

1200V, 1.4mΩ SiC MOSFET Module

Features

- Electrical features
 - $V_{DS} = 1200V$
 - $I_{DN} = 1150A$ / $I_{DRM} = 2300A$
 - Standard housing
 - Isolated base plate
 - High power density
 - Low $R_{DS(on)}$
 - Low Switching Losses
 - $T_{vj op} = 175^{\circ}C$
- Mechanical features
 - 4.2kV DC 1 sec Insulation
 - High Creepage and Clearance Distances
 - Direct Cooled PinFin Base Plate
 - High Performance Si_3N_4 Ceramic
 - Guiding elements for PCB and cooler assembly
 - Integrated NTC temperature sensor
 - RoHS compliant

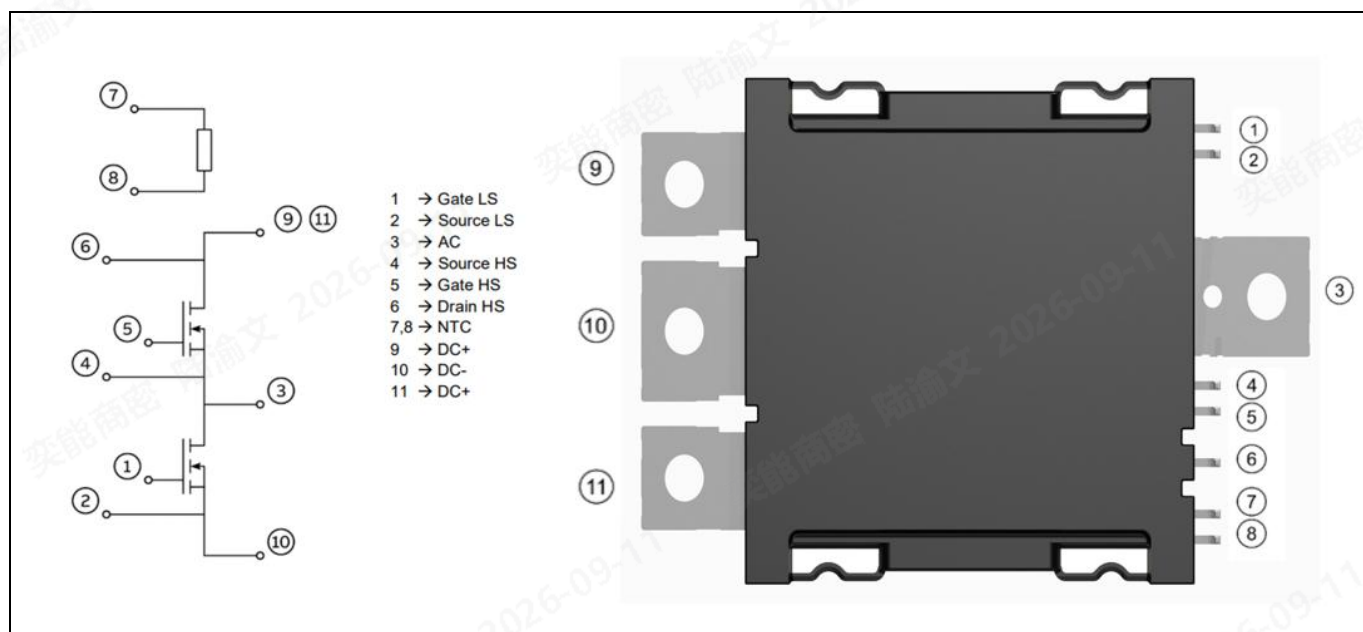
V_{DS}	1200V
$R_{DS(on)}$	1.4mΩ



Typical applications

- Automotive Applications
- Hybrid Electrical Vehicles (H)EV
- Inverters for Motor Drive

Circuit diagram



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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Value	Unit
Isolation Test Voltage	V_{ISOL}	$t = 1\text{min}, f = 50\text{Hz}$	4.2	kV
Material of Module Baseplate			Cu	
Internal Isolation		Basic insulation (class 1, IEC 61140)	Si_3N_4	
Comparative Tracking Index	CTI		600	

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Stray Inductance Module	L_s			4.5		nH
Module Lead Resistance, terminals - chip	$R_{DD'+SS'}$	$T_C = 25^\circ\text{C}$, per Switch		0.1		mΩ
Storage Temperature	T_{stg}		-40		175	°C
Mounting Torque for Module Mounting	M	Mounting according to valid application note M4, Screw	2.6		3.1	Nm
Weight	G			314		g

