

1200V, 20mΩ SiC MOSFET

SiC MOSFET in a TO-247-4L plastic package, designed for high frequency, high efficiency systems.

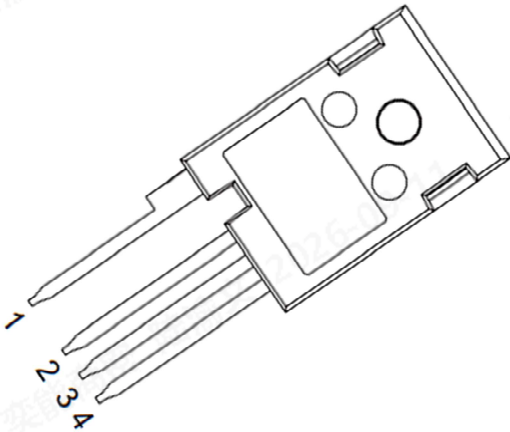
Features

- Kelvin source configuration
- Low specific on-resistance
- Optimized dynamic performance
- Robust gate design
- 0V turn-off V_{GS} for simple gate driving
- 100% UIS Tested
- Easy to parallel
- RoHS compliant

Typical applications

- Switching mode power supplies
- UPS & Energy storage system
- Battery formation instrument
- PV MPPT and inverters
- EV Chargers
- Welding machines
- Motor Drives

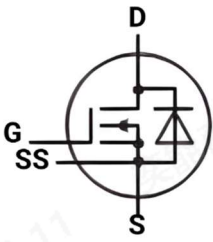
V_{DS}	1200V
$R_{DS(on)}$	20mΩ



RoHS



Halogen-free



D-Drain (Pin 1)

S-Source (Pin 2)

SS-Source sense (Pin 3)

G-Gate (Pin 4)

Type	Package	Marking
IM120R020ZW	TO-247-4L	IM120R020ZW

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1 Quick reference data

Table 1 Absolute maximum rating

Parameter	Symbol	Note or test condition	Value	Unit
Drain-source voltage	V_{DS}	$25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$	1200	V
Drain current	I_D	$V_{GS} = 18\text{V}; T_{mb} = 25^{\circ}\text{C}$	120	A
Total power dissipation	P_{tot}	$T_{mb} = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$	500	W
Junction temperature	T_j		-55 to 175	$^{\circ}\text{C}$

Table 2 Static characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 15\text{V}; I_D = 60\text{A}; T_j = 25^{\circ}\text{C}$		23		m Ω
		$V_{GS} = 18\text{V}; I_D = 60\text{A}; T_j = 25^{\circ}\text{C}$		20	30	m Ω

Table 3 Dynamic characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_{G(tot)}$	$I_D = 60\text{A}; V_{DS} = 800\text{V};$		164		nC
Gate-drain charge	Q_{GD}	$V_{GS} = -5\text{V}/18\text{V}; T_j = 25^{\circ}\text{C}$		20		nC

Table 4 Source-drain diode

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Recovered charge	Q_r	$I_{SD} = 60\text{A}; di/dt = 3600\text{A}/\mu\text{s};$ $V_{DS} = 800\text{V}; T_j = 25^{\circ}\text{C}$		439		nC

2 Limiting values

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

Table 5 Limiting values

Parameter	Symbol	Note or test condition	Value	Unit
Drain-source voltage	V_{DS}	$25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$	1200	V
Gate-source voltage	$V_{GS,MAX}$	Absolute maximum values	-10 to 22	V
Gate-source voltage	$V_{GS,op}$	Recommended operational values	-5 to 18	V
Total power dissipation	P_{tot}	$T_{mb} = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$	500	W

3 Thermal & mechanical characteristics

Drain current	I_D	$V_{GS} = 18V; T_{mb} = 25^{\circ}C$	120	A
		$V_{GS} = 18V; T_{mb} = 100^{\circ}C$	85	A
Peak drain current	I_{DM}	Pulse width t_p limited by T_{jmax}	360	A
Continuous diode current	I_S	$V_{GS} = -5V; T_{mb} = 25^{\circ}C$	110	A
Pulse diode current	I_{SM}	$V_{GS} = -5V$; pulse width t_p limited by T_{jmax}	360	A
Single pulse drain-to-source avalanche	E_{as}	$I_{AS} = 32.5A; L = 1mH$; $V_{DD} = 100V; T_j = 25^{\circ}C$	528	mJ
Storage temperature	T_{stg}		-55 to 175	$^{\circ}C$
Junction temperature	T_j		-55 to 175	$^{\circ}C$
Peak soldering temperature	$T_{sld(M)}$		260	$^{\circ}C$

3 Thermal & mechanical characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Thermal resistance from junction to mounting base	$R_{th(j-mb)}$			0.3		K/W
Thermal resistance from junction to ambient	$R_{th(j-a)}$	In free air		40		K/W
Mounting torque	M_d	M3 or 6 - 32 screw			0.6	Nm

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.

