



NSF040120T2A1-Q

1200 V, 40 mΩ, N-channel SiC MOSFET for automotive applications

29 May 2026

Product data sheet

1. General description

The NSF040120T2A1-Q is a Silicon Carbide based 1200 V power MOSFET in a 7-pin X.PAK plastic package for surface mounted, topside-cooled technology. Its excellent R_{DSon} temperature stability, combined with fast switching speed, makes it a product of choice in high power and high voltage automotive applications, such as onboard chargers, DC-DC converters, and auxiliary drives.

2. Features and benefits

- Excellent R_{DSon} temperature stability
- Very low switching losses
- Fast reverse recovery
- Fast switching speed
- Temperature independent turn-off switching losses
- Very fast and robust intrinsic body diode
- Faster commutation and improved switching due to the additional Kelvin source pin
- Qualified for automotive applications, based on AEC-Q101

3. Applications

- Onboard charger
- DC-DC converter
- Auxiliary drives

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage			-	-	1200	V
V_{GS}	gate-source voltage		[1]	-10	-	22	V
I_D	drain current	$T_c = 25\text{ °C}$	[2]	-	-	55	A
		$T_c = 100\text{ °C}$	[2]	-	-	39	A
I_{DM}	peak drain current	pulsed; t_p limited by T_j (max)	[3]	-	-	120	A
Static characteristics							
R_{DSon}	drain-source on-state resistance	$V_{GS} = 18\text{ V}$; $I_D = 30\text{ A}$; $T_j = 25\text{ °C}$		-	40	60	mΩ

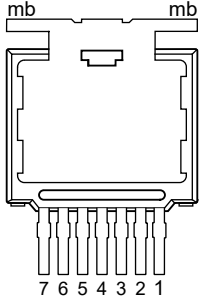
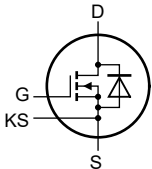
[1] Recommended turn off gate voltage is -5 V to 0 V. Recommended turn on gate voltage is 15 V to 18 V. Do not use with $V_{GSon} < 13\text{ V}$.

[2] Limited by the maximum values of T_j , $R_{th(j-c)}$ and $R_{DSon}(T_j)$.

[3] Designed value (not tested).

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 Top view X.PAK (SOT8107-2)	 aaa-036675
2	KS	Kelvin source		
3 to 7	S	source		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NSF040120T2A1-Q	X.PAK	Plastic, surface-mounted Top Side Cooling (TSC) Package; 1.27 mm pitch; 14.0 mm x 11.8 mm x 3.5 mm body	SOT8107-2

7. Marking

Table 4. Marking codes

Type number	Marking code
NSF040120T2A1-Q	NSF040120T2A1 - Q

8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage			-	1200	V
V _{GS}	gate-source voltage		[1]	-10	22	V
I _D	drain current	T _c = 25 °C	[2]	-	55	A
		T _c = 100 °C	[2]	-	39	A
I _{DM}	peak drain current	pulsed; t _p limited by T _j (max)	[3]	-	120	A
P _{tot}	total power dissipation	T _c = 25 °C	[2]	-	254	W
T _j	junction temperature			-55	175	°C
T _{stg}	storage temperature			-55	150	°C
Source-drain diode						
I _S	source current	T _c = 25 °C	[2]	-	56	A
I _{SM}	peak source current	pulsed; limited by T _j (max)	[3]	-	90	A

[1] Recommended turn off gate voltage is -5 V to 0 V. Recommended turn on gate voltage is 15 V to 18 V. Do not use with V_{GSon} < 13 V.
[2] Limited by the maximum values of T_j, R_{th(j-c)} and R_{DSon}(T_j).
[3] Designed value (not tested).

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _{th(j-c)}	thermal resistance from junction to case			-	0.45	0.59	K/W

