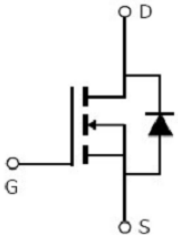
Main Product Characteristics:

V_{DSS}	650V
R_{DS}(on)	0.15Ω (typ.)
I_D	20A ①

TO-263

Marking and Pin Assignment



Schematic Diagram

Features and Benefits:

- High dv/dt and avalanche capabilities
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Description:

The SSF20NS65MA series MOSFETs is a new technology, which combines an innovative technology and advance process. This new technology achieves low Rdson, energy saving, high reliability and uniformity, superior power density and space saving.

Absolute Max Rating:

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V ①	20	A
I_{DM}	Pulsed Drain Current ②	60	
P_D @TC = 25°C	Power Dissipation ③	151	W
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy	484	mJ
I_{AR}	Avalanche Current	3.5	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

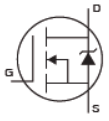
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	0.83	℃/W
$R_{\theta JA}$	Junction-to-ambient (t ≤ 10s) ④	—	62	℃/W

Electrical Characteristics @T_A=25℃ unless otherwise specified

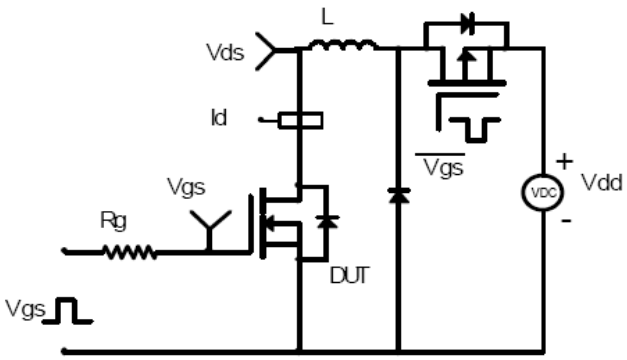
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	650	—	—	V	V_{GS} = 0V, I_D = 250μA
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	0.15	0.17	Ω	V_{GS}=10V,I_D = 10A
$V_{GS(th)}$	Gate threshold voltage	2.5	—	4.5	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	V_{DS} =650V,V_{GS} = 0V
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	V_{GS} =30V
		—	—	-100		V_{GS} = -30V
Q_g	Total gate charge	—	38.5	—	nC	I_D = 20A,
Q_{gs}	Gate-to-Source charge	—	8	—		V_{DS}=520V,
Q_{gd}	Gate-to-Drain("Miller") charge	—	15	—		V_{GS} = 10V
$t_{d(on)}$	Turn-on delay time	—	15	—	ns	V_{GS}=10V, V_{DS} =400V, R_{GEN}=25Ω,I_D =20A
t_r	Rise time	—	59	—		
$t_{d(off)}$	Turn-Off delay time	—	121	—		
t_f	Fall time	—	44	—		
C_{iss}	Input capacitance	—	1676	—	pF	V_{GS} = 0V
C_{oss}	Output capacitance	—	59	—		V_{DS} =100V
C_{rss}	Reverse transfer capacitance	—	2.5	—		f = 1MHz

Source-Drain Ratings and Characteristics

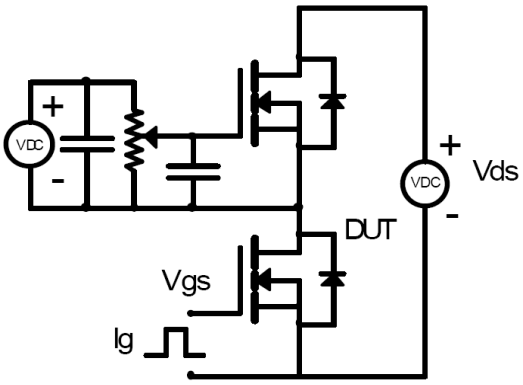
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode) ①	—	—	17	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	60	A	
V_{sd}	Diode Forward Voltage	—	0.9	1.2	V	I_S=10A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	—	423	—	ns	T_J = 25°C, I_F =17A, di/dt = 100A/μs
Q_{rr}	Reverse Recovery Charge	—	5300	—	nc	

