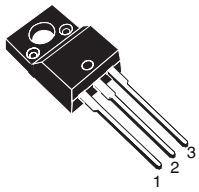
STF11NM80(045Y)

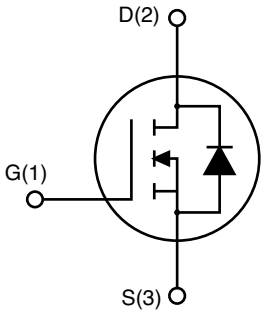
N-channel 800 V, 0.35 Ω typ., 11 A MDmesh™ Power MOSFET in a TO-220FP narrow leads package

Datasheet - production data



TO-220FP narrow leads

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	$R_{DS(on)}$*Q_g	I_D
STF11NM80(045Y)	800 V	0.40 Ω	14 Ω*nC	11 A

- Low input capacitance and gate charge
- Low gate input resistance
- Best $R_{DS(on)}$* Q_g in the industry

Applications

- Switching applications

Description

This N-channel Power MOSFET is developed using STMicroelectronics' revolutionary MDmesh™ technology, which associates the multiple drain process with the company's PowerMESH™ horizontal layout. This device offer extremely low on-resistance, high dv/dt and excellent avalanche characteristics. Utilizing ST's proprietary strip technique, this Power MOSFET boasts an overall dynamic performance which is superior to similar products on the market.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STF11NM80(045Y)	11NM80	TO-220FP narrow leads	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	800	V
V_{GS}	Gate-source voltage	±30	V
I_D	Drain current (continuous) at T_C = 25 °C	11 (1)	A
I_D	Drain current (continuous) at T_C=100 °C	8 (1)	A
I_{DM}(2)	Drain current (pulsed)	44 (1)	A
P_{TOT}	Total dissipation at T_C = 25 °C	35	W
	Derating factor	0.28	W/°C
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; Tc = 25 °C)	2500	V
T_J T_{stg}	Operating junction temperature Storage temperature	-65 to 150	°C

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	3.6	°C/W
$R_{thj\text{-}a}$	Thermal resistance junction-ambient max	62.5	°C/W

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_{j\ max}$)	2.5	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	400	mJ

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage (V_{GS} = 0)	I_D = 250 µA	800			V
dv/dt (1)	Drain source voltage slope	V_{DD} = 640 V, I_D = 11 A, V_{GS} = 10 V		30		V/ns
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 800 V			10	µA
		V_{DS} = 800 V @125°C			100	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±30 V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS}= 10 V, I_D= 5.5 A		0.35	0.40	Ω

1. Characteristic value at turn off on inductive load.

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$, I_D= 7.5 A	-	8	-	S
C_{iss}	Input capacitance	V_{DS} =25 V, f=1 MHz, V_{GS}=0	-	1630	-	pF
C_{oss}	Output capacitance		-	750	-	pF
C_{rss}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	V_{DD}=640 V, I_D = 11 A V_{GS} =10 V (see *Figure 16*)	-	43.6	-	nC
Q_{gs}	Gate-source charge		-	11.6	-	nC
Q_{gd}	Gate-drain charge		-	21	-	nC
R_g	Gate input resistance	f=1 MHz Gate DC Bias=0 Test signal level=20 mV open drain	-	2.7	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD}=400 V, I_D= 5.5 A, R_G=4.7 Ω, V_{GS}=10 V (see *Figure 15*)	-	22	-	ns
t_r	Rise time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	46	-	ns
t_f	Fall time		-	15	-	ns

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

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		11	A
I_{SDM}(1)	Source-drain current (pulsed)		-		44	A
V_{SD}(2)	Forward on voltage	I_{SD}=11 A, V_{GS}=0	-		0.86	V
t_{rr}	Reverse recovery time	I_{SD}=11 A, di/dt = 100 A/µs, V_{DD}= 50 V	-	612		ns
Q_{rr}	Reverse recovery charge		-	7.22		µC
I_{RRM}	Reverse recovery current		-	23.6		A
t_{rr}	Reverse recovery time	I_{SD}=11 A, di/dt = 100 A/µs, V_{DD}= 50 V, Tj=150 °C	-	970		ns
Q_{rr}	Reverse recovery charge		-	11.25		µC
I_{RRM}	Reverse recovery current		-	23.2		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

