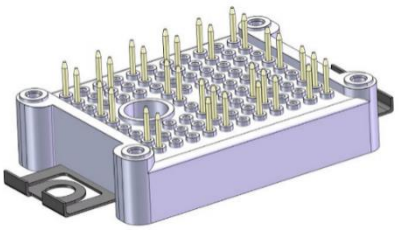
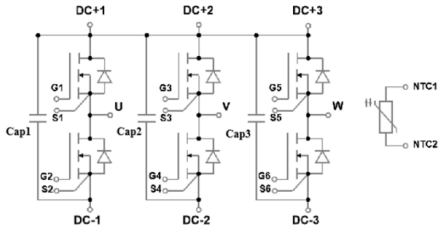
ATSCM40RN120FBEY1B

3 Phase Topology

Product Summary

Product Type	V_{DS}	I_D	$R_{DS(ON)}$	Package
ATSCM40RN120FBEY1B	1200V	80A	40mΩ	EASY-1B





Features

- Optimized 1200V high performance and cost effective SiC technology
- Built-in NTC thermistor for temperature monitoring
- High voltage decoupling capacitors for noise immunity
- Lead free, RoHS compliant
- Ultra-Low Loss
- High Frequency Operation
- Al2O3 substrate for reinforced thermal management
- Enhanced electrical isolation and creepage

Applications

- EV Chargers
- Solar
- High-Efficiency Converters / Inverters
- Motor & Traction Drives
- Smart-Grid / Grid-Tied Distributed Generation

Maximum Ratings

Absolute Maximum Ratings (Per Position), T_j=25°C, unless otherwise Specified

Parameter	Symbol	Conditions	Value	Unit
Drain-source voltage	V_{DS}	V_{GS}=0V, I_D= 100μA	1200	V
Gate-source voltage	V_{GSmax}	DC	-8 to 22	V
Gate-source voltage	$V_{GS-operation}$	DC	-4 to 18	V
Continuous drain current	I_D	T_C =25°C	80	A
		T_C =100°C	56	A
Pulsed drain current	I_{DM}	t_P limited by T_{Jmax}	120	A
Maximum junction temperature	$T_{J.max}$		150	°C
Operating and storage temperature	T_J ,T_{STG}		-40~125	°C

Thermal Characteristics (Per Position)

Parameter	Symbol	Min	Typ	Max	Unit
thermal resistance, junction-case	R_{thJC}		0.4		K/W
thermal resistance, junction-heatsink	R_{thJH}		1.2		K/W

Not*:Kpaste=3w/mK, Thickness=100um

Static Characteristics (Per Position)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Drain-source breakdown voltage	BV_{DS}	V_{GS}=0V, I_D=100μA	1200			V
Total drain leakage current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V, T_J=25°		1	10	μA
Total gate leakage current	I_{GSS}	V_{DS} =0V, T_J=25°C, V_{GS}=15V			100	nA
Drain-source on resistance	$R_{DS(on)}$	V_{GS}=15V, I_D=33.3A, T_J=25°		40	50	mΩ
		V_{GS}=15V, I_D=33.3A, T_J=150°		57		
		V_{GS}=18V, I_D=33.3A, T_J=25°		32	40	
		V_{GS}=18V, I_D=33.3A, T_J=150°		55		
Gate threshold voltage	$V_{G(th)}$	V_{DS}= V_{GS}, I_D= 10mA T_J=25°	2.3	2.8	3.6	V
		V_{DS}= V_{GS}, I_D= 10mA T_J=150°		2.2		
Gate resistance	R_G	f=1MHz, V_{AC}=25mV		0.9		Ω
Diode forward voltage	V_{SD}	V_{GS}= -4V, I_{SD} =20A T_J=25°		3.8		V
		V_{GS}=-4V, I_{SD}=20A T_J=150°		3.5		
Continuous diode forward current	I_S	V_{GS}= -4V, T_C= 25°		76		A