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 1 mA; V _{GS} = 0 V; T _j = 25 °C		1200	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 3 mA; V _{DS} = V _{GS} ; T _j = 25 °C	[1]	1.7	2.3	2.9	V
		I _D = 15 mA; V _{DS} = V _{GS} ; T _j = 25 °C	[1]	-	2.77	-	V
I _{DSS}	drain leakage current	V _{DS} = 1200 V; V _{GS} = 0 V; T _j = 25 °C		-	-	100	μA
I _{GSS}	gate leakage current	V _{GS} = 22 V; V _{DS} = 0 V; T _j = 25 °C		-	-	100	nA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C		-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 18 V; I _D = 30 A; T _j = 25 °C		-	40	60	mΩ
		V _{GS} = 18 V; I _D = 30 A; T _j = 175 °C		-	65	-	mΩ
		V _{GS} = 15 V; I _D = 30 A; T _j = 25 °C		-	53	-	mΩ
		V _{GS} = 15 V; I _D = 30 A; T _j = 175 °C		-	70	-	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 30 A; T _j = 25 °C		-	10	-	S
R _{G(int)}	internal gate resistance	f = 0.5 MHz; T _j = 25 °C		-	2	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DD} = 800 V; I _D = 30 A; V _{GS} = -5/+18 V; T _j = 25 °C		-	81	-	nC
Q _{GS}	gate-source charge			-	35	-	nC
Q _{GD}	gate-drain charge			-	21	-	nC
C _{iss}	input capacitance	V _{DD} = 800 V; f = 0.5 MHz; V _{GS} = 0 V; T _j = 25 °C		-	1980	-	pF
C _{oss}	output capacitance			-	109	-	pF
C _{rss}	reverse transfer capacitance			-	3	-	pF
t _{d(on)}	turn-on delay time	V _{DD} = 800 V; I _D = 30 A; R _{G(ext)} = 2.2 Ω; L _L = 82 μH; V _{GS} = -5/+18 V; T _j = 25 °C		-	15	-	ns
t _r	rise time			-	10	-	ns
t _{d(off)}	turn-off delay time			-	20	-	ns
t _f	fall time			-	8	-	ns
E _{on}	turn-on switching loss			-	445	-	μJ
E _{off}	turn-off switching loss			-	44	-	μJ
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 30 A; V _{GS} = -5 V; T _j = 25 °C		-	4.4	-	V
t _{rr}	reverse recovery time	V _{DD} = 800 V; I _S = 30 A; V _{GS} = -5 V; dI _S /dt = 7171 A/μs; T _j = 25 °C		-	8.8	-	ns
Q _r	recovered charge			-	207	-	nC

[1] Measured according to JEP183.

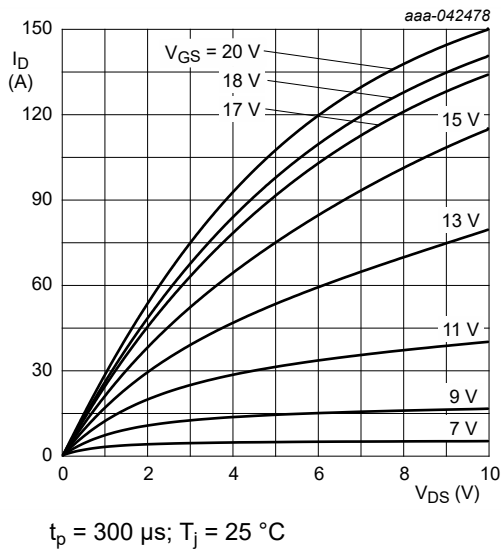


Fig. 1. Output characteristics: drain current as a function of drain-source voltage; typical values

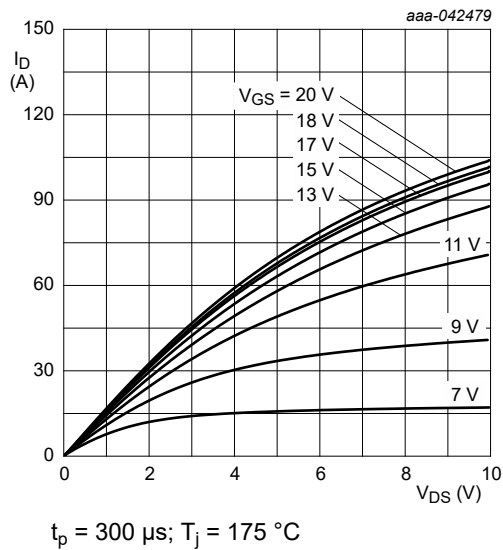


Fig. 2. Output characteristics: drain current as a function of drain-source voltage; typical values

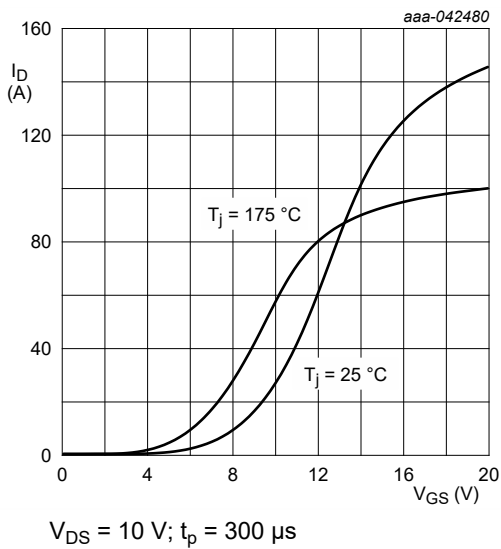


Fig. 3. Transfer characteristics: drain current as a function of gate-source voltage; typical values

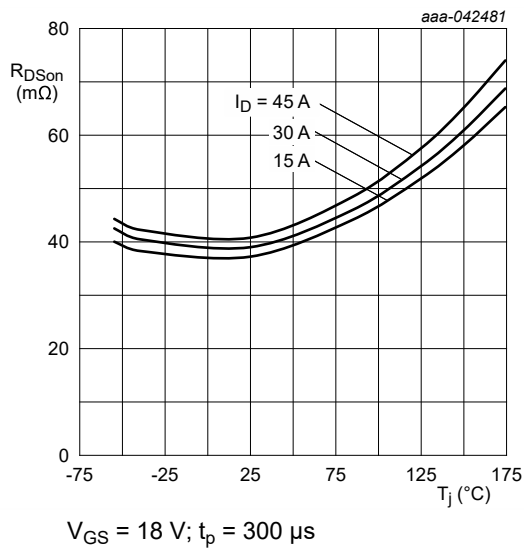


Fig. 4. Drain-source on-state resistance as a function of junction temperature; typical values