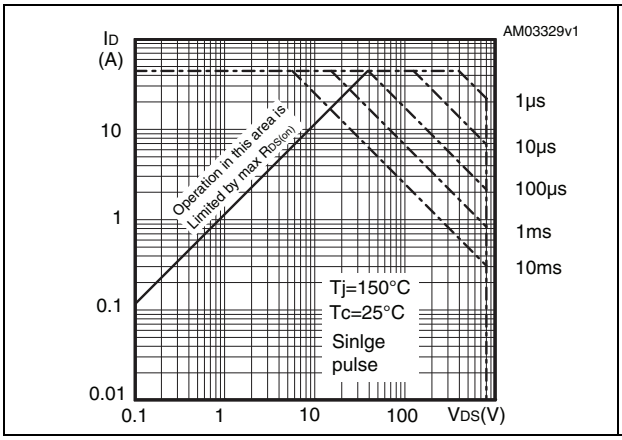


Figure 3. Thermal impedance

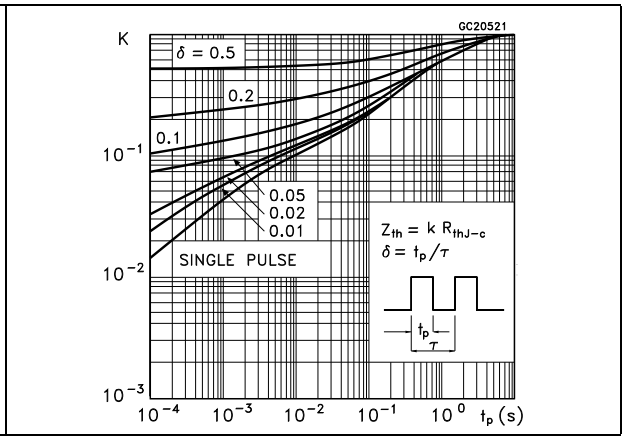


Figure 4. Output characteristics

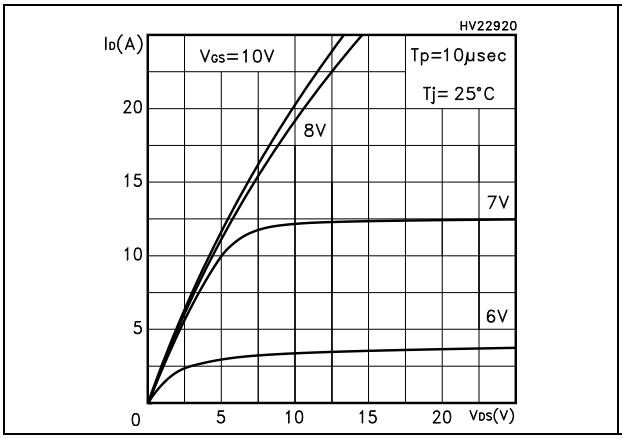


Figure 5. Output characteristics @ T_J=150 °C

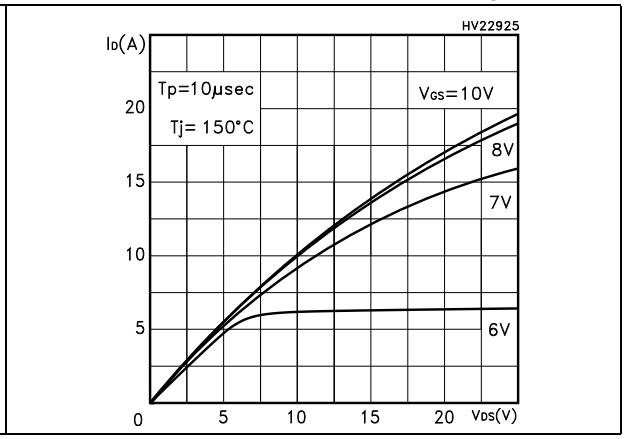


Figure 6. Transfer characteristics

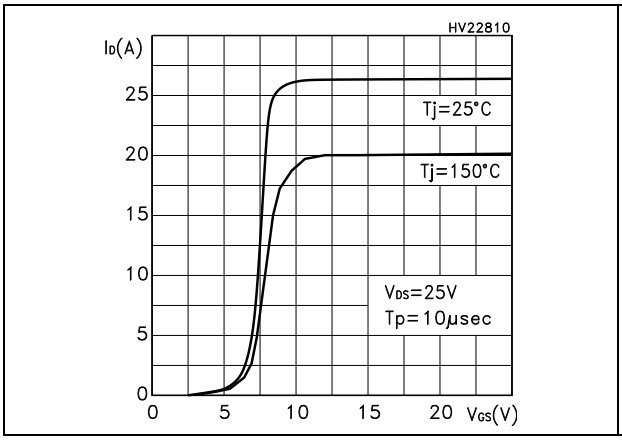