Typical Performance -Dynamic

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
Input capacitance	C_{iss}	V_{DS}=1000V, V_{GS}=0V V_{AC}=25mV, f=100kHz		2159		pF
Output capacitance	C_{oss}			127		
Reverse transfer capacitance	C_{rss}			10		
Coss stored energy	E_{oss}			79		μJ
Total gate charge	Q_G	V_{DS}=800V, I_D=40A, V_{GS} = -4V to +15V		76		nC
Gate-source charge	Q_{GD}			36		nC
Gate-drain charge	Q_{GS}			16		nC
Turn-on delay time	$t_{d(on)}$	V_{DS}=800V, I_D=40A, Gate Driver = -4V to +15V, R_G=2.5Ω, L=120μH		31		ns
Rise time	t_r			18		ns
Turn-off delay time	$t_{d(off)}$			32		ns
Fall time	t_f			9		ns
Turn on energy	E_{on}			259		μJ
Turn off energy	E_{off}			50		μJ
Reverse recovery time	t_{rr}	V_R = 800V, V_{GS} = -4V I_D = 40A ;di/dt = 2281A/μS T_J = 150°C		55		ns
Reverse recovery charge	Q_{rr}			750		nC
Peak reverse recovery currrrent	I_{rrm}			26		A

Module Physical Characteristics (Per Position)

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
Backside curvature					100	um
Weight	W			24		g
Case Isolation Voltage	V_{isol}	AC, 50 Hz, 1 min	3000			V
Comparative Tracking Index	CTI			600		
Clearance Distance		Terminal to Terminal		5.0		mm
		Terminal to Heatsink		10		
Creepage Distance		Terminal to Terminal		5.0		
		Terminal to Heatsink		11.5		

NTC Thermistor Characteristics (Per Position)

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
Rated Resistance	R_{NTC}	T_{NTC}= 25°C		5		KΩ
Resistance Tolerance at 25°C	ΔR/R		-5		5	%
Beta Value (T2 = 50°C)	$\beta_{25/50}$			3380		K
Beta Value (T2 = 50°C)	$\beta_{25/80}$			3428		
Beta Value (T2 = 50°C)	$\beta_{25/100}$			3455		
Power Dissipation	P_{Max}			100		mW

Capacitance Characteristics

Parameter	Symbol	Test condition	Min	Typ	Max	Unit
Rated capacitance	Cap	T_{NTC}= 25°C		22		nF
Capacitance Tolerance at 25°C	ΔC/C		-5		5	%