Test circuits and Waveforms

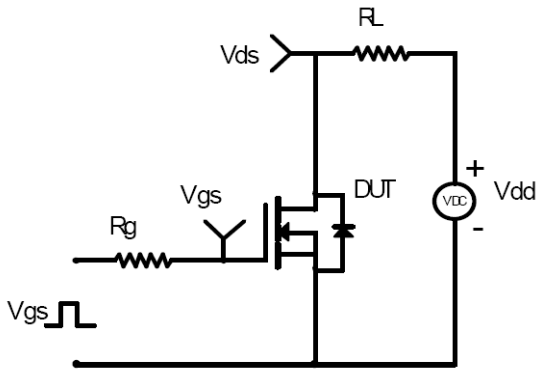
EAS Test Circuit:



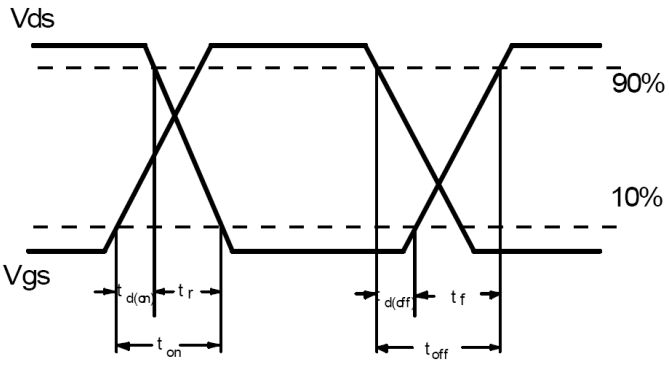
Gate charge test circuit:



Switching Time Test Circuit:



Switching Waveforms:



Notes:

①Calculated continuous current based on maximum allowable junction temperature.

②Repetitive rating; pulse width limited by max. junction temperature.

③The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.

