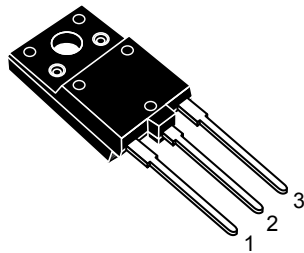
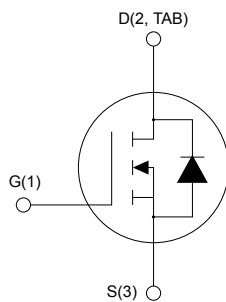


N-channel 1700 V, 7 Ω typ., 2.6 A PowerMESH Power MOSFET in a TO-3PF package


TO-3PF


AM01475v1_noZen



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STFW3N170	1700 V	13 Ω	2.6 A

- High speed switching
- Intrinsic capacitances and Q_g minimized
- 100% avalanche tested

Applications

- Switching applications

Description

This Power MOSFET is designed using the STMicroelectronics consolidated strip-layout-based MESH OVERLAY process. The result is a product that matches or improves on the performance of comparable standard parts from other manufacturers.

Product status link

[STFW3N170](#)

Product summary

Order code	STFW3N170
Marking	3N170
Package	TO-3PF
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1700	V
V_{GS}	Gate-source voltage	±30	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ °C}$	2.6	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	1.6	
$I_{DM}^{(2)}$	Drain current (pulsed)	10.4	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	63	W
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1\text{ s}$; $T_C = 25\text{ °C}$)	3.5	kV
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		

1. Limited by maximum junction temperature.
2. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	2	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max)	0.8	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	2	mJ

2 Electrical characteristics

($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1700	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 1700\text{ V}$	-	-	10	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 1700\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$	-	-	500	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 1.3\text{ A}$	-	7	13	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1100	-	pF
C_{oss}	Output capacitance		-	50	-	pF
C_{rss}	Reverse transfer capacitance		-	7	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, open drain	-	3.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 1360\text{ V}$, $I_D = 2.6\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 14. Test circuit for gate charge behavior)	-	44	-	nC
Q_{gs}	Gate-source charge		-	7	-	nC
Q_{gd}	Gate-drain charge		-	25	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 850\text{ V}$, $I_D = 1.3\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	25	-	ns
t_r	Rise time		-	9	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	51	-	ns
t_f	Fall time		-	53	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	2.6	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	10.4	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 2.6\text{ A}$	-	-	1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 2.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$	-	1.58	-	μs
Q_{rr}	Reverse recovery charge		-	6	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 15. Test circuit for inductive load switching and diode recovery times)	-	7.9	-	A
t_{rr}	Reverse recovery time	$I_{SD} = 2.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	2.12	-	ns
Q_{rr}	Reverse recovery charge		-	8.8	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 15. Test circuit for inductive load switching and diode recovery times)	-	8.3	-	A

