

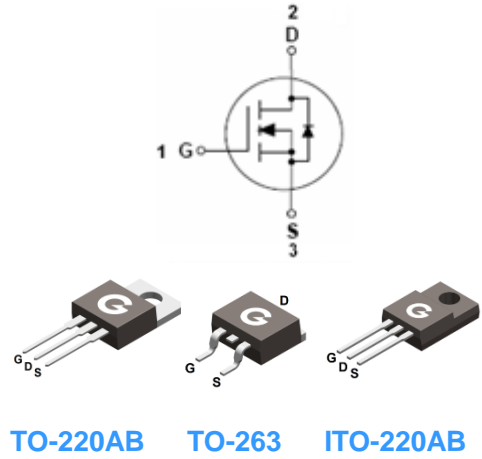
### Features

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

HF

### 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



### Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
SJM65R190X	TO-220AB	50 pcs / Tube	SJM65R190X
SJM65R190XB	TO-263	50 pcs / Tube or 800 pcs / Tape & Reel	SJM65R190XB
SJM65R190XF	ITO-220AB	50 pcs / Tube	SJM65R190XF

### Maximum Ratings (@ T<sub>C</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	650	V
Gate-to-Source Voltage	V <sub>GSS</sub>	±30	V
Continuous Drain Current (T <sub>C</sub> = 25°C)	I <sub>D</sub>	21	A
Continuous Drain Current (T <sub>C</sub> = 100°C)		13	A
Pulsed Drain Current (t <sub>p</sub> = 10μs, T <sub>C</sub> = 25°C)	I <sub>DM</sub>	84	A
Single Pulse Avalanche Energy <sup>2</sup>	E <sub>AS</sub>	500	mJ
Power Dissipation (TO-220AB, T <sub>C</sub> = 25°C)	P <sub>D</sub>	208	W
Power Dissipation (TO-263, T <sub>C</sub> = 25°C)		208	W
Power Dissipation (ITO-220AB, T <sub>C</sub> = 25°C)		36	W
Operating Junction Temperature Range	T <sub>J</sub>	-55 ~ +150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ +150	°C

### Thermal Characteristics

Parameter	Symbol	TO-220AB/TO-263	ITO-220AB	Unit
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	0.6	3.5	°C/W
Thermal Resistance Junction-to-Air	R <sub>θJA</sub>	62	75	°C/W

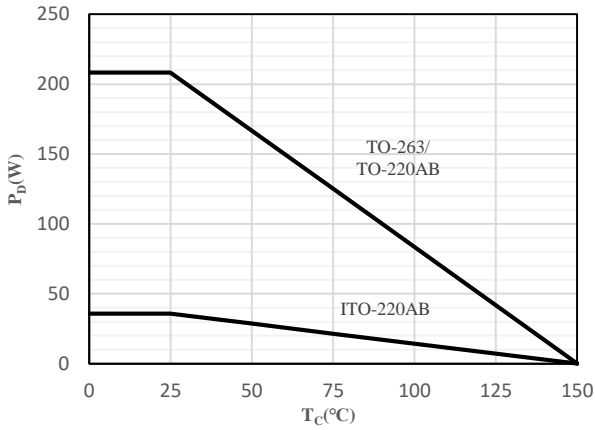
### Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
$V_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	650	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	-	-	1	$\mu A$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$R_{DS(ON)}$	Drain-Source On-resistance *1	$V_{GS} = 10V, I_D = 10A$	-	0.14	0.19	$\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5	3.5	4.5	V
$R_G$	Gate Resistance	$V_{GS} = 0V, f = 1MHz$	-	1.3	-	$\Omega$
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 40V$ $f = 250kHz$	-	1450	-	$\mu F$
$C_{OSS}$	Output Capacitance		-	365	-	
$C_{RSS}$	Reverse Transfer Capacitance		-	5.6	-	
<b>Switching Characteristics</b>						
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD} = 480V$ $V_{GS} = 15V$ $I_D = 10A$ $R_G = 3.3\Omega$	-	26	-	ns
$t_r$	Turn-on Rise Time		-	37	-	
$t_{d(OFF)}$	Turn-Off Delay Time		-	52	-	
$t_f$	Turn-Off Fall Time		-	32	-	
$Q_G$	Total Gate-Charge	$V_{DD} = 480V$ $V_{GS} = 10V$ $I_D = 10A$	-	41.4	-	nC
$Q_{GS}$	Gate to Source Charge		-	9.2	-	
$Q_{GD}$	Gate to Drain (Miller) Charge		-	24	-	
<b>Source-Drain Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage *1	$I_{SD} = 10A, V_{GS} = 0V$	-	0.83	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 10A, V_R = 30V$ $di/dt = 100A/\mu s$	-	330	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	4.2	-	$\mu C$