Typical Performance

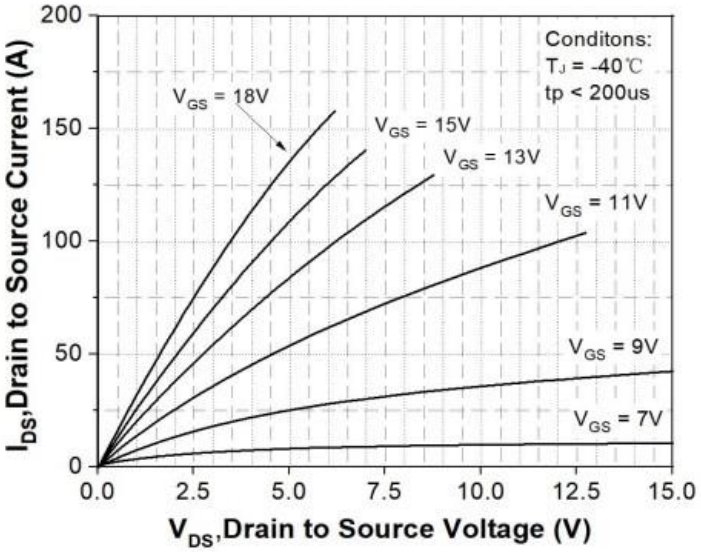


Figure 1. Output characteristic MOSFET

$I_D=f(V_{DS})$, T_{vj}= -40℃

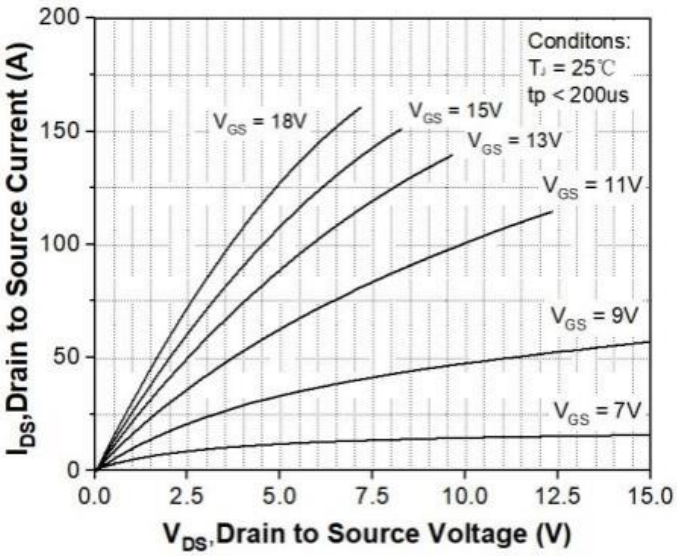


Figure 2. Output characteristic MOSFET

$I_D=f(V_{DS})$, T_v=25℃

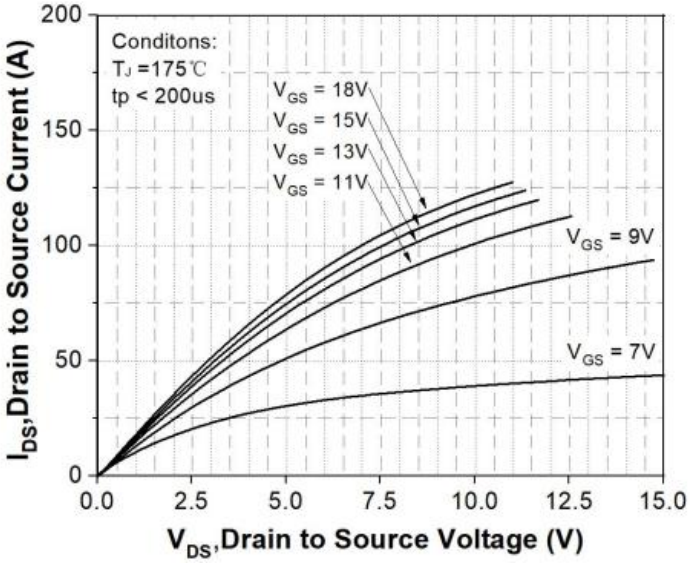


Figure 3. Output characteristic MOSFET

$I_D=f(V_{DS})$, T_{vj}=175℃

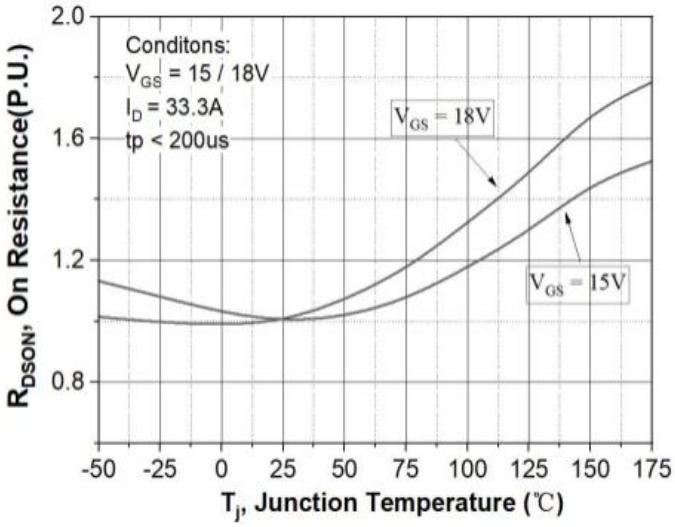


Figure 4. Normalized on-resistanceg MOSFET