4 Characteristics

Table 6 Static characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 100\mu A; V_{GS} = 0V; T_j = 25^{\circ}C$	1200			V
Gate-source threshold voltage	$V_{GS(th)}$	$I_D = 16mA; T_j = 25^{\circ}C$	2.5	3.1	4.0	V
		$I_D = 16mA; T_j = 175^{\circ}C$		2.4		V
Drain leakage current	I_{DSS}	$V_{DS} = 1200V; V_{GS} = 0V$; $T_j = 25^{\circ}C$		0.1	100	μA
		$V_{DS} = 1200V; V_{GS} = 0V$; $T_j = 175^{\circ}C$		1		μA

4 Characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Gate leakage current	I_{GSS}	$V_{GS} = 22V; V_{DS} = 0V; T_j = 25^{\circ}C$		10	100	nA
		$V_{GS} = -10V; V_{DS} = 0V; T_j = 25^{\circ}C$		10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 15V; I_D = 60A; T_j = 25^{\circ}C$		23		m Ω
		$V_{GS} = 18V; I_D = 60A; T_j = 25^{\circ}C$		20	30	m Ω
		$V_{GS} = 18V; I_D = 60A; T_j = 175^{\circ}C$		35		m Ω
Gate resistance	R_G	$f = 1MHz; T_j = 25^{\circ}C$		1.2		Ω
Transconductance	g_{fs}	$V_{DS} = 20V; I_D = 60A; T_j = 25^{\circ}C$		46		S

Table 7 Dynamic characteristics

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_{G(tot)}$	$I_D = 60A; V_{DS} = 800V;$ $V_{GS} = -5V/18V; T_j = 25^{\circ}C$		164		nC
Gate-source charge	Q_{GS}			75		nC
Gate-drain charge	Q_{GD}			20		nC
Input capacitance	C_{iss}	$V_{DS} = 1000V; V_{GS} = 0V;$ $f = 1MHz; T_j = 25^{\circ}C$		4133		pF
Output capacitance	C_{oss}			129		pF
Reverse transfer capacitance	C_{rss}			5.6		pF
C_{oss} stored energy	E_{oss}	$V_{DS} = 800V; V_{GS} = -5V/18V;$ $R_{G(ext)} = 5.1\Omega; I_D = 60A;$ $L = 100\mu H; T_j = 25^{\circ}C$		64.5		μJ
Turn-on delay time	$t_{d(on)}$			32		ns
Rise time	t_r			30		ns
Turn-off delay time	$t_{d(off)}$			49		ns
Fall time	t_f			8		ns
Turn-on energy (Body Diode FWD)	E_{on}			721		μJ
Turn-off energy (Body Diode FWD)	E_{off}			127		μJ

Table 8 Source-drain diode

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Source-drain voltage	V_{SD}	$V_{GS} = 0V; I_{SD} = 30A; T_j = 25^{\circ}C$		3.0		V
		$V_{GS} = -5V; I_{SD} = 30A; T_j = 25^{\circ}C$		4.0		V
		$V_{GS} = -5V; I_{SD} = 30A; T_j = 175^{\circ}C$		3.5		V
Reverse recovery time	t_{rr}	$I_{SD} = 60A; di/dt = 3600A/\mu s;$ $V_{DS} = 800V; T_j = 25^{\circ}C$		18		ns
Recovered charge	Q_r			439		nC
Reverse recovery current	I_{rrm}			41		A

