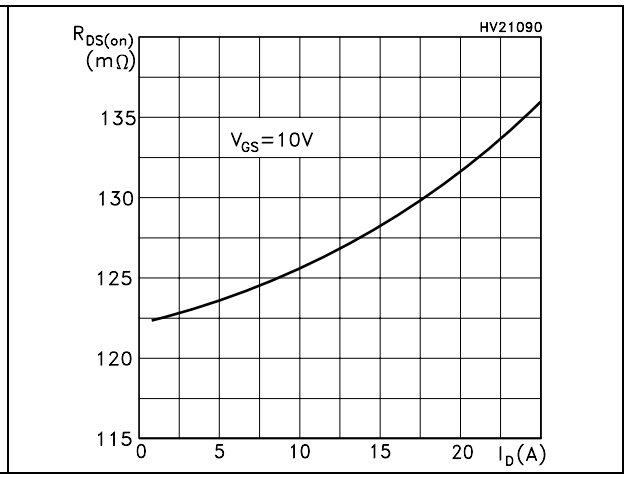


Figure 7. Gate charge vs gate-source voltage

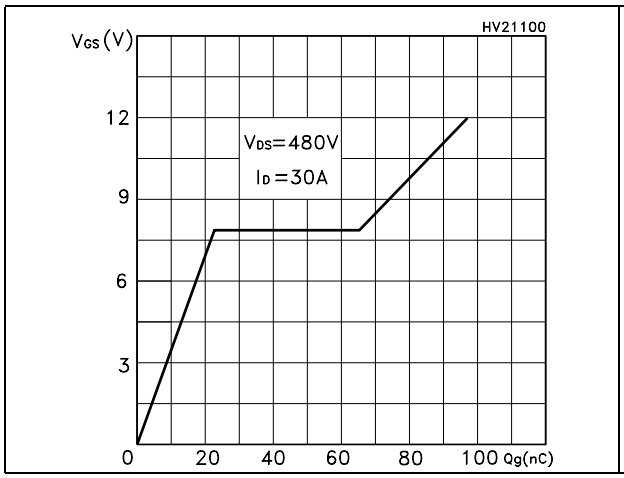


Figure 8. Capacitance variations

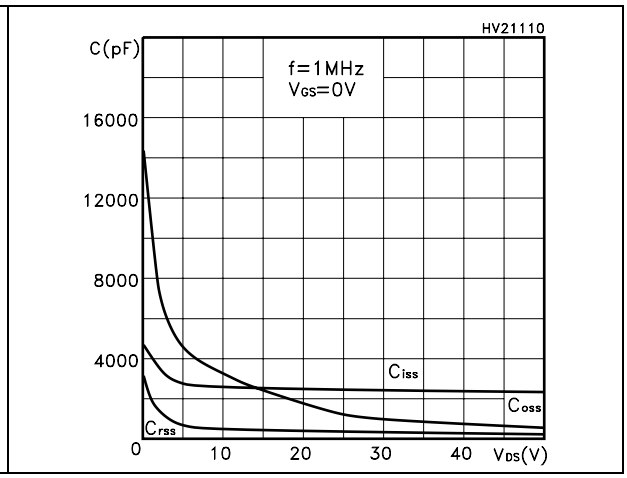


Figure 9. Normalized gate threshold voltage vs temperature

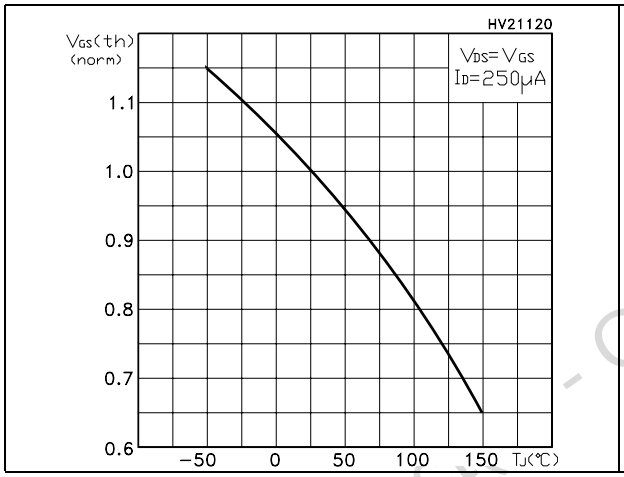


Figure 10. Normalized on resistance vs temperature

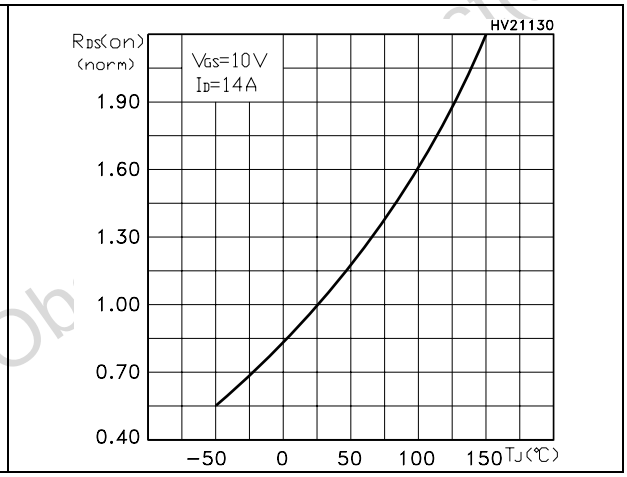
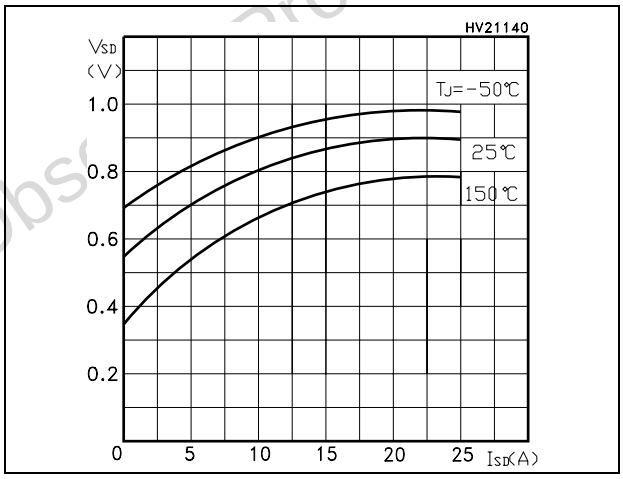