$R_{dson}=f(T_J)$，V_{GS}=15V/18V，I_D=40A

Typ vical Performance

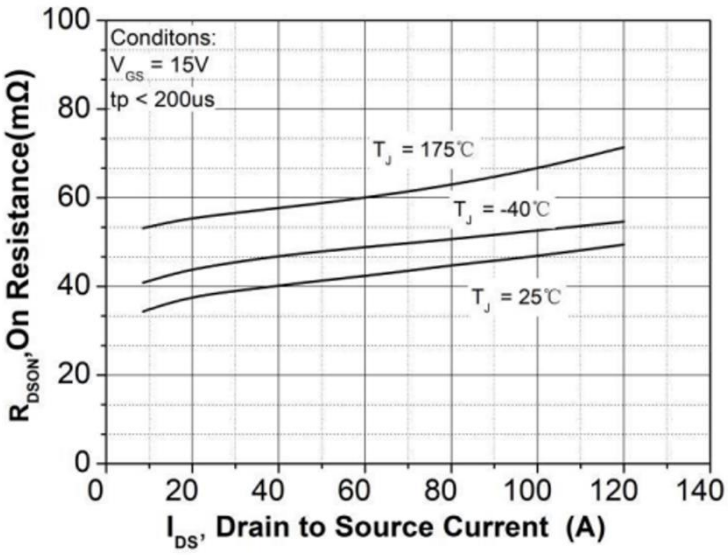


Figure 5. Typical drain-source on-resistances at V_{GS} = 15V

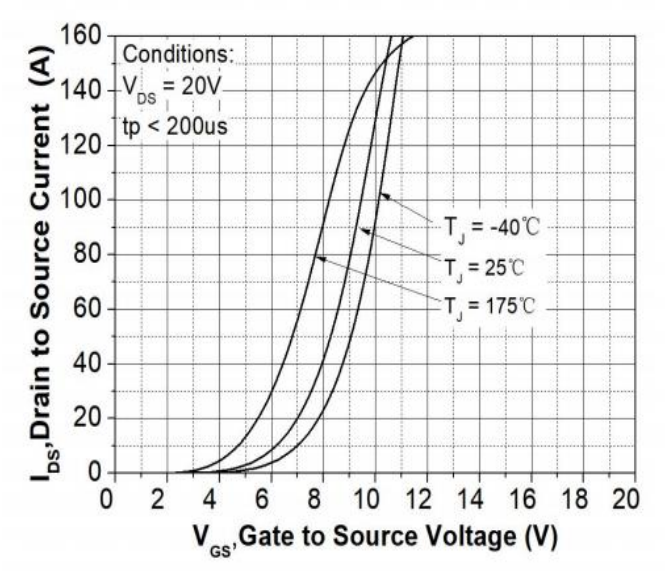


Figure 6. Typical transfer characteristics at V_{DS} =20V

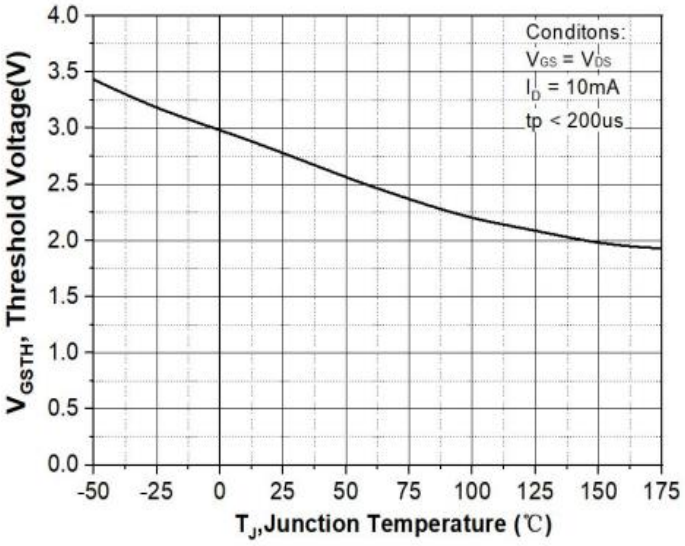


Figure 7. Threshold voltage vs. Junction temperature at V_{DS}= V_{GS} and I_D= 10mA