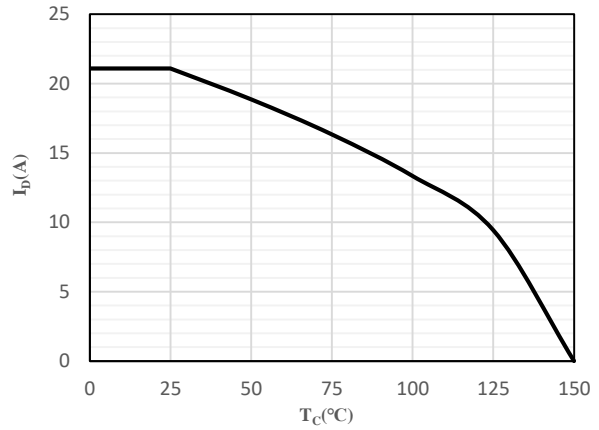
Notes:

- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The  $E_{AS}$  data shows Max. rating. The test condition is  $V_{DD} = 100V, V_{GS} = 15V, L = 50mH$

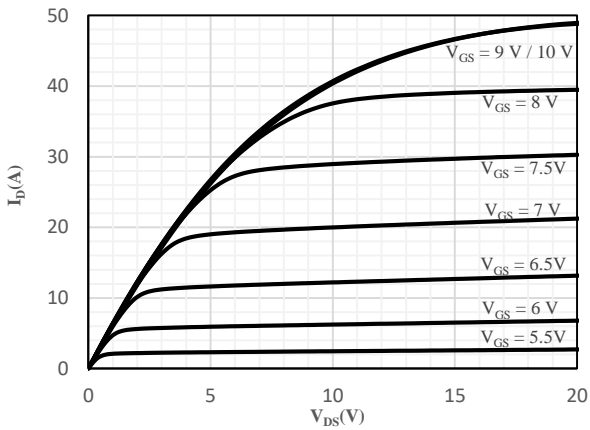
**Ratings and Characteristics Curves** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