5 Characteristic diagrams

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

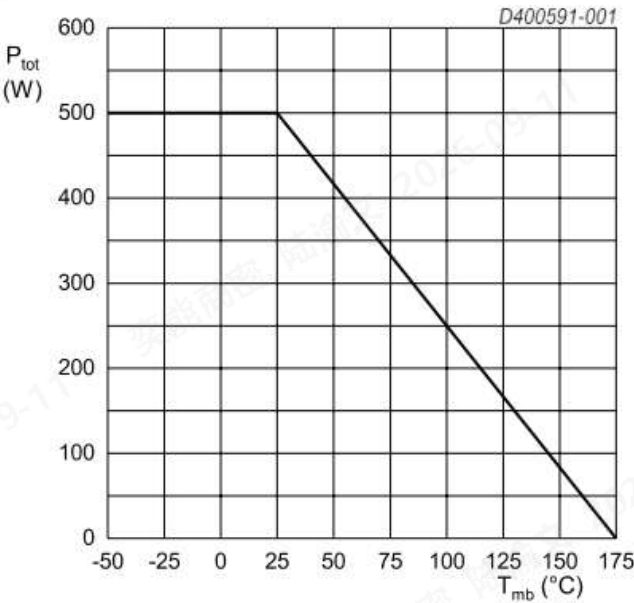


Figure 2 Continuous Drain Current as a function of mounting base temperature

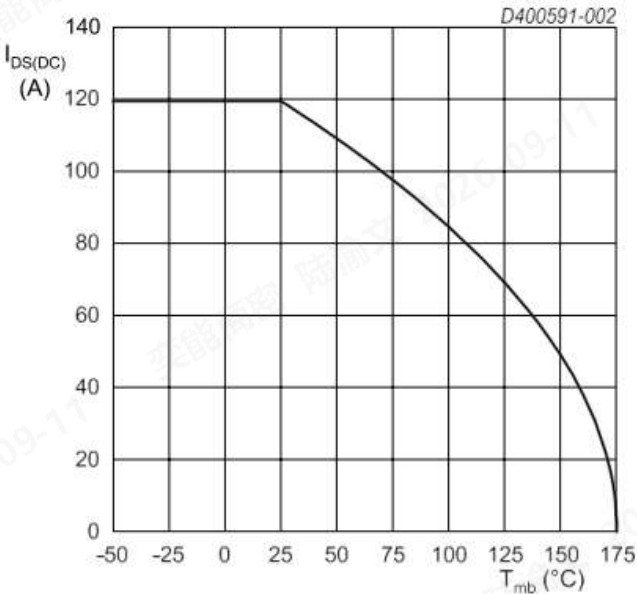
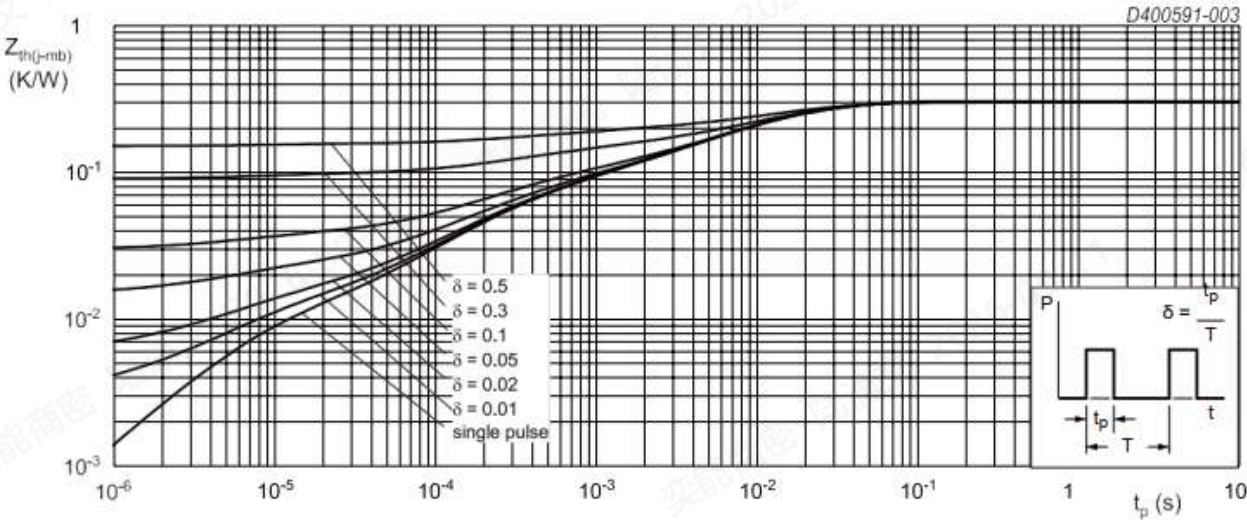
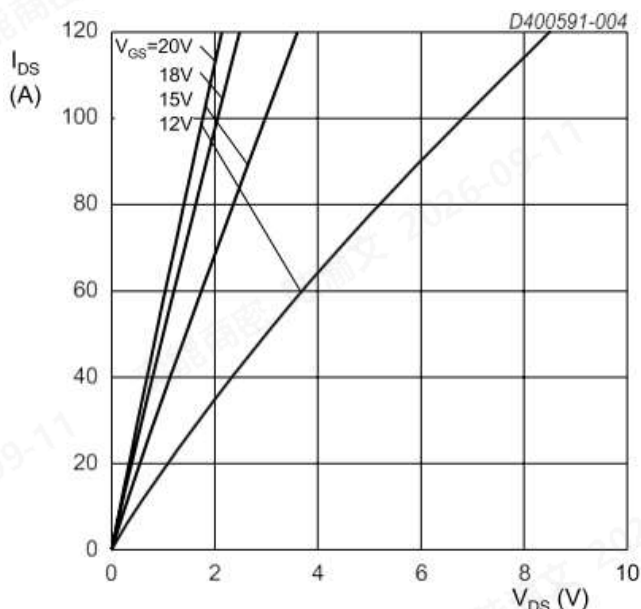
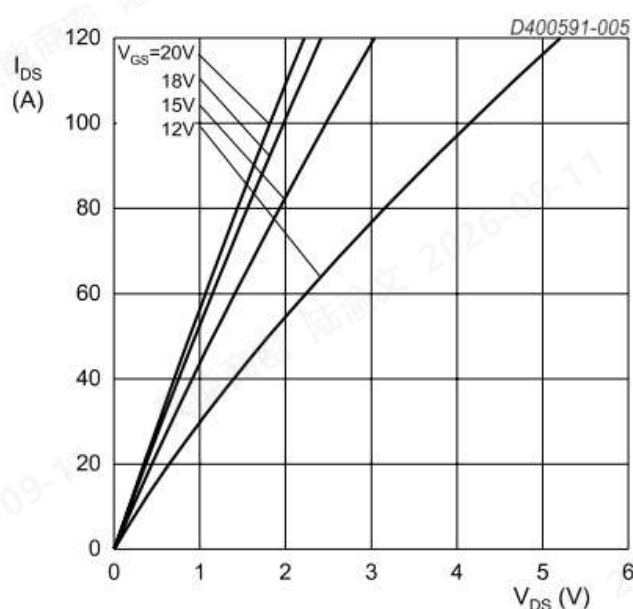
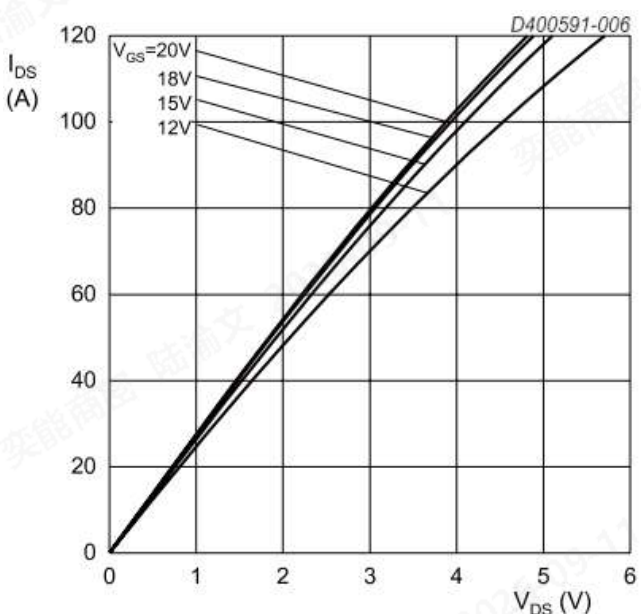
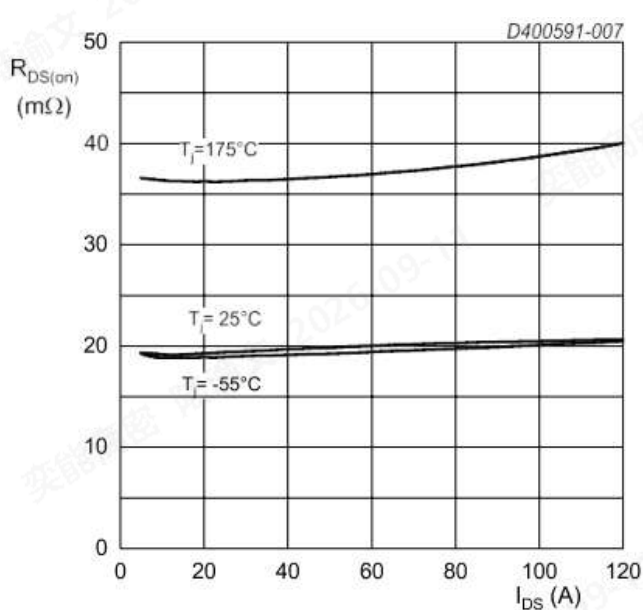