④The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C

Typical electrical and thermal characteristics

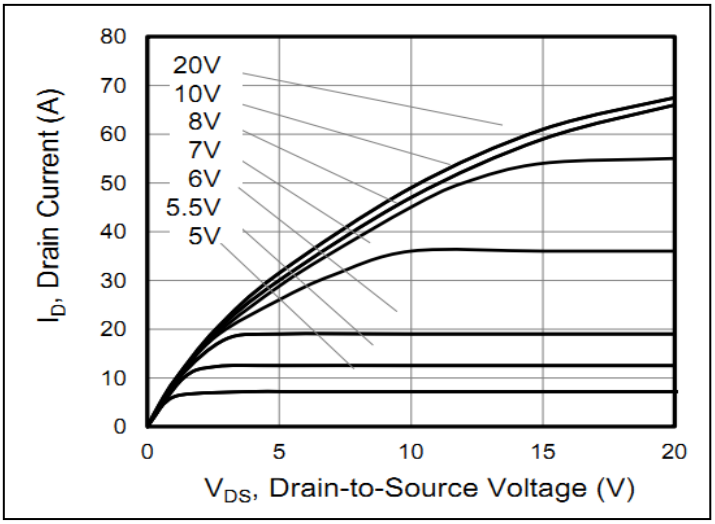


Figure 1: Typical Output Characteristics

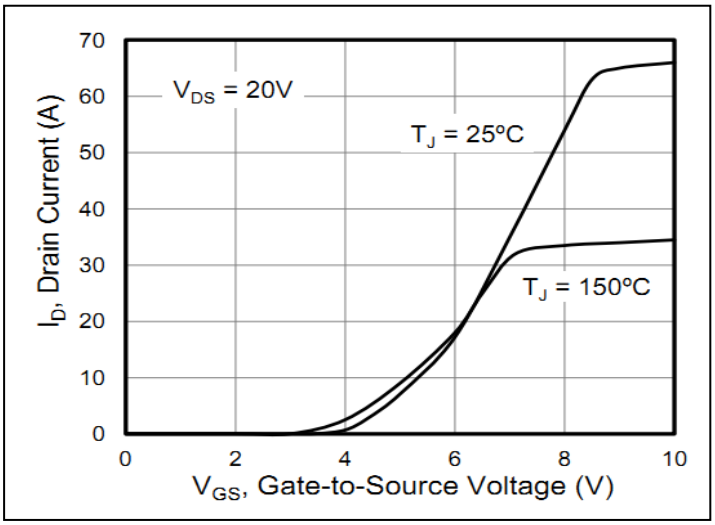


Figure 2: Transfer Characteristics

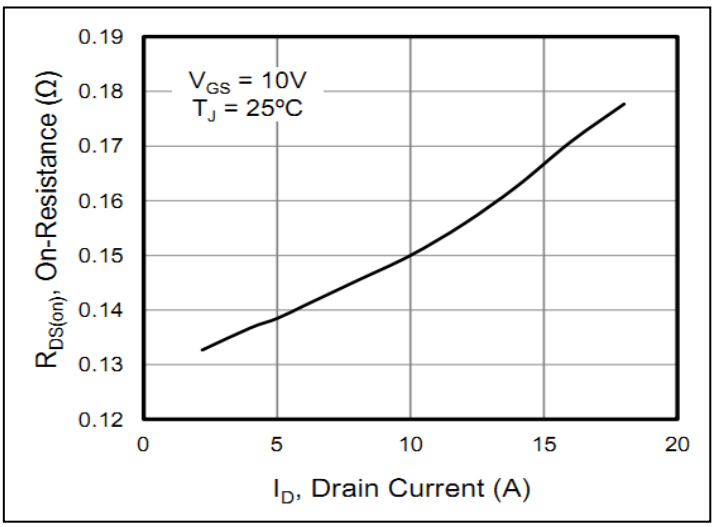


Figure 3: On-Resistance vs. Drain Current