2 MOSFET, T1/T2

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Value	Unit
Drain-source Voltage	V_{DSS}	$T_{vj} = 25^\circ\text{C}$	1200	V
Implemented Drain Current	I_{DN}	Current rating based on chip rating times number of chips	1150	A
Continuous DC Drain Current	I_{DDC}	$T_{vj} = 175^\circ\text{C}$, $T_f = 65^\circ\text{C}$	850	A

Parameter	Symbol	Note or test condition	Value	Unit
		$V_{GS} = 15V$		
Repetitive Peak Drain Current	I_{DRM}	Verified by design, t_p limited by T_{vjmax}	2300	A
Gate-source Voltage, Max. Static Voltage	V_{GS}		-8/19	V

Table 4 Recommended values

Parameter	Symbol	Note or test condition	Value	Unit
On-state Gate Voltage	$V_{GS(on)}$		15	V
Off-state Gate Voltage	$V_{GS(off)}$		-4	V

Table 5 Characteristic values

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Drain-source On-resistance	$R_{DS(on)}$	$I_D = 1150A$	$V_{GS} = 15V,$ $T_{vj} = 25^{\circ}C$	1.45		mΩ
			$V_{GS} = 15V,$ $T_{vj} = 125^{\circ}C$	2.18		
			$V_{GS} = 15V,$ $T_{vj} = 175^{\circ}C$	2.86		
Gate Threshold Voltage	$V_{GS(th)}$	$I_D = 209mA, V_{DS} = V_{GS},$ $T_{vj} = 25^{\circ}C,$ (tested after 10ms pulse at $V_{GS} = +19V$)		2.6		V
Total Gate Charge	Q_G	$V_{DD} = 800V, V_{GS} = -4/15V,$ $T_{vj} = 25^{\circ}C$		2.47		μC
Internal Gate Resistor	R_{Gint}	$T_{vj} = 25^{\circ}C$		0.8		Ω
Input Capacitance	C_{iss}	$f = 100kHz,$ $V_{DS} = 800V,$ $V_{GS} = 0V$	$T_{vj} = 25^{\circ}C$	69.2		nF
Output Capacitance	C_{oss}	$f = 100kHz,$ $V_{DS} = 800V,$ $V_{GS} = 0V$	$T_{vj} = 25^{\circ}C$	2.02		nF

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
Reverse Transfer Capacitance	C_{rss}	$f = 100\text{kHz}$, $V_{DS} = 800\text{V}$, $V_{GS} = 0\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		0.156		nF
Coss Stored Energy	E_{oss}	$V_{DS} = 800\text{V}$, $V_{GS} = -4/15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		1652		μJ
Drain-source Leakage Current	I_{DSS}	$V_{DS} = 1200\text{V}$, $V_{GS} = 0\text{V}$	$T_{vj} = 25^{\circ}\text{C}$			320	μA
Gate-source Leakage Current	I_{GSS}	$V_{DS} = 0\text{V}$, $T_{vj} = 25^{\circ}\text{C}$	$V_{GS} = 19\text{V}$			1	μA
Turn-on Delay Time (Inductive Load)	$t_{d\ on}$	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/15\text{V}$, $R_{Gon} = 1.5\Omega$	$T_{vj} = 25^{\circ}\text{C}$		68		ns
			$T_{vj} = 125^{\circ}\text{C}$		104		
			$T_{vj} = 175^{\circ}\text{C}$		101		
Rise Time (Inductive Load)	t_r	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/15\text{V}$, $R_{Gon} = 1.5\Omega$	$T_{vj} = 25^{\circ}\text{C}$		153		ns
			$T_{vj} = 125^{\circ}\text{C}$		146		
			$T_{vj} = 175^{\circ}\text{C}$		142		
Turn-off Delay Time (Inductive Load)	$t_{d\ off}$	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/15\text{V}$, $R_{Goff} = 1.5\Omega$	$T_{vj} = 25^{\circ}\text{C}$		301		ns
			$T_{vj} = 125^{\circ}\text{C}$		375		
			$T_{vj} = 175^{\circ}\text{C}$		387		
Fall Time (Inductive Load)	t_f	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/15\text{V}$, $R_{Goff} = 1.5\Omega$	$T_{vj} = 25^{\circ}\text{C}$		71.2		ns
			$T_{vj} = 125^{\circ}\text{C}$		84		
			$T_{vj} = 175^{\circ}\text{C}$		83.2		
Turn-on Energy Loss per Pulse	E_{on}	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/15\text{V}$, $R_{Gon} = 1.5\Omega$	$T_{vj} = 25^{\circ}\text{C}$		45.4		mJ
			$T_{vj} = 125^{\circ}\text{C}$		45.9		
			$T_{vj} = 175^{\circ}\text{C}$		50.4		
Turn-off Energy Loss per Pulse	E_{off}	$I_D = 1150\text{A}$, $V_{DD} = 800\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		77.3		mJ
			$T_{vj} = 125^{\circ}\text{C}$		84.5		

