

## 1. General description

WeEn Gen-2 Silicon Carbide MOSFET in a TO263-7L plastic package, designed for high frequency, high efficiency systems.



## 2. Features and benefits

- Kelvin source configuration
- Low specific on-resistance
- Optimized dynamic performance
- 0V turn-off  $V_{GS}$  for simple gate driving
- 100% UIS Tested
- Easy to parallel
- RoHS compliant
- Automotive Qualified (AEC-Q101)

## 3. Applications

- Automotive on board chargers
- Automotive DC-DC converters
- Automotive electric compressor motor drives
- HV battery management systems

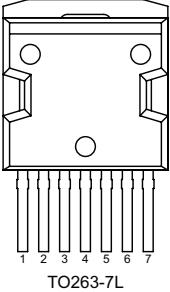
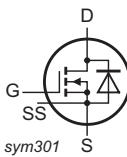
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{DS}$	drain-source voltage	$25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$		750			V
$I_D$	drain current	$V_{GS} = 18\text{ V}; T_{mb} = 25^{\circ}\text{C}$		78			A
$P_{tot}$	total power dissipation	$T_{mb} = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$		268			W
$T_j$	junction temperature			-55 to 175			$^{\circ}\text{C}$
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 15\text{ V}; I_D = 25\text{ A}; T_j = 25^{\circ}\text{C}$		-	40	-	$\text{m}\Omega$
		$V_{GS} = 18\text{ V}; I_D = 25\text{ A}; T_j = 25^{\circ}\text{C}$		-	31	40	$\text{m}\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 25\text{ A}; V_{DS} = 400\text{ V}; V_{GS} = -4\text{ V}/18\text{ V}; T_j = 25^{\circ}\text{C}$		-	90	-	$\text{nC}$
$Q_{GD}$	gate-drain charge			-	10.8	-	$\text{nC}$
<b>Source-drain diode</b>							
$Q_r$	recovered charge	$I_{SD} = 25\text{ A}; \text{di}/\text{dt} = 500\text{ A}/\mu\text{s}; V_{DS} = 400\text{ V}; T_j = 25^{\circ}\text{C}$		-	97.9	-	$\text{nC}$

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	SS	source sense		
3-7	S	source		
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
WNSC2M40075B7-A	TO263-7L	WNSC2M40075B7-A6J	Reel	800	TO263P-7L	05-Mar-2024

## 7. Marking

Table 4. Marking codes

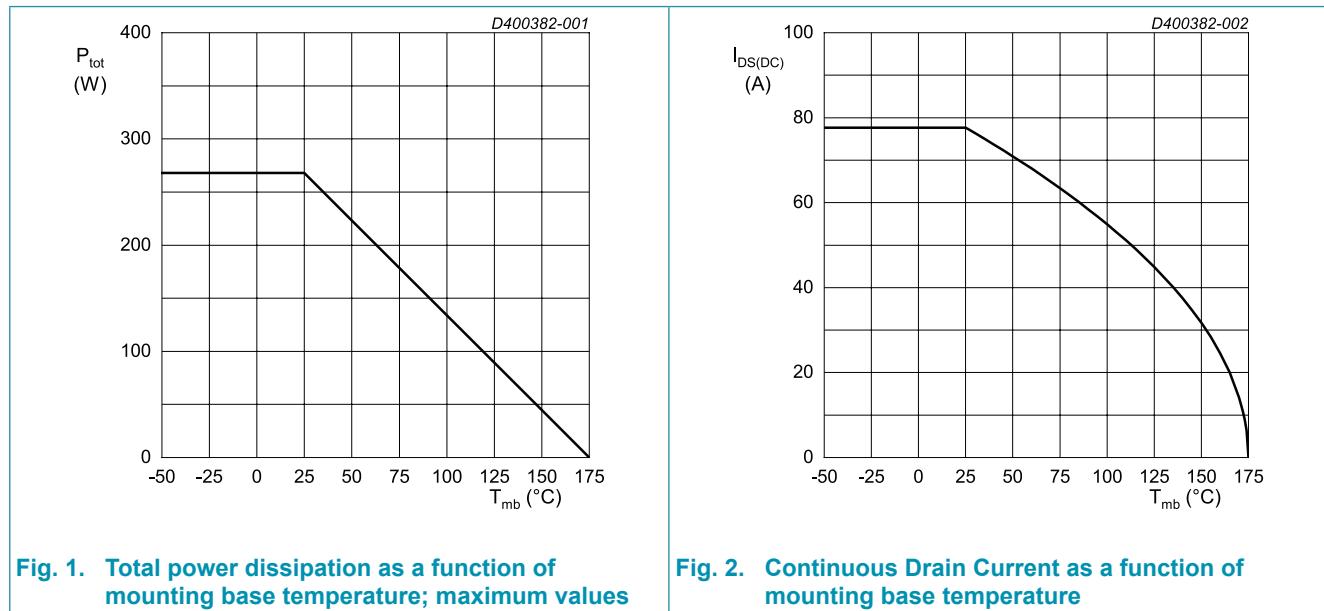
Type number	Marking codes
WNSC2M40075B7-A	WNSC2M40075B7-A

