WNSC2M40140RS-D

N-Channel Silicon Carbide MOSFET

Rev.01 - 22 July 2025 Product data sheet

1. General description

Silicon Carbide MOSFET in a TO247-4L NL plastic package, designed for high frequency, high efficiency systems.

2. Features and benefits

- Kelvin source configuration
- Low on-resistance
- Fast switching speed
- 0V turn-off V_{GS} for simple gate driving
- 100% UIS Tested
- Easy to parallel
- Reverse paralleling Si diode for protection

3. Applications

- PV MPPT circuit
- Energy storage systems

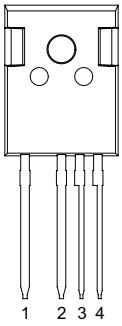
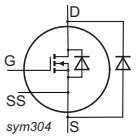
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DS}	drain-source voltage	25 °C ≤ T_j ≤ 175 °C		1400			V
I_D	drain current	V_{GS} = 18 V; T_{mb} = 25 °C		75			A
P_{tot}	total power dissipation	T_{mb} = 25 °C, T_j = 175 °C		652			W
T_j	junction temperature			-55 to 175			°C
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = 15 V; I_D = 33 A; T_j = 25 °C		-	40	-	mΩ
		V_{GS} = 18 V; I_D = 33 A; T_j = 25 °C		-	33	45	mΩ
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 33 A; V_{DS} = 800 V; V_{GS} = -4 V/18 V; T_j = 25 °C		-	115	-	nC
Q_{GD}	gate-drain charge			-	18	-	nC
Source-drain diode							
Q_r	recovered charge	I_{SD} = 5 A; di/dt = 100 A/µs; V_{DS} = 400 V; T_j = 25 °C		-	23447	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain		
2	S	source		
3	SS	source sense		
4	G	gate		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WNSC2M40140RS-D	TO247-4L NL	WNSC2M40140RS-D6Q	Tube	30	TO247N-4L NL	10-Jun-2025

7. Marking

Table 4. Marking codes

Type number	Marking codes
WNSC2M40140RS-D	WNSC2M 40140RS-D

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	Unit
SiC MOSFET					
V_{DS}	drain-source voltage	25 °C ≤ T_j ≤ 175 °C		1400	V
$V_{GS,max}$	gate-source voltage	Absolute maximum values		-12 to 24	V
$V_{GS,op}$	gate-source voltage	Recommended operational values		-4 to 18	V
I_D	drain current	V_{GS} = 18 V; T_{mb} = 25 °C		75	A
		V_{GS} = 18 V; T_{mb} = 100 °C		55	A
I_{DM}	peak drain current	pulse width t_p limited by T_{jmax}		150	A
T_j	junction temperature			-55 to 175	°C
Si diode					
V_R	Reverse voltage	25 °C ≤ T_j ≤ 150 °C		1600	V
T_j	junction temperature			-55 to 150	°C
Source-drain diode					
P_{tot}	total power dissipation	T_{mb} = 25 °C, T_j = 175 °C		652	W
E_{as}	single pulse drain−to-source avalanche	I_{AS} = 4.5 A; L = 5 mH; V_{DD} = 50 V; T_j = 25 °C		50	mJ
I_F	average forward current	DC , T_{mb} ≤ 125 °C, square-wave pulse		97	A
		DC , T_{mb} ≤ 25 °C, square-wave pulse		195	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; T_{mb} = 125 °C; square-wave pulse		152	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		610	A
		t_p = 100 µs; $T_{j(init)}$ = 25 °C; square-wave pulse		2800	A
T_{stg}	storage temperature			-55 to 150	°C
$T_{j,max}$	maximum junction temperature	Intermittent condition with shorted lifetime		-55 to 175	°C
$T_{sld(M)}$	peak soldering temperature			260	°C
M_d	monting torque	M3 or 6 - 32 screw		0.6	Nm

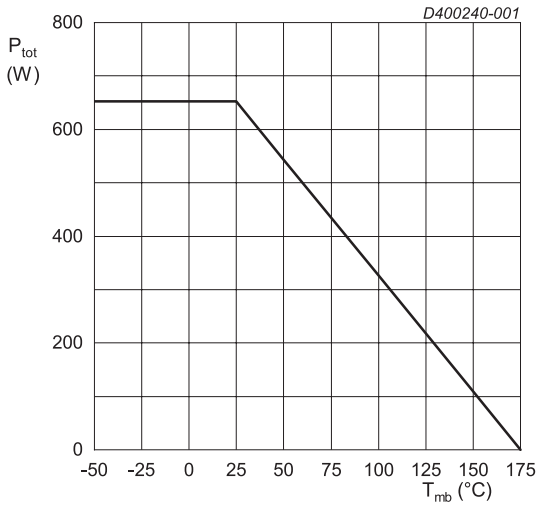


Fig. 1. Total power dissipation as a function of mounting base temperature; maximum values