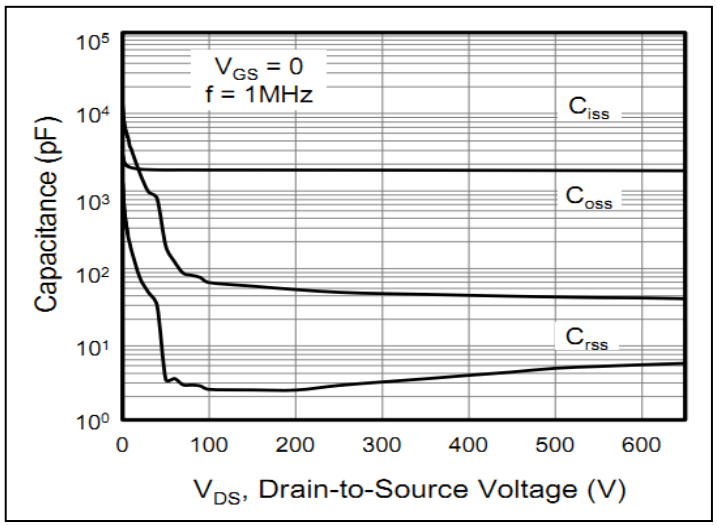


Figure 4: Capacitance

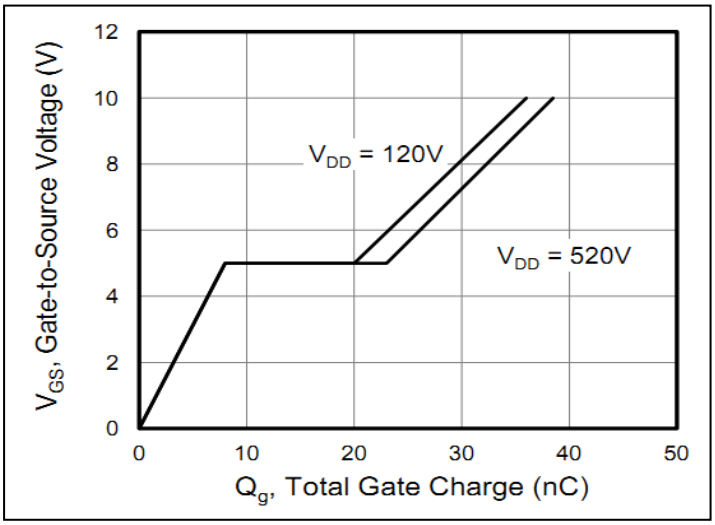


Figure 5: Gate Charge

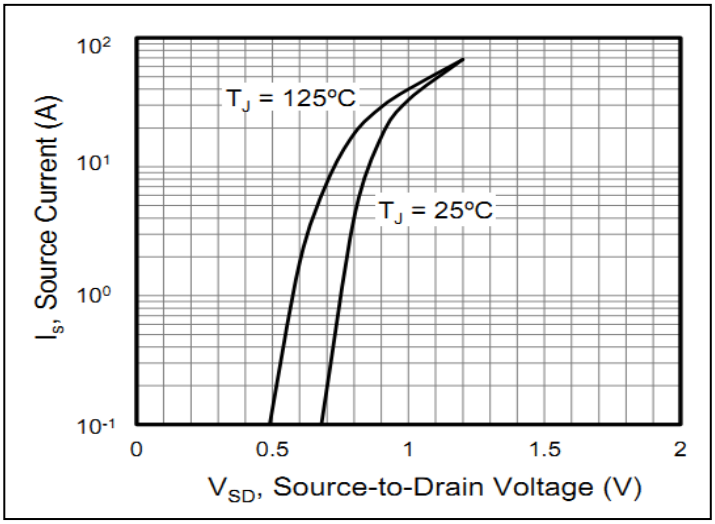


Figure 6: Body Diode Forward Voltage

Typical electrical and thermal characteristics

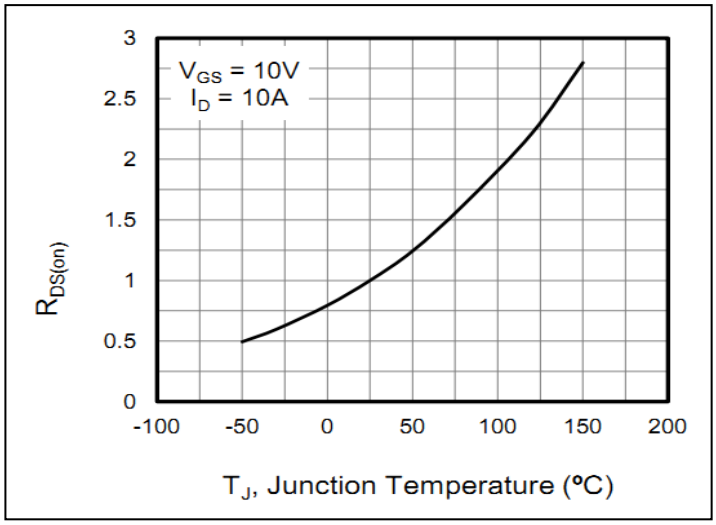


Figure 7: On-Resistance vs. Junction Temperature