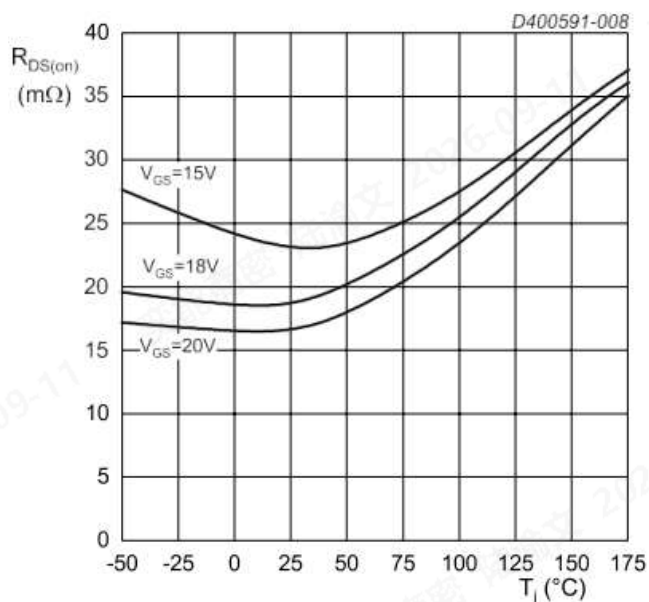
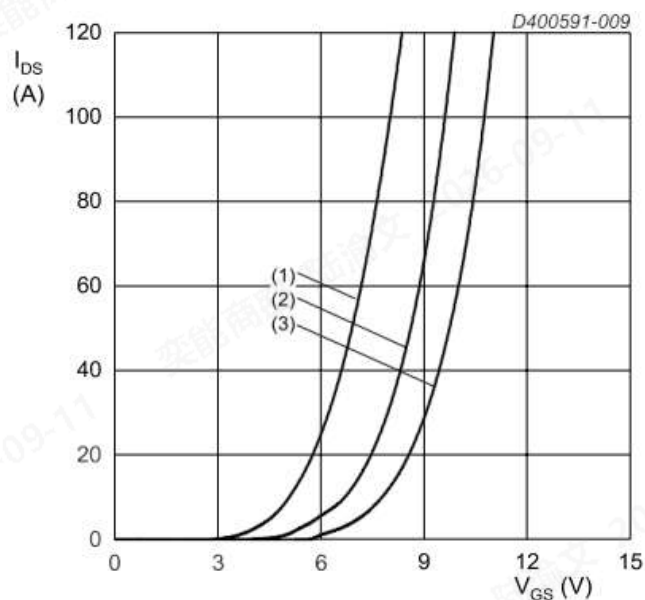
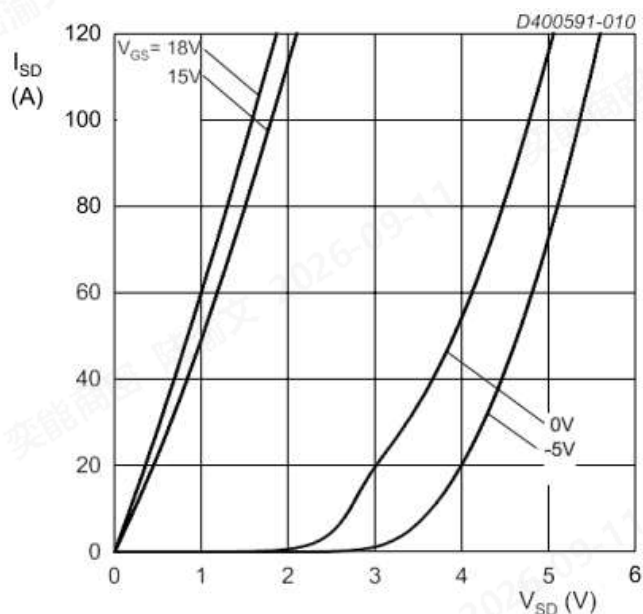
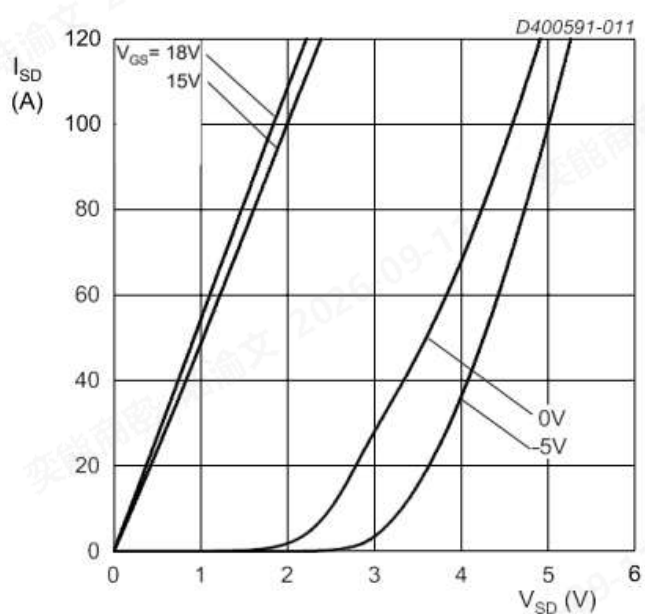
Figure 3 Transient thermal impedance from junction to mounting base as a function of pulse duration