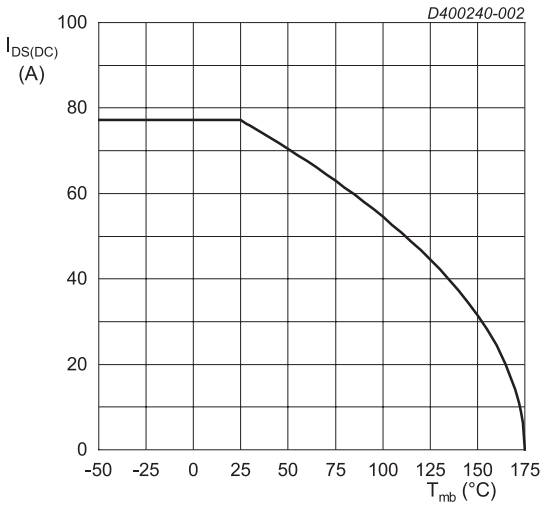


Fig. 2. Continuous Drain Current as a function of mounting base temperature

9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case			-	0.23	-	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	40	-	K/W

Note: It is recommended that a metal washer is inserted between screw head and mounting tab.
Do not use self-tapping screws.
Device is ESD sensitive. Handling precautions are recommended.

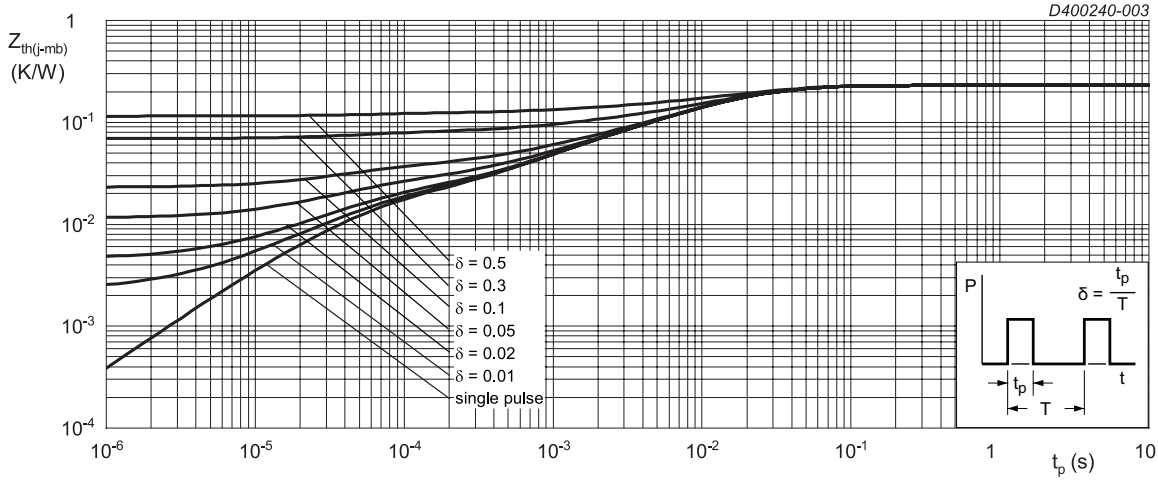
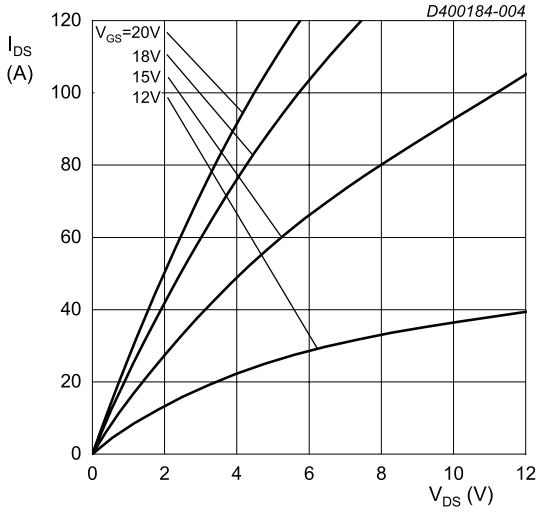


