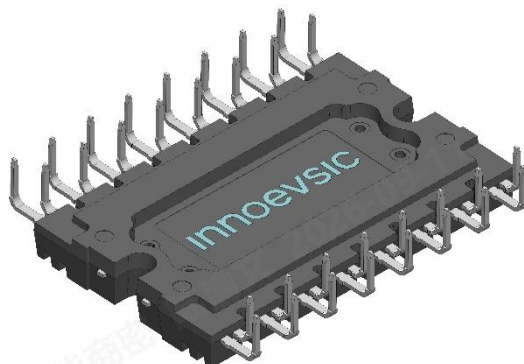


1200V, 23mΩ SiC MOSFET Module

Features

- Electrical features
 - $V_{DSS} = 1200V$
 - $I_{DDC} = 70A$ / $I_{DRM}^* = 140A$
- Mechanical features
 - Standard housing
 - Si_3N_4 material
 - Isolated base plate
 - High power density

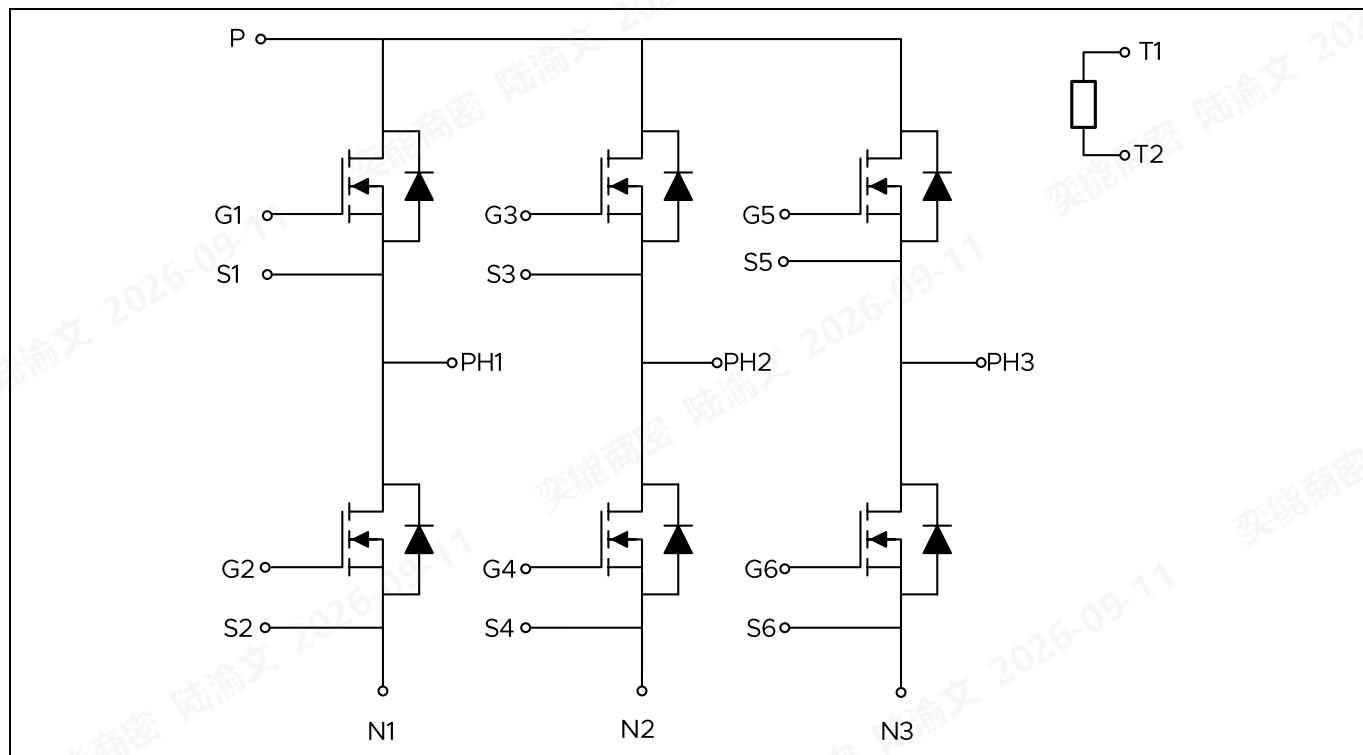
V_{DS}	1200V
$R_{DS(on)}$	23mΩ



Typical applications

- Automotive Applications
- Hybrid Electrical Vehicles (H)EV
- Motor Drives
- Commercial Agriculture Vehicles

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}	RMS, $f = 50\text{Hz}$, $t = 5\text{s}$	3.5	kV
Material of Module Baseplate			Cu	
Internal Isolation		Basic insulation (class 1, IEC 61140)	Si_3N_4	
Creepage Distance	d_{Creep}	Terminal to heatsink	7.32	mm
Creepage Distance	d_{Creep}	Terminal to terminal	5.4	mm
Clearance	d_{Clear}	Terminal to heatsink	3.3	mm
Clearance	d_{Clear}	Terminal to terminal	2.6	mm
Comparative Tracking Index	CTI		>200	