5 Characteristic diagrams

Figure 4 Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = -55^{\circ}\text{C}$; $t_p < 200\mu\text{s}$ **Figure 5** Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = 25^{\circ}\text{C}$; $t_p < 200\mu\text{s}$ **Figure 6** Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = 175^{\circ}\text{C}$; $t_p < 200\mu\text{s}$ **Figure 7** Drain-source on-state resistance as a function of drain current; typical values $V_{GS} = 18\text{V}$; $t_p < 200\mu\text{s}$ 

5 Characteristic diagrams

Figure 8 Drain-source on-state resistance as a function of junction temperature $I_{DS} = 60A$; $t_p < 200\mu s$ **Figure 9 Transfer characteristics; drain current as a function of gate-source voltage; typical values** $V_{DS} = 20V$; $t_p < 200\mu s$ (1) $T_J = 175^{\circ}C$; (2) $T_J = 25^{\circ}C$; (3) $T_J = -55^{\circ}C$ **Figure 10 Body diode forward characteristics; typical values** $T_J = -55^{\circ}C$; $t_p < 200\mu s$ **Figure 11 Body diode forward characteristics; typical values** $T_J = 25^{\circ}C$; $t_p < 200\mu s$ 

5 Characteristic diagrams

Figure 12 Body diode forward characteristics;
typical values

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

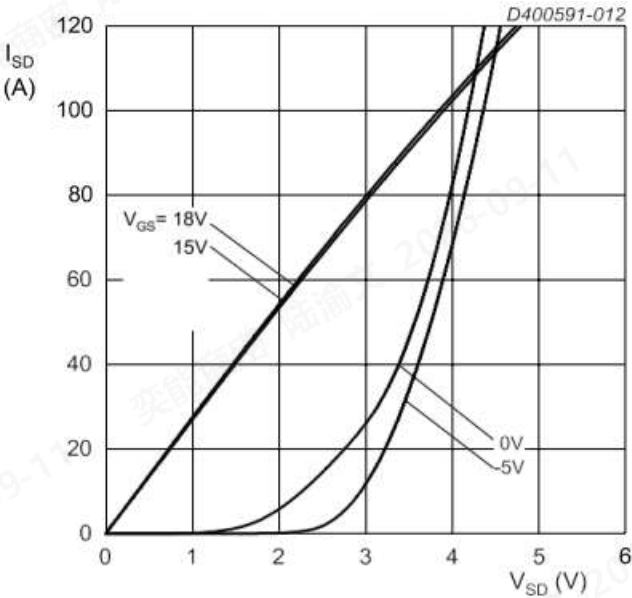


Figure 13 Threshold voltage as a function of
junction temperature

$V_{DS} = 10\text{V}$; $I_{DS} = 16\text{mA}$

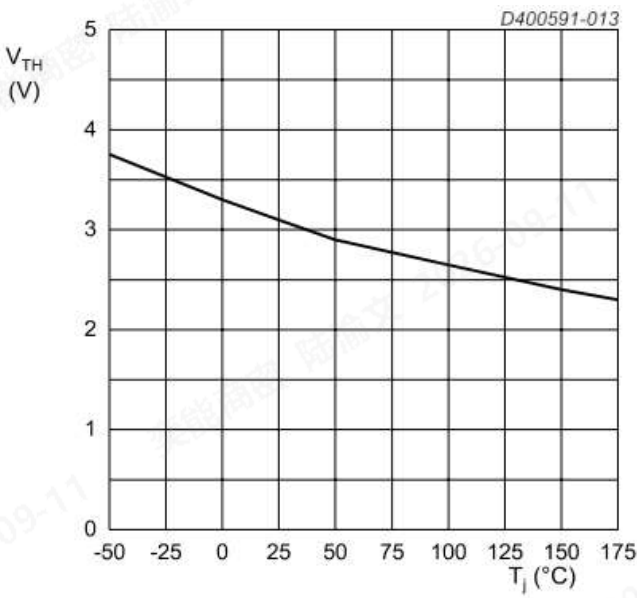


Figure 14 Gate-source voltage as a function of gate
charge; typical values

$I_{DS} = 60\text{A}$; $I_{GS} = 0.1\text{mA}$; $V_{DS} = 800\text{V}$; $T_j = 25^{\circ}\text{C}$