3 Body diode

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
		$V_{GS} = -4/15V$, $R_{Goff} = 1.5\Omega$	$T_{vj} = 175^{\circ}C$		84.8		
Thermal Resistance, Junction to Cooling Fluid	R_{thJF}	per MOSFET, 100% water, $\Delta V/\Delta T = 10L/min$, $T_f = 60^{\circ}C$			0.0609		K/W
Temperature Under Switching Conditions	$T_{vj\ op}$			-40		175	$^{\circ}C$

3 Body diode

Table 6 Maximum rated values

Parameter	Symbol	Note or test condition		Value	Unit
DC Body Diode Forward Current	I_{SD}	$V_{GS} = -4V$, $T_{vj} = 175^{\circ}C$	$T_f = 65^{\circ}C$	350	A

Table 7 Characteristic values

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
Forward Voltage	V_{SD}	$I_{SD} = 1150A$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		6.55		V
			$T_{vj} = 125^{\circ}C$		6.02		
			$T_{vj} = 175^{\circ}C$		5.98		
Peak Reverse Recovery Current	I_{rrm}	$I_{SD} = 1150A$, $V_{DD} = 800V$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		174		A
			$T_{vj} = 125^{\circ}C$		314		
			$T_{vj} = 175^{\circ}C$		460		
Recovered Charge	Q_{rr}	$I_{SD} = 1150A$, $V_{DD} = 800V$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		2.5		μC
			$T_{vj} = 125^{\circ}C$		4.5		
			$T_{vj} = 175^{\circ}C$		9.5		
Reverse Recovery Energy	E_{rec}	$I_{SD} = 1150A$, $V_{DD} = 800V$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		1.43		mJ
			$T_{vj} = 125^{\circ}C$		3.73		
			$T_{vj} = 175^{\circ}C$		7.64		

4 NTC-Thermistor

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R ₂₅	T _{NTC} = 25°C		5		kΩ
Deviation of R ₂₅	ΔR/R	T _{NTC} = 25°C, R ₂₅ = 5kΩ	-3		3	%
Power Dissipation	P ₂₅	T _{NTC} = 25°C			60	mW
B-value	B _{25/50}	R ₂ = R ₂₅ exp[B _{25/50} (1/T ₂ -1/(298,15K))]		3375		K
B-value	B _{25/80}	R ₂ = R ₂₅ exp[B _{25/80} (1/T ₂ -1/(298,15K))]		3411		K
B-value	B _{25/100}	R ₂ = R ₂₅ exp[B _{25/100} (1/T ₂ -1/(298,15K))]		3433		K