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{DS}$	drain-source voltage	$25^\circ\text{C} \leq T_j \leq 175^\circ\text{C}$		750	V
$V_{GS,max}$	gate-source voltage	Absolute maximum values		-10 to 22	V
$V_{GS,op}$	gate-source voltage	Recommended operational values		-4 to 18	V
$P_{tot}$	total power dissipation	$T_{mb} = 25^\circ\text{C}, T_j = 175^\circ\text{C}$		268	W
$I_D$		$V_{GS} = 18\text{ V}; T_{mb} = 25^\circ\text{C}$		78	A
		$V_{GS} = 18\text{ V}; T_{mb} = 100^\circ\text{C}$		55	A
$I_{DM}$	peak drain current	pulse width $t_p$ limited by $T_{jmax}$	Fig.17	155	A
$I_S$	continuous diode current	$V_{GS} = -4\text{ V}; T_{mb} = 25^\circ\text{C}$		52	A
$I_{SM}$	pulse diode current	$V_{GS} = -4\text{ V};$ pulse width $t_p$ limited by $T_{jmax}$		155	A
$E_{as}$	single pulse drain-to-source avalanche	$I_{AS} = 23.8\text{ A}; L = 1\text{ mH}; V_{DD} = 100\text{ V}; T_j = 25^\circ\text{C}$		283	mJ
$T_{stg}$	storage temperature			-55 to 175	°C
$T_j$	junction temperature			-55 to 175	°C
$T_{sld(M)}$	peak soldering temperature			260	°C



## 9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j\text{-mb})}$	thermal resistance from junction to mounting base			-	0.56	-	K/W
$R_{th(j\text{-a})}$	thermal resistance from junction to ambient	in free air		-	40	-	K/W

Note: Device is ESD sensitive. Handling precautions are recommended.

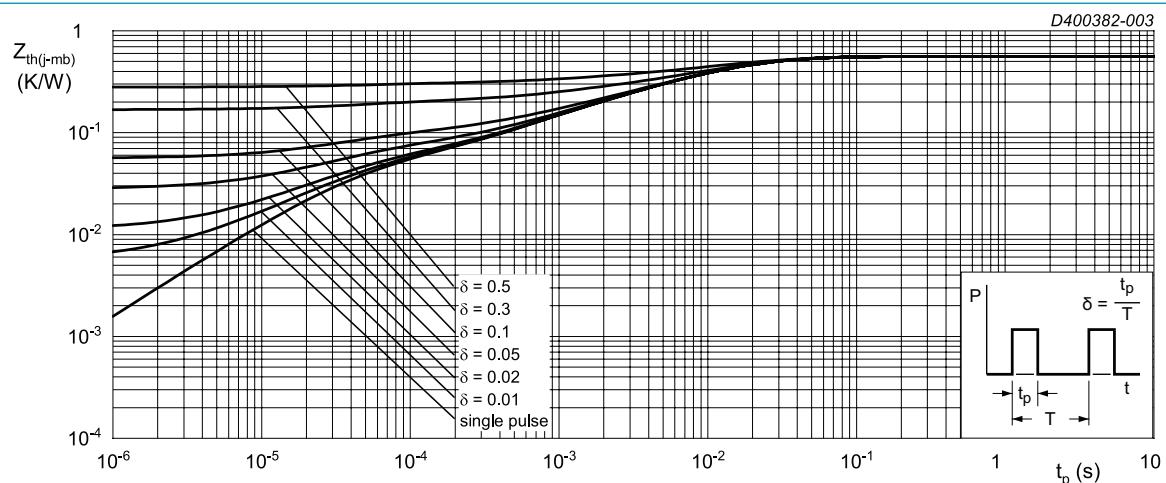
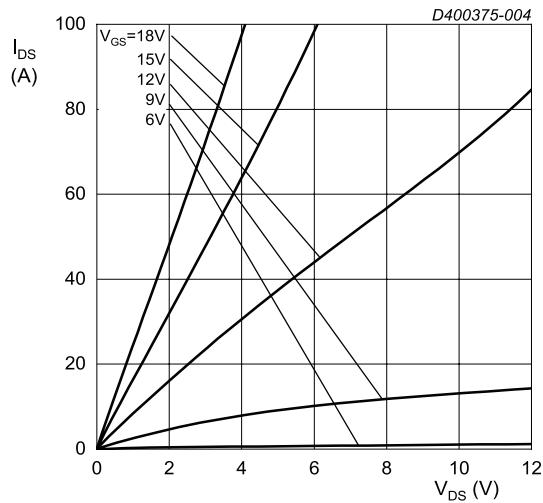