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

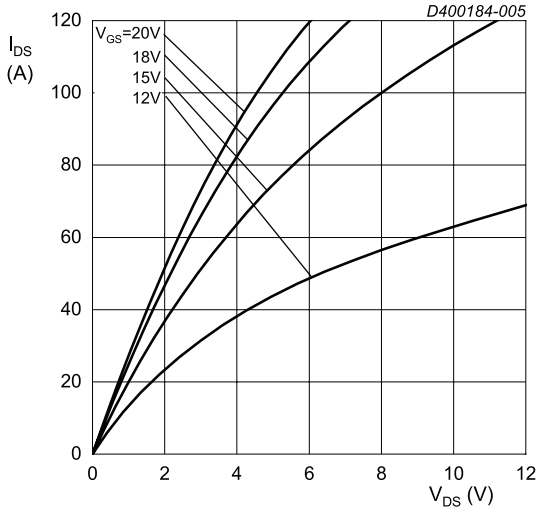
Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 100 µA; V_{GS} = 0 V; T_j = 25 °C		1400	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 10 mA; V_{DS} = 10 V; T_j = 25 °C		1.9	2.6	3.5	V
		I_D = 10 mA; V_{DS} = 10 V; T_j = 175 °C		-	1.9	-	V
I_{DSS}	drain leakage current	V_{DS} = 1400 V; V_{GS} = 0 V; T_j = 25 °C		-	1	100	µA
		V_{DS} = 1400 V; V_{GS} = 0 V; T_j = 175 °C		-	2	-	mA
I_{GSS}	gate leakage current	V_{GS} = 24 V; V_{DS} = 0 V; T_j = 25 °C		-	10	100	nA
		V_{GS} = -12 V; V_{DS} = 0 V; T_j = 25 °C		-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = 15 V; I_D = 33 A; T_j = 25 °C		-	40	-	mΩ
		V_{GS} = 18 V; I_D = 33 A; T_j = 25 °C		-	33	45	mΩ
		V_{GS} = 18 V; I_D = 33 A; T_j = 175 °C		-	56	-	mΩ
R_G	gate resistance	f = 1 MHz; T_j = 25 °C		-	1	-	Ω
g_{fs}	transconductance	V_{DS} = 20 V; I_D = 33 A; T_j = 25 °C		-	20	-	S
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 33 A; V_{DS} = 800 V; V_{GS} = -4 V/18 V; T_j = 25 °C		-	115	-	nC
Q_{GS}	gate-source charge			-	47	-	nC
Q_{GD}	gate-drain charge			-	18	-	nC
C_{iss}	input capacitance	V_{DS} = 1000 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C		-	2400	-	pF
C_{oss}	output capacitance			-	120	-	pF
C_{rss}	reverse transfer capacitance			-	10	-	pF
E_{oss}	Coss stored energy			-	60	-	µJ
$t_{d(on)}$	turn-on delay time	V_{DS} = 800 V; V_{GS} = -4 V/18 V; $R_{G(ext)}$ = 5.1 Ω; I_D = 33 A; L = 300 µH; T_j = 25 °C		-	14	-	ns
t_r	rise time			-	27	-	ns
$t_{d(off)}$	turn-off delay time			-	34	-	ns
t_f	fall time			-	11	-	ns
E_{on}	turn-on energy (SiC Diode FWD)		Fig.20	-	413	-	µJ
E_{off}	turn-off energy (SiC Diode FWD)		Fig.20	-	81	-	µJ
E_{on}	turn-on energy (Body Diode FWD)		Fig.20	-	8591	-	µJ
E_{off}	turn-off energy (Body Diode FWD)		Fig.20	-	97	-	µJ
Source-drain diode							
V_{SD}	source-drain voltage	V_{GS} = -4 V; I_{SD} = 33 A; T_j = 25 °C		-	1.1	-	V
		V_{GS} = -4 V; I_{SD} = 33 A; T_j = 175 °C		-	1.0	-	V
		V_{GS} = -4 V; I_{SD} = 40 A; T_j = 25 °C		-	1.15	-	V
		V_{GS} = -4 V; I_{SD} = 50 A; T_j = 25 °C		-	1.2	-	V
t_{rr}	reverse recovery time	I_{SD} = 5 A; di/dt = 100 A/µs; V_{DS} = 400 V; T_j = 25 °C		-	950	-	ns
Q_r	recovered charge			-	23447	-	nC
I_{rrm}	reverse recovery current			-	43	-	A