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Value			Unit
			Min.	Typ.	Max.	
Stray Inductance Module	L_s			34.7		nH
Module Lead Resistance, terminals - chip	$R_{DD'+SS'}$	$T_C = 25^\circ\text{C}$, per Switch		3.3		m Ω
Storage Temperature	T_{stg}		-40		125	$^\circ\text{C}$
Weight	G			13.4		g

2 MOSFET

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		70	A
Continuous DC Drain Current	I_{DDC}	$T_{vj} = 175^\circ\text{C}$, $V_{GS} = 18\text{V}$	$T_C = 60^\circ\text{C}$	70	A

2 MOSFET

Parameter	Symbol	Note or test condition	Value	Unit
Repetitive Peak Drain Current	I_{DRM}	Verified by design, t_p limited by $T_{vj\text{max}}$	140	A
Gate-source Voltage, Max. Static Voltage	V_{GS}		-10/22	V

Table 4 Recommended values

Parameter	Symbol	Note or test condition	Value	Unit
On-state Gate Voltage	$V_{\text{GS(on)}}$		18	V
Off-state Gate Voltage	$V_{\text{GS(off)}}$		-4	V

Table 5 Characteristic values

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
Drain-source On-resistance	$R_{\text{DS(on)}}$	$I_{\text{D}} = 70\text{A}$	$V_{\text{GS}} = 15\text{V}, T_{vj} = 25^\circ\text{C}$		22.8		m Ω
			$V_{\text{GS}} = 18\text{V}, T_{vj} = 25^\circ\text{C}$		19.6	31	
			$V_{\text{GS}} = 18\text{V}, T_{vj} = 125^\circ\text{C}$		30.6		
			$V_{\text{GS}} = 18\text{V}, T_{vj} = 175^\circ\text{C}$		40.7		
Gate Threshold Voltage	$V_{\text{GS(th)}}$	$I_{\text{D}} = 14\text{mA}, V_{\text{DS}} = V_{\text{GS}}, T_{vj} = 25^\circ\text{C},$ (tested after 1ms pulse at $V_{\text{GS}} = +22\text{V}$)			2.7		V
Total Gate Charge	Q_{G}	$V_{\text{DD}} = 800\text{V}, V_{\text{GS}} = -4/18\text{V}, T_{vj} = 25^\circ\text{C}$			0.116		μC
Internal Gate Resistor	R_{Gint}	$T_{vj} = 25^\circ\text{C}$			4.6		Ω
Input Capacitance	C_{ISS}	$f = 100\text{kHz}, V_{\text{DS}} = 800\text{V}, V_{\text{GS}} = 0\text{V}$	$T_{vj} = 25^\circ\text{C}$		2.88		nF
Output Capacitance	C_{OSS}	$f = 100\text{kHz}, V_{\text{DS}} = 800\text{V}, V_{\text{GS}} = 0\text{V}$	$T_{vj} = 25^\circ\text{C}$		0.35		nF

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
Reverse Transfer Capacitance	C_{rss}	$f = 100\text{kHz}$, $V_{DS} = 800\text{V}$, $V_{GS} = 0\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		0.011		nF
C _{oss} Stored Energy	E_{oss}	$V_{DS} = 800\text{V}$, $V_{GS} = -4/18\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		274		μJ
Drain-source Leakage Current	I_{DSS}	$V_{DS} = 1200\text{V}$, $V_{GS} = 0\text{V}$	$T_{vj} = 25^{\circ}\text{C}$			10	μA
Gate-source Leakage Current	I_{GSS}	$V_{DS} = 0\text{V}$, $T_{vj} = 25^{\circ}\text{C}$	$V_{GS} = 22\text{V}$			100	nA
Turn-on Delay Time (Inductive Load)	$t_{d\ on}$	$I_D = 70\text{A}$, $R_{Gon} = 12.2\Omega$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/18\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		36		ns
			$T_{vj} = 125^{\circ}\text{C}$		34		
			$T_{vj} = 175^{\circ}\text{C}$		32		
Rise Time (Inductive Load)	t_r	$I_D = 70\text{A}$, $R_{Gon} = 12.2\Omega$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/18\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		17		ns
			$T_{vj} = 125^{\circ}\text{C}$		17		
			$T_{vj} = 175^{\circ}\text{C}$		17		
Turn-off Delay Time (Inductive Load)	$t_{d\ off}$	$I_D = 70\text{A}$, $R_{Goff} = 2\Omega$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/18\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		42		ns
			$T_{vj} = 125^{\circ}\text{C}$		46		
			$T_{vj} = 175^{\circ}\text{C}$		47		
Fall Time (Inductive Load)	t_f	$I_D = 70\text{A}$, $R_{Goff} = 2\Omega$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/18\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		19		ns
			$T_{vj} = 125^{\circ}\text{C}$		20		
			$T_{vj} = 175^{\circ}\text{C}$		22		
Turn-on Energy Loss per Pulse	E_{on}	$I_D = 70\text{A}$, $V_{DD} = 800\text{V}$, $V_{GS} = -4/18\text{V}$, $R_{Gon} = 12.2\Omega$	$T_{vj} = 25^{\circ}\text{C}$		1.29		mJ
			$T_{vj} = 125^{\circ}\text{C}$		1.58		
			$T_{vj} = 175^{\circ}\text{C}$		1.85		
Turn-off Energy Loss per Pulse	E_{off}	$I_D = 70\text{A}$, $V_{DD} = 800\text{V}$	$T_{vj} = 25^{\circ}\text{C}$		0.37		mJ
			$T_{vj} = 125^{\circ}\text{C}$		0.40		