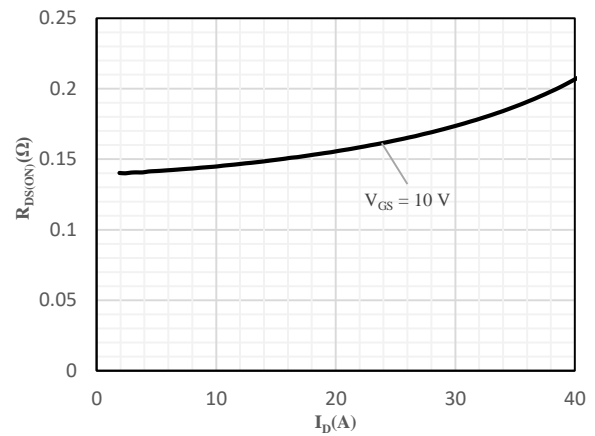
**Fig 1 Power Dissipation**



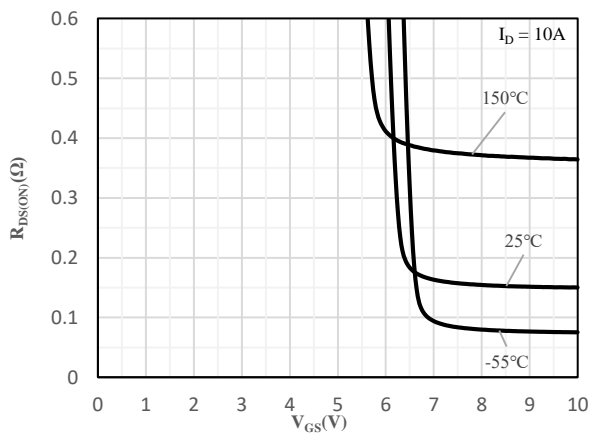
**Fig 2 Drain Current**



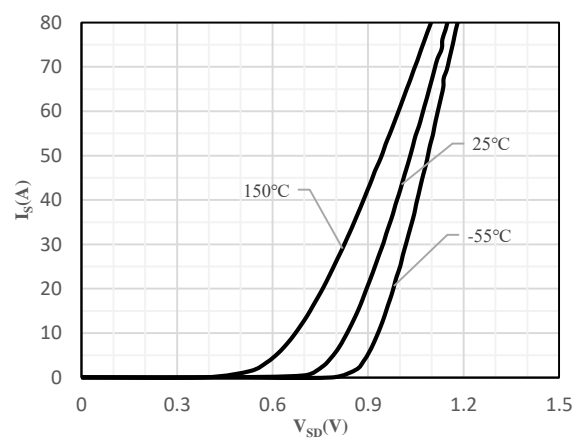
**Fig 3 Typical Output Characteristics**



