

Features

- Low power loss by high speed switching and low on-resistance
- Ultra-fast body diode
- Excellent thermal behavior
- Product validation acc. JEDEC Standard
- RoHS compliant with Halogen-free

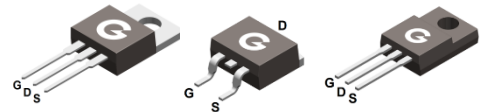
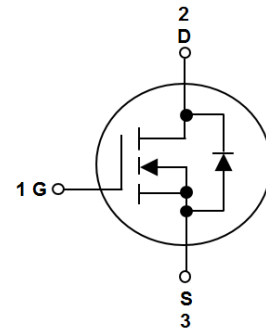
HF

Applications

- EV charger
- Lighting
- Power supply
- Solar inverter

Mechanical Data

- Case: TO-220AB, TO-263, ITO-220AB
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



TO-220AB TO-263 ITO-220AB

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
SJ65R190FR	TO-220AB	50 pcs / Tube	65R190FR
SJ65R190FRB	TO-263	50 pcs / Tube or 800 pcs / Tape & Reel	65R190FRB
SJ65R190FRF	ITO-220AB	50 pcs / Tube	65R190FRF

Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	650	V
Gate-to-Source Voltage	V_{GSS}	± 30	V
Continuous Drain Current ($T_C = 25^\circ\text{C}$)	I_D	20	A
Continuous Drain Current ($T_C = 100^\circ\text{C}$)		12.6	
Pulsed Drain Current ($t_p = 10\mu\text{s}$, $T_C = 25^\circ\text{C}$)	I_{DM}	80	A
Single Pulse Avalanche Energy ($L = 50\text{mH}$) ²	E_{AS}	220	mJ
Power Dissipation (TO-220AB, $T_C = 25^\circ\text{C}$)	P_D	192	W
Power Dissipation (TO-263, $T_C = 25^\circ\text{C}$)		192	
Power Dissipation (ITO-220AB, $T_C = 25^\circ\text{C}$)		35	
Operating Junction Temperature Range	T_J	-55 ~ +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 ~ +150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case (TO-220AB, TO-263)	R _{θJC}	-	-	0.65	°C/W
Thermal Resistance Junction-to-Case (ITO-220AB)		-	-	3.6	°C/W
Thermal Resistance Junction-to-Air (TO-220AB, TO-263)	R _{θJA}	-	-	62	°C/W
Thermal Resistance Junction-to-Air (ITO-220AB)		-	-	75	°C/W

Electrical Characteristics (@ T_A = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
V _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 1mA	650	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650V, V _{GS} = 0V	-	-	10	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±30V, V _{DS} = 0V	-	-	±100	nA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *1	V _{GS} = 10V, I _D = 10A	-	0.15	0.19	Ω
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	3	3.5	5	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	9.5	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	1460	-	pF
C _{OSS}	Output Capacitance	V _{DS} = 40V	-	60	-	
C _{RSS}	Reverse Transfer Capacitance	f = 250kHz	-	4.6	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time *3	V _{DD} = 400V V _{GS} = 10V R _G = 10Ω I _D = 10A	-	68	-	ns
t _r	Turn-on Rise Time *3		-	20.6	-	
t _{d(OFF)}	Turn-Off Delay Time *3		-	70	-	
t _f	Turn-Off Fall Time *3		-	14.5	-	
Q _G	Total Gate-Charge	V _{DD} = 400V	-	28.7	-	nC
Q _{GS}	Gate to Source Charge	V _{GS} = 10V	-	8	-	
Q _{GD}	Gate to Drain (Miller) Charge	I _D = 10A	-	12	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *1	I _{SD} = 10A, V _{GS} = 0V	-	0.9	1.2	V
t _{rr}	Reverse Recovery Time	I _F = 10A, V _R = 400V	-	108	-	ns
Q _{rr}	Reverse Recovery Charge	di/dt = 100 A/μs	-	486	-	nC

Notes:

- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The E_{AS} data shows Max. rating. The test condition is V_{DD} = 100V, V_{GS} = 15V, L = 50mH
- Guaranteed by design, not subject to production

Ratings and Characteristics Curves (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