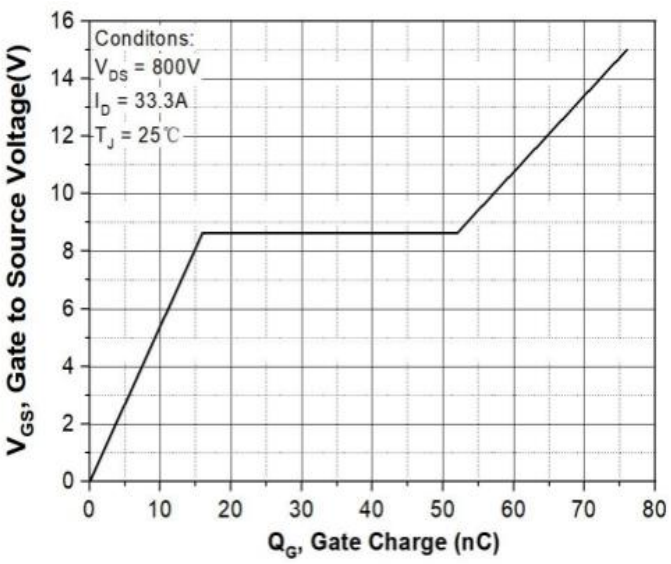


Figure 8. Typical gate charge at I_D = 33.3A

Typvical Performance

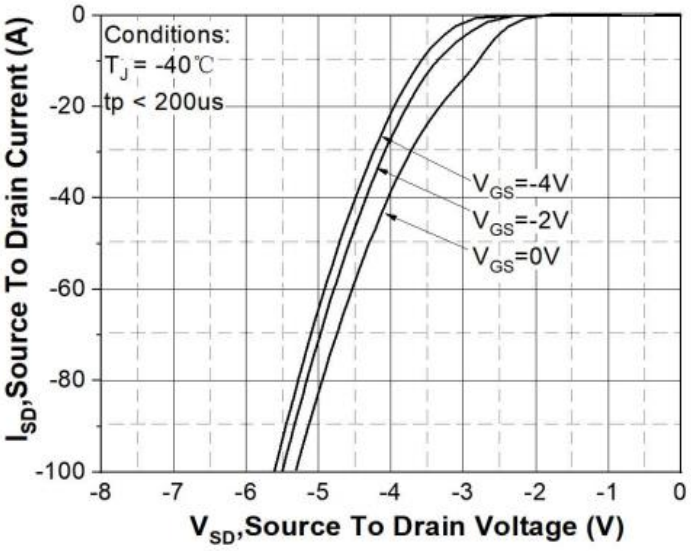


Figure 9. Body diode characteristics at T_{vj} = -40℃

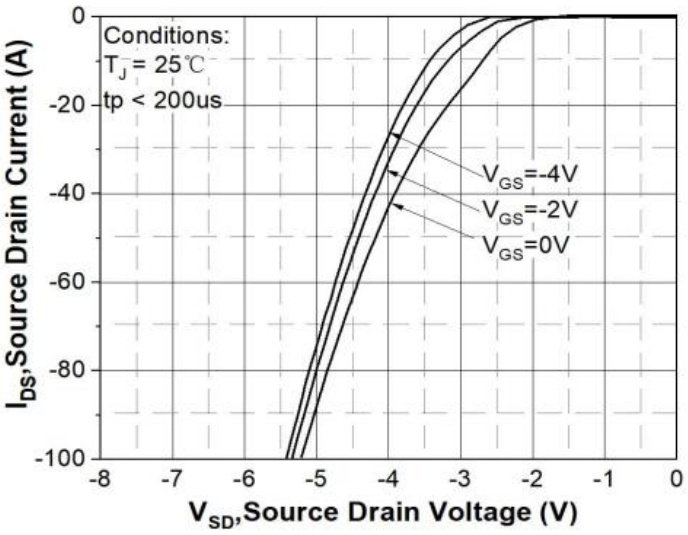