**Fig 4 On-Resistance vs. Drain Current and Gate Voltage**



**Fig 5 On-Resistance vs. Gate-Source Voltage**



**Fig 6 Body-Diode Characteristics**

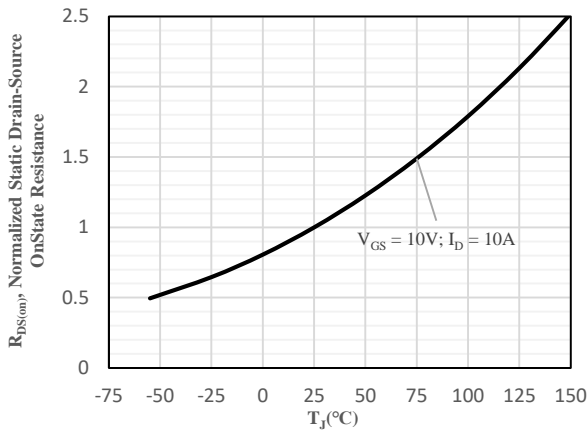


Fig 7 Normalized On-Resistance vs. Junction Temperature

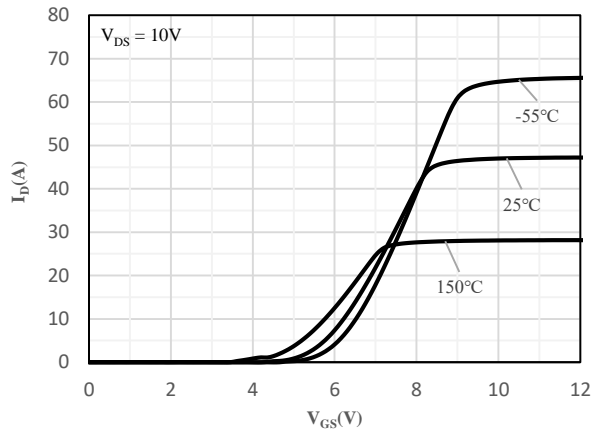


Fig 8 Transfer Characteristics

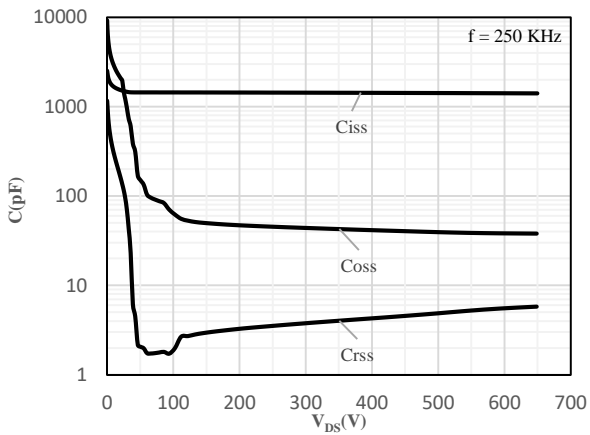


Fig 9 Capacitance Characteristics

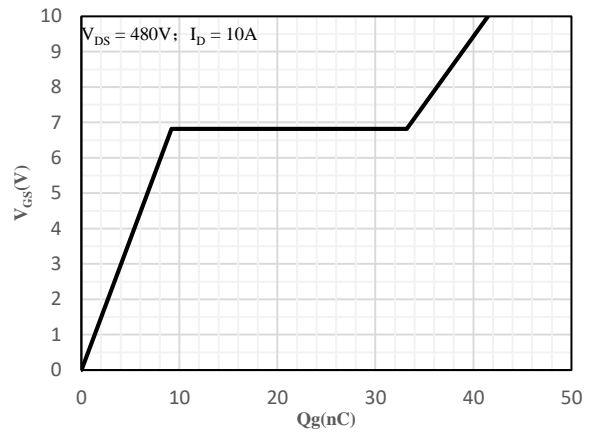


Fig 10 Gate-Charge Characteristics

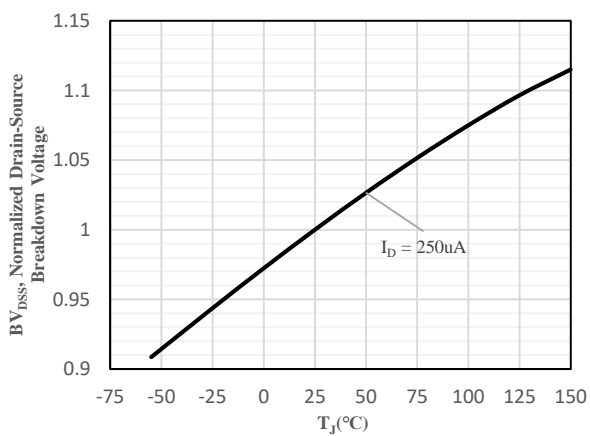


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

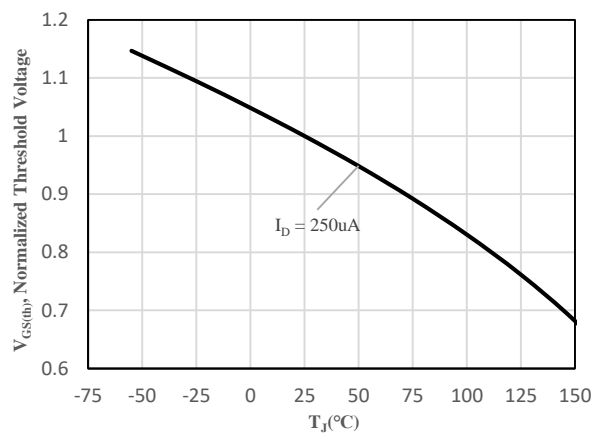
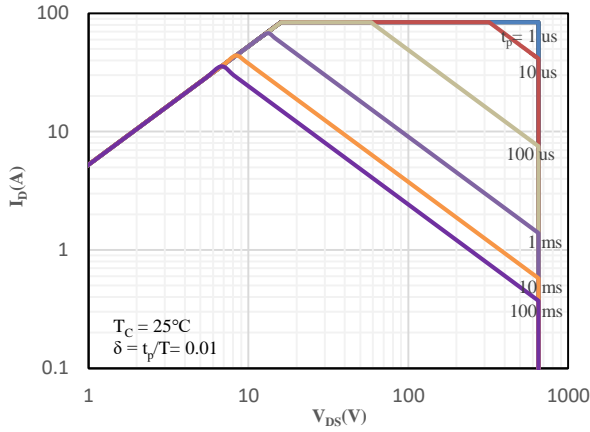
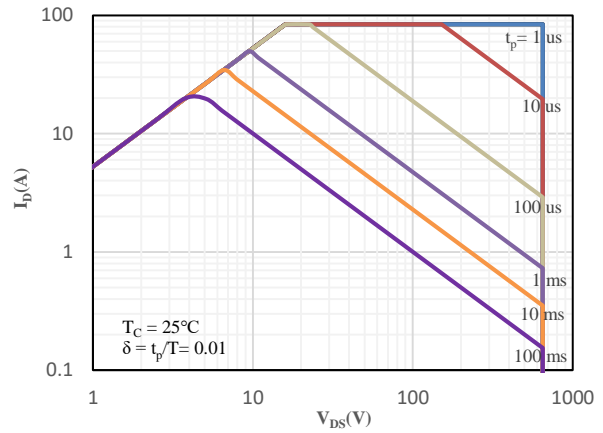


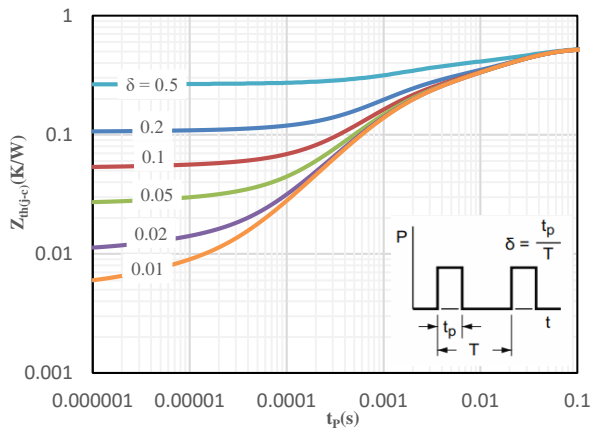
Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature