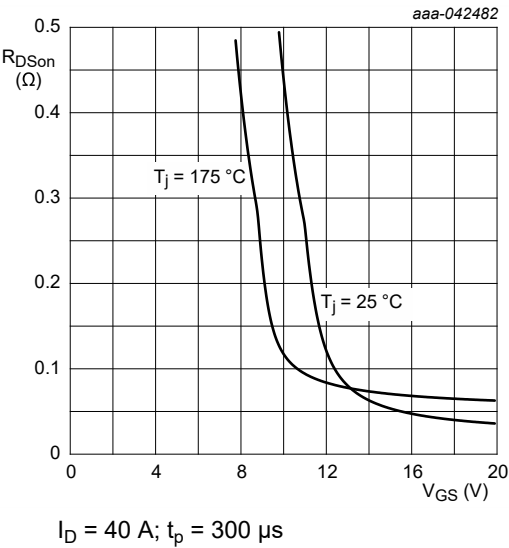


Fig. 5. Drain-source on-state resistance as a function of gate-source voltage

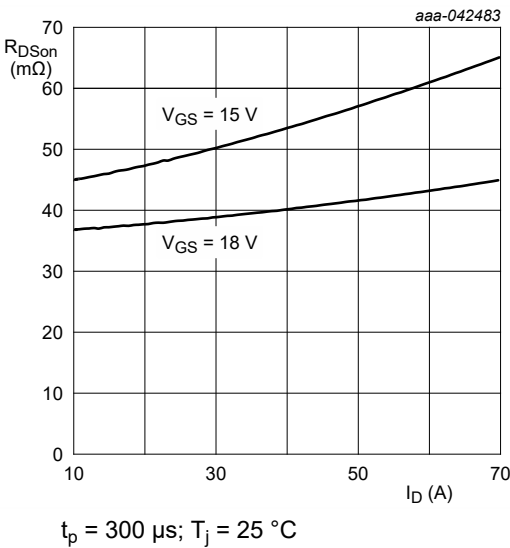


Fig. 6. Drain-source on-state resistance as a function of drain current; typical values

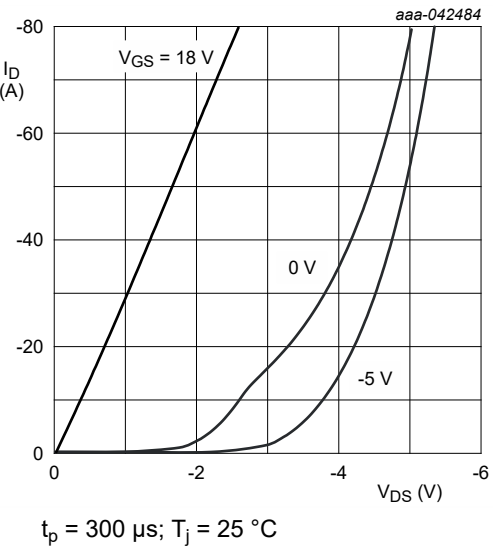


Fig. 7. Drain current as a function of drain-source voltage; typical values (third quadrant characteristics)

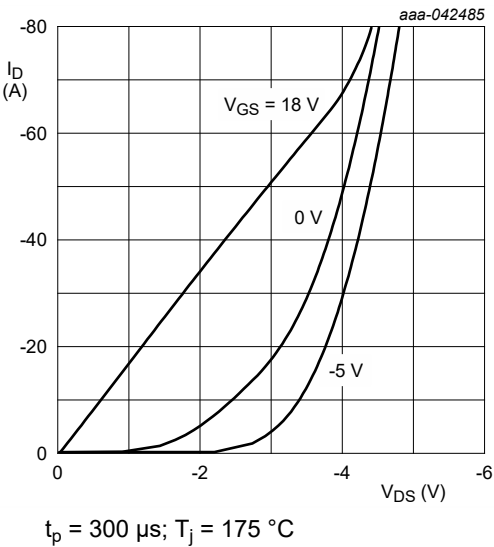


Fig. 8. Drain current as a function of drain-source voltage; typical values (third quadrant characteristics)

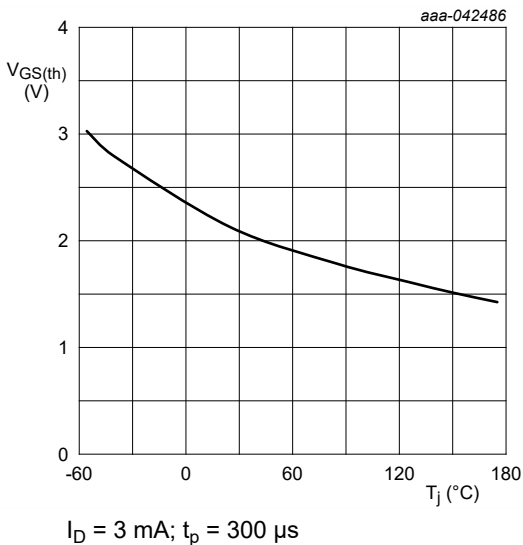


Fig. 9. Gate-source threshold voltage as a function of junction temperature; typical values

