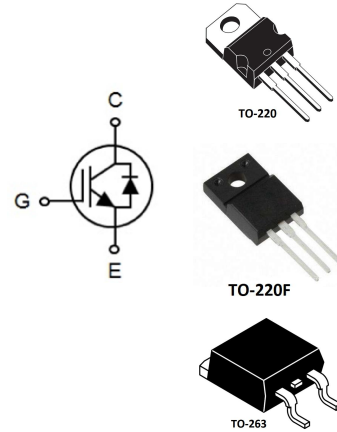


Feature

- High ruggedness for motor control
- VCE(sat) positive temperature coefficient
- Very soft, fast recovery anti-parallel diode
- Low EMI
- Maximum junction temperature 175°C



Applications

- Inverter for motor control

Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector-emitter voltage	V_{CE}	650	V
DC collector current, limited by T_{vjmax}	I_C	$T_C=25^{\circ}C$ 30	A
		$T_C=100^{\circ}C$ 15	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	60	A
Diode forward current, limited by T_{vjmax}	I_F	$T_C=25^{\circ}C$ 30	A
		$T_C=100^{\circ}C$ 15	
Gate-emitter voltage	V_{GE}	± 20	V
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	60	A
Power dissipation (TO-220/TO-263)	P_D	182	W
Power dissipation (TO-220F)	P_D	48	W
Short circuit withstand time $V_{CC} \leq 360V$, $V_{GE} = 15V$, $T_{vj} = 150^{\circ}C$	t_{sc}	5	μs
Operating Junction temperature range	T_{vj}	-40~175	$^{\circ}C$
Storage temperature range	T_{stg}	-55~150	$^{\circ}C$

Thermal Characteristics

Parameter	Symbol	Rating		Unit
		MSG15T65FL	MSG15T65FLT/ MSG15T65FLE	
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	62	62.5	$^{\circ}C/W$
Thermal resistance junction-to-case for IGBT	$R_{th(j-c)}$	3.1	0.77	
Thermal resistance junction-to-case for Diode	$R_{th(j-a)}$	5.2	2.05	

Electrical Characteristics (T_{vj} = 25°C unless otherwise specified)

Static Characteristics

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Collector-emitter breakdown voltage	V _{(BR)CES}	V _{GE} =0V, I _C =2mA		650	-	-	V
Collector-emitter saturation voltage	V _{CE(sat)}	V _{GE} =15V, I _C =15A	T _j =25℃	-	1.8	2.20	V
			T _j =150℃	-	2.1	-	V
Diode forward voltage	V _F	V _{GE} =0V, I _F =15A	T _j =25℃	-	1.85	2.10	V
			T _j =150℃	-	1.6	-	V
Gate-emitter threshold voltage	V _{GE(th)}	I _C =0.5mA, V _{CE} =V _{GE}		4.5	5.5	6.5	V
Zero gate voltage collector current	I _{CES}	V _{CE} =650V, V _{GE} =0V	T _j =25℃	-	-	20	μA
			T _j =150℃	-	-	1	mA
Gate-emitter leakage current	I _{GES}	V _{CE} =0V, V _{GE} =20V		-	-	±200	nA

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C _{ies}	V _{CE} =25V V _{GE} =0V f=1MHz	-	652	-	pF
Output capacitance	C _{oes}		-	64	-	
Reverse transfer capacitance	C _{res}		-	23	-	
Total gate charge	Q _g	V _{CE} =400V, I _C =15A V _{GE} =15V	-	25	-	nC
Gate-emitter charge	Q _{ge}		-	9	-	nC
Gate-collector charge	Q _{gc}		-	10	-	nC

Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	t _{d(on)}	V _{GE} = 15V, V _{CC} = 400V, I _C = 15A, R _G = 10Ω, T _{vj} = 25°C Inductive Load	-	4	-	nS
Rise time	t _r		-	26	-	
Turn-off delay time	t _{d(off)}		-	26	-	
Fall time	t _f		-	80	-	
Turn-on switching energy	E _{on}		-	0.18	-	μJ
Turn-off switching energy	E _{off}		-	0.27	-	
Total switching energy	E _{ts}		-	0.45	-	

