General Description

FSMOS® MOSFET is based on Oriental Semiconductor's unique device design to achieve low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. The high V_{th} series is specially designed to use in the control systems with driving voltage of more than 10V.

Features

- Low $R_{DS(ON)}$ & FOM
- Extremely low switching loss
- Excellent reliability and uniformity
- Fast switching and soft recovery
- AEC-Q101 Qualified for Automotive Applications

Applications

- PD charger
- Motor driver
- Switching voltage regulator
- DC-DC convertor
- Switching mode power supply

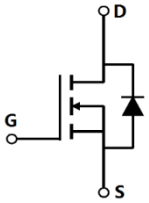
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	150	V
$I_{D,\ pulse}$	740	A
$R_{DS(ON),\ max}$ @ V_{GS}=10V	4.5	mΩ

Marking Information

Product Name	Package	Marking
SFS15R045PNAF	TO-220-3L	SFS15R045PNA

Package & Pin information



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Absolute Maximum Ratings at T_j=25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	150	V
Gate-source voltage	V_{GS}	±20	V
Continuous drain current[1], T_C=25 °C	I_D	185	A
Pulsed drain current[2], T_C=25 °C	$I_{D,\ pulse}$	740	A
Continuous diode forward current[1], T_C=25 °C	I_S	185	A
Diode pulsed current[2], T_C=25 °C	$I_{S,\ pulse}$	740	A
Power dissipation[3], T_C=25 °C	P_D	350	W
Single pulsed avalanche energy[4]	E_{AS}	487	mJ
Operation and storage temperature	T_{stg}, T_j	-55 to 175	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.43	°C/W
Thermal resistance, junction-ambient	$R_{\theta JA}$	62	°C/W

Electrical Characteristics at T_j=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	150			V	V_{GS}=0 V, I_D=250 μA
Gate threshold voltage	$V_{GS(th)}$	3		4.5	V	V_{DS}=V_{GS}, I_D=250 μA
Drain-source on-state resistance	$R_{DS(ON)}$		3.5	4.5	mΩ	V_{GS}=10 V, I_D=50 A
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=20 V
				-100		V_{GS}=-20 V
Drain-source leakage current	I_{DSS}			1	μA	V_{DS}=135 V, V_{GS}=0 V
Gate resistance	R_G		4.3		Ω	f=1 MHz, Open drain

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Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		6770		pF	V_{GS}=0 V, V_{DS}=25 V, f=100 kHz
Output capacitance	C_{oss}		3760		pF	
Reverse transfer capacitance	C_{rss}		238		pF	
Turn-on delay time	$t_{d(on)}$		51		ns	V_{GS}=10 V, V_{DS}=80 V, R_G=10 Ω, I_D=40 A
Rise time	t_r		80		ns	
Turn-off delay time	$t_{d(off)}$		121		ns	
Fall time	t_f		60		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		87		nC	V_{GS}=10 V, V_{DS}=80 V, I_D=40 A
Gate-source charge	Q_{gs}		30		nC	
Gate-drain charge	Q_{gd}		25		nC	
Gate plateau voltage	$V_{plateau}$		5.5		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	I_S=50 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		74		ns	V_R=80 V, I_S=40 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		130		nC	
Peak reverse recovery current	I_{rrm}		3.3		A	

Note

1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd is based on max. junction temperature, using junction-case thermal resistance.
4) V_{DD}=50 V,V_{GS}=10 V, L=0.3 mH, starting T_j=25 °C.

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Electrical Characteristics Diagrams