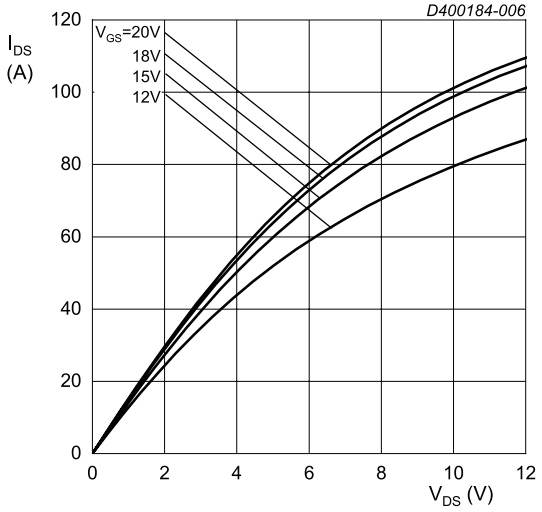
T_j = -55 °C; t_p < 200 µs

Fig. 4. Output characteristics; drain current as a function of drain-source voltage; typical values



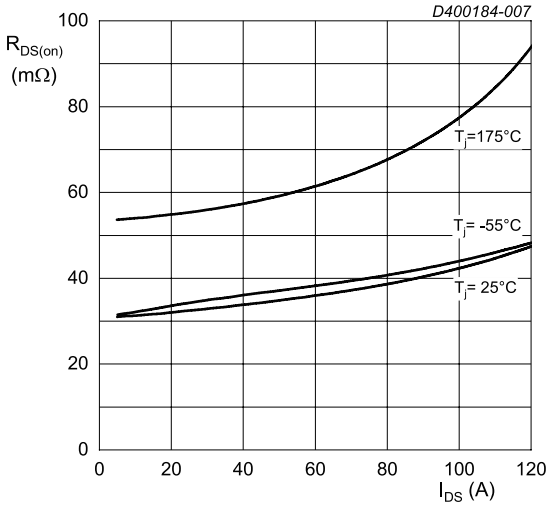
T_j = 25 °C; t_p < 200 µs

Fig. 5. Output characteristics; drain current as a function of drain-source voltage; typical values



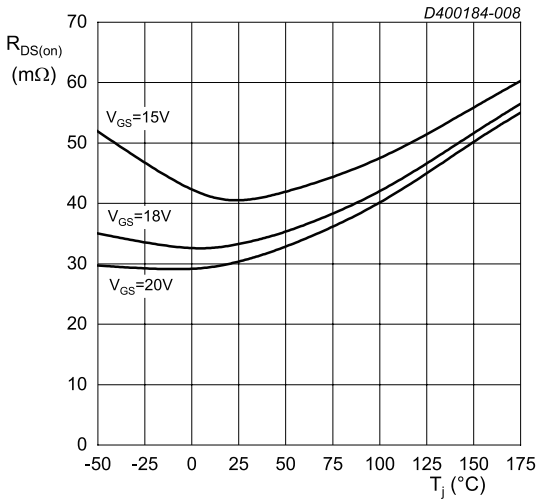
T_j = 175 °C; t_p < 200 µs

Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values



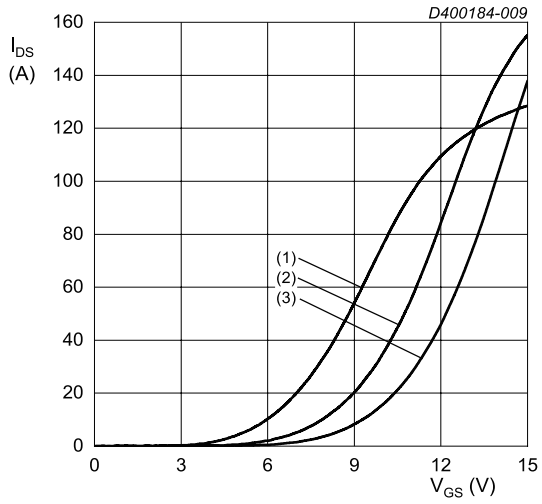
V_{GS} = 18 V; t_p < 200 µs

Fig. 7. Drain-source on-state resistance as a function of drain current; typical values