3 Body diode (MOSFET)

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
		$V_{GS} = -4/18V$, $R_{Goff} = 2\Omega$,	$T_{vj} = 175^{\circ}C$		0.41		
Thermal Resistance, Junction to Case	R_{thJC}	per MOSFET			0.45		K/W
Temperature Under Switching Conditions	$T_{vj op}$			-40		175	$^{\circ}C$

3 Body diode (MOSFET)

Table 6 Maximum rated values

Parameter	Symbol	Note or test condition		Value	Unit
DC Body Diode Forward Current	I_{SD}	$T_{vj} = 175^{\circ}C$ $V_{GS} = -4V$,	$T_C = 60^{\circ}C$	65	A

Table 7 Characteristic values

Parameter	Symbol	Note or test condition		Value			Unit
				Min.	Typ.	Max.	
Forward Voltage	V_{SD}	$I_{SD} = 70A$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		4.57		V
			$T_{vj} = 125^{\circ}C$		4.21		
			$T_{vj} = 175^{\circ}C$		3.98		
Peak Reverse Recovery Current	I_{rrm}	$I_{SD} = 70A$, $V_{DD} = 800V$, $V_{GS} = -4V$	$T_{vj} = 25^{\circ}C$		42		A
			$T_{vj} = 125^{\circ}C$		54		
			$T_{vj} = 175^{\circ}C$		75		
Recovered Charge	Q_{rr}	$I_{SD} = 70A$, $V_{DD} = 800V$, $V_{GS} = -4V$,	$T_{vj} = 25^{\circ}C$		0.46		μC
			$T_{vj} = 125^{\circ}C$		0.94		
			$T_{vj} = 175^{\circ}C$		1.69		
Reverse Recovery Energy	E_{rec}	$I_{SD} = 70A$, $V_{DD} = 800V$, $V_{GS} = -4V$,	$T_{vj} = 25^{\circ}C$		0.15		mJ
			$T_{vj} = 125^{\circ}C$		0.40		
			$T_{vj} = 175^{\circ}C$		0.81		