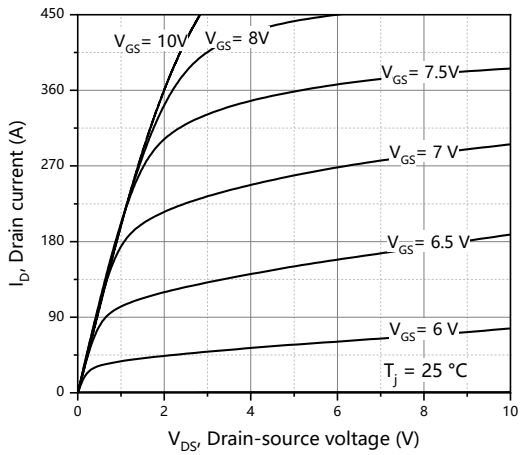

Figure 1. Typ. output characteristics

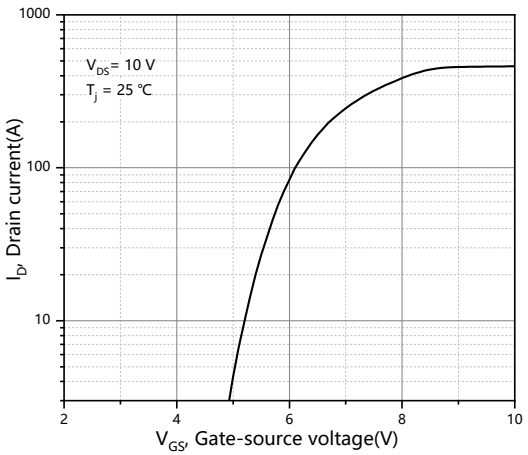

Figure 2. Typ. transfer characteristics

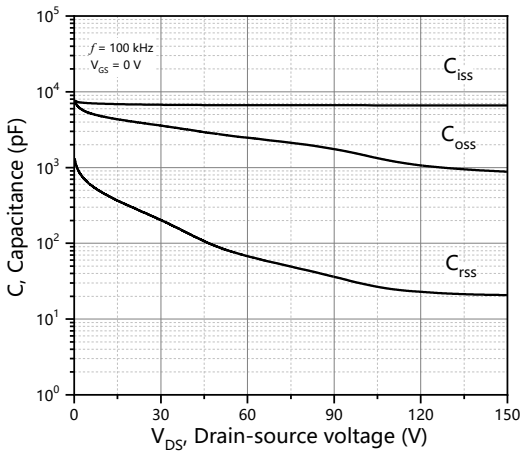

Figure 3. Typ. capacitances

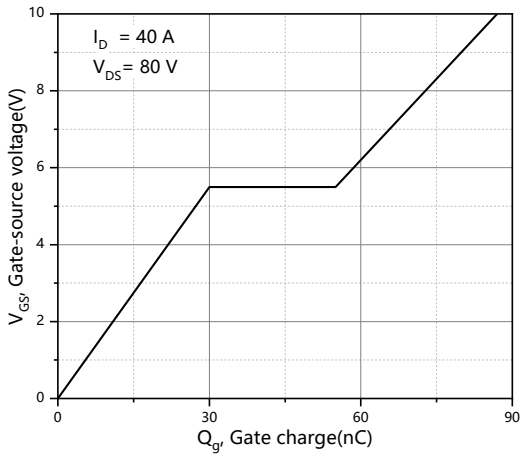

Figure 4. Typ. gate charge

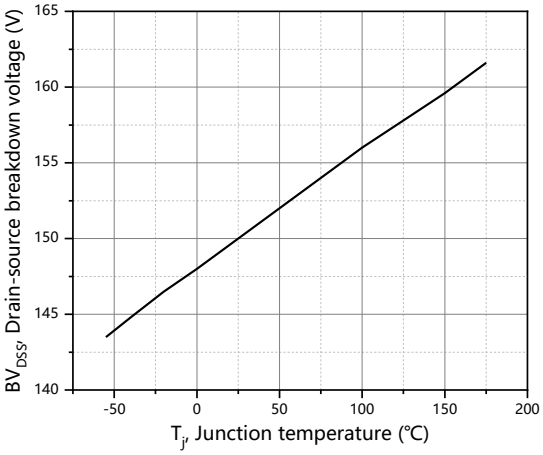

Figure 5. Drain-source breakdown voltage

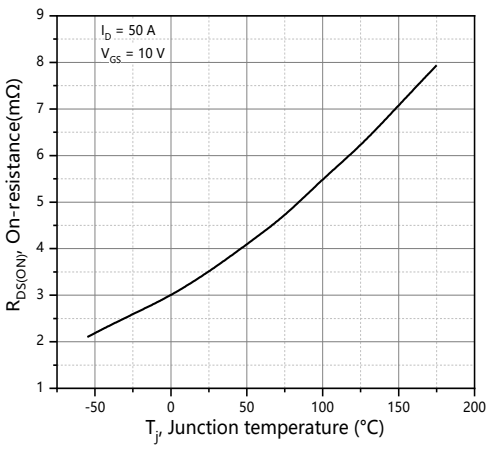

Figure 6. Drain-source on-state resistance

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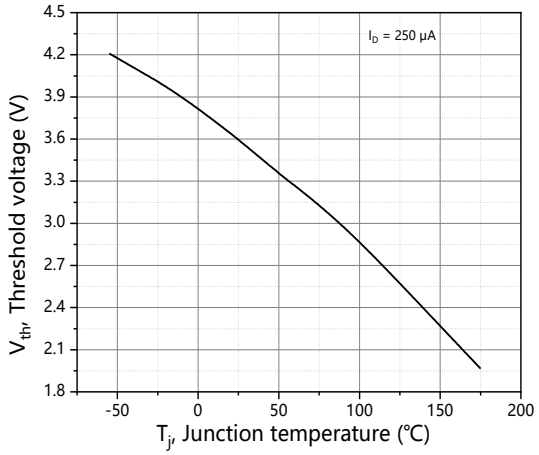