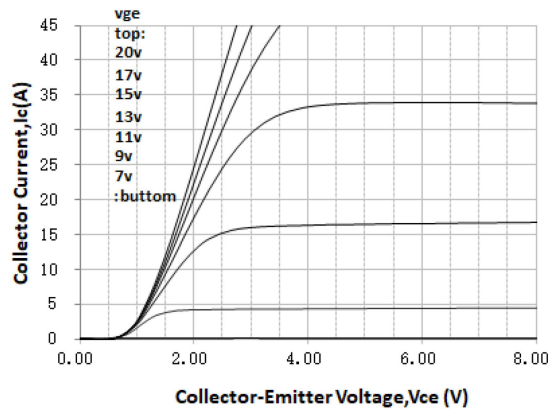
Turn-on delay time	td(on)	$V_{GE} = 15V, V_{CC} = 400V,$ $I_C = 15A, R_G = 10\Omega, T_{vj} = 175^\circ C$ Inductive Load	-	6	-	nS
Rise time	t _r		-	28	-	
Turn-off delay time	td(off)		-	28	-	
Fall time	t _f		-	134	-	
Turn-on switching energy	Eon		-	0.2	-	μJ
Turn-off switching energy	Eoff		-	0.4	-	
Total switching energy	Ets		-	0.6	-	
Reverse recovery time	trr	$T_j = 25^\circ C \quad I_F = 15A$ $di_F/dt = 200A/\mu s$	-	40	-	nS
Reverse recovery charge	Qrr		-	20	-	nC
Reverse recovery current	Irrm		-	1	-	A
Reverse recovery time	trr	$T_j = 175^\circ C \quad I_F = 15A$ $di_F/dt = 200A/\mu s$	-	180	-	nS
Reverse recovery charge	Qrr		-	260	-	nC
Reverse recovery current	Irrm		-	2.5	-	A

Order Message

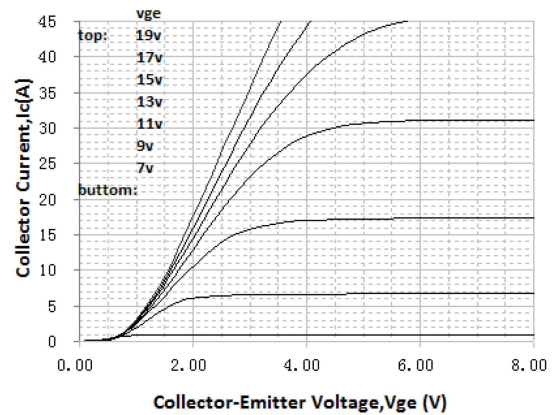
Order codes	Package	Packaging
MSG15T65FL	TO-220F	Tube
MSG15T65FLT	TO-220	Tube
MSG15T65FLE	TO-263	Tube

Electrical Characteristics

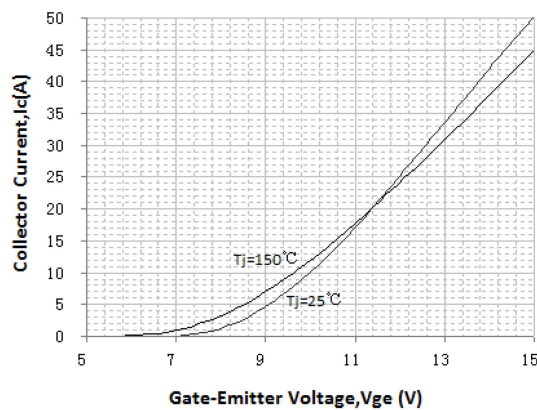
Output Characteristics (25°C)



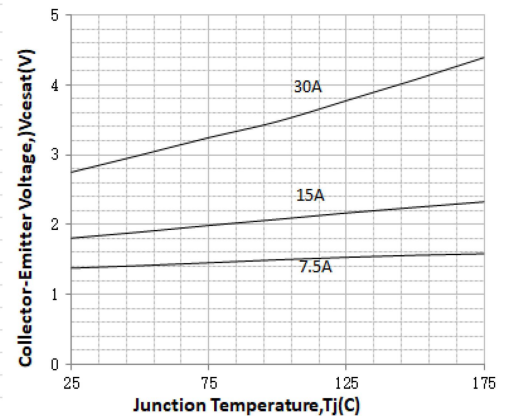
Output Characteristics (175°C)