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

2.1 Electrical characteristics (curves)

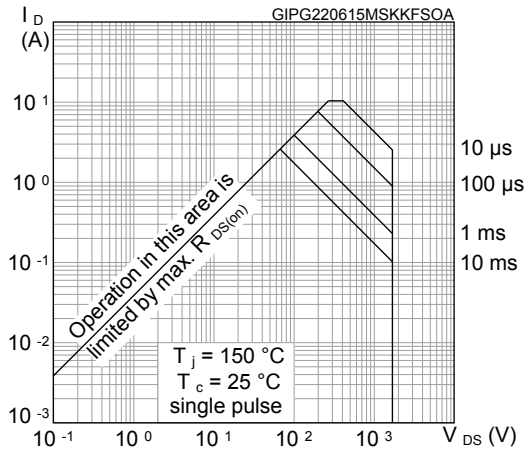
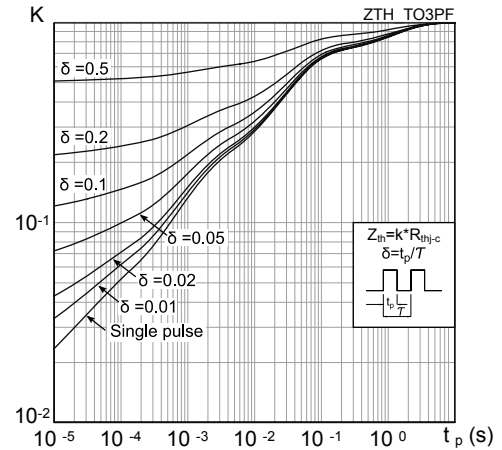
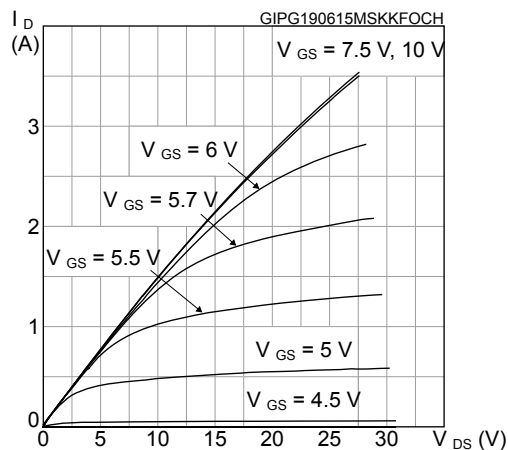
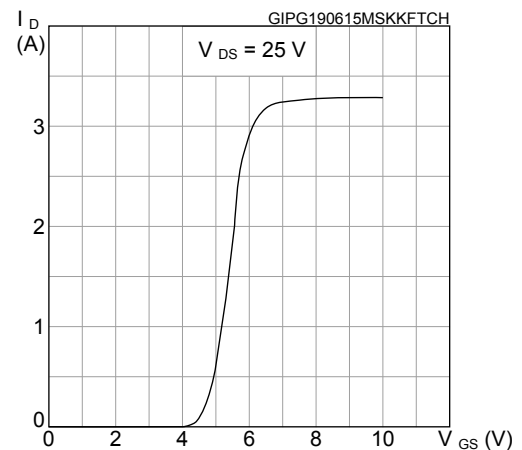
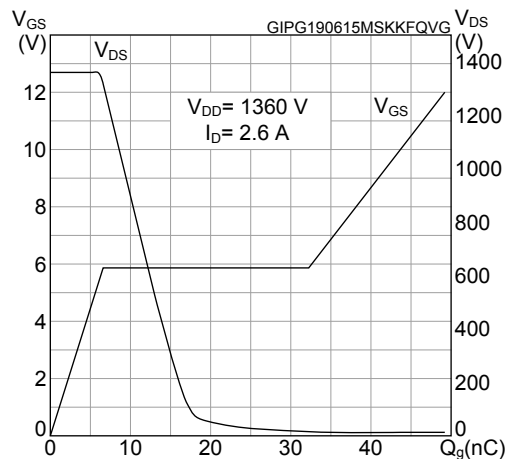
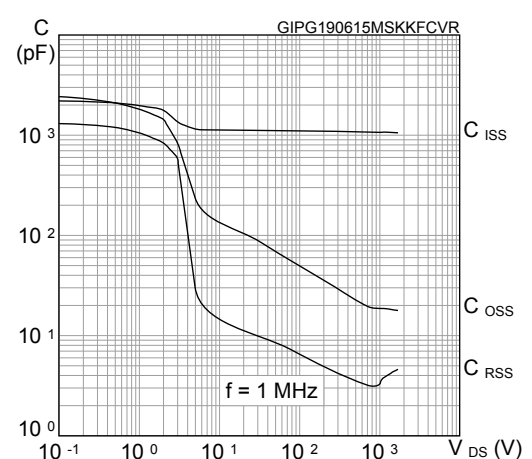