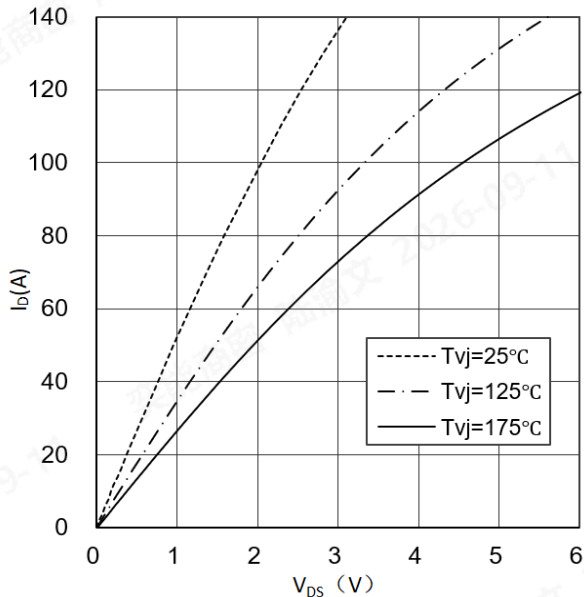
4 Characteristic diagrams

4 Characteristic diagrams

Output characteristic (typical), MOSFET

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

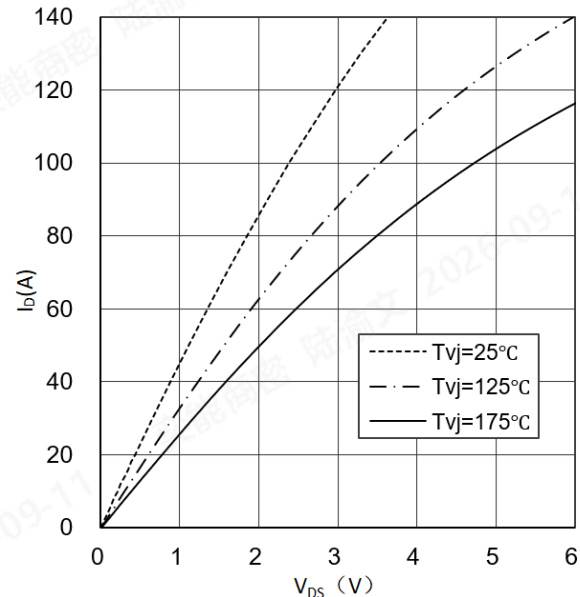
$$V_{GS} = 18V$$



Output characteristic (typical), MOSFET

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

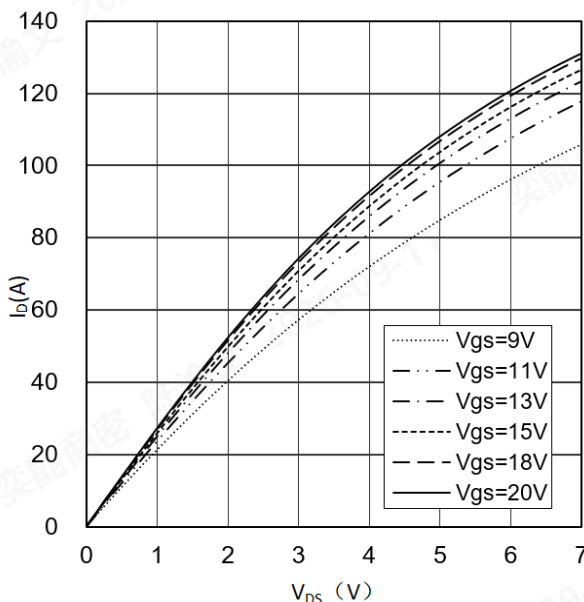
$$V_{GS} = 15V$$



Output characteristic (typical), MOSFET

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

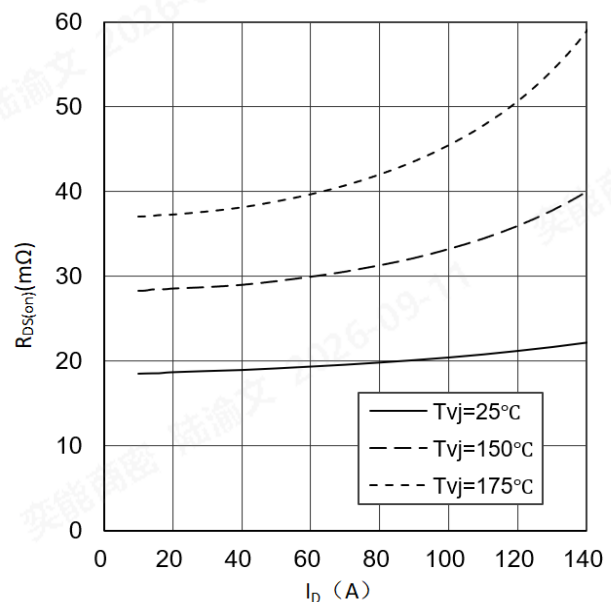
$$T_{vj} = 175^{\circ}C$$



Output characteristic (typical), MOSFET

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

$$V_{GS} = 18V$$

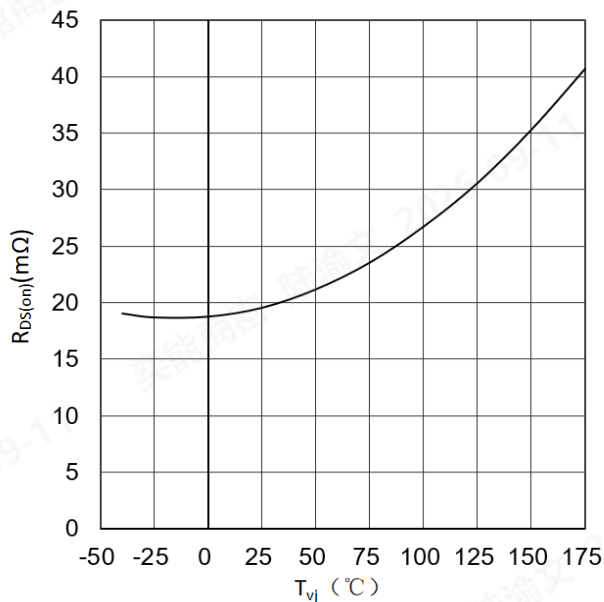


4 Characteristic diagrams

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

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

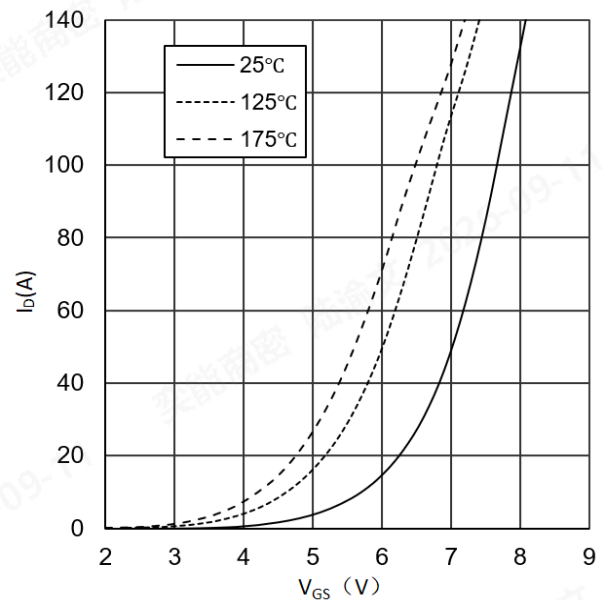
$$I_D = 70A, V_{GS} = 18V$$



Transfer characteristic (typical)