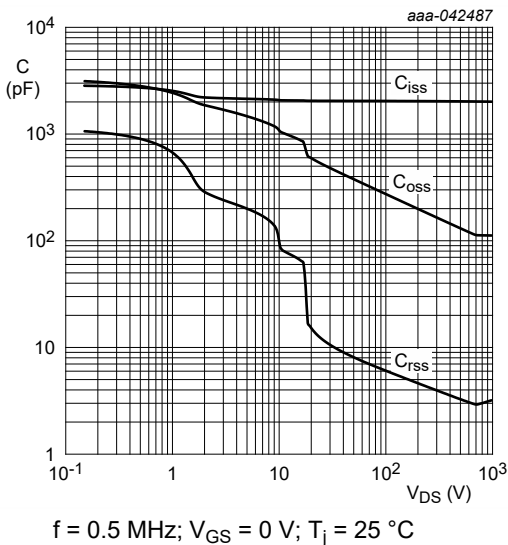


Fig. 10. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

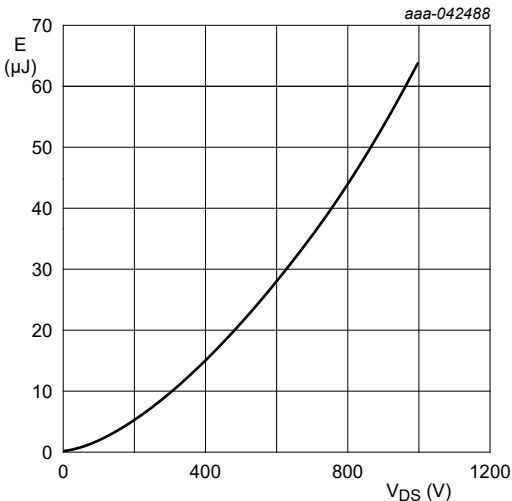


Fig. 11. C_{oss} stored energy as a function of drain-source voltage; typical values