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

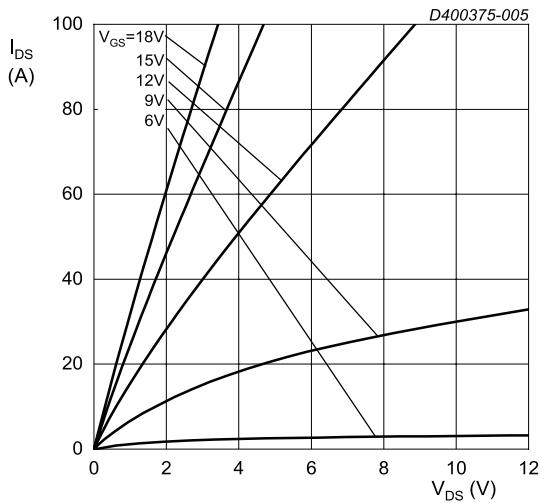
Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 100 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$		750	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 7 mA; V_{DS} = V_{GS}; T_j = 25^\circ C$		2	2.8	3.6	V
		$I_D = 7 mA; V_{DS} = V_{GS}; T_j = 175^\circ C$		-	2.1	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 750 V; V_{GS} = 0 V; T_j = 25^\circ C$		-	0.1	50	$\mu A$
		$V_{DS} = 750 V; V_{GS} = 0 V; T_j = 175^\circ C$		-	5	-	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 22 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	5	100	nA
		$V_{GS} = -10 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	5	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 15 V; I_D = 25 A; T_j = 25^\circ C$		-	40	-	$m\Omega$
		$V_{GS} = 18 V; I_D = 25 A; T_j = 25^\circ C$		-	31	40	$m\Omega$
		$V_{GS} = 18 V; I_D = 25 A; T_j = 175^\circ C$		-	37	-	$m\Omega$
$R_G$	gate resistance	$f = 1 MHz; T_j = 25^\circ C$		-	1.14	-	$\Omega$
$g_{fs}$	transconductance	$V_{DS} = 20 V; I_D = 25 A; T_j = 25^\circ C$		-	14	-	S
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 25 A; V_{DS} = 400 V; V_{GS} = -4 V/18 V; T_j = 25^\circ C$		-	90	-	nC
$Q_{GS}$	gate-source charge			-	38	-	nC
$Q_{GD}$	gate-drain charge			-	10.8	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 400 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25^\circ C$		-	2139	-	pF
$C_{oss}$	output capacitance			-	156	-	pF
$C_{rss}$	reverse transfer capacitance			-	11.5	-	pF
$E_{oss}$	Coss stored energy			-	12.5	-	$\mu J$
$t_{d(on)}$	turn-on delay time	$V_{DS} = 400 V; V_{GS} = -4 V/18 V; R_{G(ext)} = 5.1 \Omega; I_D = 12.5 A; L = 100 \mu H; T_j = 25^\circ C$		-	23	-	ns
$t_r$	rise time			-	15	-	ns
$t_{d(off)}$	turn-off delay time			-	45	-	ns
$t_f$	fall time			-	15	-	ns
$E_{on}$	turn-on energy (Body Diode FWD)		Fig.19	-	103	-	$\mu J$
$E_{off}$	turn-off energy (Body Diode FWD)		Fig.19	-	14	-	$\mu J$
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$V_{GS} = 0 V; I_{SD} = 25 A; T_j = 25^\circ C$		-	3.7	-	V
		$V_{GS} = -4 V; I_{SD} = 25 A; T_j = 25^\circ C$		-	4.2	-	V
		$V_{GS} = -4 V; I_{SD} = 25 A; T_j = 175^\circ C$		-	3.7	-	V
$t_{rr}$	reverse recovery time	$I_{SD} = 25 A; di/dt = 500 A/\mu s; V_{DS} = 400 V; T_j = 25^\circ C$		-	30.8	-	ns
$Q_r$	recovered charge			-	97.9	-	nC
$I_{rrm}$	reverse recovery current			-	6.4	-	A