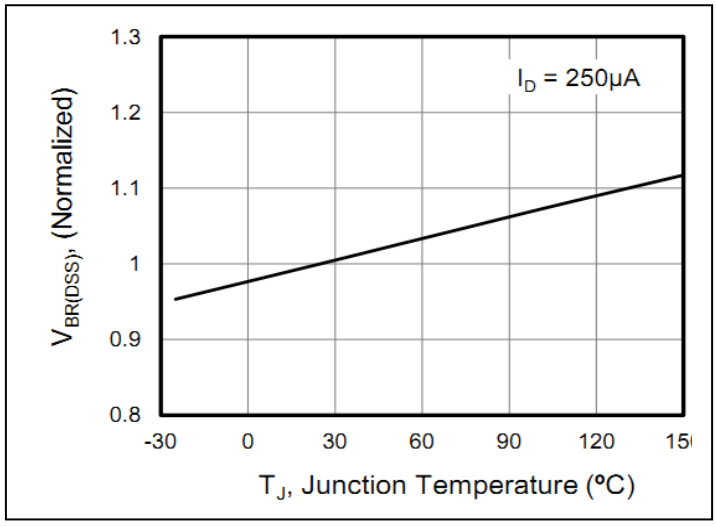


Figure 8: Threshold Voltage vs. Junction Temperature

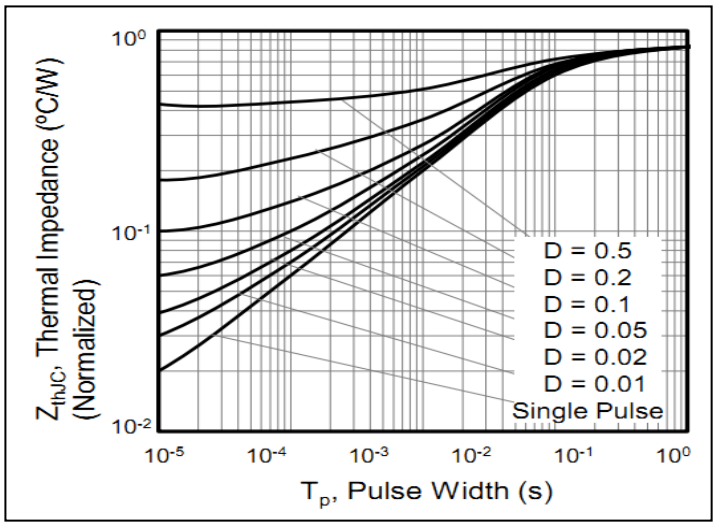


Figure 9: Breakdown Voltage vs. Junction Temperature

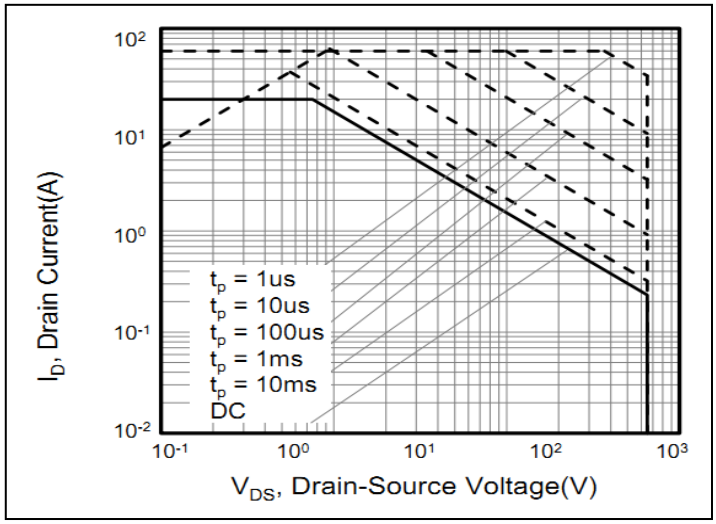
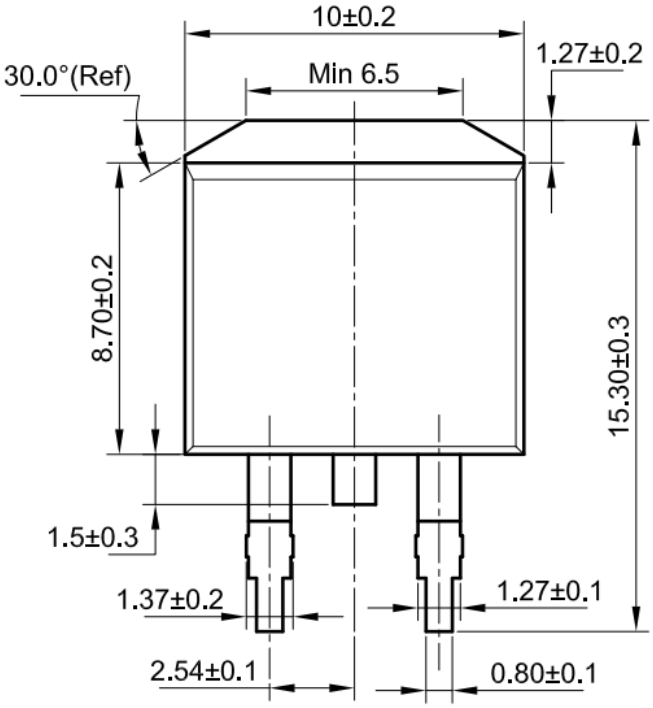
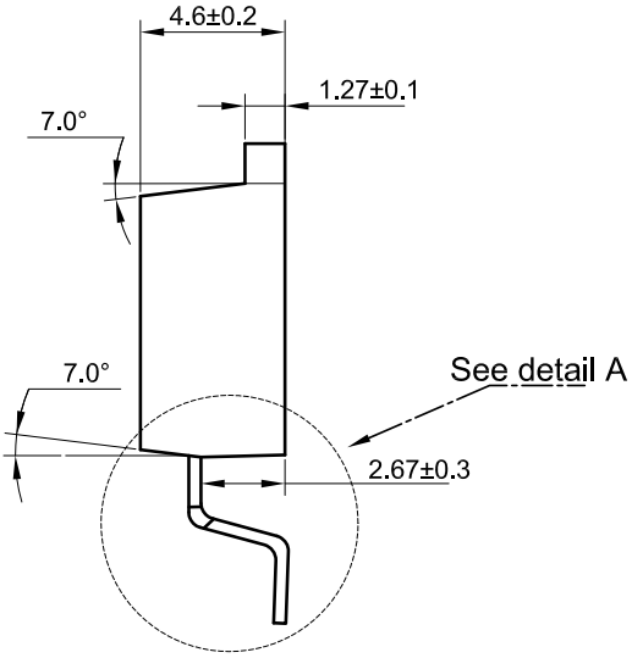
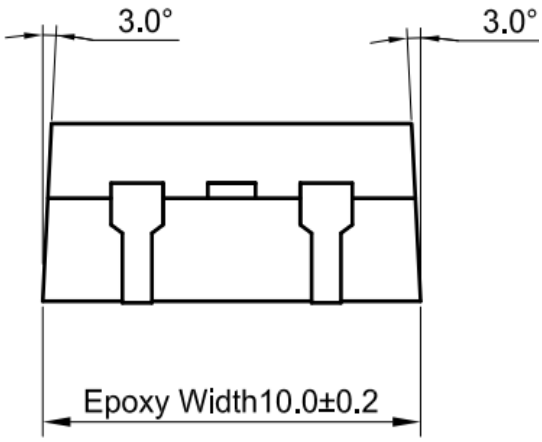