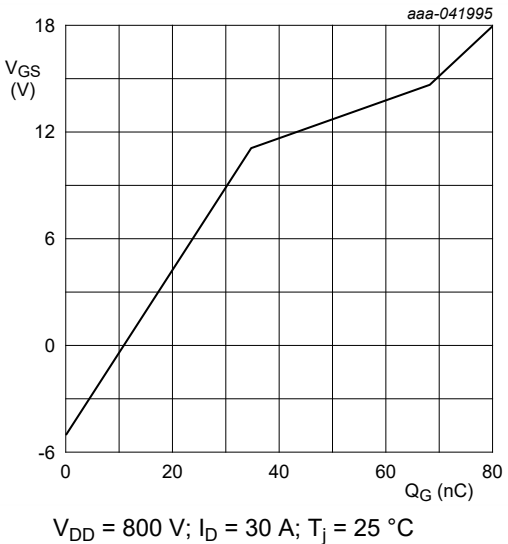


Fig. 12. Gate-source voltage as a function of gate charge; typical values

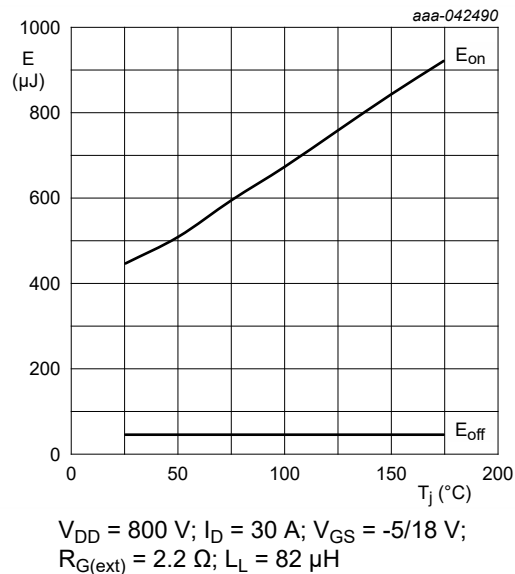


Fig. 13. Switching loss as a function of junction temperature; typical values

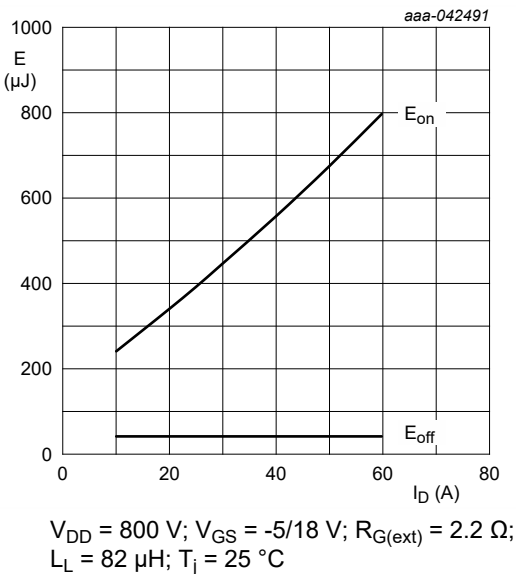


Fig. 14. Switching loss as a function of drain current; typical values

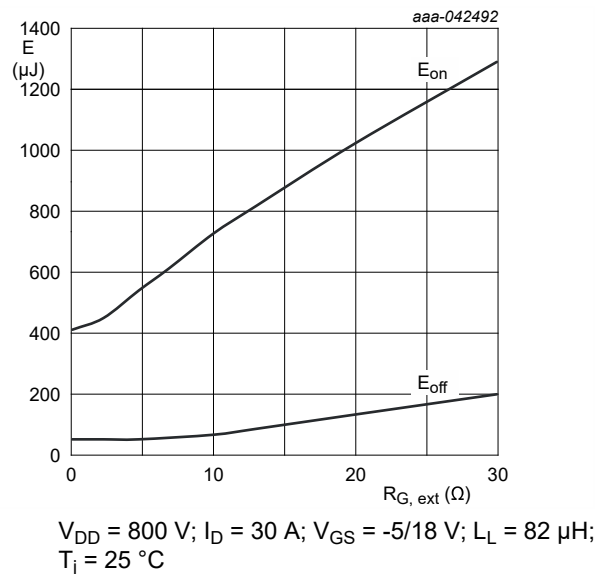


Fig. 15. Switching loss as a function of external gate resistance; typical values

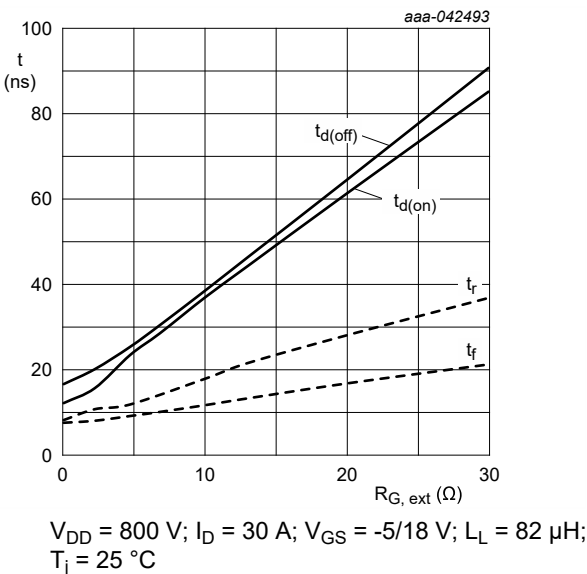


Fig. 16. Switching times as a function of external gate resistance; typical values

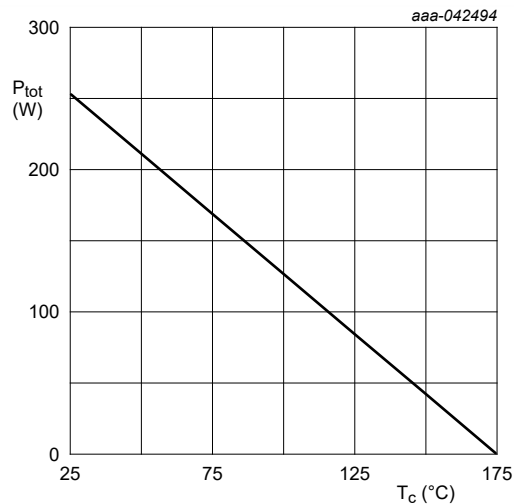


Fig. 17. Power dissipation derating as a function of case temperature; maximum values

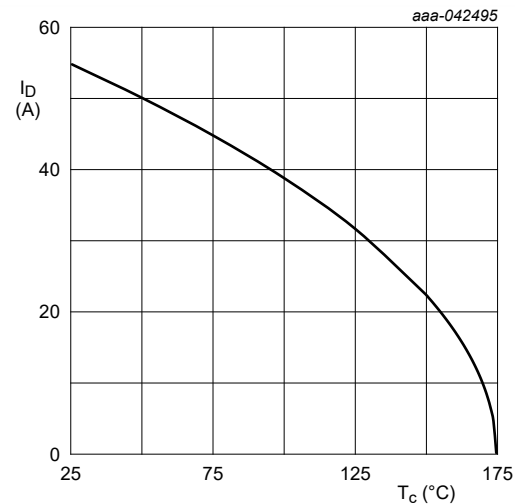


Fig. 18. Continuous drain current as a function of case temperature; maximum values