Transfer Characteristics

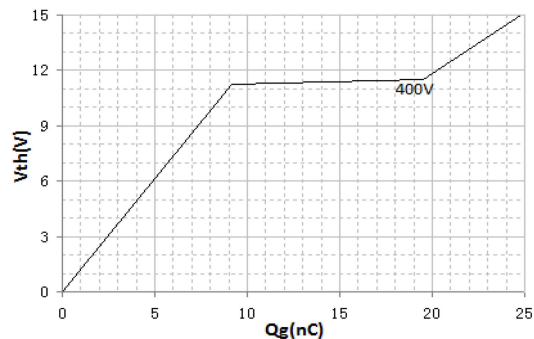


Vcesat vs. Tj



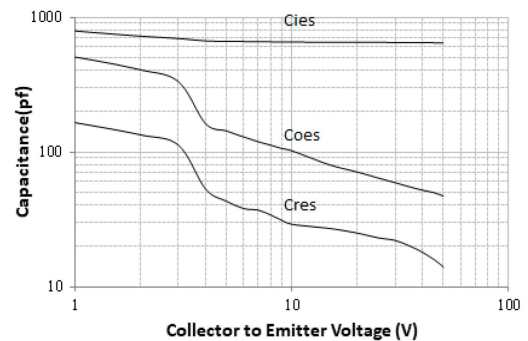
Gate Charge Characteristics

$V_{GE}=15\text{V}$, $V_{CC}=400\text{V}$, $I_C=15\text{A}$



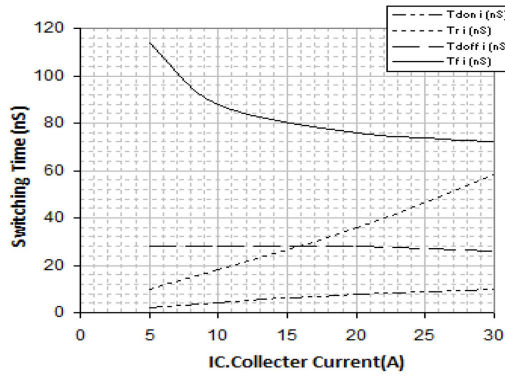
Capacitance Characteristic

$V_{GE}=0\text{V}$, $f=1.0\text{MHz}$



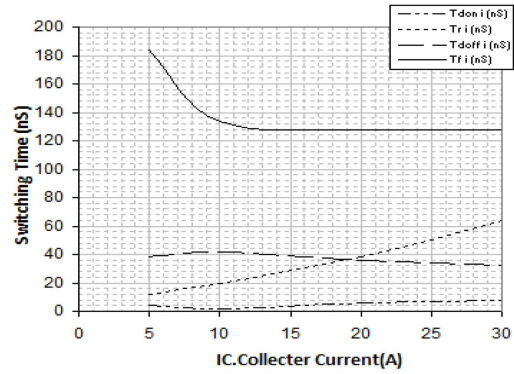
Switching Time vs. IC(25°C)

VCE=400V, VGE=15V, Rg=10Ω



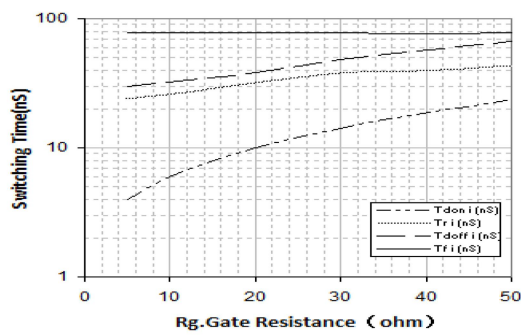
Switching Time vs. IC(150°C)

VCE=400V, VGE=15V, Rg=10Ω



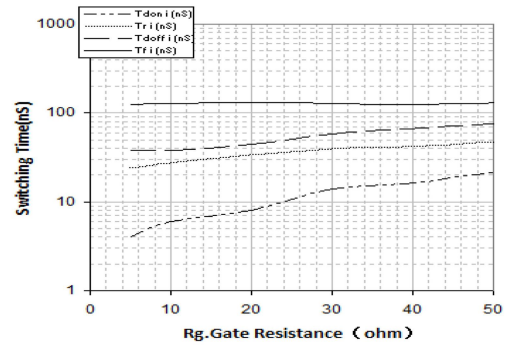
Switching Time vs. Rg(25°C)