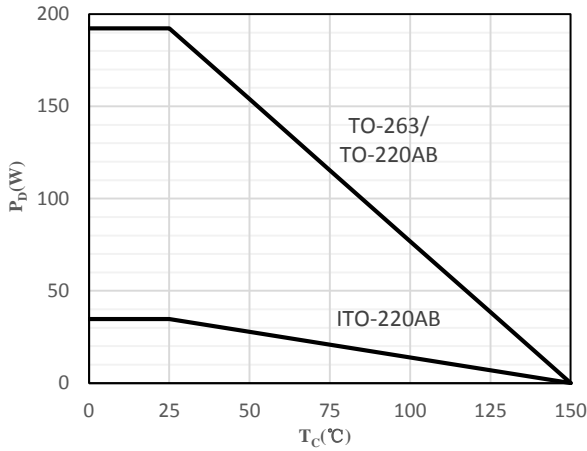


Fig 1 Power Dissipation

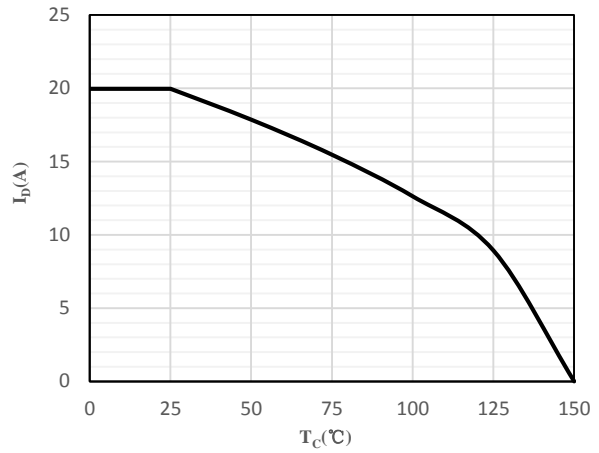


Fig 2 Drain Current

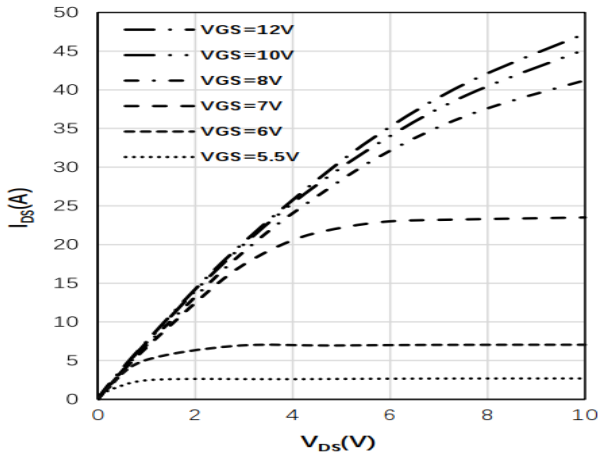


Fig 3 Typical Output Characteristics

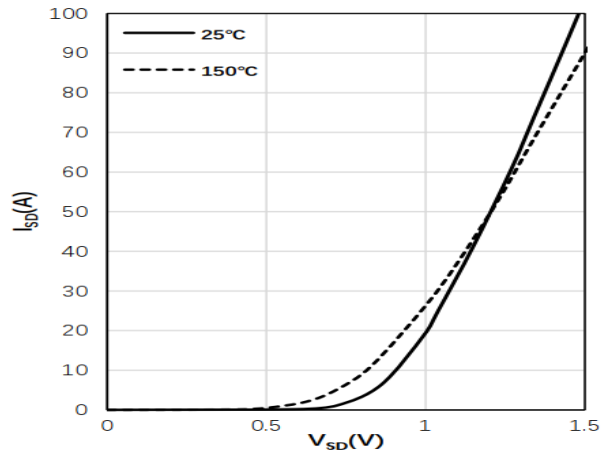