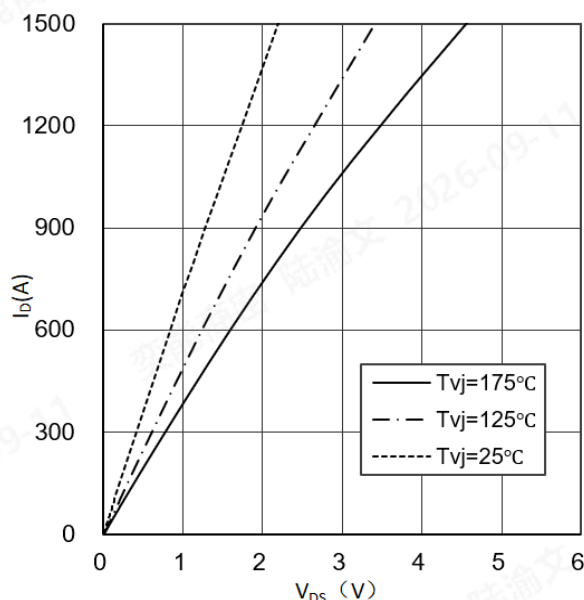
5 Characteristic diagrams

5 Characteristic diagrams

Output characteristic (typical), MOSFET

$$I_D = f(V_{DS})$$

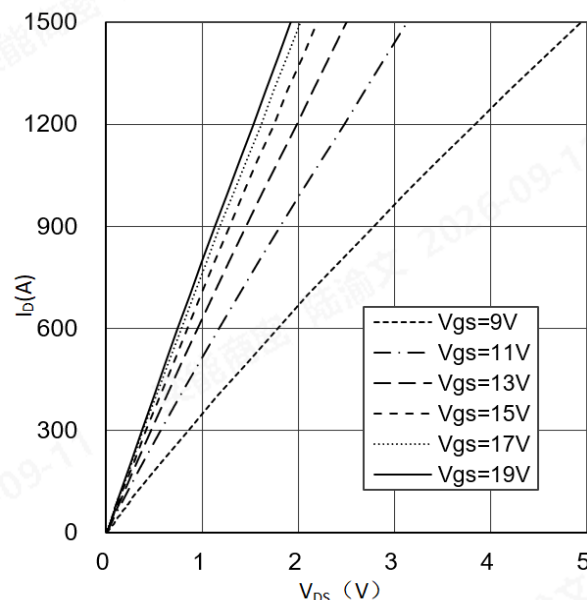
$$V_{GS} = 15V$$



Output characteristic (typical), MOSFET

$$I_D = f(V_{DS})$$

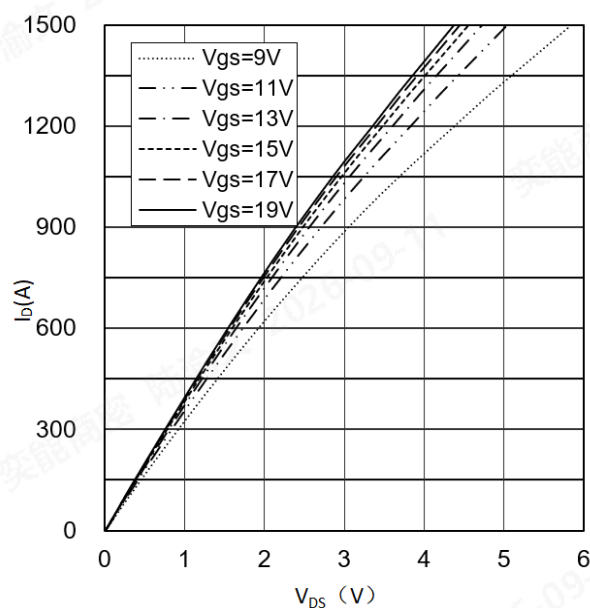
$$T_{vj} = 25^\circ C$$



Output characteristic (typical), MOSFET

$$I_D = f(V_{DS})$$

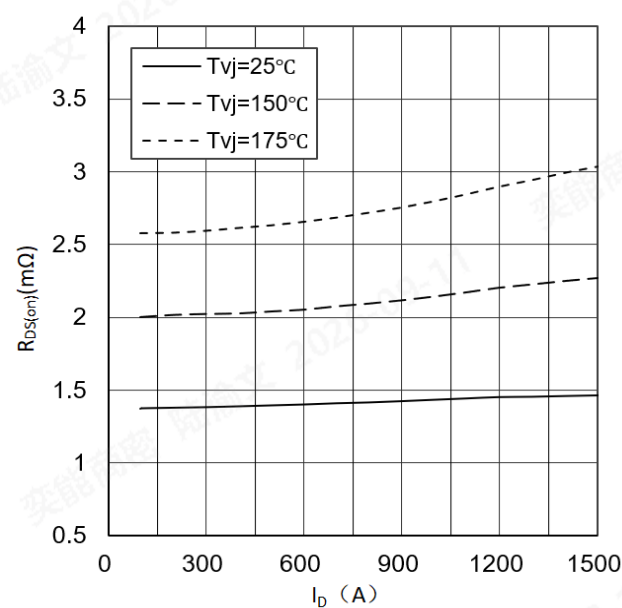
$$T_{vj} = 175^\circ C$$



Output characteristic (typical), MOSFET

$$R_{DS(on)} = f(I_D)$$

$$V_{GS} = 15V$$

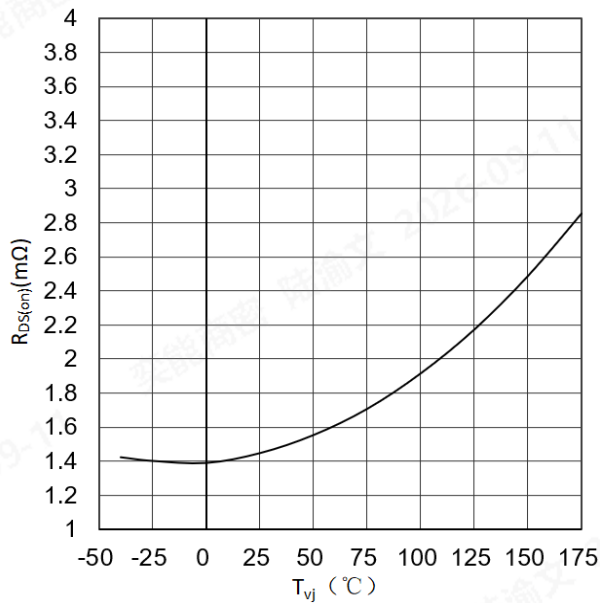


5 Characteristic diagrams

Drain-source on resistance as a function of junction temperature(typical)