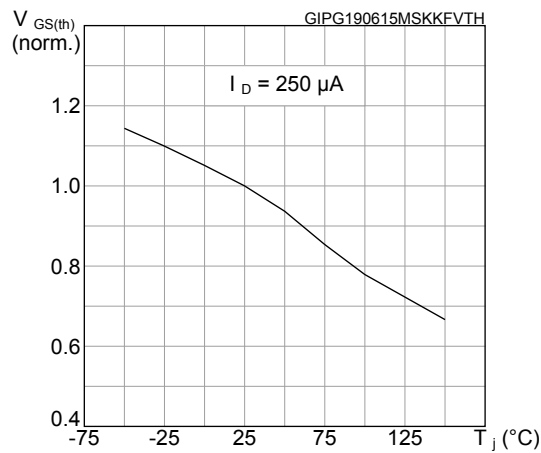
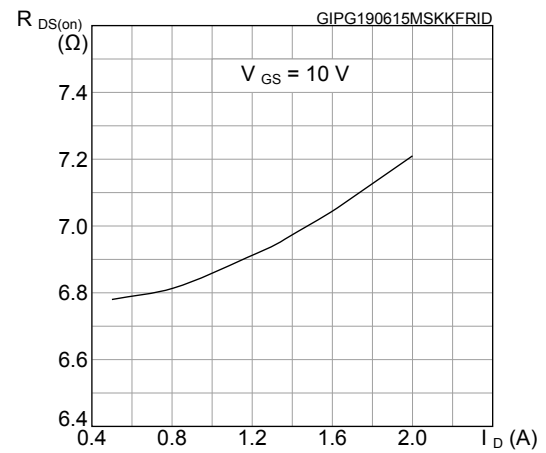
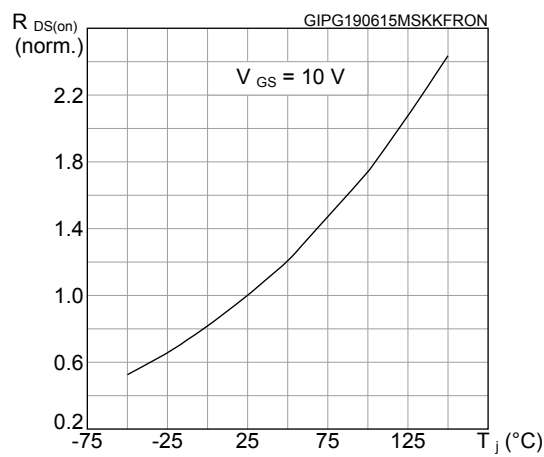
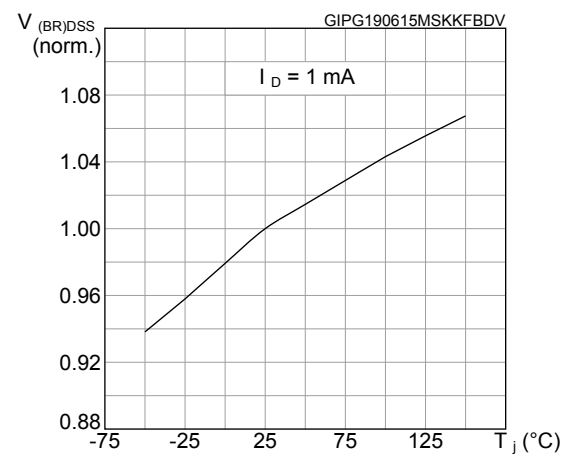
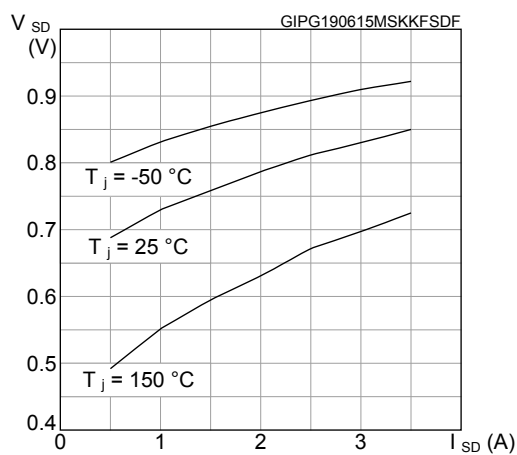
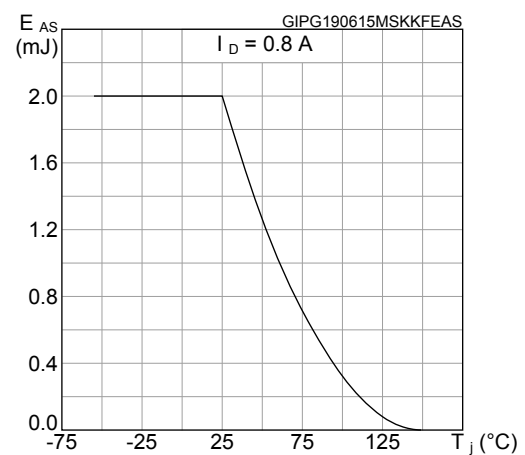
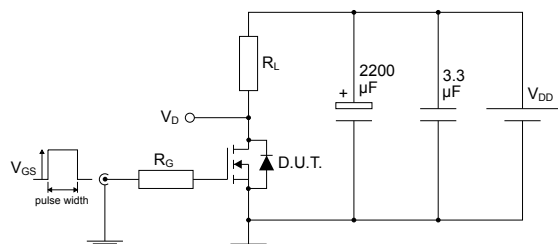
Figure 1. Safe operating area