Figure 10: Transient Thermal Impedance

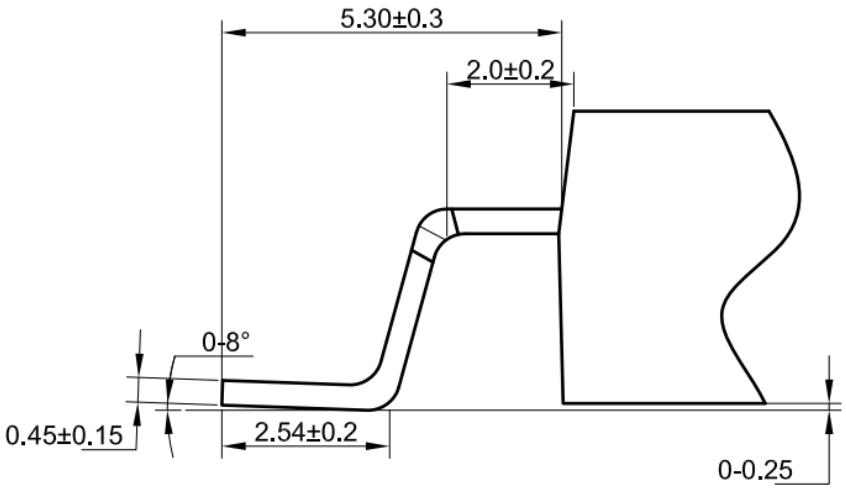
Mechanical Data：







Detail A



Ordering and Marking Information

Device Marking: SSF20NS65MA

Package (Available)

TO-263

Operating Temperature Range

C : -55 to 150 ºC

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	T_j=150℃ @ 80% of Max V_{DSS}/V_{CES}/VR	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	T_j=150℃ @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices

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