Figure 11. Source-drain diode forward characteristics



Obsolete Product(s) - Obs

3 Test circuit

Figure 12. Unclamped inductive load test circuit

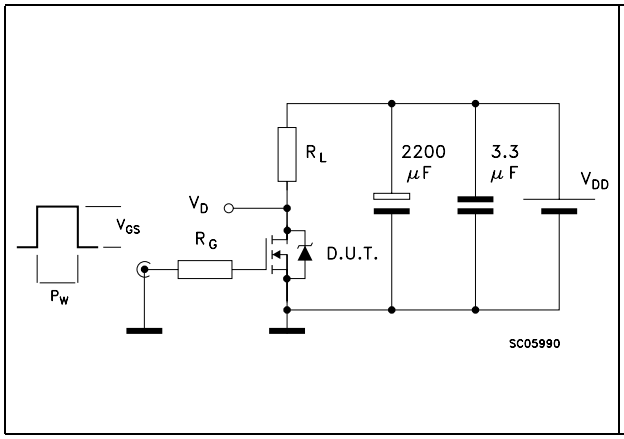


Figure 13. Unclamped inductive wafeform

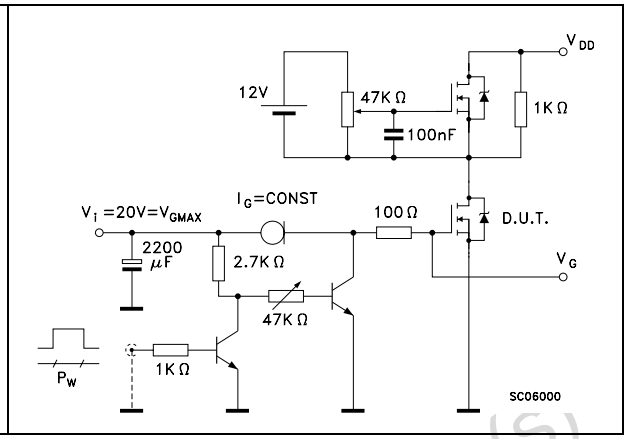


Figure 14. Switching times test circuit for resistive load

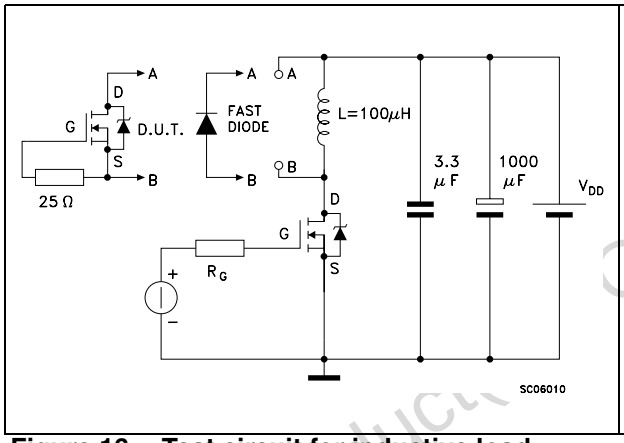


Figure 15. Gate charge test circuit

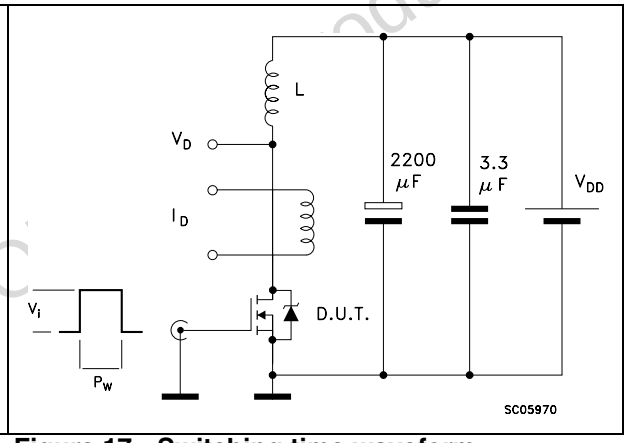


Figure 16. Test circuit for inductive load switching and diode recovery times

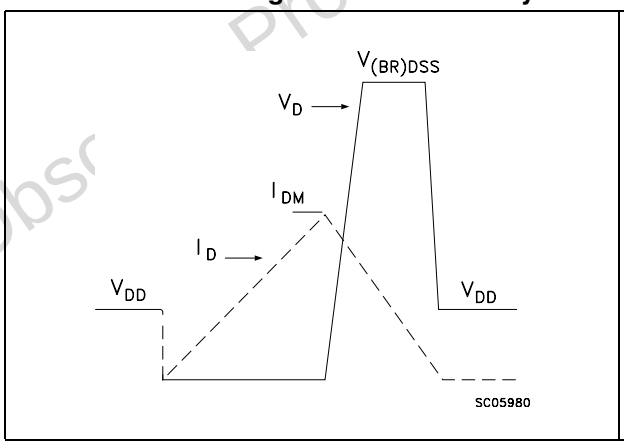
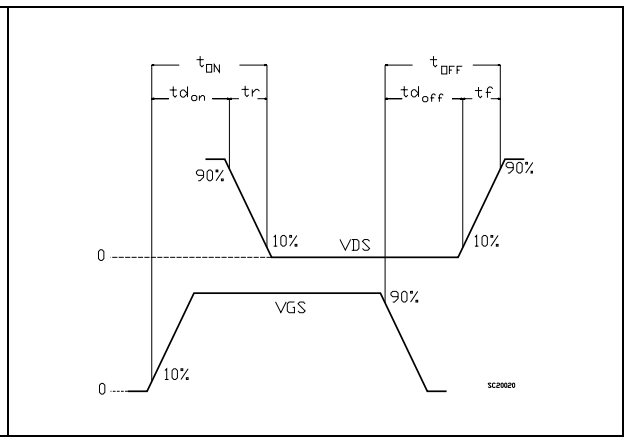


Figure 17. Switching time waveform



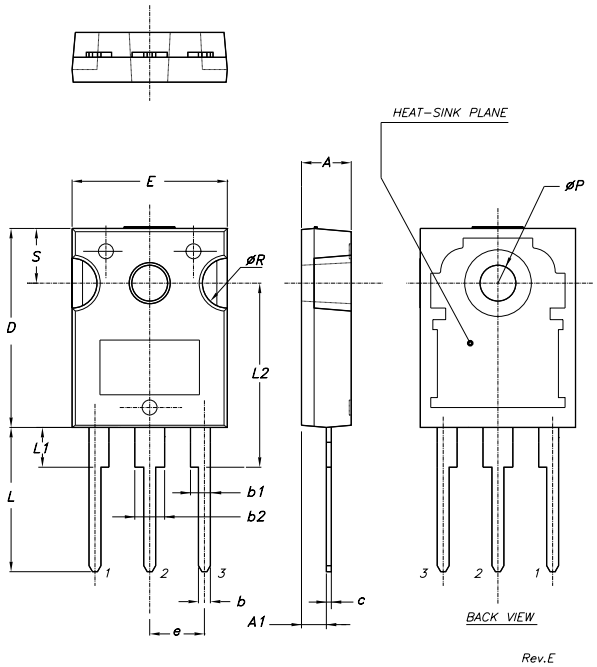
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: *www.st.com*

Obsolete Product(s) - Obsolete Product(s)

TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	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	



Obsole

5 Revision history

Table 8. Revision history

Date	Revision	Changes
24-June-2004	1	The document change from “ADVANCED” to “COMPLETE”. New stylesheet. Rds(on) Max@10V changed. See *Table 4*.
06-Dec-2005	2	Inserted ecopack indication
20-Dec-2005	3	Modified value on *Source drain diode*
24-Jan-2006	4	Changed unit on *Dynamic*
13-Jul-2006	5	New template, modified unit on *Source drain diode*

Obsolete Product(s) - Obsolete Product(s)

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