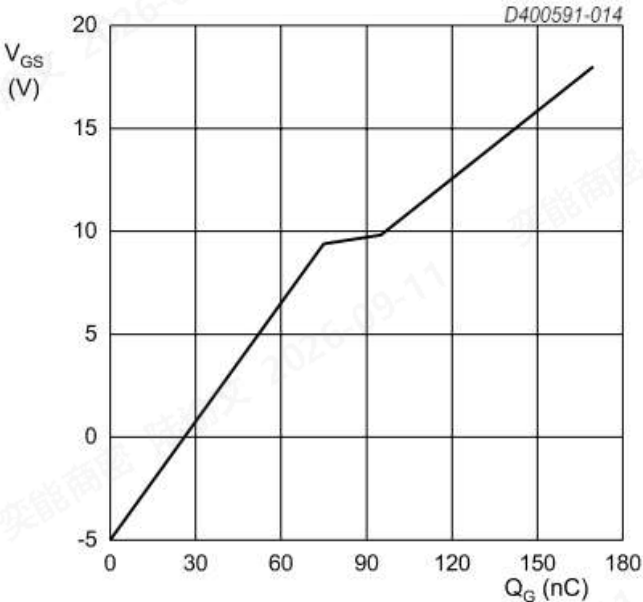
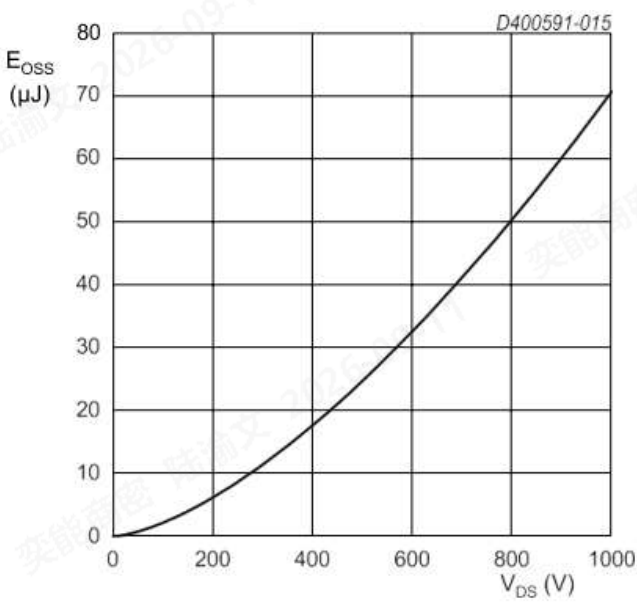


Figure 15 Output capacitor stored energy as a
function of drain-source voltage



5 Characteristic diagrams

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

$V_{DS} = 0 - 1000V$
 $T_j = 25^\circ C$; $V_{AC} = 25mV$; $f = 1MHz$

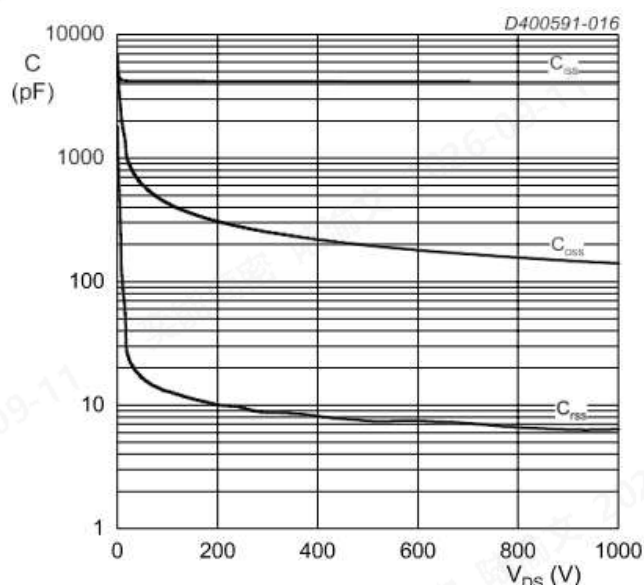


Figure 17 Forward bias safe operating area

$T_j = 25^\circ C$; $D = 0$

Parameter: t_p

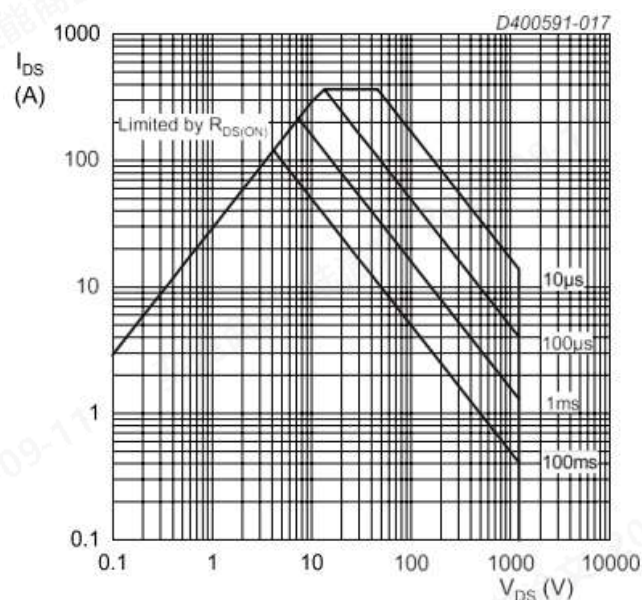


Figure 18 Clamped Inductive Switching Energy as a function of drain current

$T_j = 25^\circ C$; $V_{DD} = 800V$; $R_{G(ext)} = 5.1\Omega$;
 $V_{GS} = -5V/18V$; $L = 100\mu H$