Figure 7. Transconductance

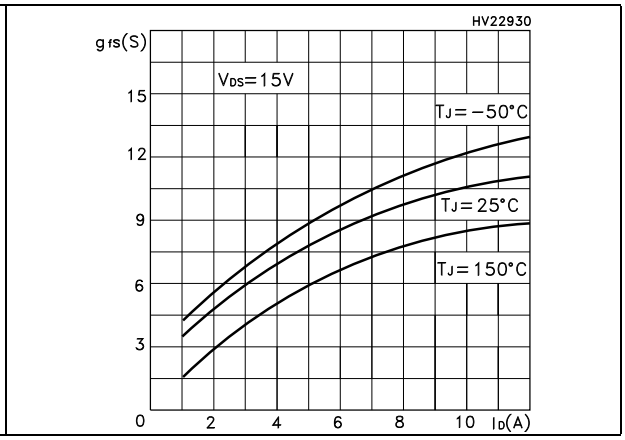


Figure 8. Gate charge vs gate-source voltage

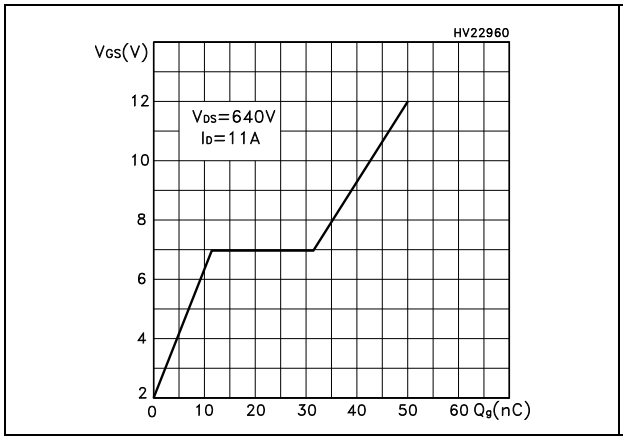


Figure 9. Capacitance variations

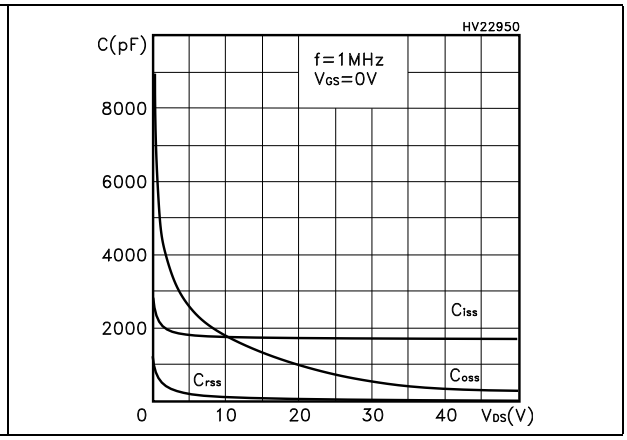


Figure 10. Normalized gate threshold voltage vs temperature

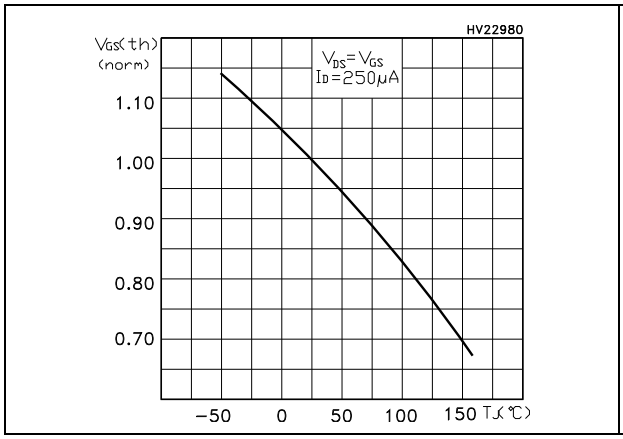