$$R_{DS(on)} = f(T_{vj})$$

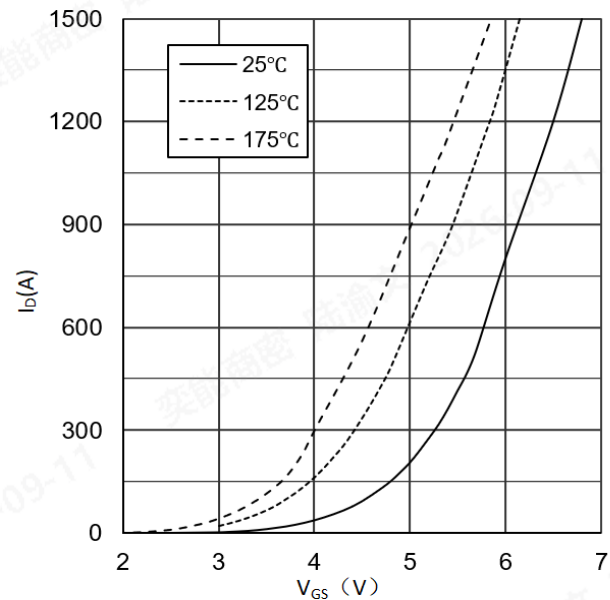
$$I_D = 1150A, V_{GS} = 15V$$



Transfer characteristic(typical)

$$I_D = f(V_{GS})$$

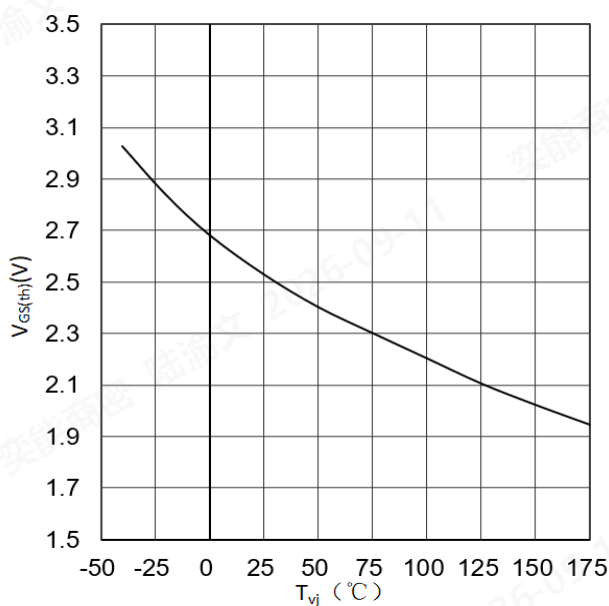
$$V_{DS} = 20V$$



Gate-source threshold voltage as a function of junction temperature(typical)

$$V_{GS(th)} = f(T_{vj})$$

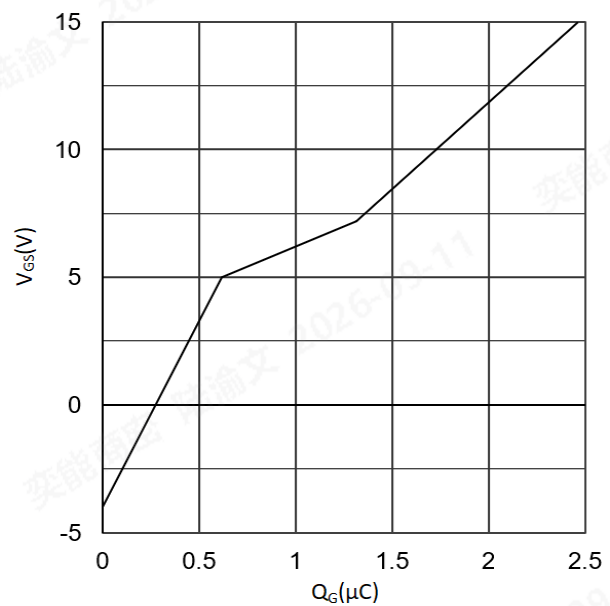
$$V_{GS} = V_{DS}, I_D = 209mA$$



Gate charge (typical)