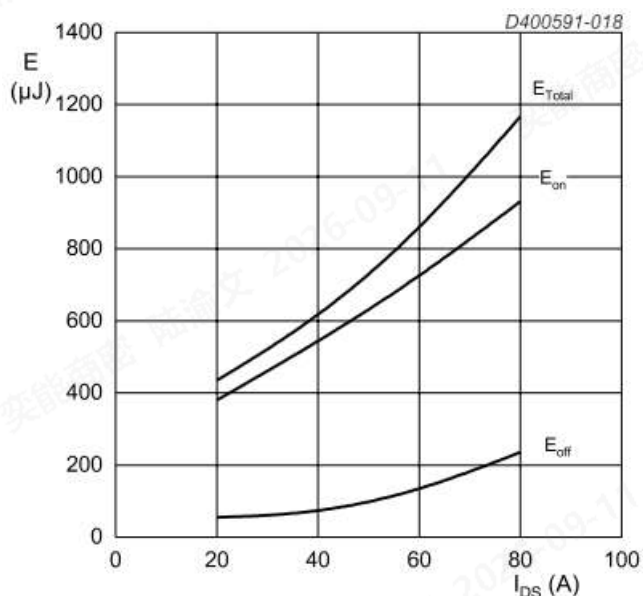
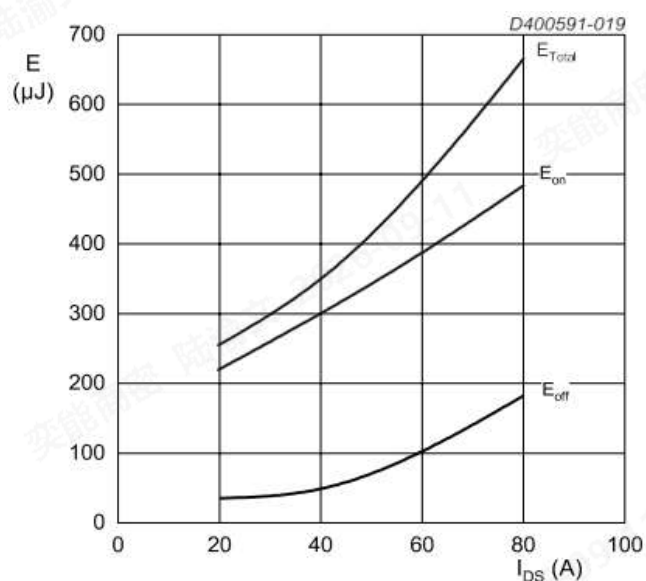


Figure 19 Clamped Inductive Switching Energy as a function of drain current

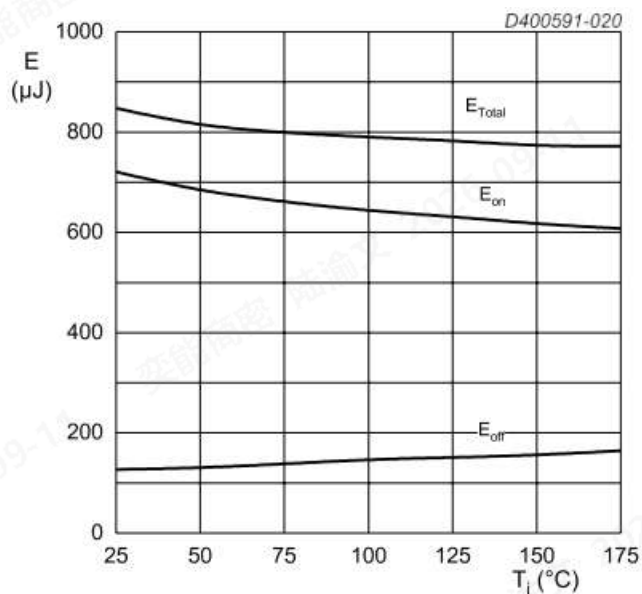
$T_j = 25^\circ C$; $V_{DD} = 600V$; $R_{G(ext)} = 5.1\Omega$;
 $V_{GS} = -5V/18V$; $L = 100\mu H$



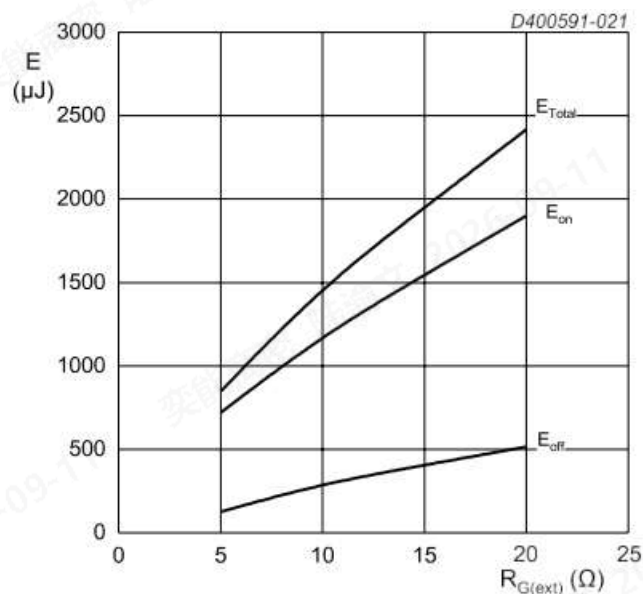
5 Characteristic diagrams

Figure 20 Clamped Inductive Switching Energy as a function of junction temperature