Figure 2. Normalized transient thermal impedance

Figure 3. Typical output characteristics

Figure 4. Typical transfer characteristics

Figure 5. Typical gate charge characteristics

Figure 6. Typical capacitance characteristics


Figure 7. Normalized on-resistance vs temperature

Figure 8. Typical drain-source on-resistance

Figure 9. Normalized gate threshold vs temperature

Figure 10. Normalized breakdown voltage vs temperature

Figure 11. Typical reverse diode forward characteristics

Figure 12. Maximum avalanche energy vs temperature


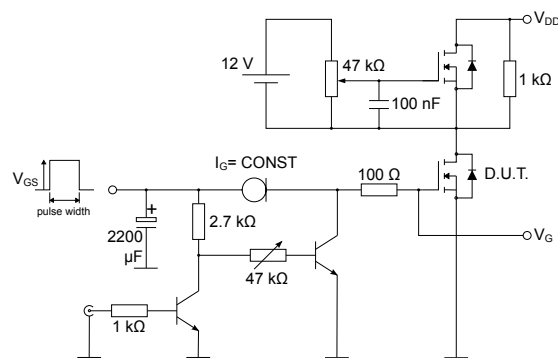
3 Test circuits

Figure 13. Test circuit for resistive load switching times



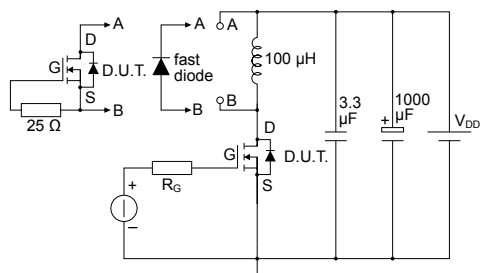
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Figure 14. Test circuit for gate charge behavior



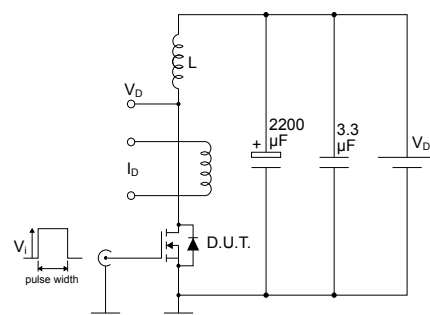
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Figure 15. Test circuit for inductive load switching and diode recovery times