$$V_{GS} = f(Q_G)$$

$$I_D = 1150A, V_{DS} = 800V$$

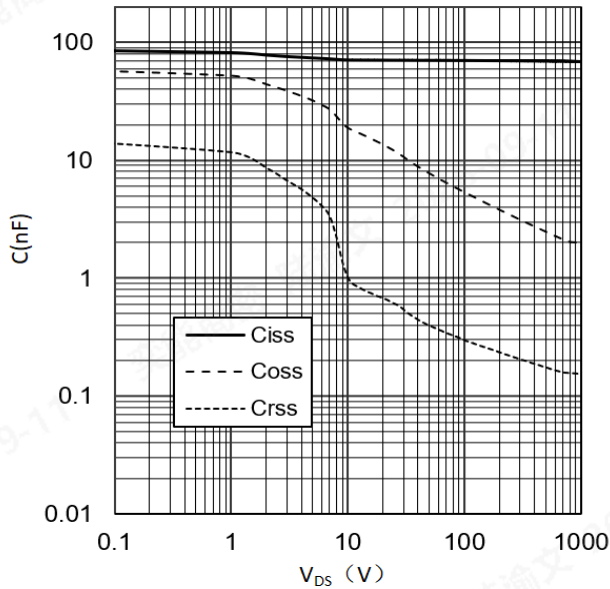


5 Characteristic diagrams

Typical capacitance as a function of Drain-Source voltage

$$C = f(V_{DS})$$

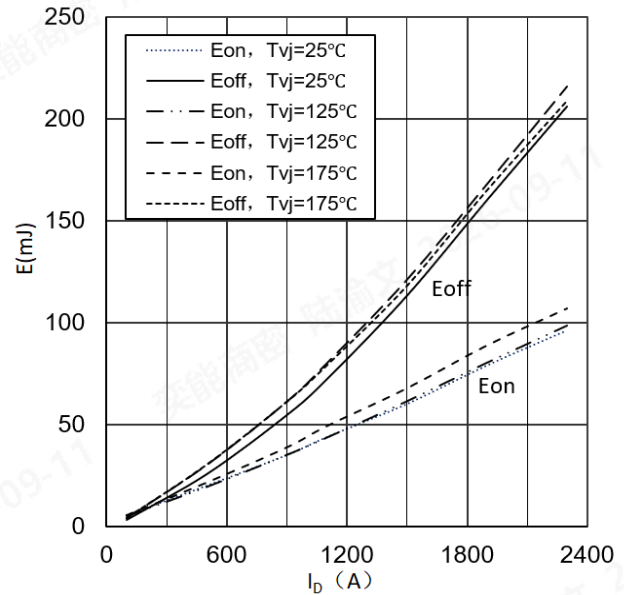
$$f = 100\text{kHz}, V_{GS} = 0\text{V}$$



Switching losses (typical)

$$E = f(I_D)$$

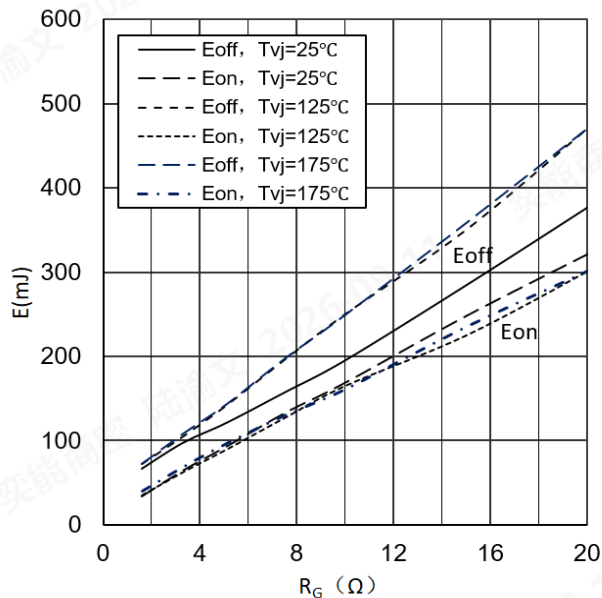
$$V_{GS} = -4/+15\text{V}, R_{Gon} = 1.5\Omega, R_{Goff} = 1.5\Omega, V_{DS} = 800\text{V}$$



Switching losses (typical)

$$E = f(R_G)$$

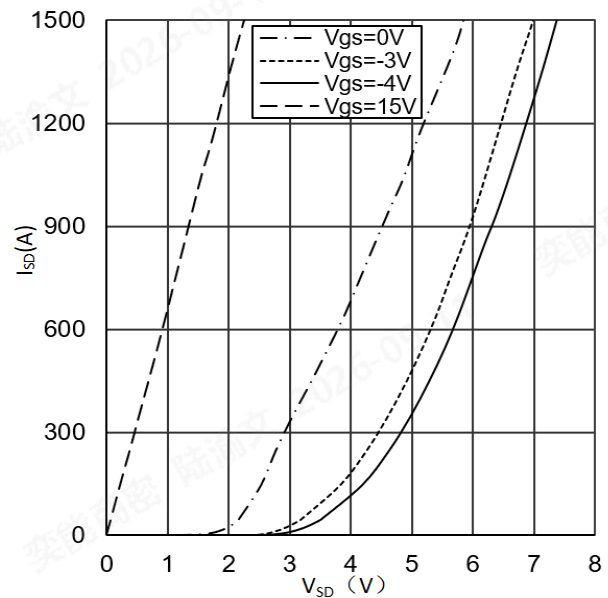
$$V_{GS} = -4/+15\text{V}, I_D = 1150\text{A}, V_{DS} = 800\text{V}$$