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

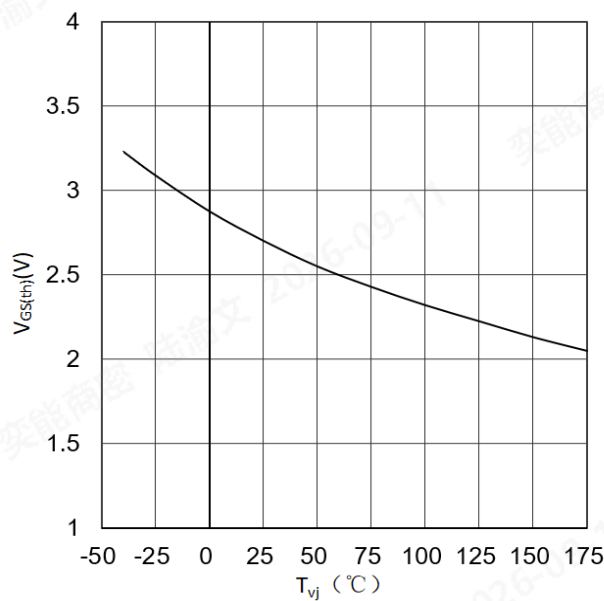
$$V_{DS} = 20V$$



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

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

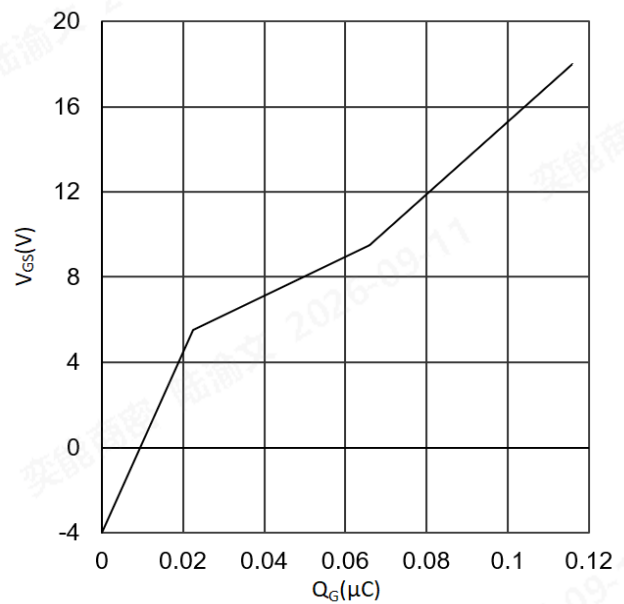
$$V_{GS} = V_{DS}, I_D = 14mA$$



Gate charge (typical)