Figure 7. Threshold voltage

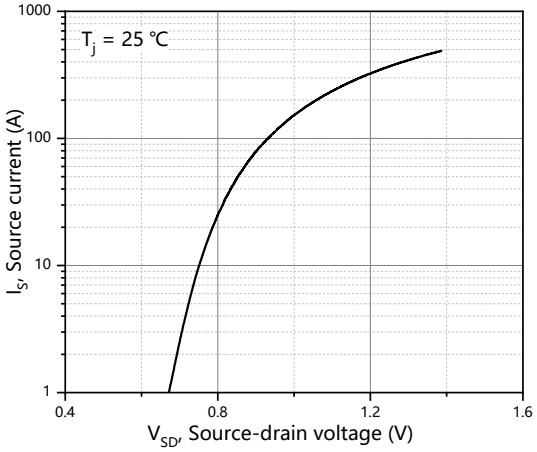

Figure 8. Forward characteristic of body diode

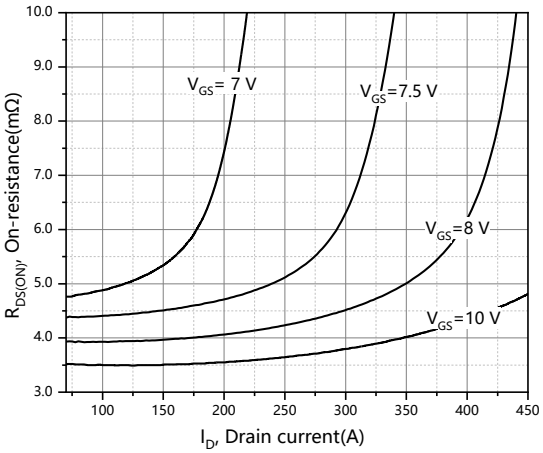

Figure 9. Drain-source on-state resistance

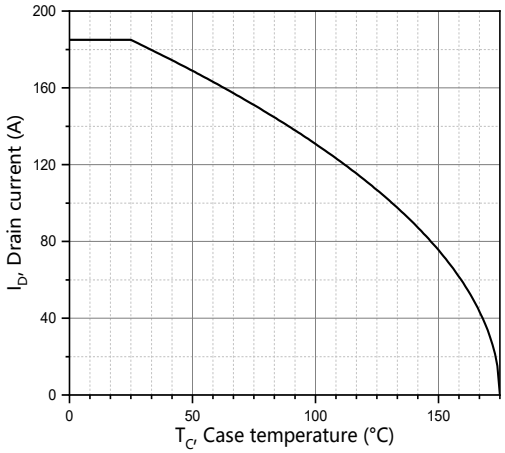

Figure 10. Drain current

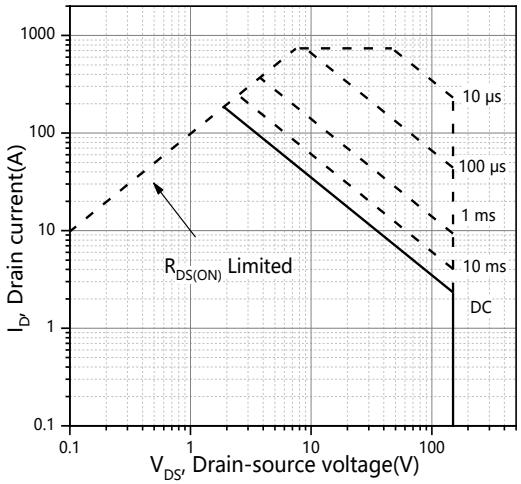

Figure 11. Safe operation area T_C=25℃

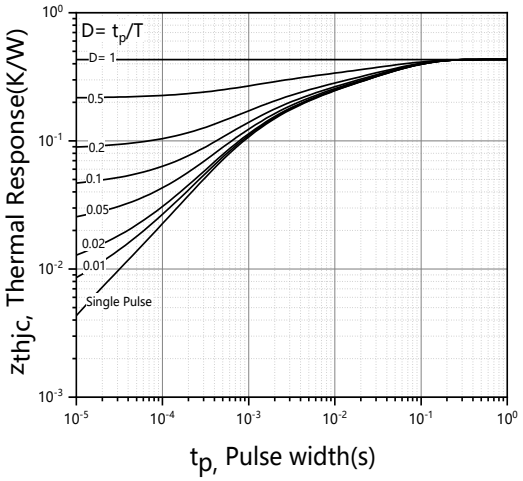

Figure 12. Max. transient thermal impedance

Test circuits and waveforms

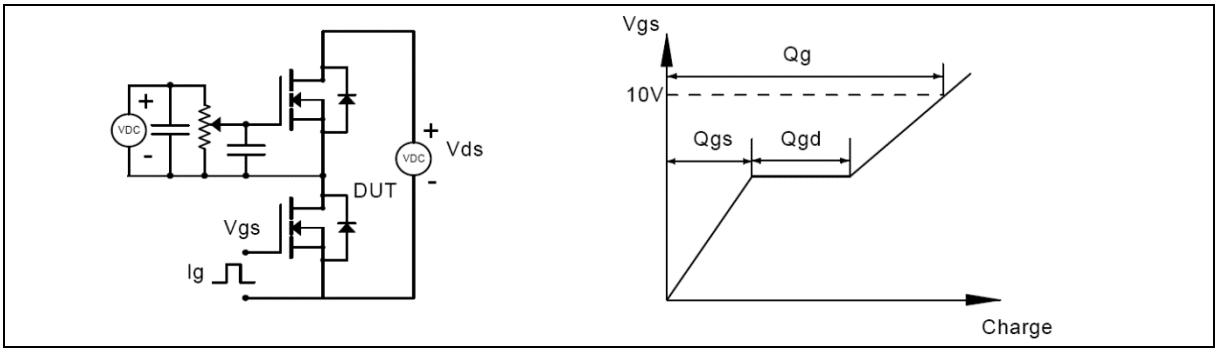