Forward characteristic of Diode (typical)

$$I_{SD} = f(V_{SD})$$

$$T_{vj} = 25^\circ\text{C}$$

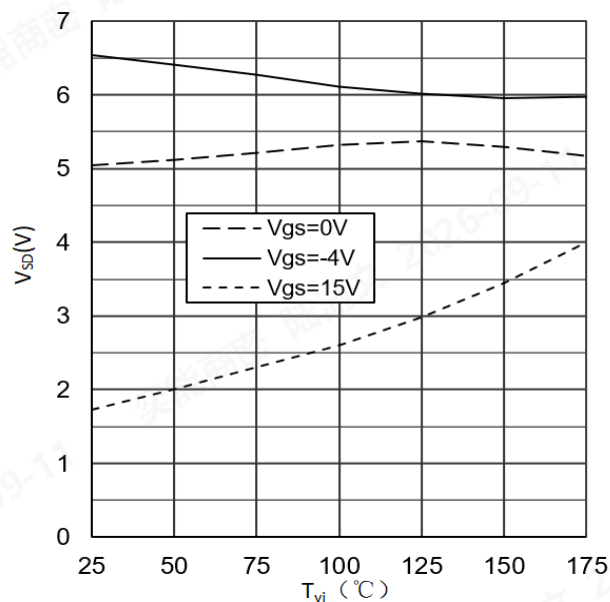


5 Characteristic diagrams

Forward characteristic of Diode (typical)

$$V_{SD} = f(T_{vj})$$

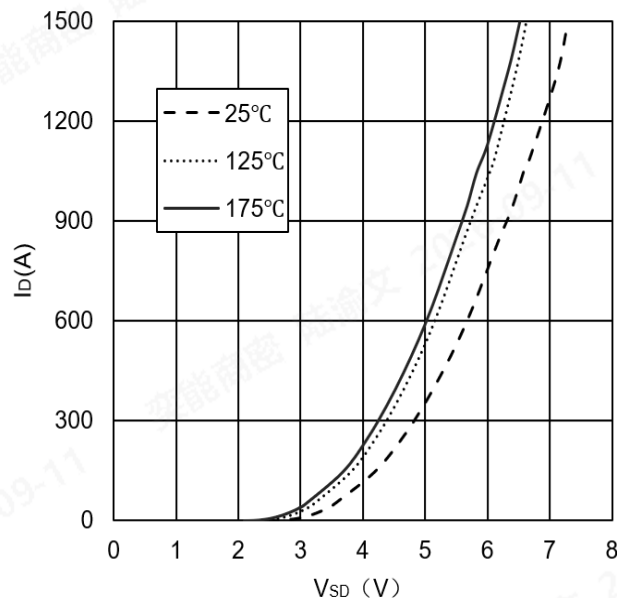
$$I_{SD} = 1150A$$



Forward characteristic body diode (typical), MOSFET

$$I_{FS} = f(V_{SD})$$

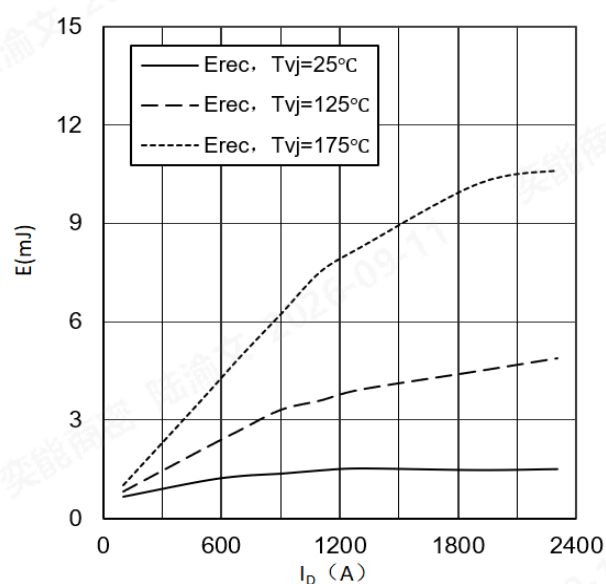
$$V_{GS} = -4V$$



Switching losses body diode (typical)