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

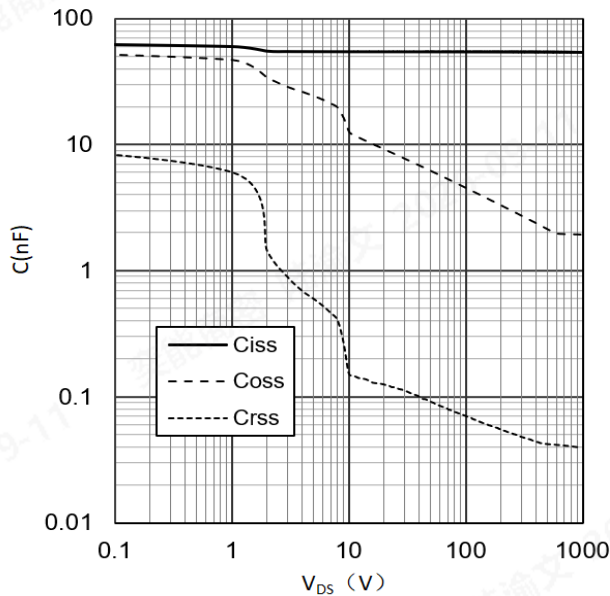
$$I_D = 70A, V_{DS} = 800V$$



Typical capacitance as a function of drain-source voltage

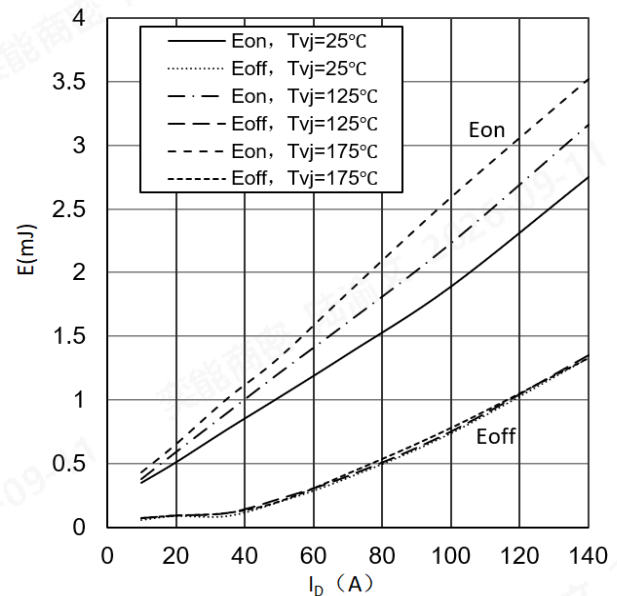
$$C = f(V_{DS})$$

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

**Switching losses (typical)**

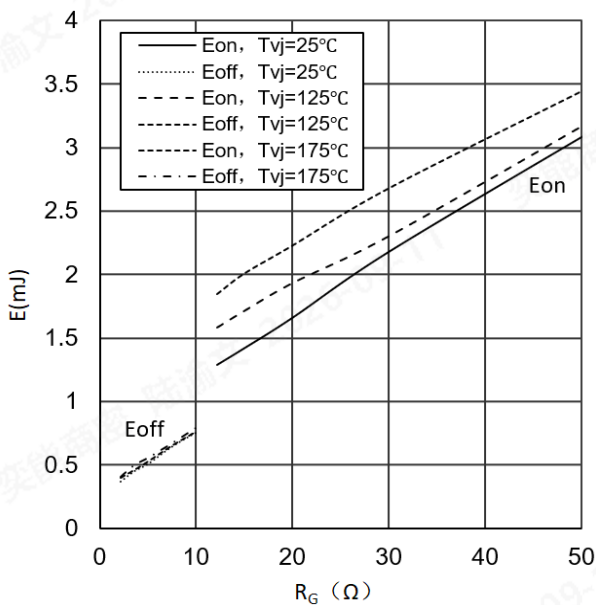
$$E = f(I_D)$$

$$V_{GS} = -4/+18\text{V}, R_{Gon} = 12.2\Omega, R_{Goff} = 2\Omega, V_{DS} = 800\text{V}$$

**Switching losses (typical)**

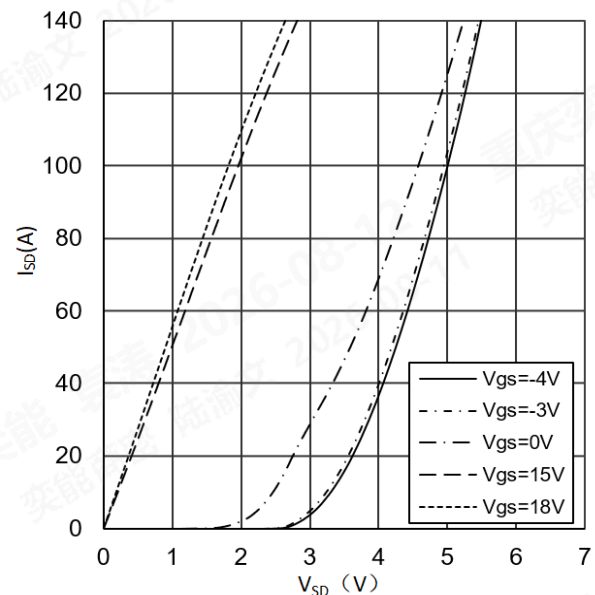
$$E = f(R_G)$$

$$V_{GS} = -4/+18\text{V}, I_D = 70\text{A}, V_{DS} = 800\text{V}$$

**Forward characteristic of Diode (typical)**

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

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

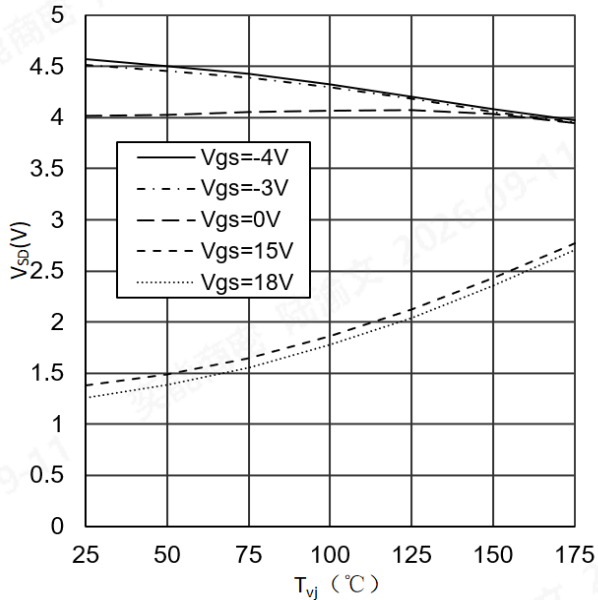


4 Characteristic diagrams

Forward characteristic of Diode (typical)