Figure 11. Static drain-source on-resistance

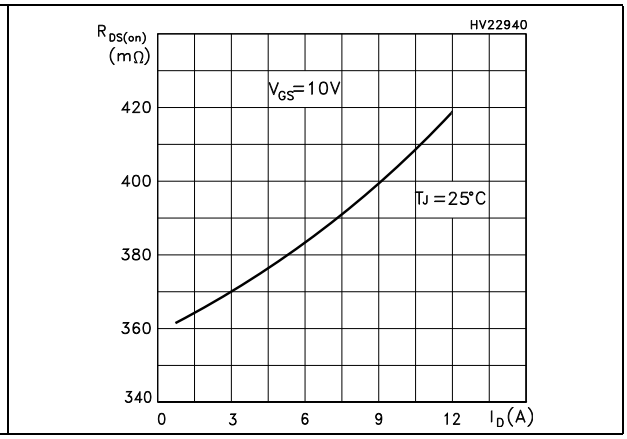


Figure 12. Source-drain diode forward characteristics

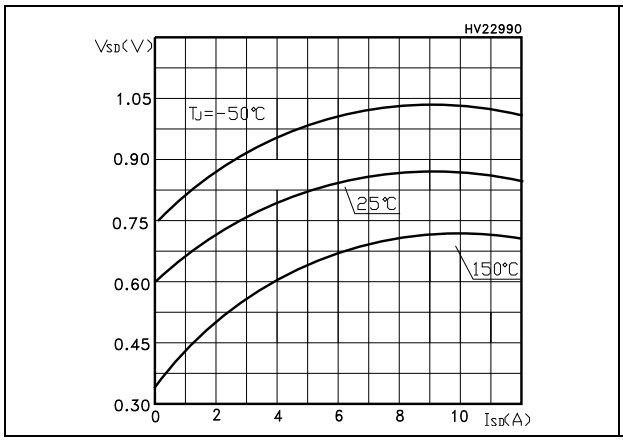


Figure 13. Normalized on-resistance vs temperature

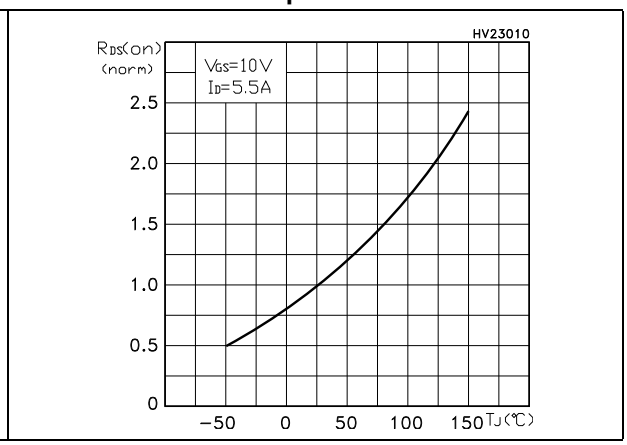
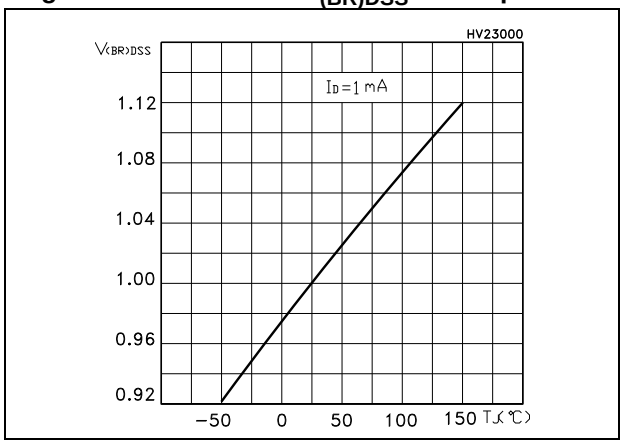