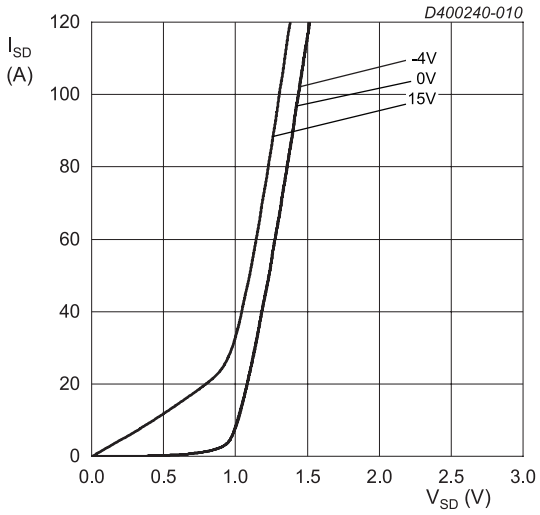
I_{DS} = 33 A; t_p < 200 µs

Fig. 8. Drain-source on-state resistance as a function of junction temperature



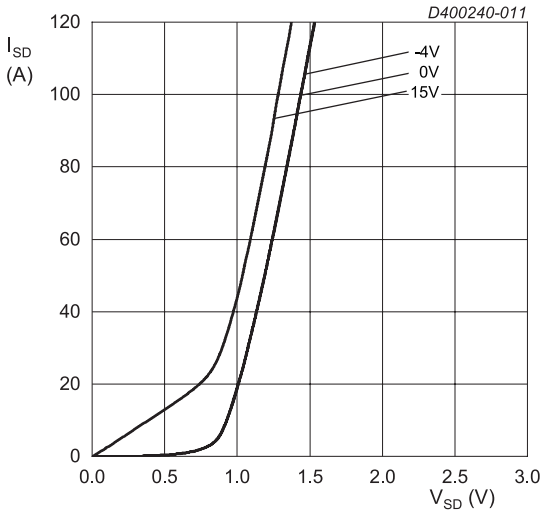
V_{DS} = 20 V; t_p < 200 µs
(1) T_j = 175 °C
(2) T_j = 25 °C
(3) T_j = -55 °C

Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values



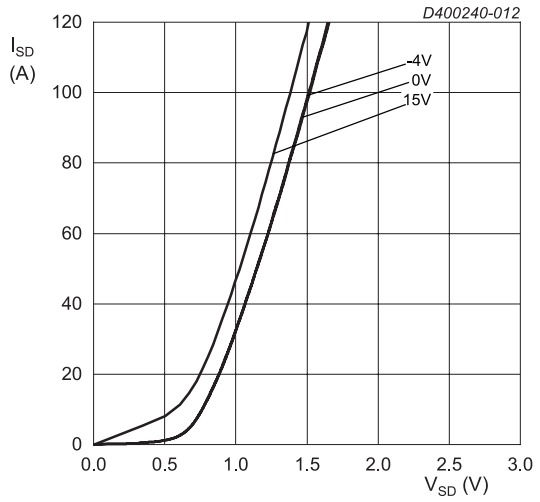
T_j = -55 °C; t_p < 200 µs

Fig. 10. Body diode forward characteristics; typical values



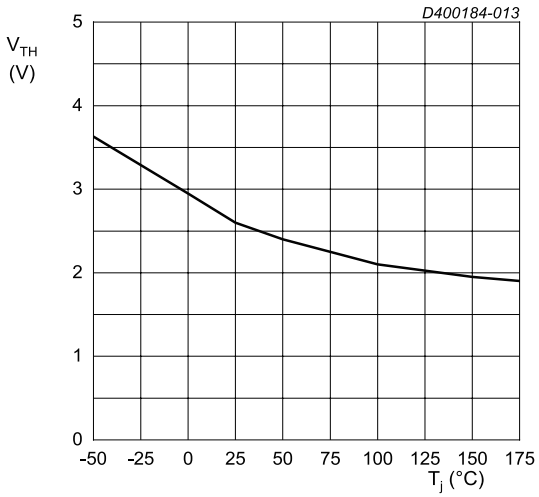
T_j = 25 °C; t_p < 200 µs

Fig. 11. Body diode forward characteristics; typical values



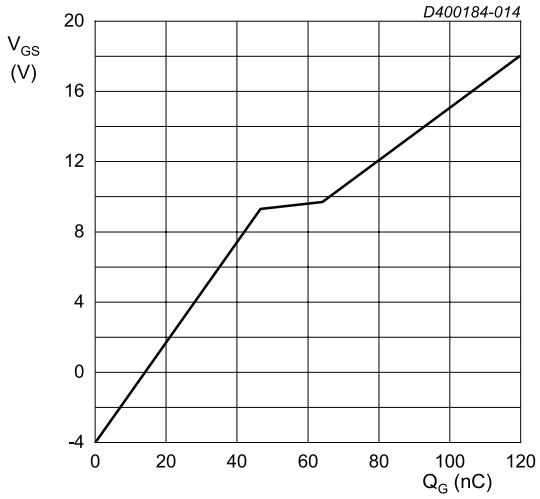
T_j = 175 °C; t_p < 200 µs

Fig. 12. Body diode forward characteristics; typical values



V_{DS} = 10 V; I_{DS} = 10 mA

Fig. 13. Threshold voltage as a function of junction temperature



I_{DS} = 33 A; I_{GS} = 0.1 mA; V_{DS} = 800 V; T_j = 25 °C

Fig. 14. Gate-source voltage as a function of gate charge; typical values

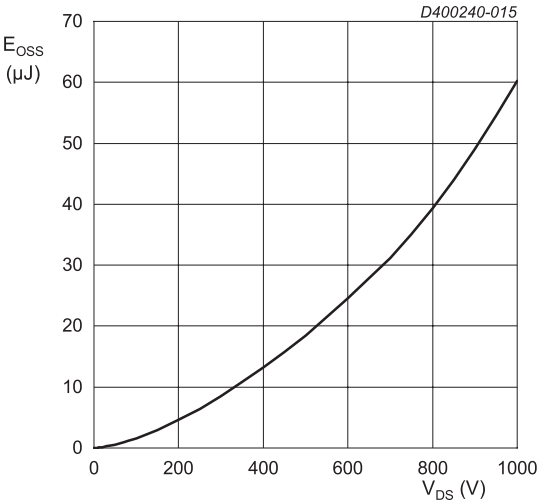
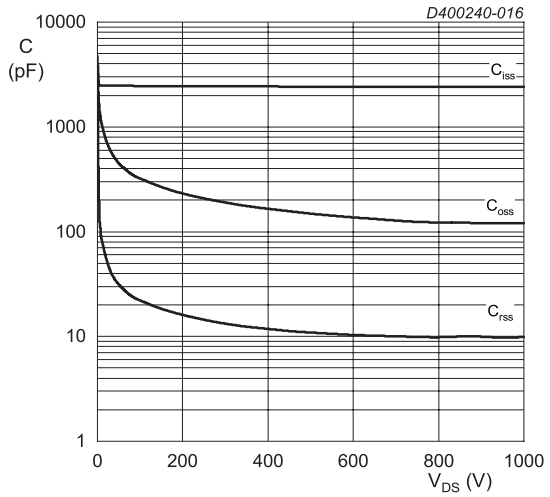
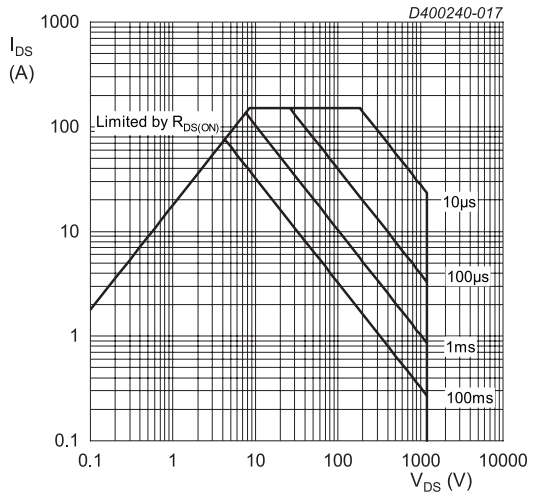


Fig. 15. Output capacitor stored energy as a function of drain-source voltage



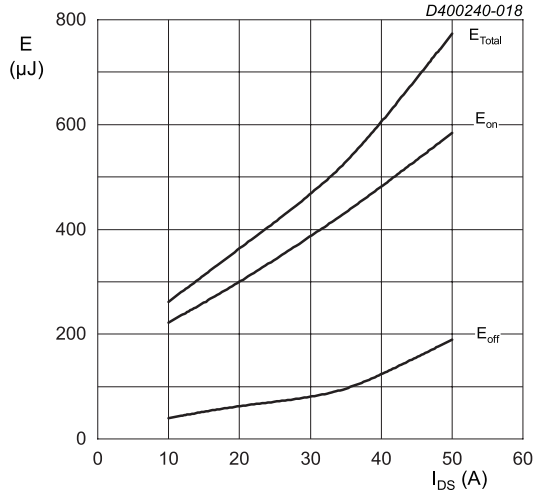
V_{DS} = 0 - 1000 V
T_j = 25 °C; V_{AC} = 25 mV; f = 1 MHz

Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



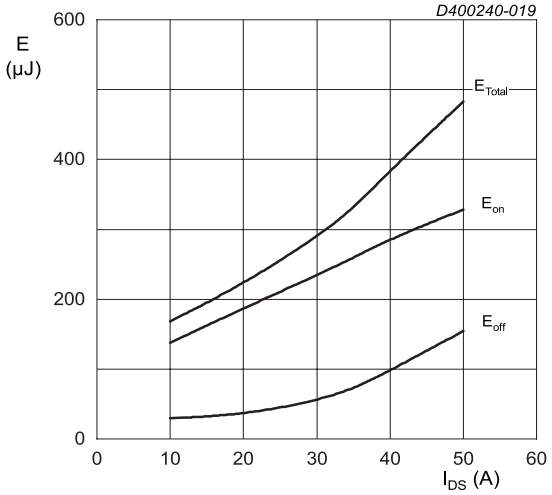
T_j = 25 °C; D = 0
Parameter: t_p

Fig. 17. Forward bias safe operating area



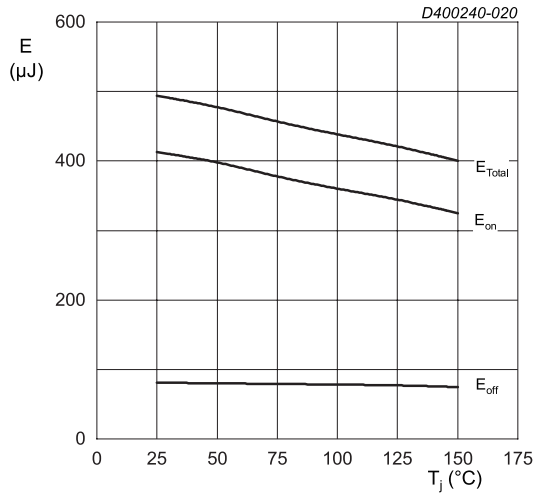
T_j = 25 °C; V_{DD} = 800 V; $R_{G(ext)}$ = 5.1 Ω;
V_{GS} = -4 V/18 V; L = 300 µH
FWD = WNSC2D401200W

Fig. 18. Clamped Inductive Switching Energy as a function of drain current



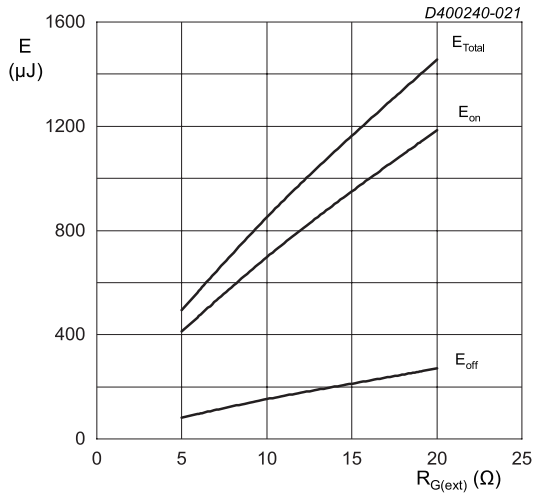
T_j = 25 °C; V_{DD} = 600 V; $R_{G(ext)}$ = 5.1 Ω;
V_{GS} = -4 V/18 V; L = 300 µH
FWD = WNSC2D401200W

Fig. 19. Clamped Inductive Switching Energy as a function of drain current



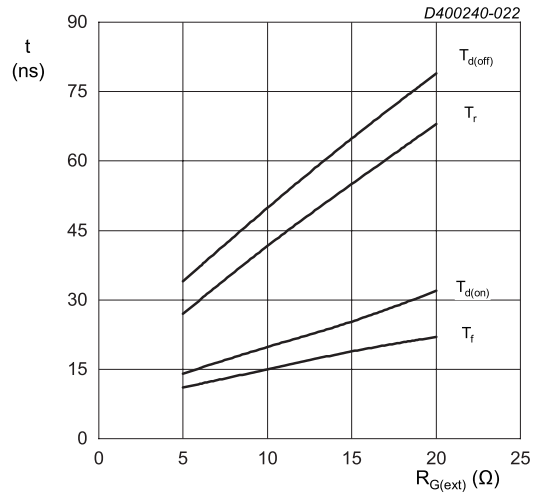
I_{DS} = 33 A; V_{DD} = 800 V; $R_{G(ext)}$ = 5.1 Ω;
V_{GS} = -4 V/18 V; L = 300 µH
FWD = WNSC2D401200W