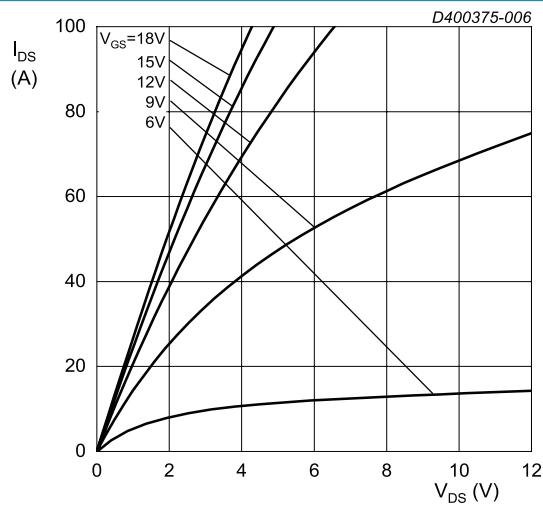
$T_j = -55^\circ\text{C}$ ;  $t_p < 200 \mu\text{s}$

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



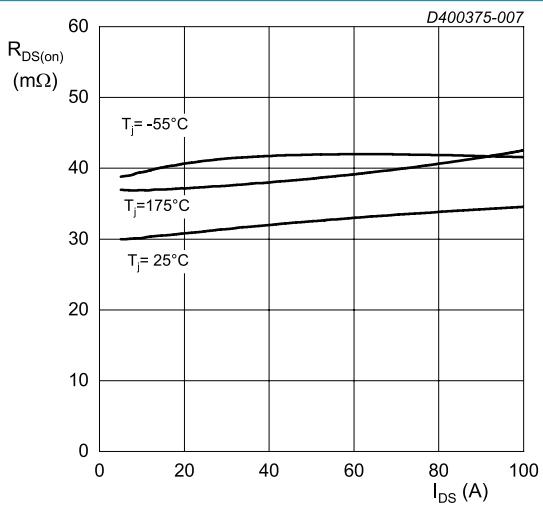
$T_j = 25^\circ\text{C}$ ;  $t_p < 200 \mu\text{s}$

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



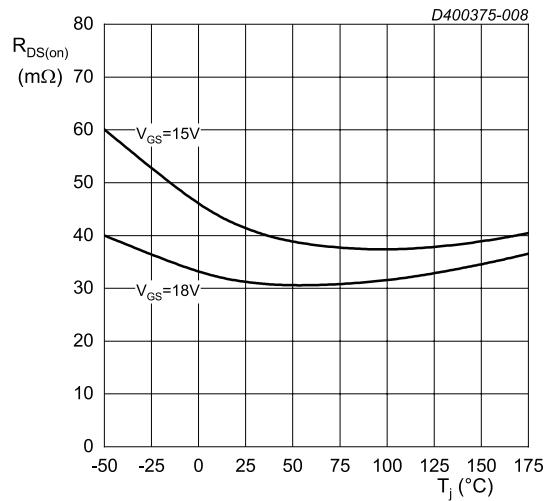
$T_j = 175^\circ\text{C}$ ;  $t_p < 200 \mu\text{s}$

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



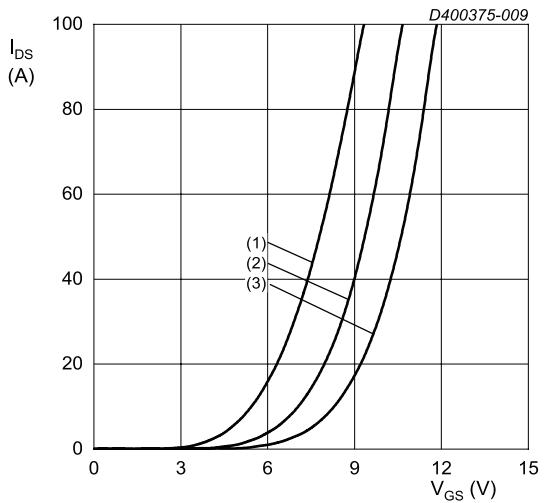
$V_{GS} = 18 \text{ V}$ ;  $t_p < 200 \mu\text{s}$