Fig 4 Body-Diode Characteristics

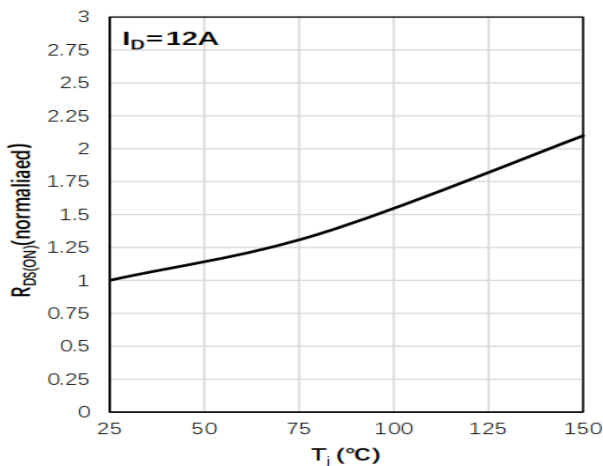


Fig 5 Normalized On-Resistance vs. Junction Temperature

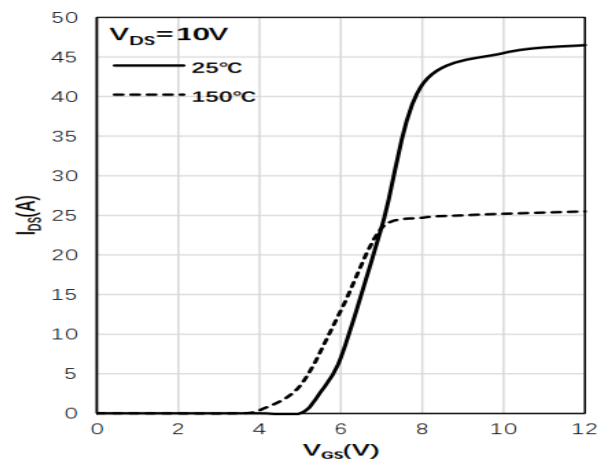


Fig 6 Transfer Characteristics

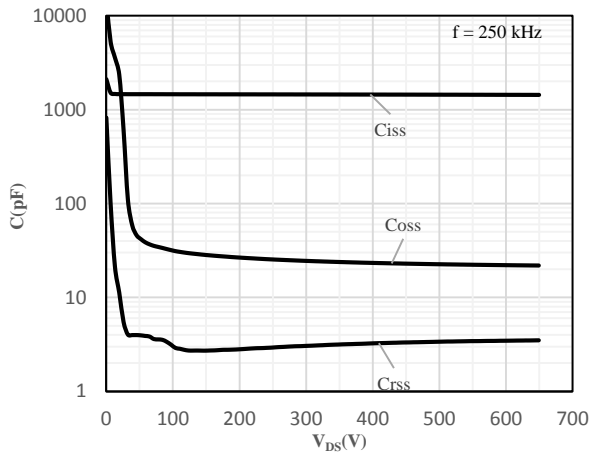