Figure 10. Body diode characteristics at T_{vj} = 25℃

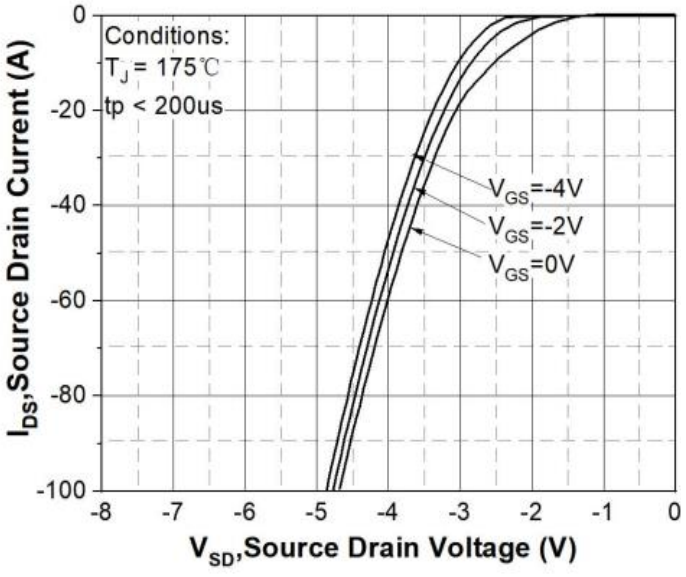


Figure 11. Body diode characteristics at T_{vj} = 175℃

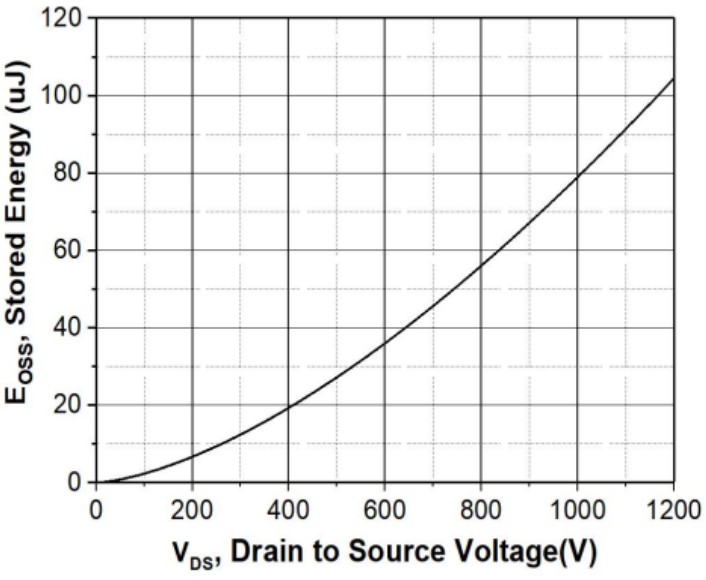


Figure 12. Typical stored energy in C_{OSS}

Typical Performance