Figure 14. Normalized $V_{(BR)DSS}$ vs temperature



3 Test circuits

Figure 15. Switching times test circuit for resistive load

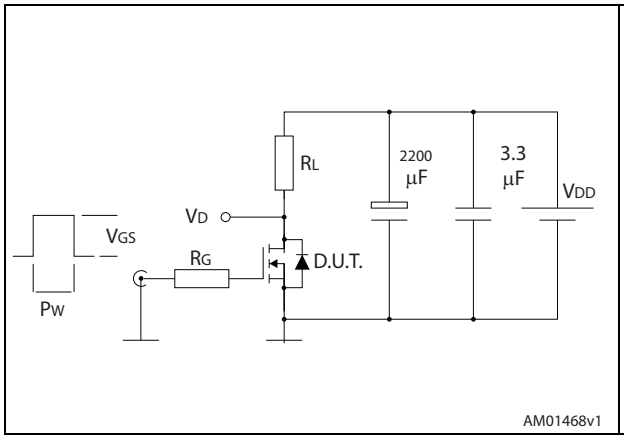


Figure 16. Gate charge test circuit

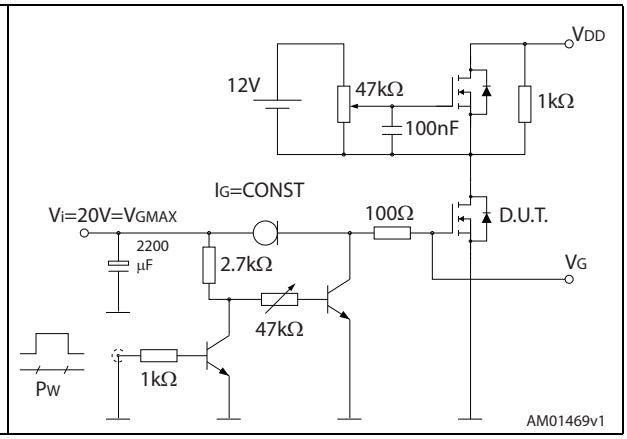


Figure 17. Test circuit for inductive load switching and diode recovery times

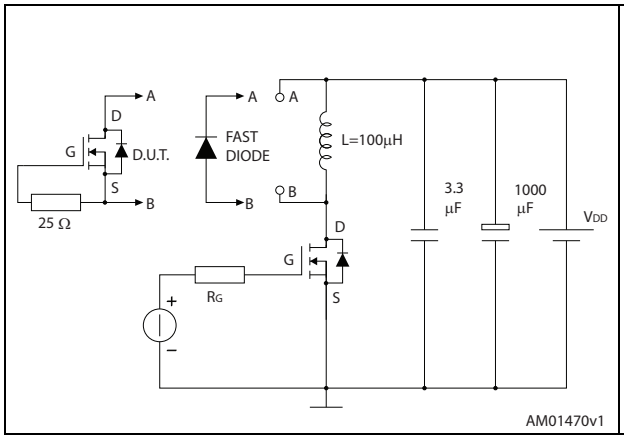


Figure 18. Unclamped inductive load test circuit

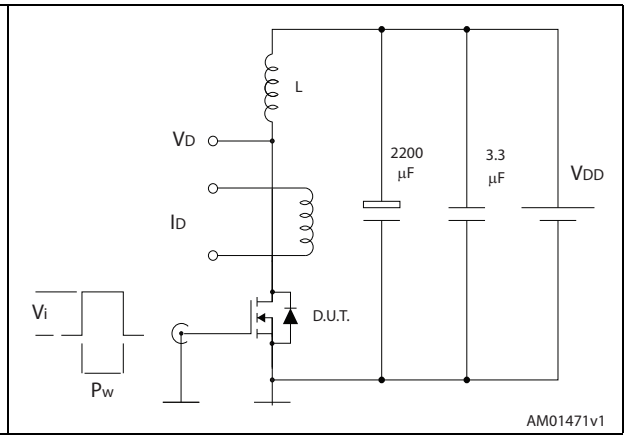


Figure 19. Unclamped inductive waveform

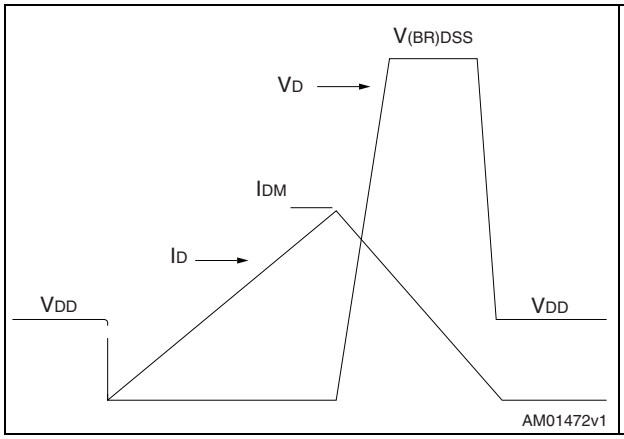
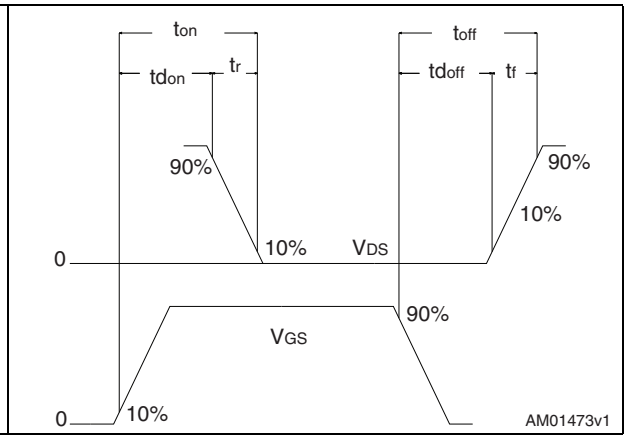


Figure 20. Switching time waveform



4 Package mechanical data

In order 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*.