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



$I_{DS} = 25 A$ ;  $t_p < 200 \mu s$

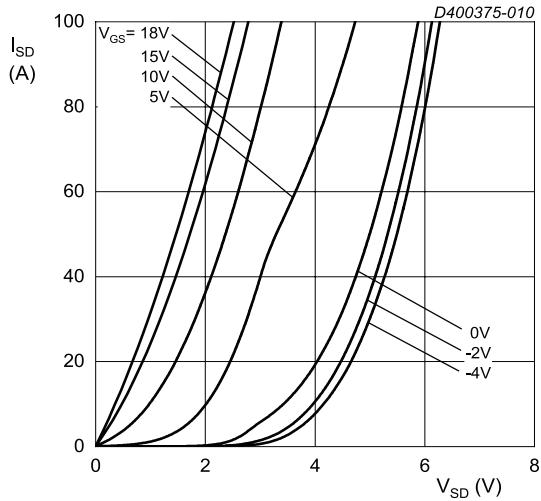
Fig. 8. Drain-source on-state resistance as a function of junction temperature



$V_{DS} = 20 V$ ;  $t_p < 200 \mu s$

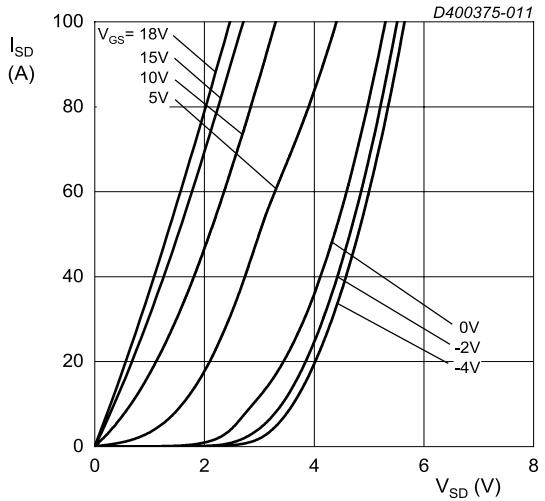
- (1)  $T_j = 175$  °C
- (2)  $T_j = 25$  °C
- (3)  $T_j = -55$  °C

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



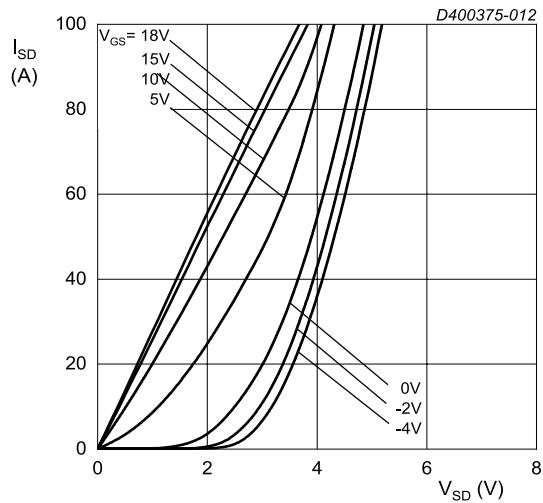
$T_j = -55$  °C;  $t_p < 200 \mu s$

Fig. 10. Body diode forward characteristics; typical values



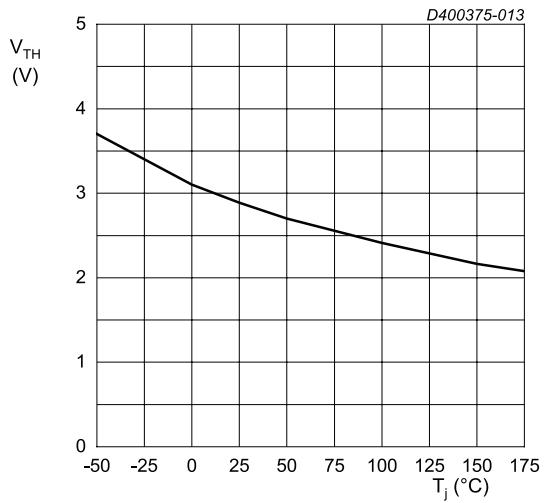
$T_j = 25$  °C;  $t_p < 200 \mu s$

Fig. 11. Body diode forward characteristics; typical values



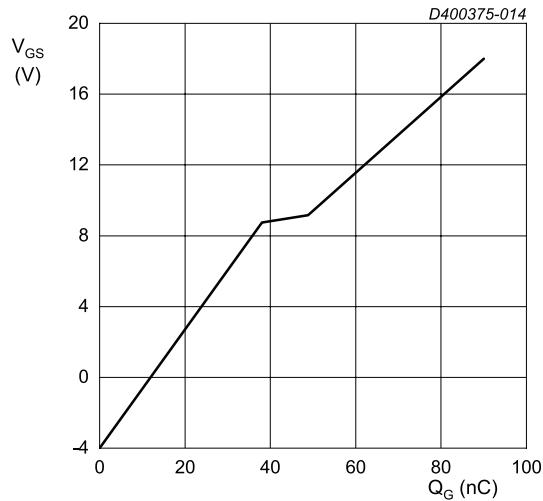
$T_j = 175^\circ\text{C}$ ;  $t_p < 200\ \mu\text{s}$