VGE=15V, VCE=400V, IC=15A



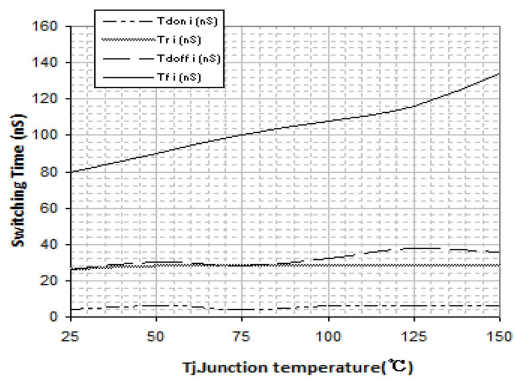
Switching Time vs. Rg(150°C)

VGE=15V, VCE=400V, IC=15A



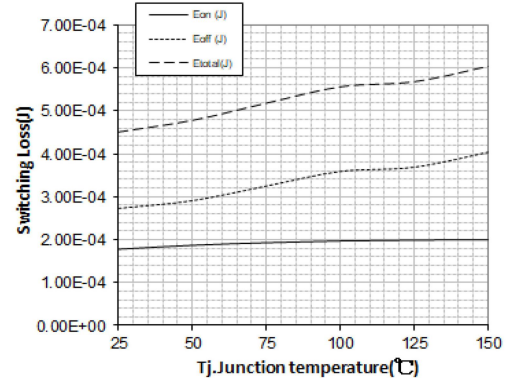
Switching Time vs. Tj

VGE=15V, VCE=400V, IC=15A, Rg=10Ω



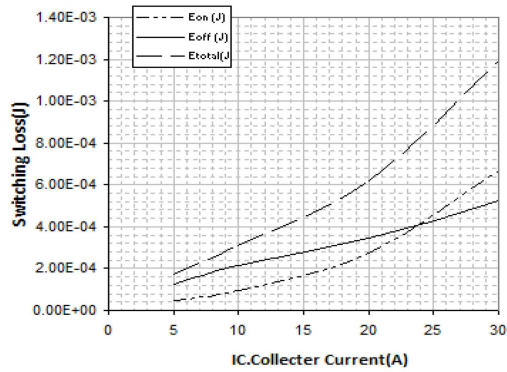
Switching Loss vs. Tj

VGE=15V, VCE=400V, IC=15A, Rg=10Ω



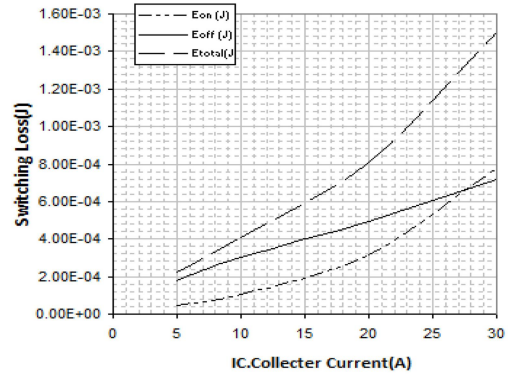
Switching Loss vs. IC(25°C)

VGE=15V, VCE=400V, Rg=10Ω



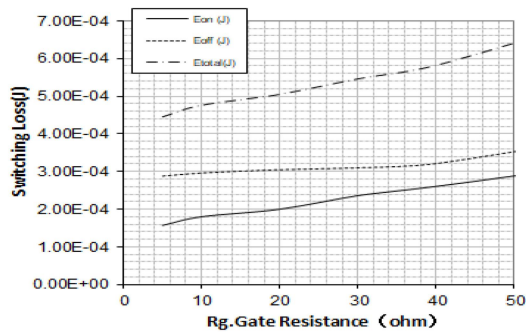
Switching Loss vs. IC(150°C)