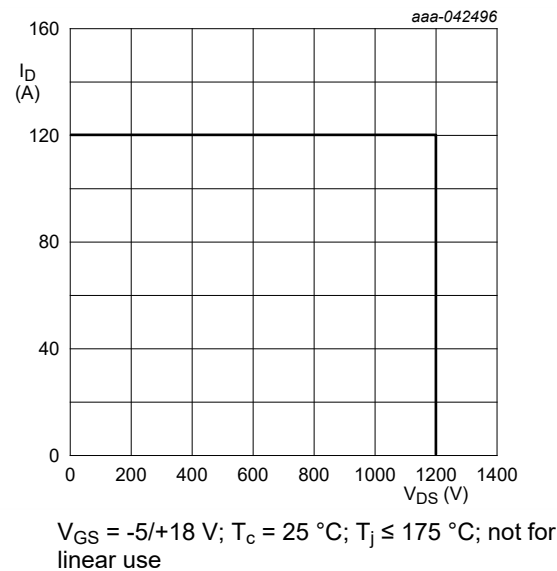


Fig. 19. Reverse bias safe operating area (RBSOA)

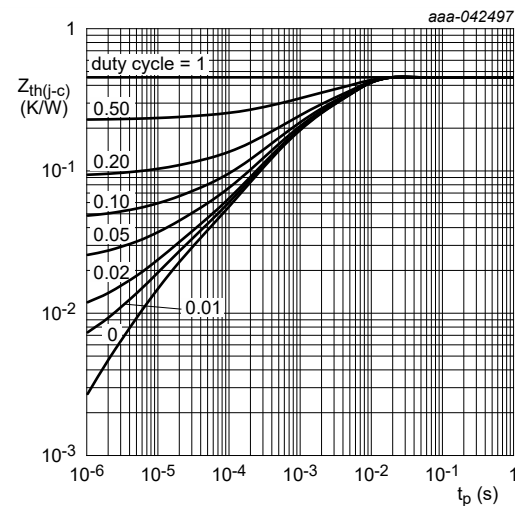
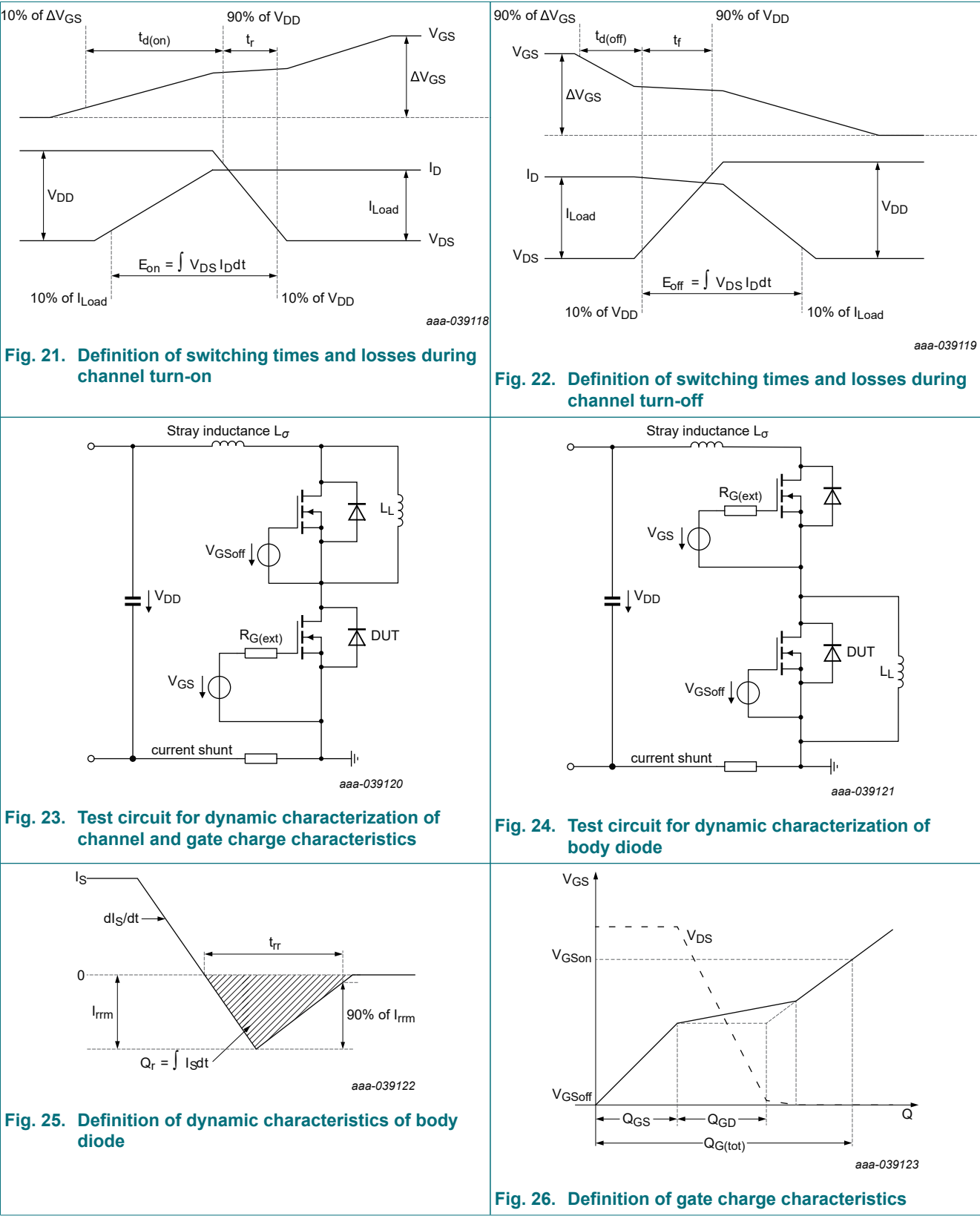