**Fig. 12. Body diode forward characteristics; typical values**



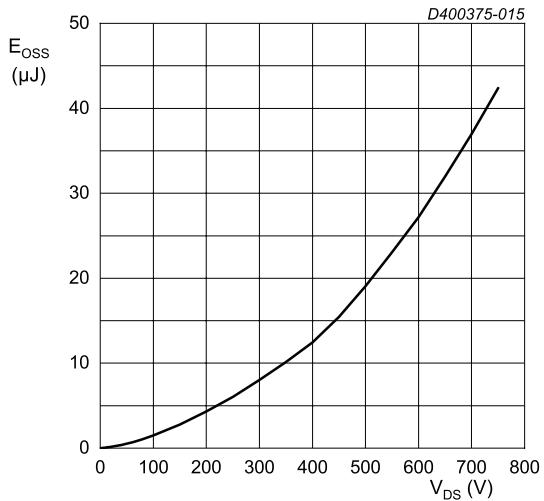
$V_{DS} = V_{GS}$ ;  $I_{DS} = 7\ \text{mA}$

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

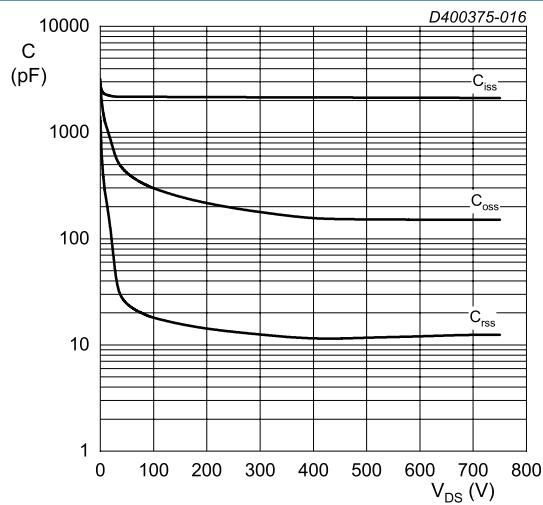


$I_{DS} = 25\ \text{A}$ ;  $I_{GS} = 0.1\ \text{mA}$ ;  $V_{DS} = 400\ \text{V}$ ;  $T_j = 25^\circ\text{C}$

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

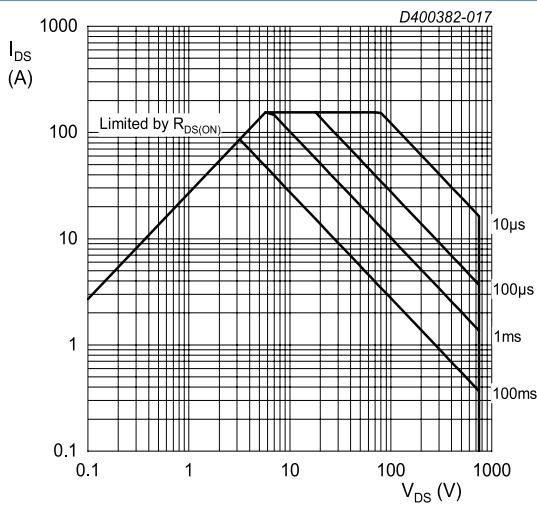


**Fig. 15. Output capacitor stored energy as a function of drain-source voltage**



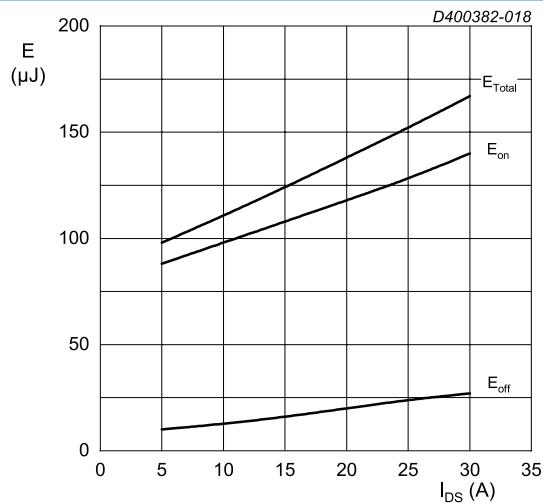
$V_{DS} = 0 - 750$  V  
 $T_j = 25$  °C;  $V_{AC} = 25$  mV;  $f = 1$  MHz