VGE=15V, VCE=400V, Rg=10Ω



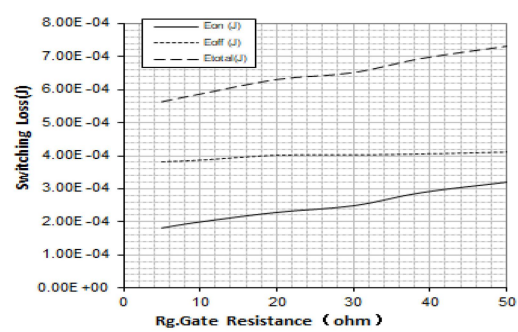
Switching Loss vs. Rg(25°C)

VGE=15V, VCE=400V, IC=15A

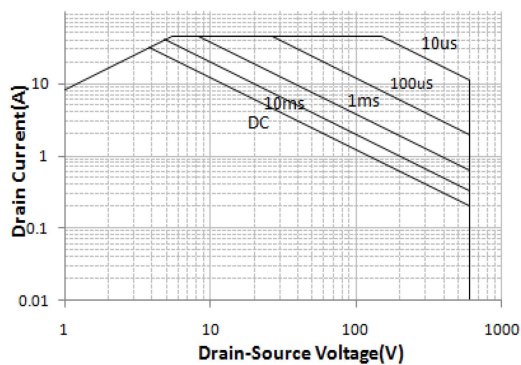


Switching Loss vs. Rg(150°C)