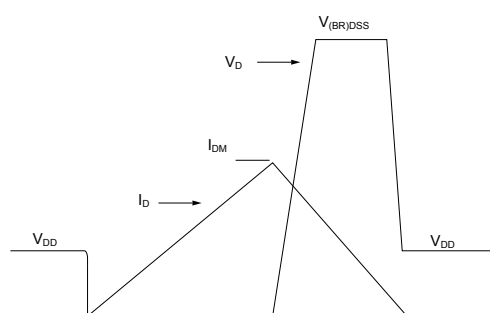
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Figure 16. Unclamped inductive load test circuit



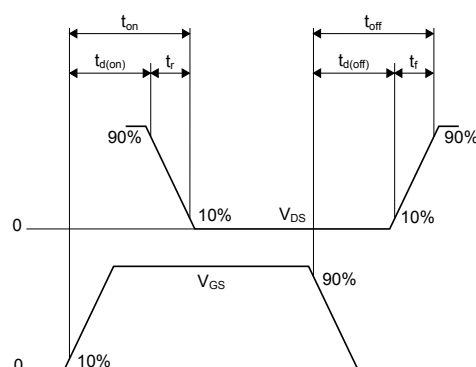
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



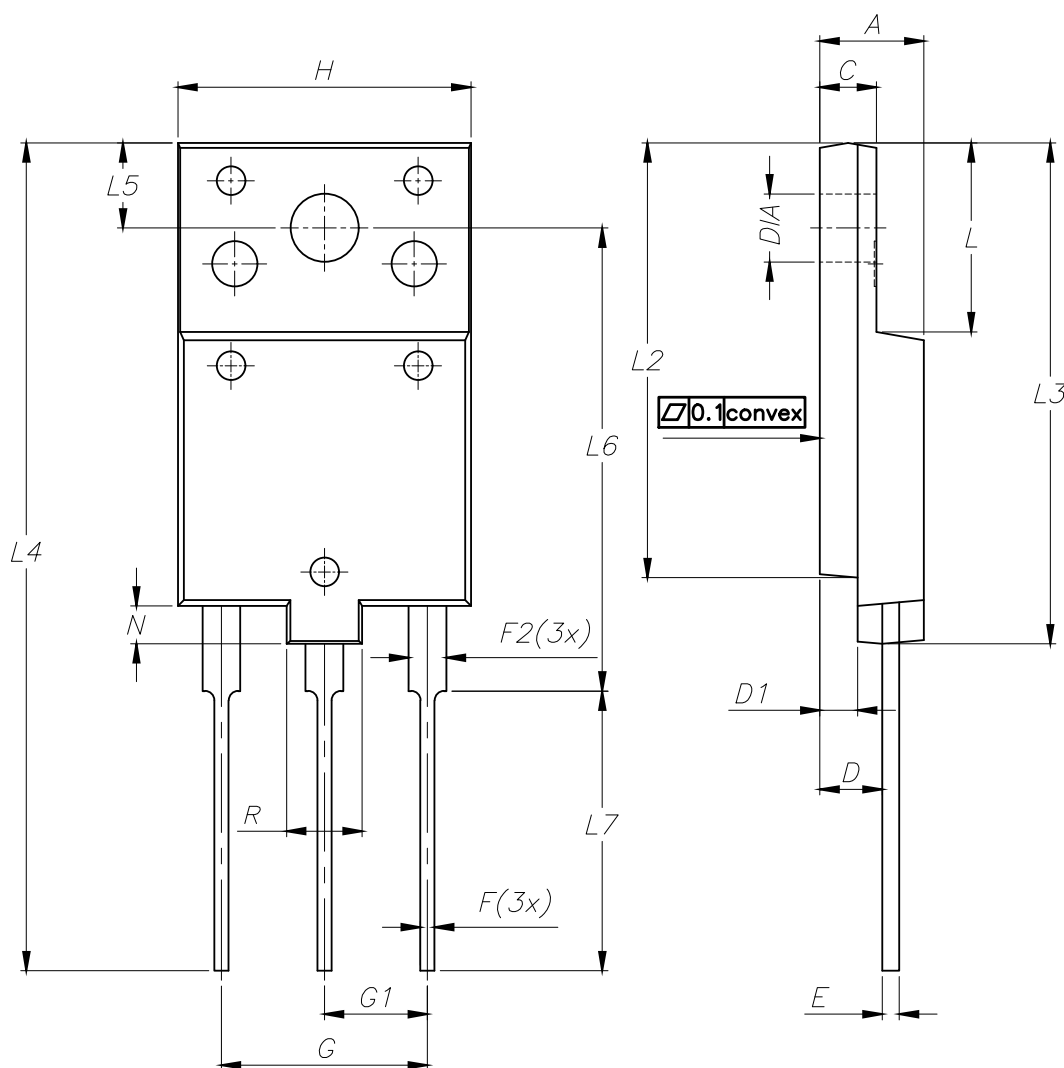
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4 Package information

To meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions, and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 TO-3PF type A package information

Figure 19. TO-3PF type A package outline



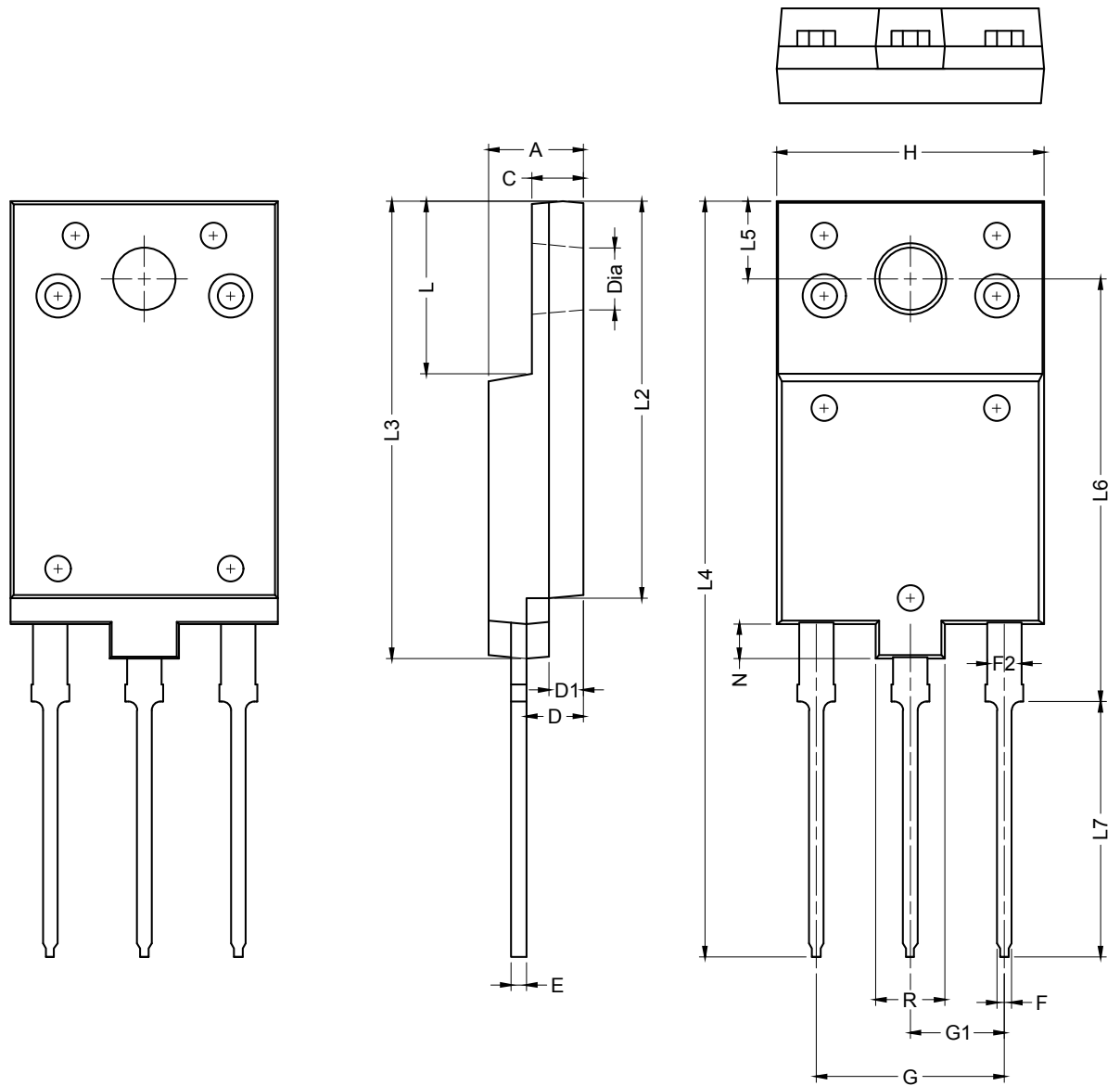
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Table 8. TO-3PF type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	5.30		5.70
C	2.80		3.20
D	3.10		3.50
D1	1.80		2.20
E	0.80		1.00
F	0.65		0.85
F2	1.80		2.20
G	10.80		11.00
G1	5.35	5.45	5.55
H	15.30		15.70
L	9.80	10.00	10.20
L2	22.80		23.20
L3	26.30		26.70
L4	43.60		44.00
L5	4.30		4.70
L6	24.30		24.70
L7	14.60		15.00
N	1.80		2.20
R	3.80		4.20
Dia	3.40		3.80