$$E_{rec} = f(I_{SD})$$

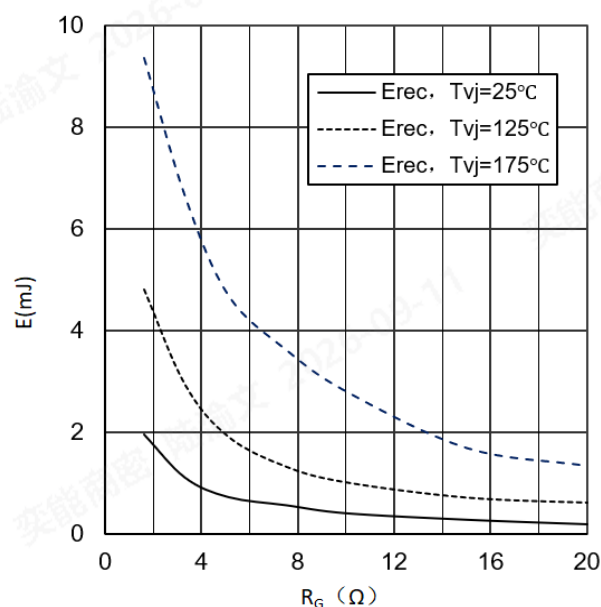
$$V_{GS} = -4/+15V, R_{Gon} = 1.5\Omega, V_{DS} = 800V$$



Switching losses body diode (typical)

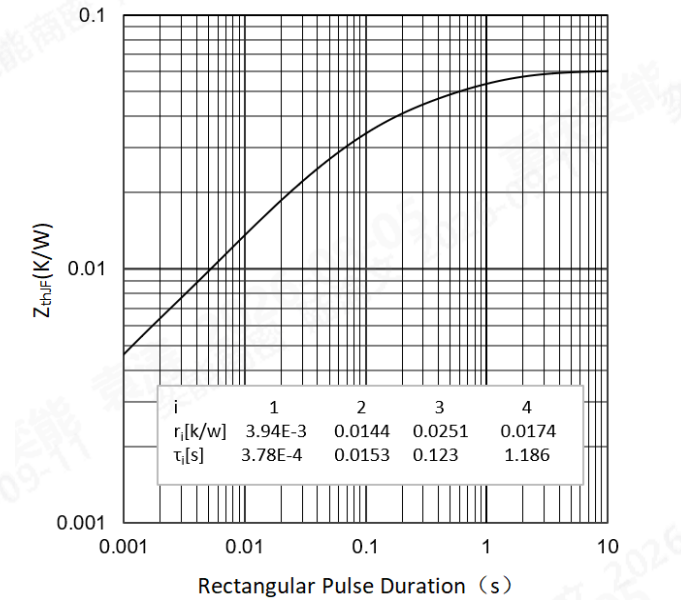
$$E_{rec} = f(R_G)$$

$$V_{GS} = -4/+15V, I_D = 1150A, V_{DS} = 800V$$

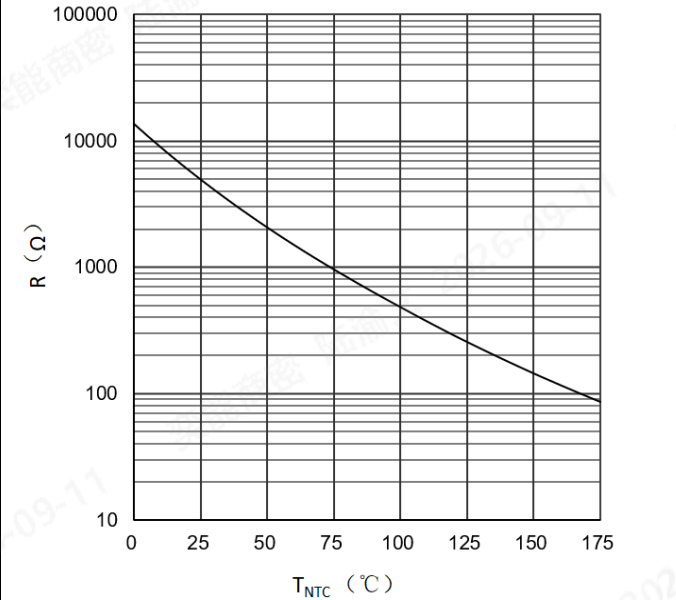


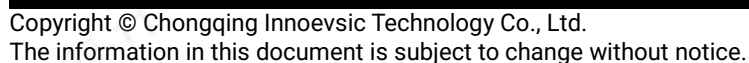
5 Characteristic diagrams

Transient thermal impedance as a function of pulse width
 $Z_{th(j-f)} = f(t_p)$



NTC-Thermistor-temperature characteristic (typical)
 $R = f(T_{NTC})$





Revision history

Document revision	Date of release	Description of changes
1.3	2026-08-05	Update parameters
1.2	2026-06-23	Change the NTC diagram
1.1	2026-06-11	Update parameters
1.0	2025-12-02	Engineering version

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