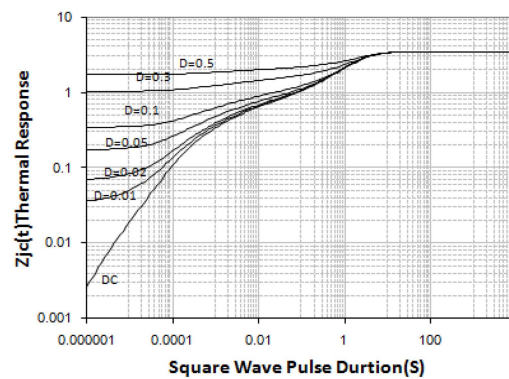
VGE=15V, VCE=400V, IC=15A



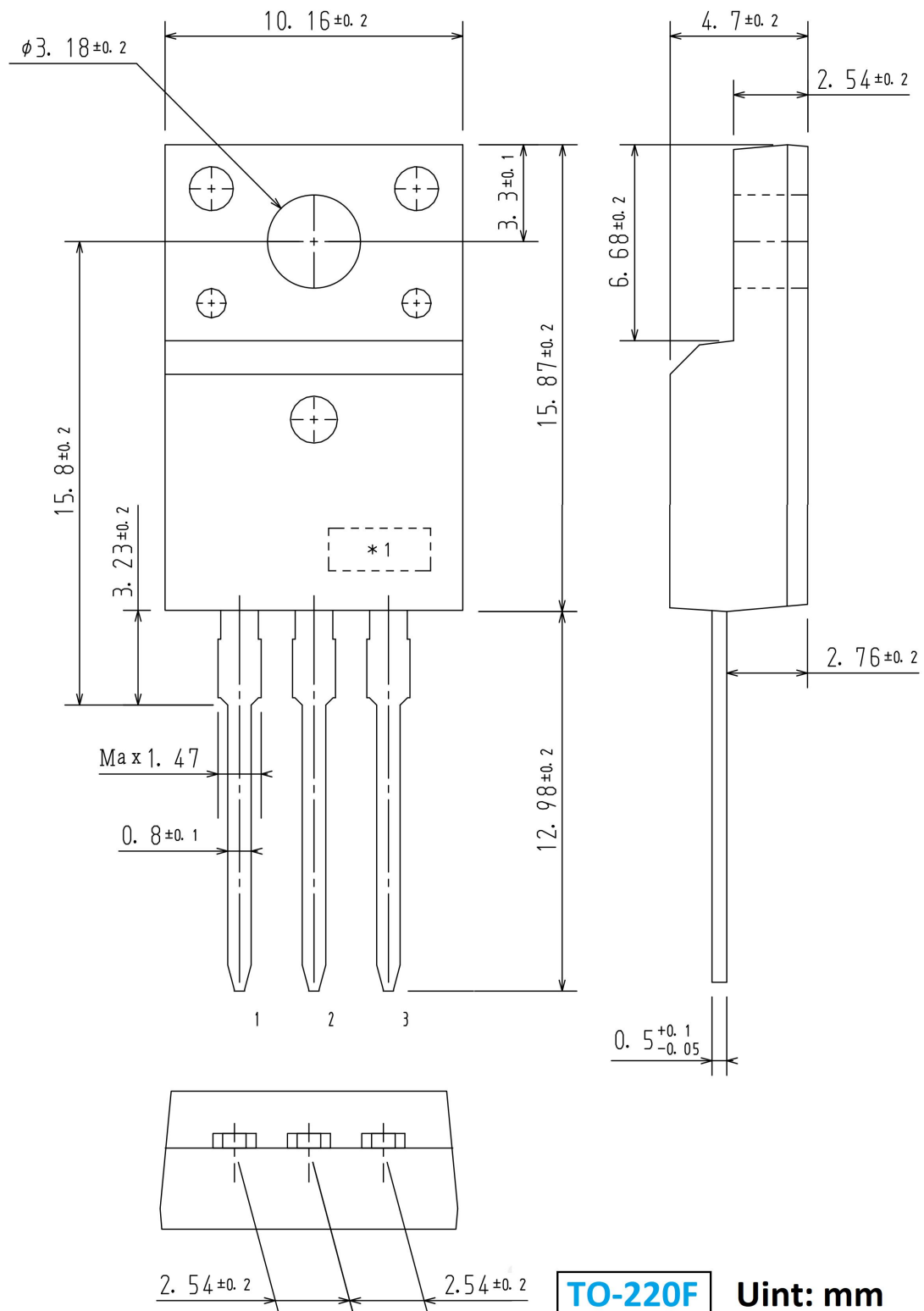
Forward Bias SOA

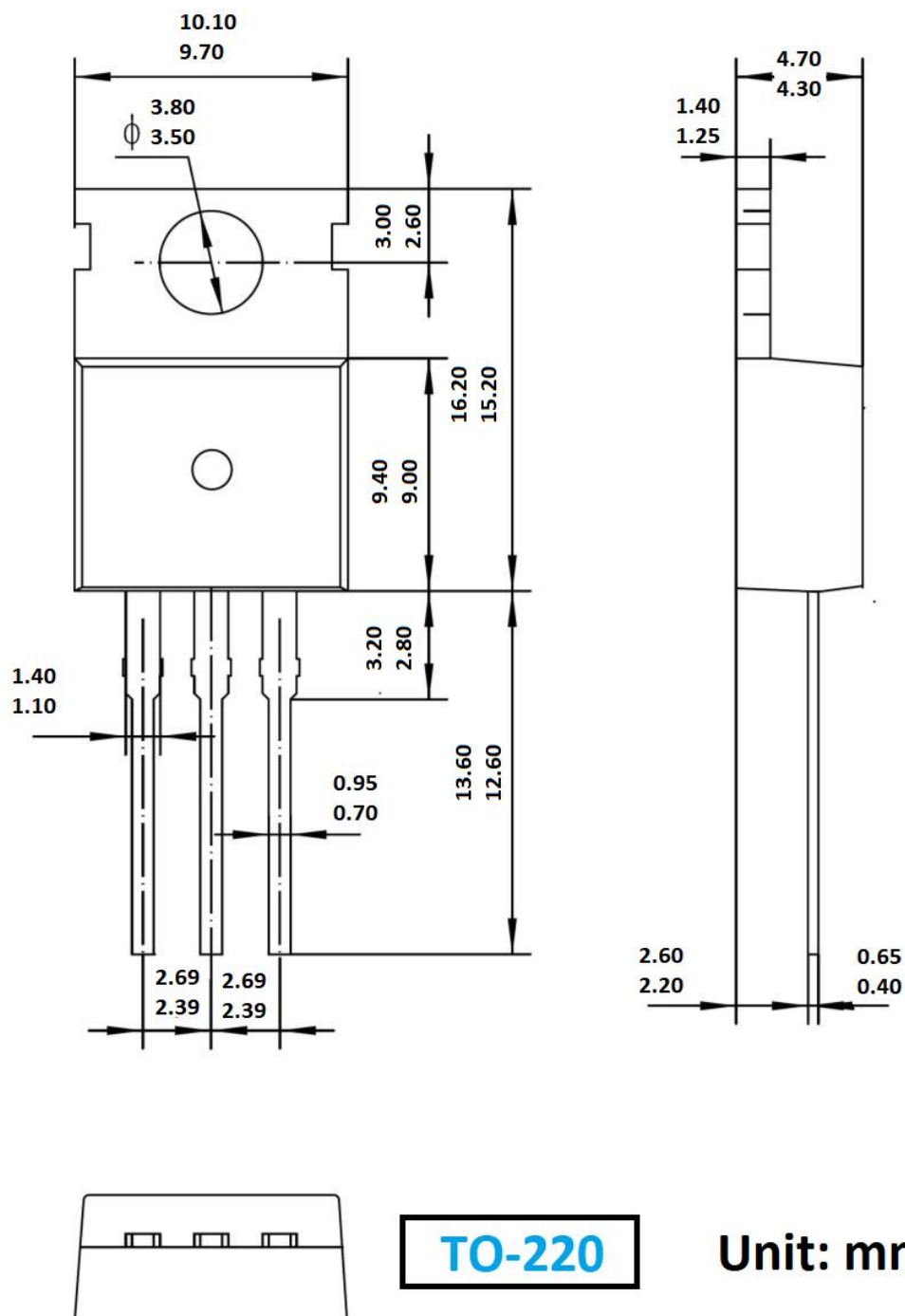