4.2 TO-3PF type B package information

Figure 20. TO-3PF type B package outline



7627132_type_B_9

Table 9. TO-3PF type B mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	5.30	5.50	5.70
C	2.80	3.00	3.20
D	3.10	3.30	3.50
D1	1.80	2.00	2.20
E	0.80	0.95	1.10
F	0.65	0.80	0.95
F2	1.80	2.00	2.20
G	10.30	10.90	11.50
G1		5.45	
H	15.30	15.50	15.70
L	9.80	10.00	10.20
L2	22.80	23.00	23.20
L3	26.30	26.50	26.70
L4	43.20	43.80	44.40
L5	4.30	4.50	4.70
L6	24.30	24.50	24.70
L7	14.60	14.80	15.00
N	1.80	2.00	2.20
R	3.80	4.00	4.20
Dia	3.40	3.60	3.80

Revision history

Table 10. Document revision history

Date	Revision	Changes
17-Jan-2013	1	Initial release
22-Jun-2015	2	Text and formatting changes throughout document. Part number STW3N170 has been moved to a separate document. In section Electrical ratings: - updated <i>Table Absolute maximum ratings</i>. In section Electrical characteristics: - renamed <i>Table Static (was On/off states)</i>. - updated <i>Table Dynamic</i>. - updated <i>Table Switching times</i>. - updated <i>Table Source-drain diode</i>. Added section <i>Electrical characteristics (curves)</i>. In section Package information: - updated section name (was <i>Package mechanical data</i>). - updated <i>TO-3PF package information</i>.
16-Sep-2015	3	In section Electrical ratings: - updated table <i>Absolute maximum ratings</i>. In section Electrical characteristics: - updated table <i>Dynamic</i>. In section Electrical characteristics (curves): - updated figures <i>Thermal impedance and Output capacitance stored energy</i>.
12-Aug-2025	4	Updated Section 4: Package information. Minor text changes.

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