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

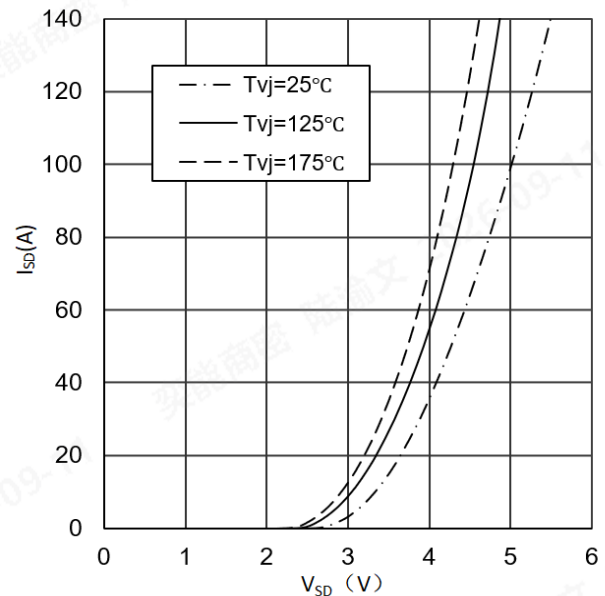
$$I_{SD} = 70A$$



Forward characteristic body diode (typical), MOSFET

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

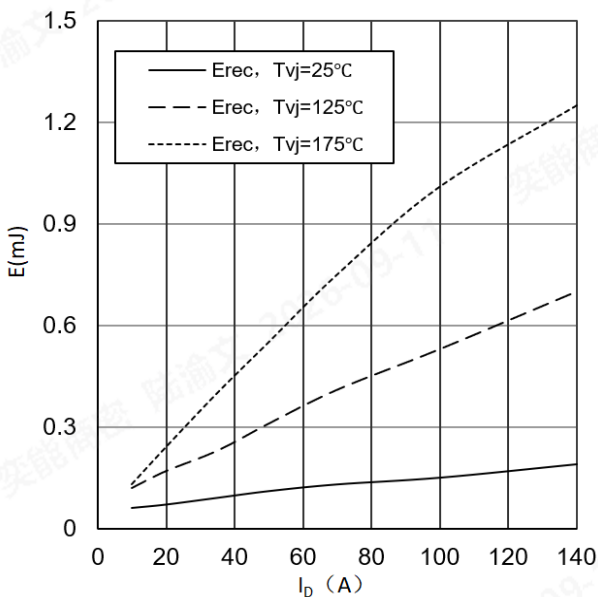
$$V_{GS} = -4V$$



Switching losses body diode (typical)

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

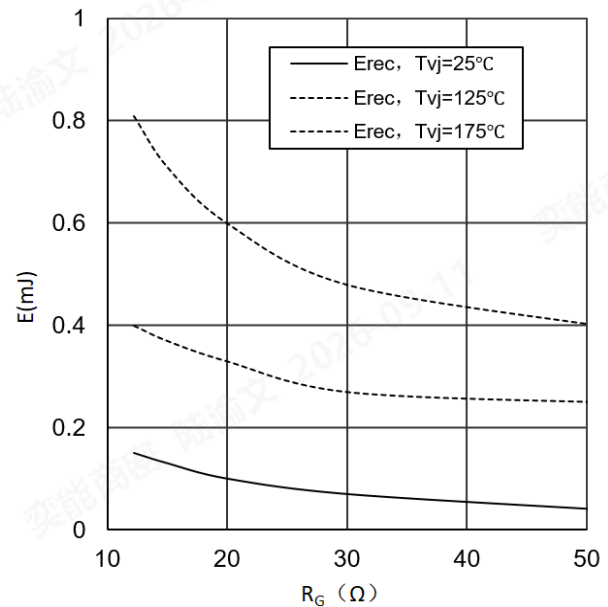
$$V_{GS} = -4/+18V, R_{Gon} = 12.2\Omega, V_{DS} = 800V$$



Switching losses body diode (typical)

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

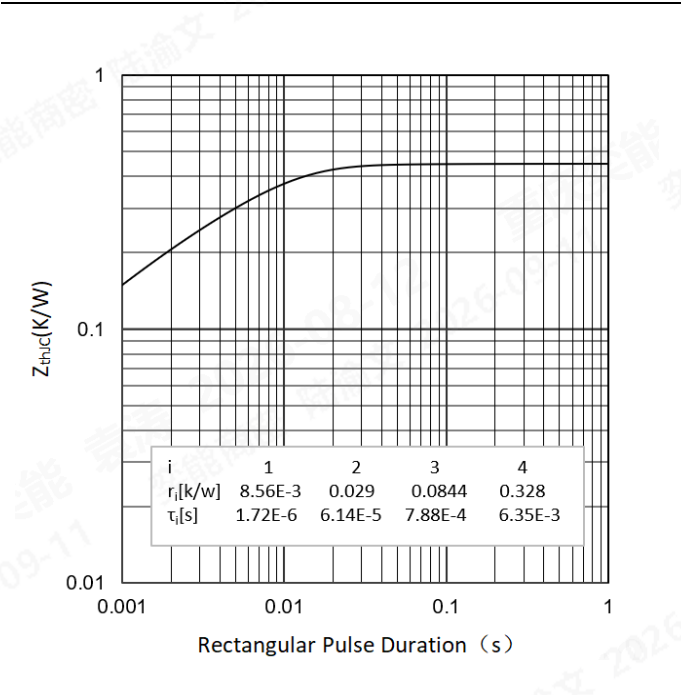
$$V_{GS} = -4/+18V, I_D = 70A, V_{DS} = 800V$$