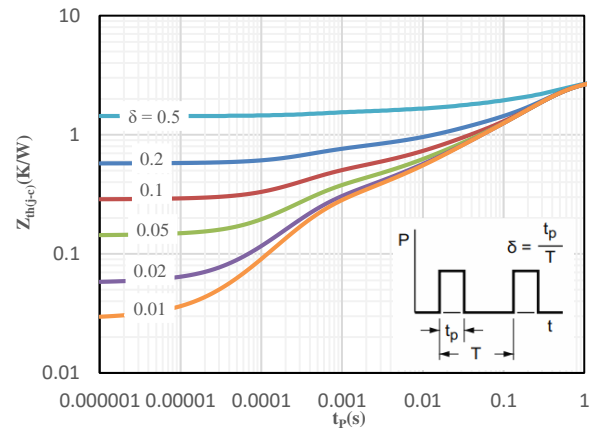
**Fig 13 Safe Operation Area (TO-220AB / TO-263)**



**Fig 14 Safe Operation Area (ITO-220AB)**

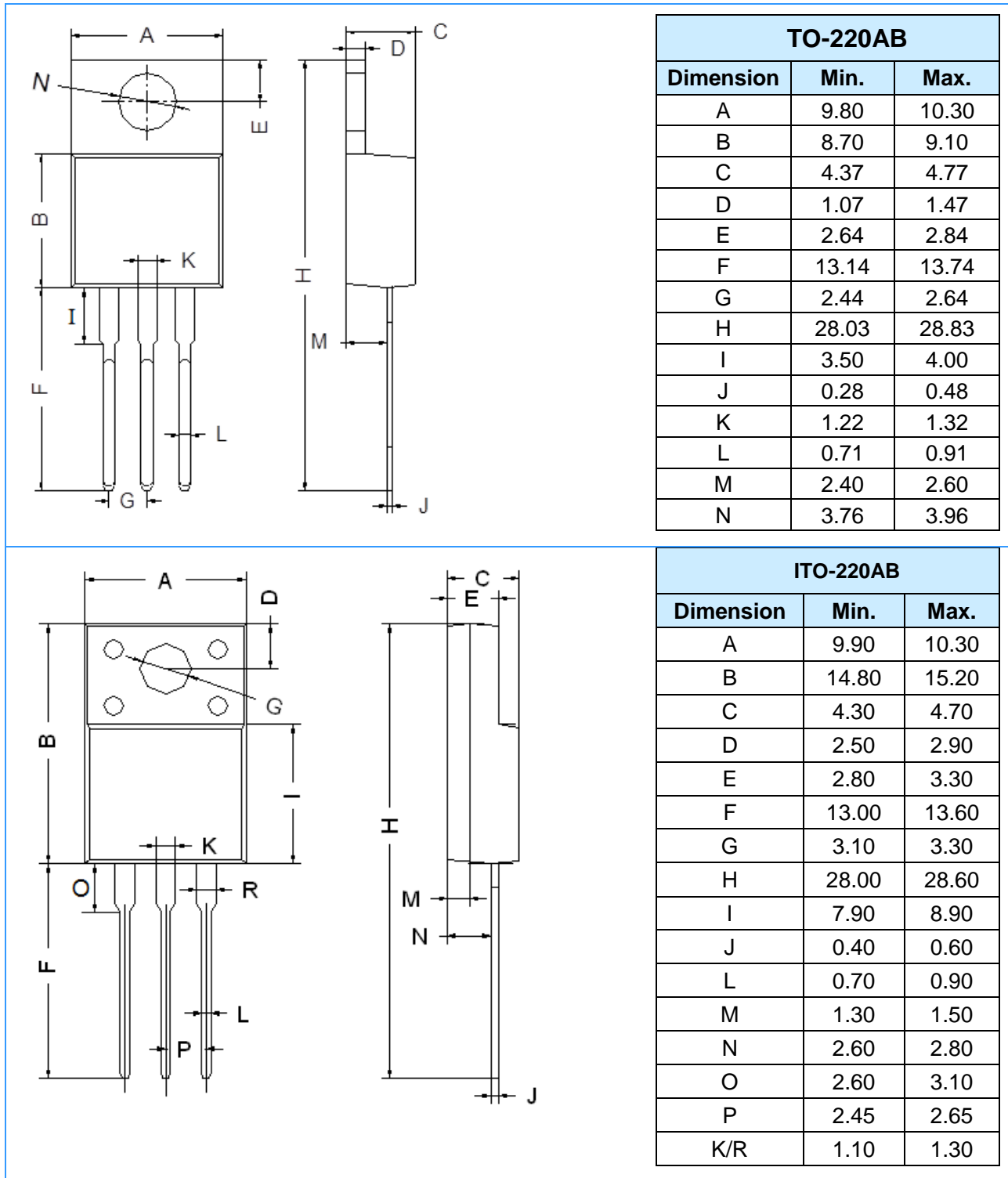


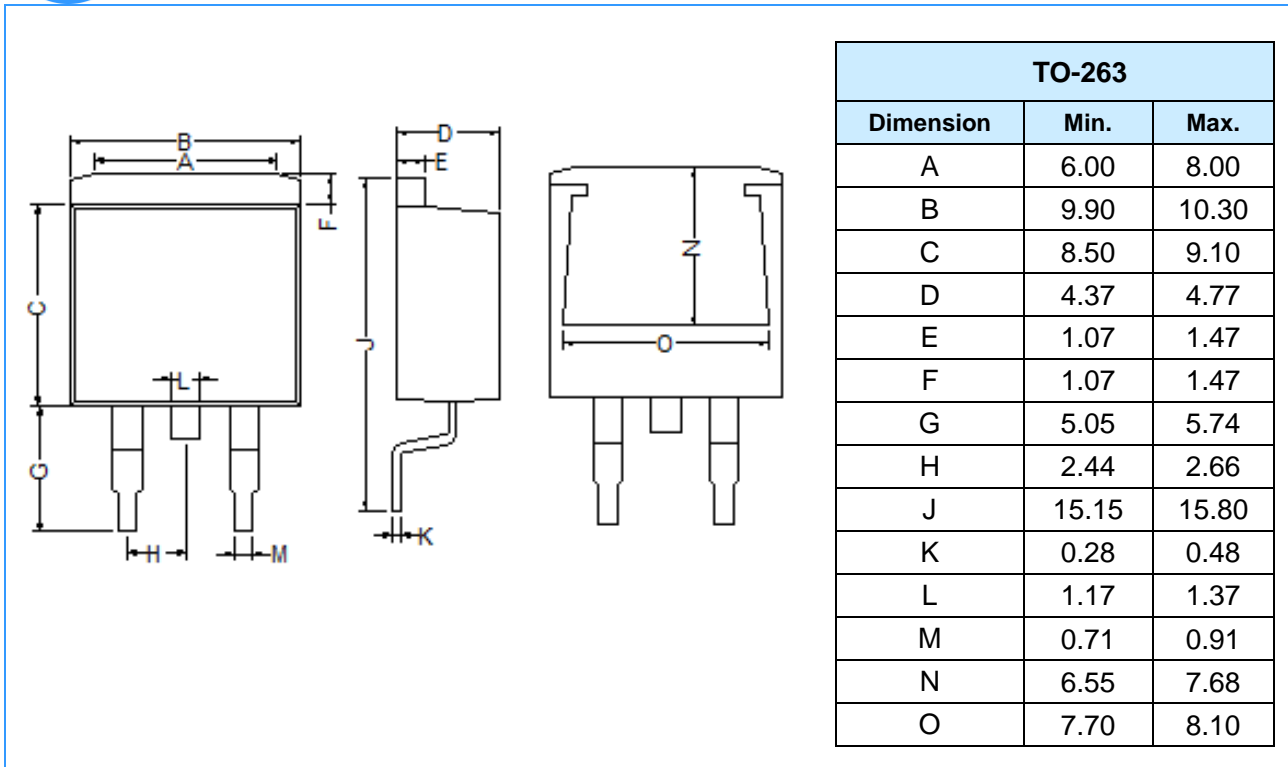
**Fig 15 Maximum transient thermal impedance (TO-220AB / TO-263)**



**Fig 16 Maximum transient thermal impedance (ITO-220AB)**

### Package Outline Dimensions (Unit: mm)





**Mounting Pad Layout** (Unit: mm)