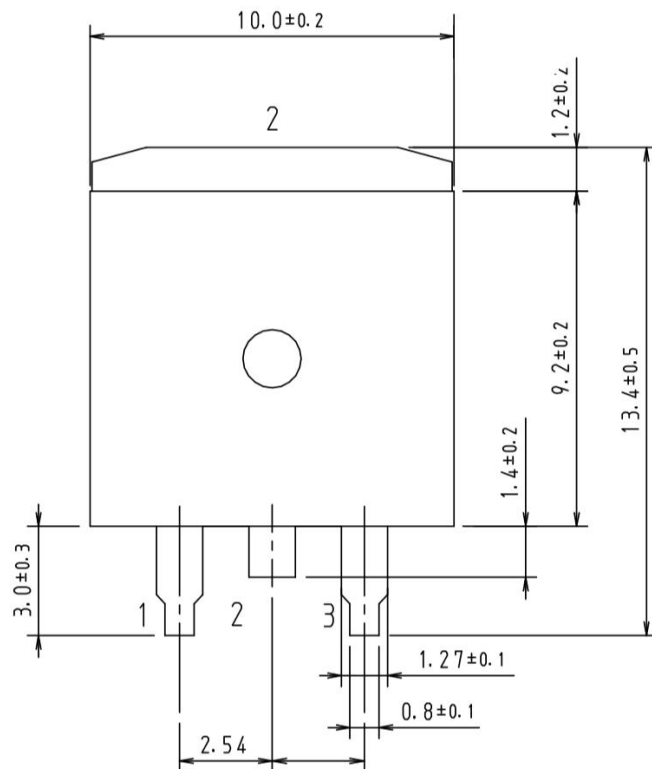
Normalized Maximum Transient Thermal Impedance for IGBT(RJC)



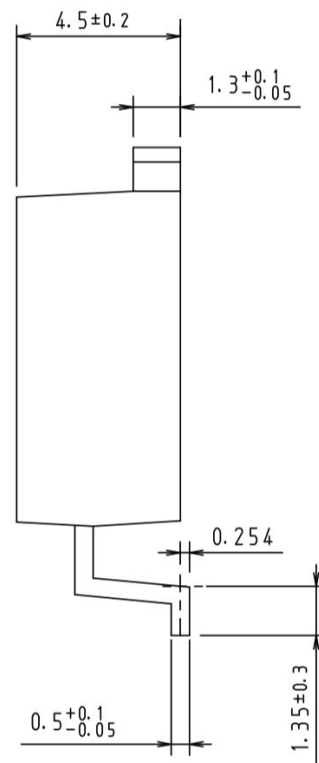
Package outline dimension







TO-263



Unit:mm