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



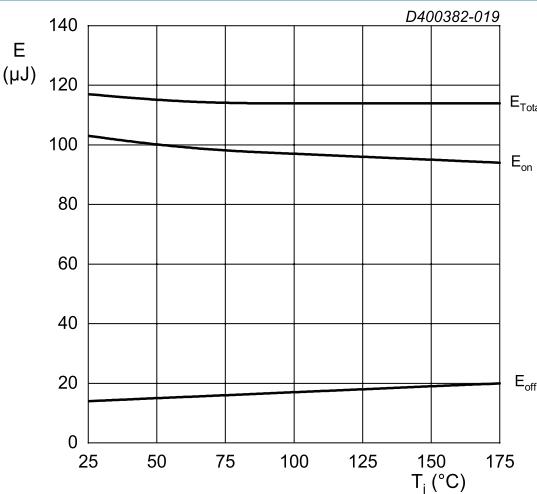
$T_j = 25$  °C;  $D = 0$   
Parameter:  $t_p$

**Fig. 17. Forward bias safe operating area**



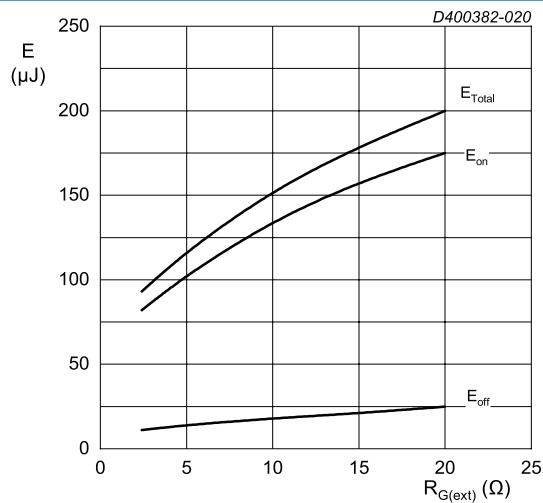
$T_j = 25$  °C;  $V_{DD} = 400$  V;  $R_{G(ext)} = 5.1$  Ω;  
 $V_{GS} = -4$  V/18 V;  $L = 100$  μH  
FWD = WNSC2M40075B7-A

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



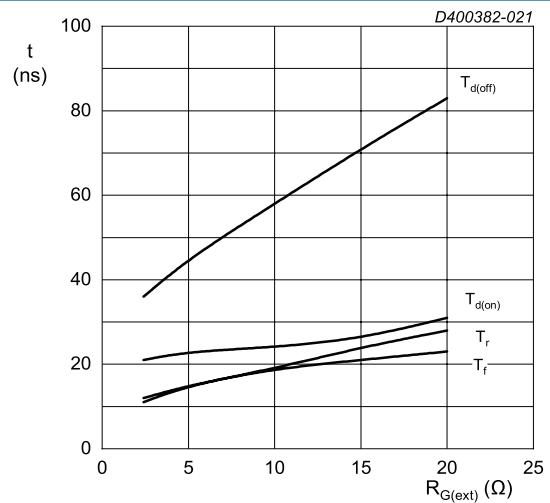
$I_{DS} = 12.5$  A;  $V_{DD} = 400$  V;  $R_{G(ext)} = 5.1$  Ω;  
 $V_{GS} = -4$  V/18 V;  $L = 100$  μH  
FWD = WNSC2M40075B7-A

**Fig. 19. Clamped Inductive Switching Energy as a function of junction temperature**



$T_j = 25^\circ\text{C}$ ;  $V_{DD} = 400\text{ V}$ ;  $I_{DS} = 12.5\text{ A}$ ;  $V_{GS} = -4\text{ V}/18\text{ V}$   
FWD = WNSC2M40075B7-A;  $L = 100\text{ }\mu\text{H}$

Fig. 20. Clamped Inductive Switching Energy as a function of external gate resistance



$T_j = 25^\circ\text{C}$ ;  $V_{DD} = 400\text{ V}$ ;  $I_{DS} = 12.5\text{ A}$ ;  $V_{GS} = -4\text{ V}/18\text{ V}$   
FWD = WNSC2M40075B7-A;  $L = 100\text{ }\mu\text{H}$