Fig. 20. Clamped Inductive Switching Energy as a function of junction temperature



T_j = 25 °C; V_{DD} = 800 V; I_{DS} = 33 A;
V_{GS} = -4 V/18 V; L = 300 µH
FWD = WNSC2D401200W

Fig. 21. Clamped Inductive Switching Energy as a function of external gate resistance



T_j = 25 °C; V_{DD} = 800 V; I_{DS} = 33 A; V_{GS} = -4 V/18 V
FWD = WNSC2D401200W; L = 300 µH

Fig. 22. Switching time as a function of external gate resistance

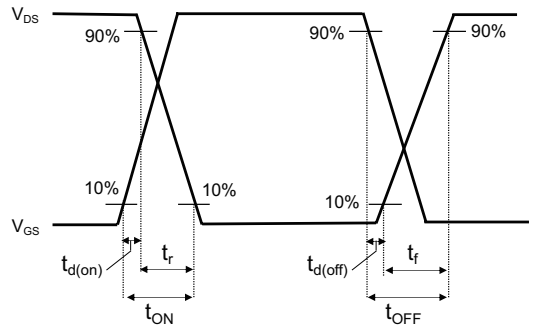
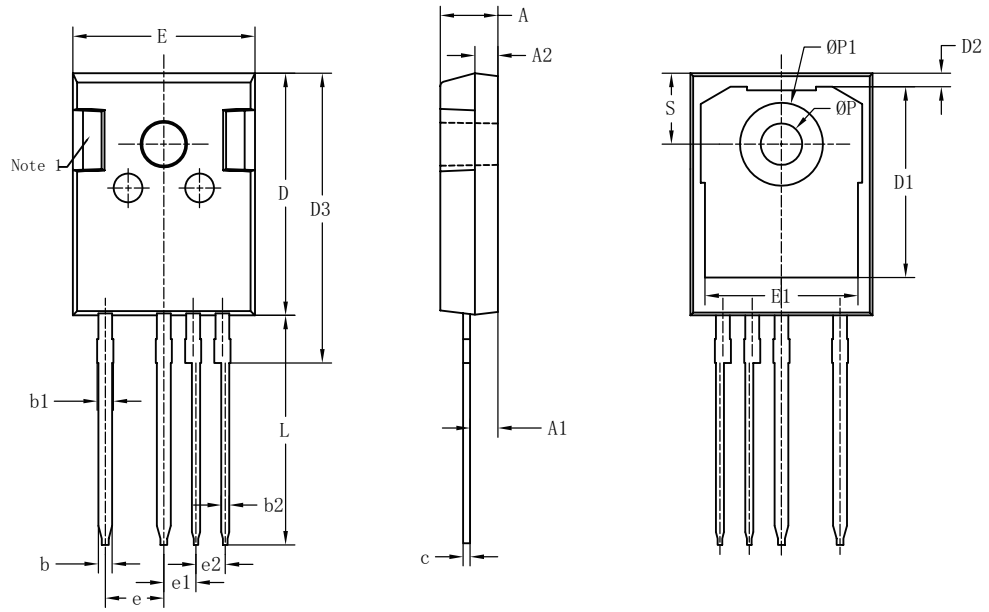


Fig. 23. Switching time definition

11. Package outline

Plastic single-ended through-hole package; headsink mounted; 1 mounting hole; 4 leads TO-247 Narrow Leads TO247-4L NL



TOP VIEW SIDE VIEW BOTTOM VIEW

SIDE VIEW

UNIT		A	A1	A2	b	b1	b2	c	D	D1	D2	D3	E	E1	e	e1	e2	L	P	P1	S
mm	MAX	5.10	2.51	2.10	1.29	1.69	0.79	0.66	21.10	16.85	1.35	25.27	15.90	13.50	5.18	2.89	2.64	20.10	3.70	(7.40)	6.30
	NOM														5.08	2.79	2.54				
	MIN	4.90	2.31	1.90	1.16	1.16	0.66	0.59	20.90	16.25	1.05	24.97	15.70	13.10	4.98	2.69	2.44	19.80	3.50	-	6.00

Note:
1. Metal exposed.
2. All dimensions do not include mold flash & gate remain

12. 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.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.ween-semi.com.

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13. Contents

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