Figure 1. Gate charge test circuit & waveform

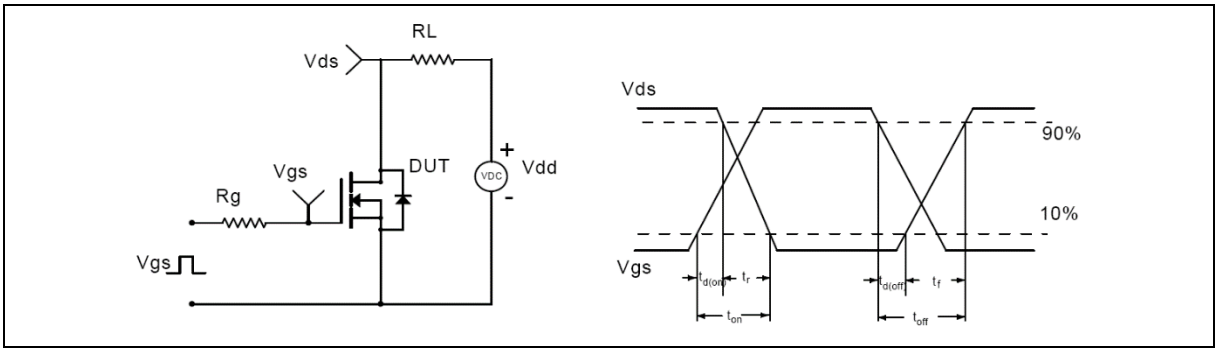

Figure 2. Switching time test circuit & waveforms

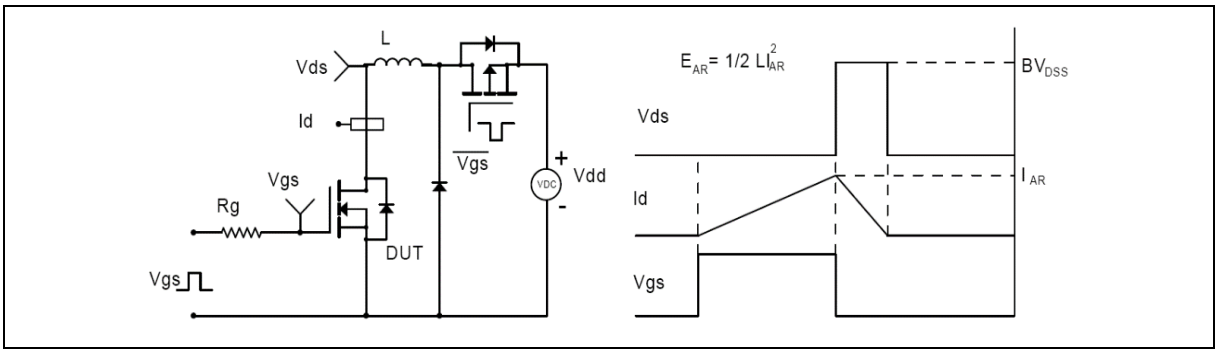

Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

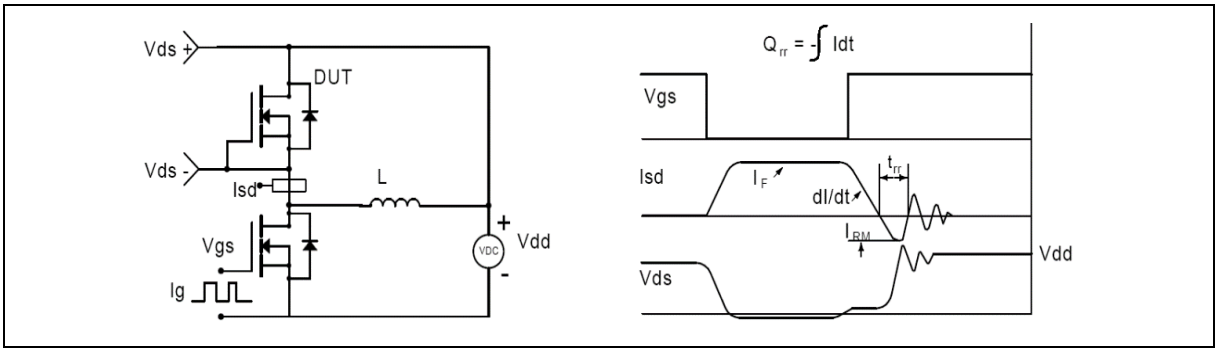

Figure 4. Diode reverse recovery test circuit & waveforms

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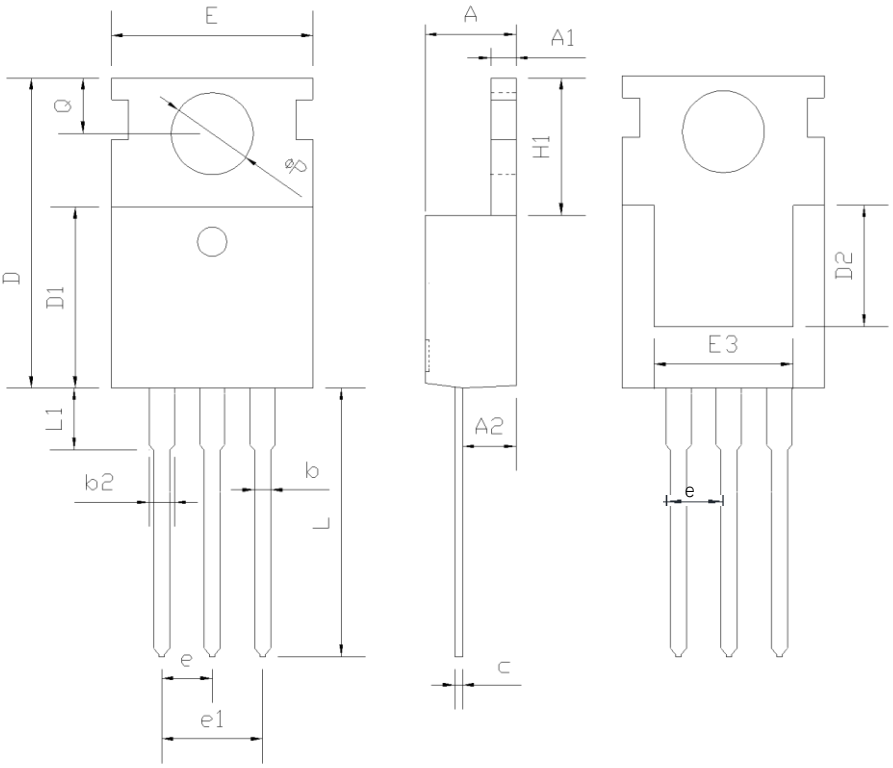
Package Information



Symbol	mm		
	Min	Nom	Max
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

Version : TO-220-3L-P package outline dimension

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Ordering Information

Package Type	Units/ Tube	Tubes / Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO-220-3L-P	50	20	1000	6	6000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS15R045PNAF	TO-220-3L	yes	yes	yes

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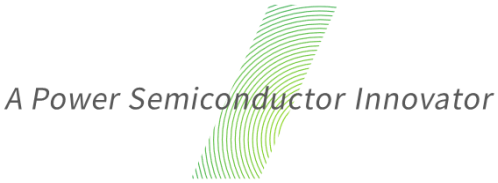
Revision History

Version	Revision History	Date
V1.0	Initial release	2024-01-19



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