Fig 7 Capacitance Characteristics

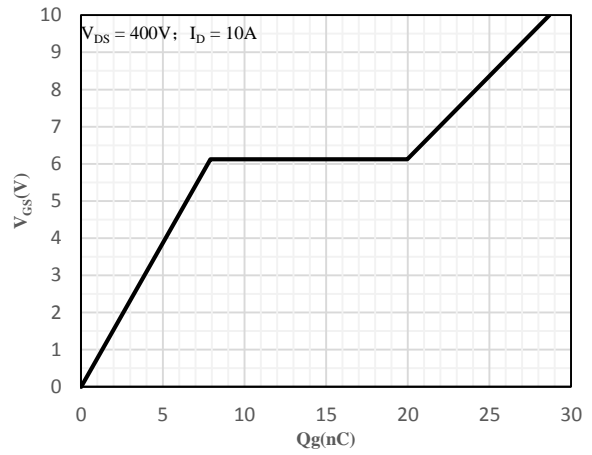


Fig 8 Gate-Charge Characteristics

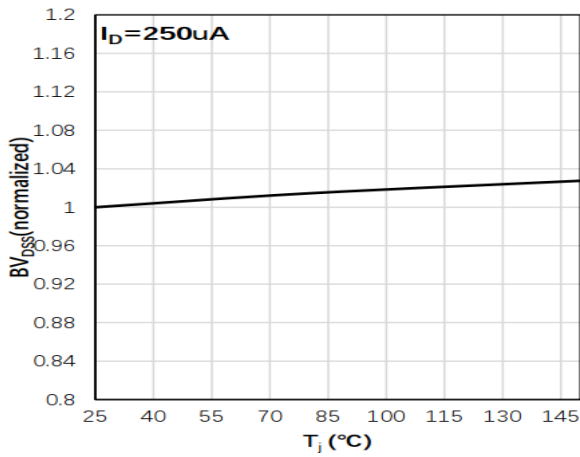


Fig 9 Normalized Breakdown Voltage vs. Junction Temperature