Fig. 21. Switching time as a function of external gate resistance

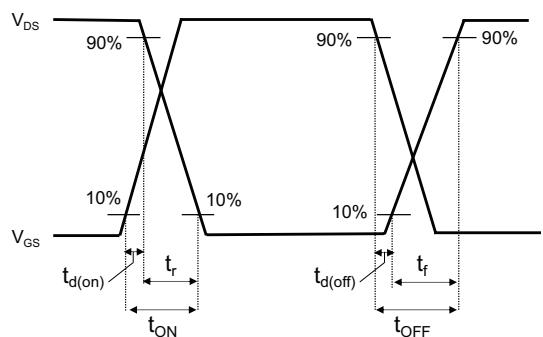
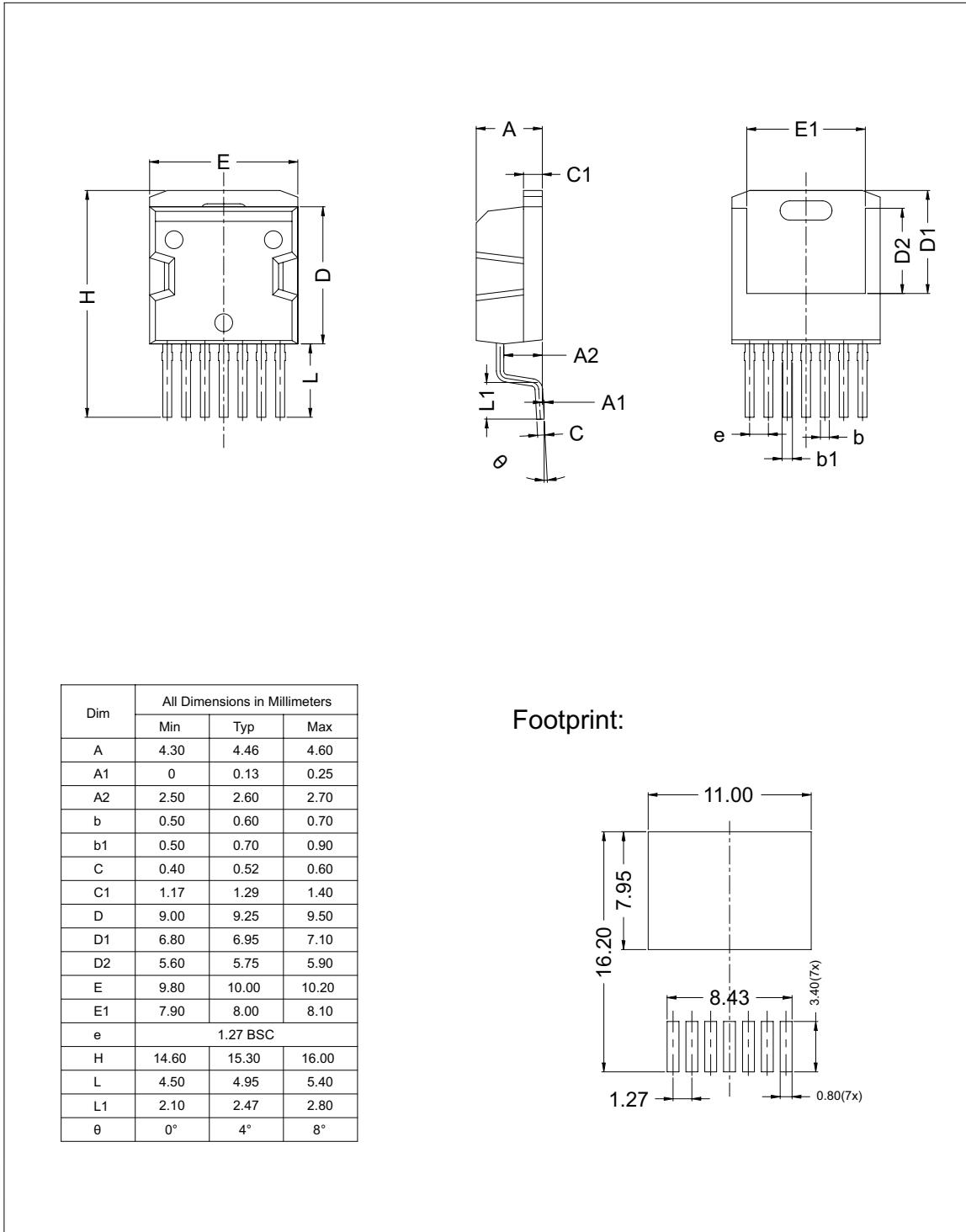


Fig. 22. Switching time definition

## 11. Package outline



## 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.
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