Fig. 20. Transient thermal impedance from junction to case as a function of pulse duration; typical values

11. Test information



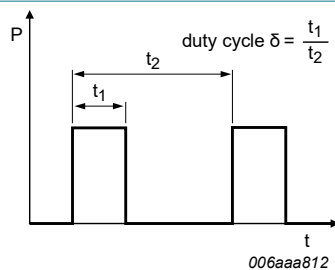


Fig. 27. Duty cycle definition

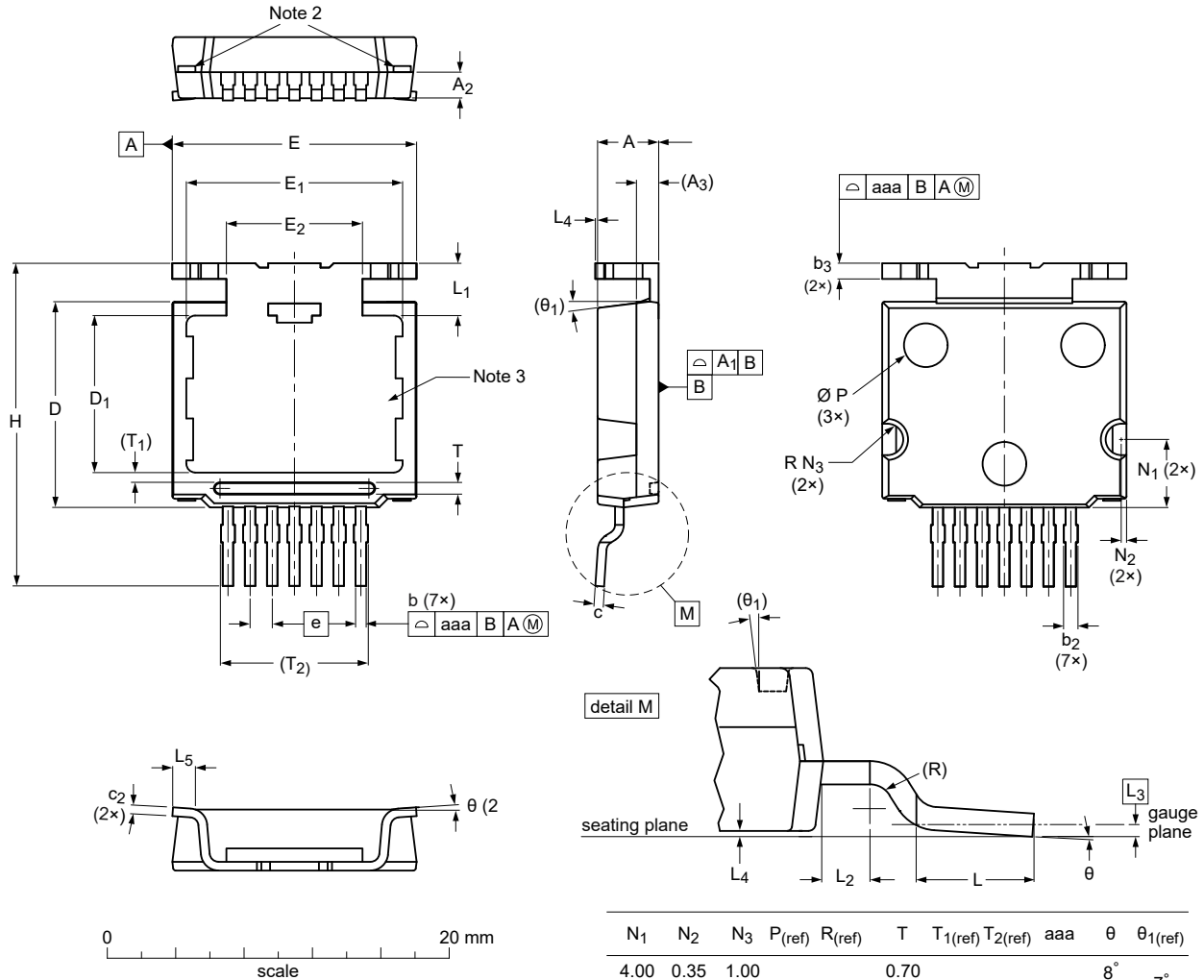
Quality information

This product has been qualified based on the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

X.PAK : Plastic, surface-mounted Top Side Cooling (TSC) Package;
1.27 mm pitch; 14.0 mm x 11.8 mm x 3.5 mm body

SOT8107-2



Dimensions (mm are the original dimensions)