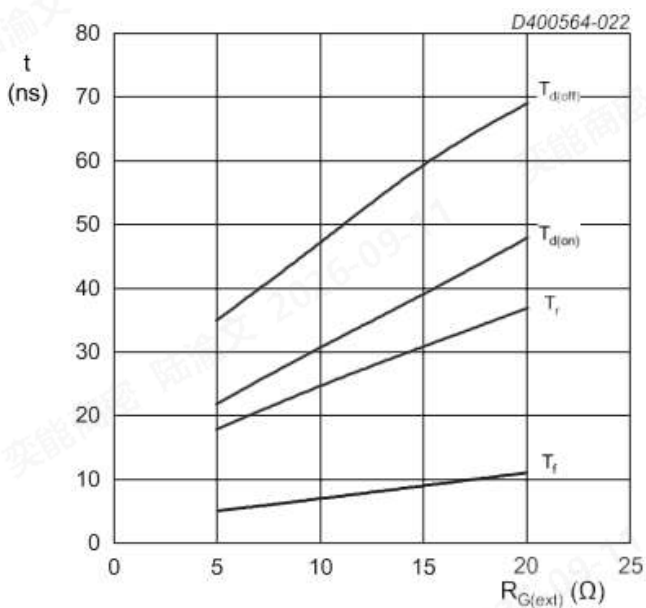
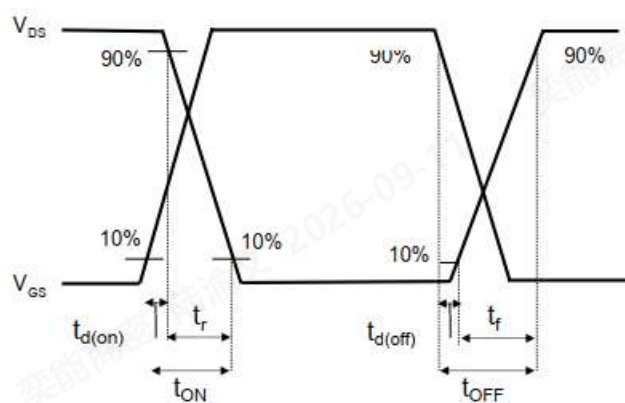
$I_{DS} = 60A$; $V_{DD} = 800V$; $R_{G(ext)} = 5.1\Omega$;
 $V_{GS} = -5V/18V$; $L = 100\mu H$

**Figure 21 Clamped Inductive Switching Energy as a function of external gate resistance**

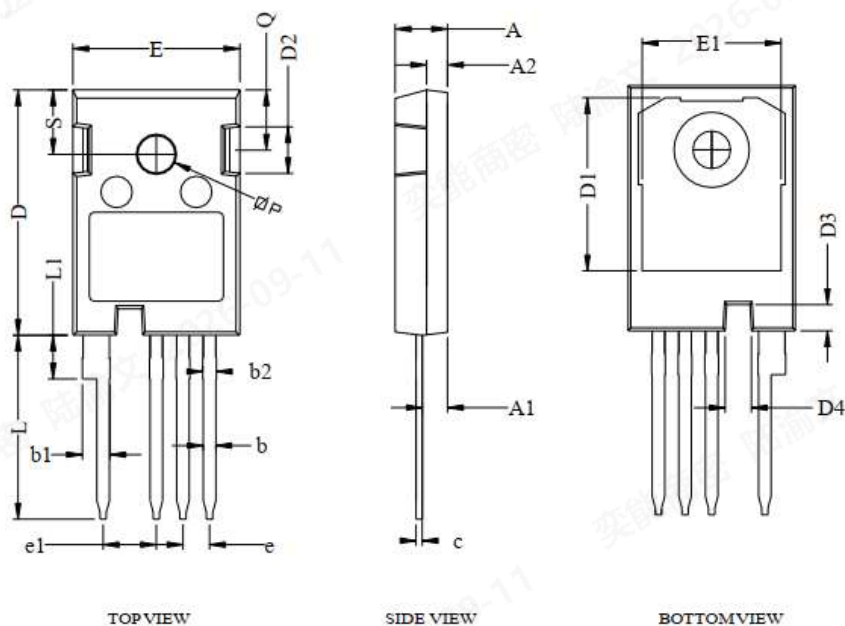
$T_j = 25^{\circ}C$; $V_{DD} = 800V$; $I_{DS} = 60A$;
 $V_{GS} = -5V/18V$; $L = 100\mu H$

**Figure 22 Switching time as a function of external gate resistance**

$T_j = 25^{\circ}C$; $V_{DD} = 800V$; $I_{DS} = 60A$;
 $V_{GS} = -5V/18V$; $L = 100\mu H$

**Figure 23 Switching time definition**

6 Package outlines



Unit	mm			Unit	mm		
	Min.	Nom.	Max.		Min.	Nom.	Max.
A	4.83		5.21	D3	(2.50)		
A1	2.29		2.54	E	15.75		16.13
A2	1.91		2.20	E1	13.11		13.41
b	1.07		1.33	e	(2.54)		
b1	2.39		2.94	e1	(5.08)		
b2	1.07		1.60	L	17.31		17.82
c	0.55		0.68	L1	3.97		4.37
D	23.30		23.60	P	3.51		3.65
D1	16.35		16.75	S	(6.15)		
D2	(2.50)						

Note:

- Metal exposed with Sn plating.
- A00 dimensions do not include mold flash & gate remain.

Revision history

Document revision	Date of release	Description of changes
1.1	2026-04-29	Update parameter in characteristic diagrams
1.0	2025-12-03	Initial version

IMPORTANT NOTICE:

This Product Datasheet describes the characteristics of Innoevsic product. The data contained in this document is exclusively intended for technically trained staff. You and your technical departments should be responsible for evaluating the suitability of product for the intended application and the completeness of the data contained in this document.

Due to technical requirements, components of the product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

In no event shall this Product Datasheet and/or any information contained thereof be regard as a guarantee of conditions or characteristics.

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