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Figure 21. TO-220FP narrow leads drawing

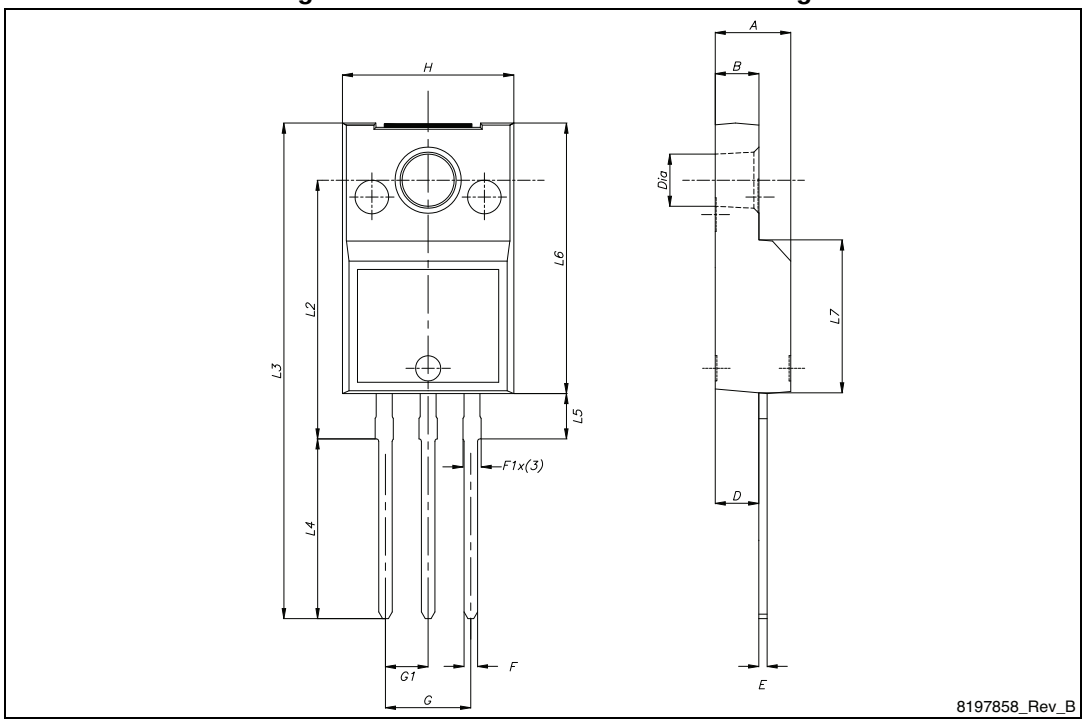

Table 8. TO-220FP narrow leads mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	0.95		1.20
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2	15.20		15.60
L3	28.6		30.6
L4	10.3		11.1
L5	2.60	2.70	2.90
L6	15.8	16.0	16.2
L7	9		9.3
∅	3		3.2

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
01-Feb-2012	1	First issue.
20-Mar-2012	2	Inserted R_g max value in *Table 6: Dynamic*.
24-Apr-2014	3	– Updated: *Figure 14*, *15*, *16*, *17* and *18* – Updated: *Section 4: Package mechanical data* – Minor text changes

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