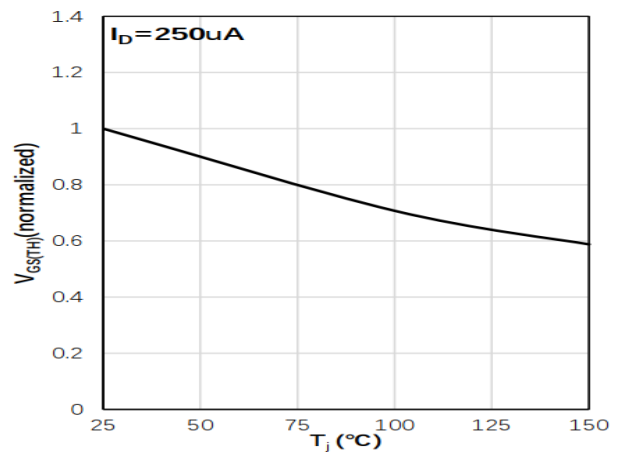
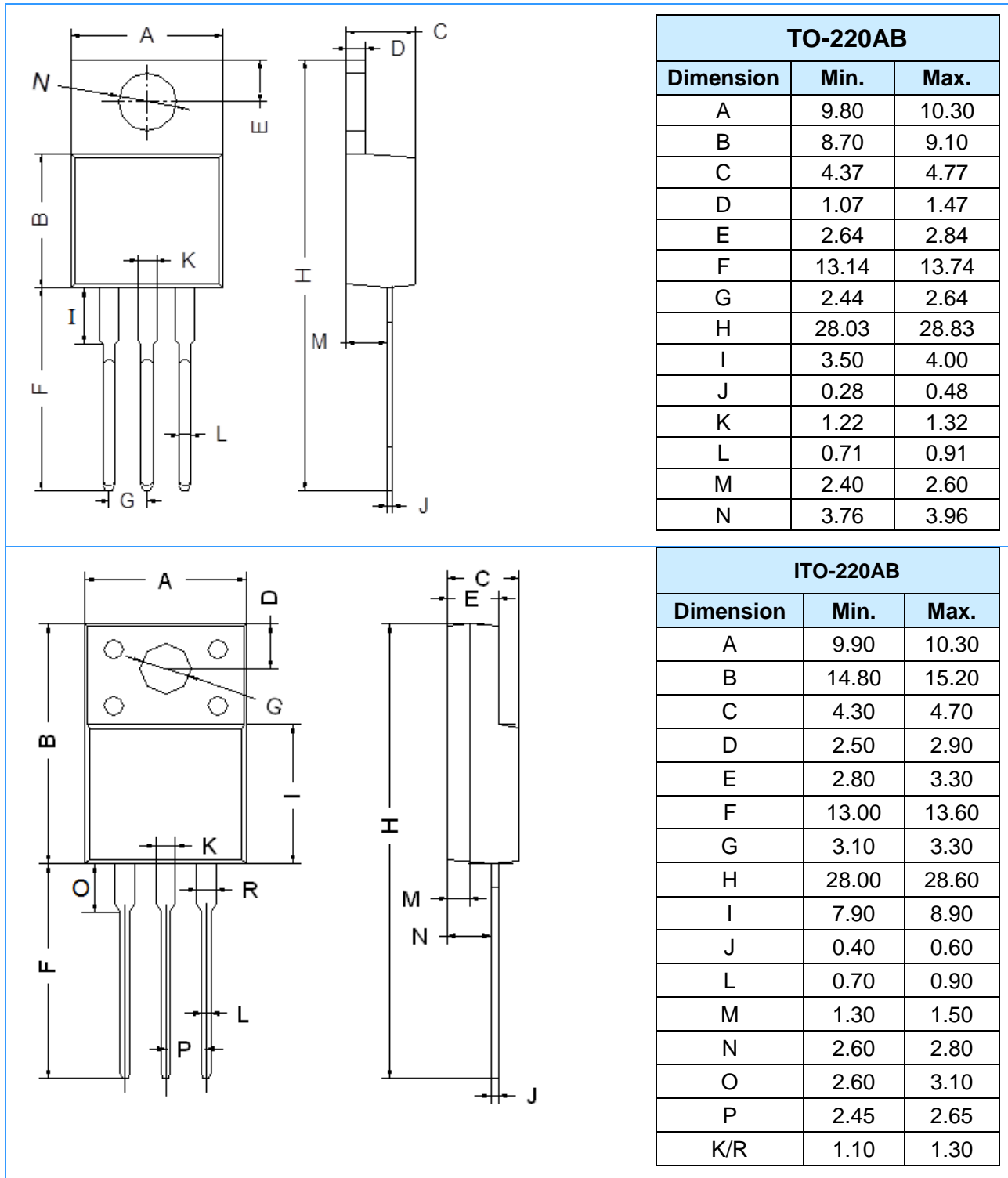
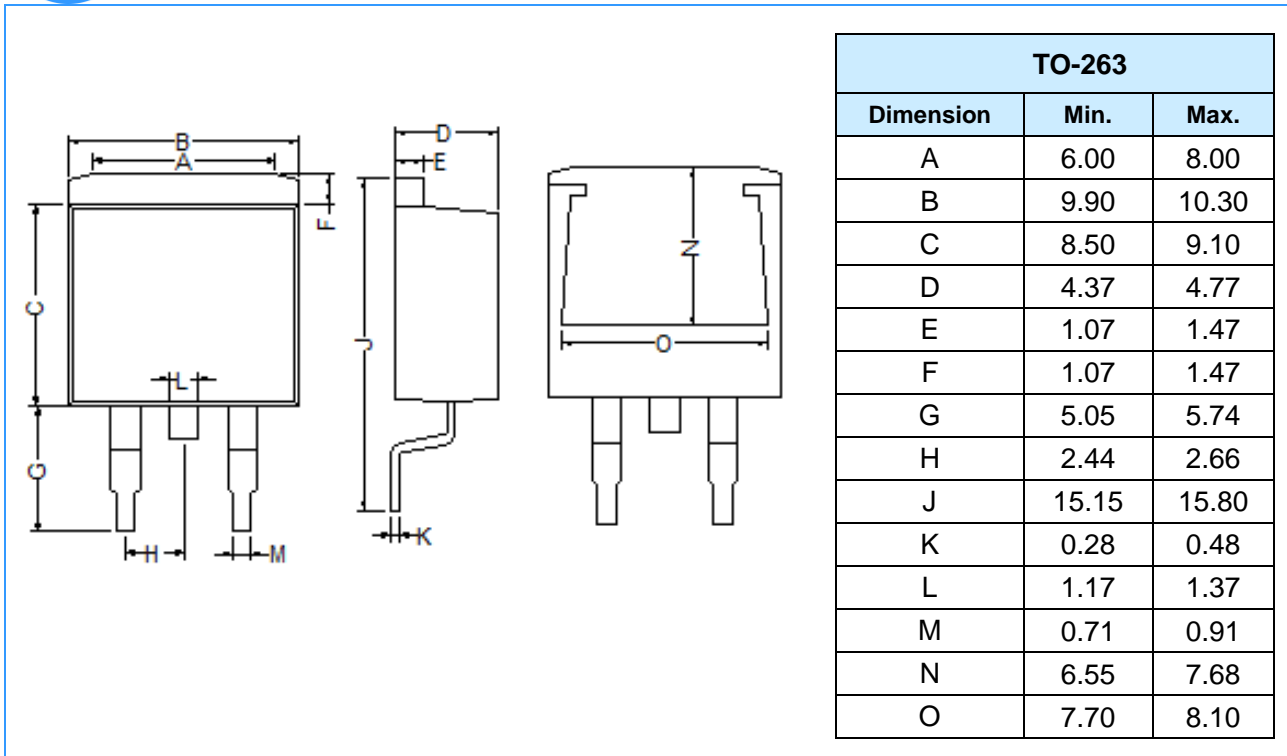


Fig 10 Normalized $V_{GS(th)}$ vs. Junction Temperature

Package Outline Dimensions (Unit: mm)





Mounting Pad Layout (Unit: mm)