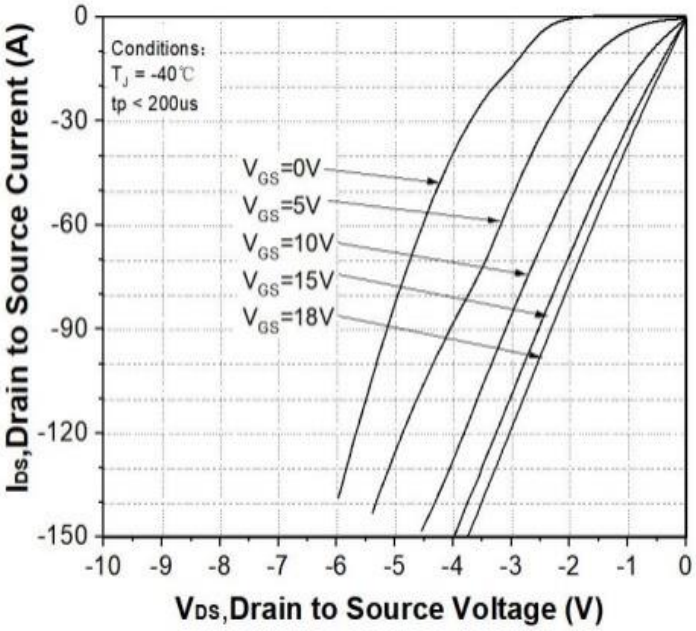


Figure 13. 3rd quadrantat characteristics T_{vj} = -40℃

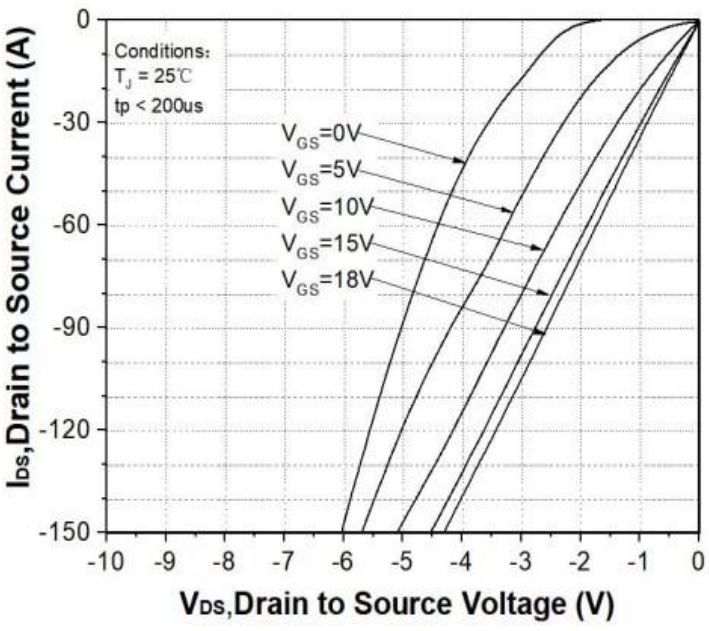


Figure 14. 3rd quadrantat characteristics at T_{vj} = 25℃

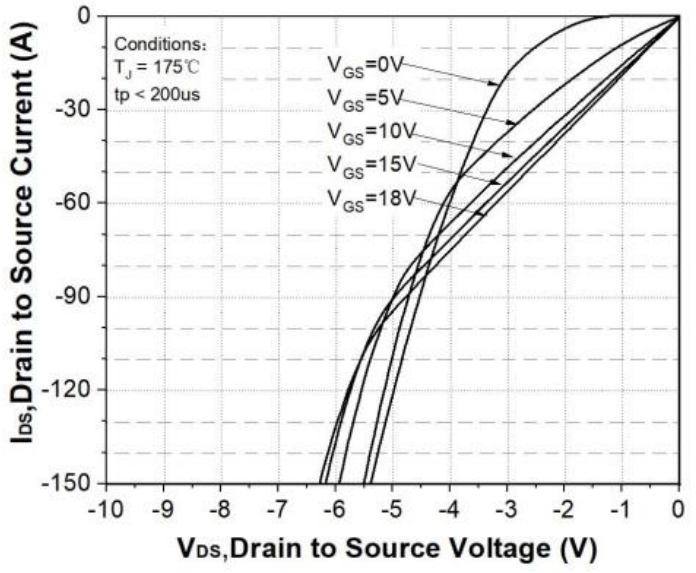


Figure 15. 3rd quadrantat characteristics at T_{vj} = 175℃