Unit ⁽¹⁾	A	A ₁	A ₂	A _{3(ref)}	b	b ₂	b ₃	c	c ₂	D	D ₁	E	E ₁	E ₂	e	H	L	L ₁	L ₂	L ₃	L ₄	L ₅
max	3.60		1.60		0.70	1.00	1.00	0.60	0.60	11.90	9.10	14.10	12.50	7.85	1.27	19.00	2.60	3.20	1.10	0.26	0.18	2.30
nom		0.05		1.27											BSC					BSC		
min	3.40		1.40		0.50	0.50	0.80	0.40	0.40	11.70	8.90	13.90	12.30	7.75		18.00	2.40	3.00	0.90	0.07	0.14	

Note

1. Max mold gate mark protrusion 0.3 mm.
2. Mold gate location shall be chosen at one of the two indicated locations.
3. Maximum allowed flash encroachment over heat sink area is 0.05 mm.

sot8107-2 _po

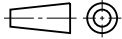
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT8107-2						24-08-07 25-03-14

Fig. 28. Package outline X.PAK (SOT8107-2)

13. Soldering

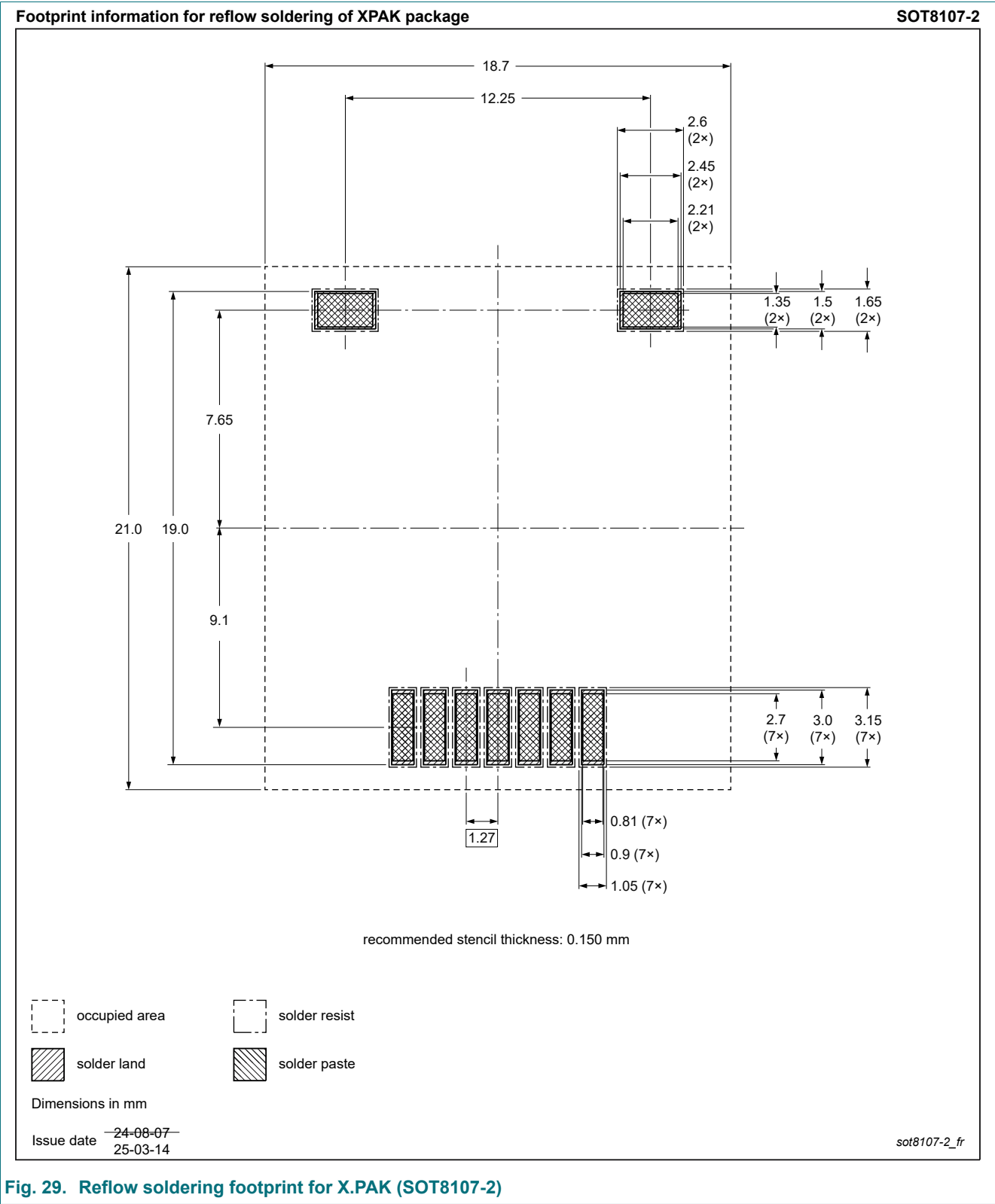


Fig. 29. Reflow soldering footprint for X.PAK (SOT8107-2)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
NSF040120T2A1-Q v.1	20260529	Product data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 29 May 2026