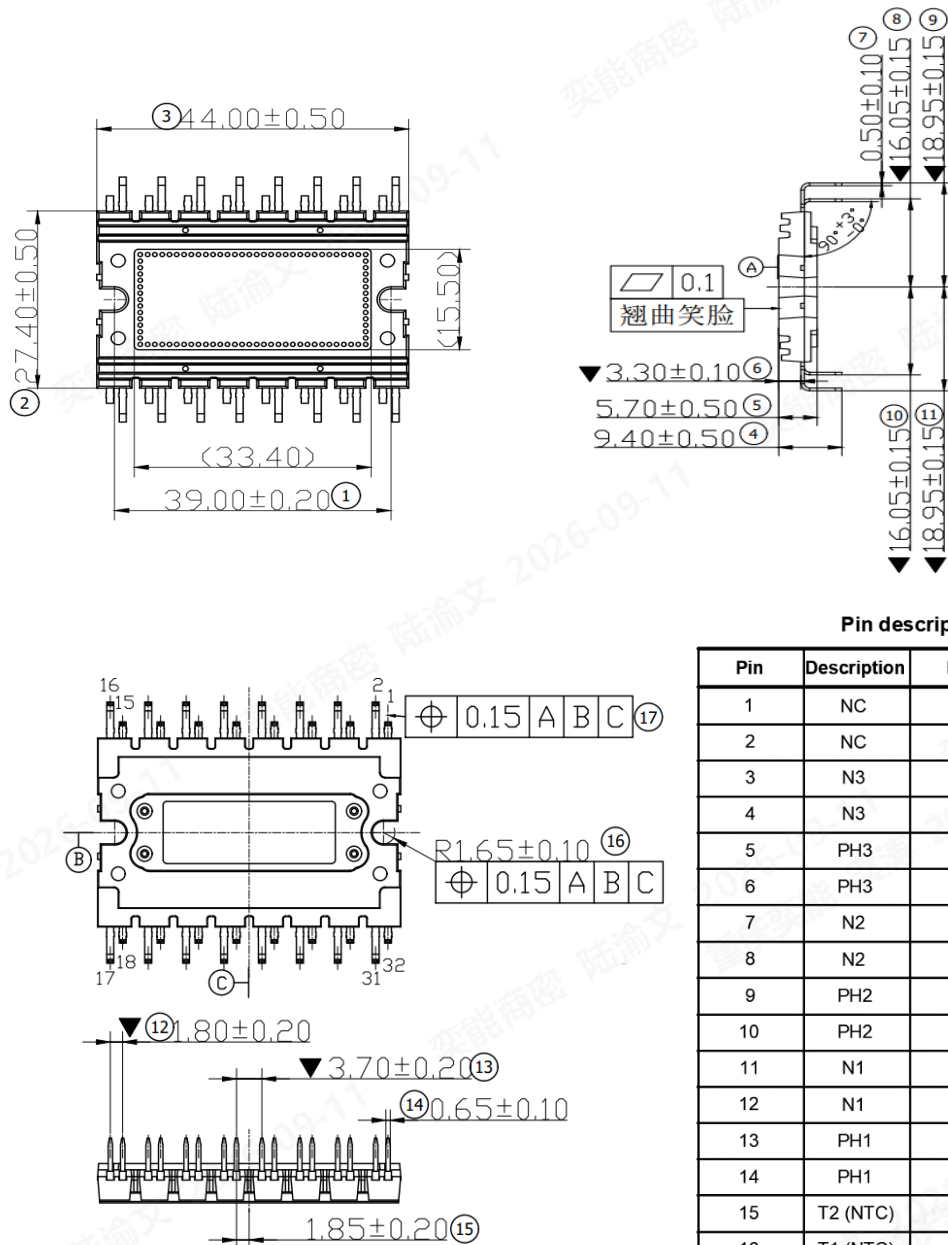
4 Characteristic diagrams

Transient thermal impedance as a function of pulse width

$Z_{th(j-c)} = (t_p)$



5 Package outlines



AM120R230M1S-Engineering

INNO APM Module

innoevsic

Revision history

Revision history

Document revision	Date of release	Description of changes
1.0	2026-08-19	Engineering version

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E-mail: Marketing@innoevsic.com

Website: www.innoevsic.com