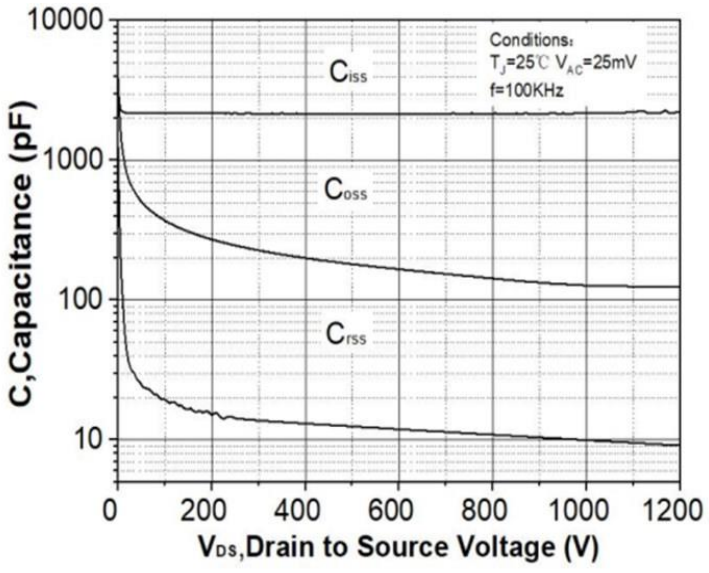
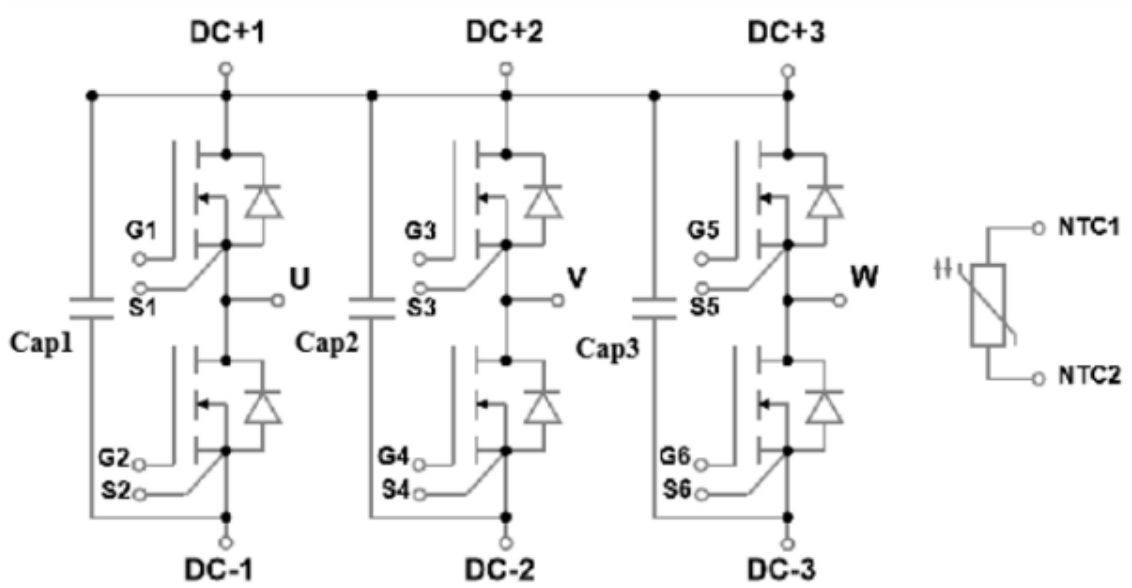
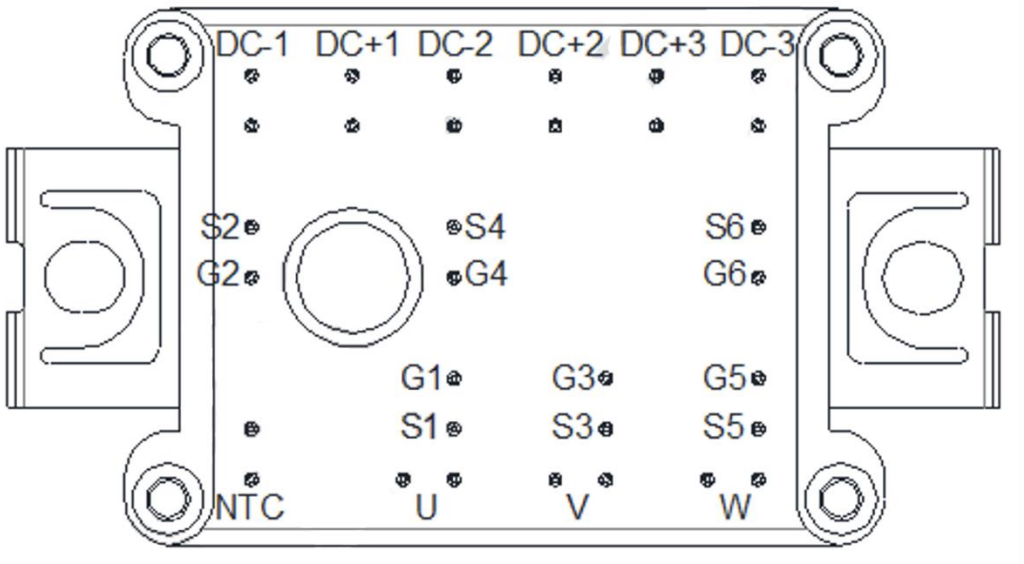


Figure 16. Capacitances at T_{vj} =25

Internal Electrical Schematic



Pin Configuration



Package Outline Dimensio