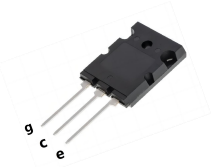
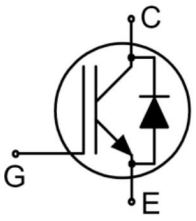
Features

- Very Low Saturation Voltage:
  VCE(sat) = 1.70V @ IC = 200 A
- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Co−Efficient
- Tight Parameter Distribution
- High Input Impedance



Applications

- Traction Inverter for HEV/EV
- Auxiliary DC/AC Converter
- Motor Drives
- Other Power−Train Applications
  Requiring High Power Switch



Absolute Ratings(Tc=25℃)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{ce}	650	V
Collector Current-continuous	I_C T=25℃	400	A
	T=100℃	200	A
Diode forward current	I_F T=25℃	400	A
	Tc=100℃	200	A
Collector Current-pulse (note 1)	I_{CM}	600	A
Gate-Emitter Voltage	V_{GES}	±20	V
Power Dissipation(TO-264)	PD	625	W
Power Dissipation(TO-247Plus)	PD	882	W
Operating Temperature Range	T_J	-40~+175	℃
Storage Temperature Range	T_{STG}	-55~+150	
Short Circuit Withstand Time(note 2)	t_{sc}	5	us
Maximum Lead Temperature for Soldering Purposes	T_L	260	℃
Isolation Voltage for Case-Terminal	V_{ISO}	2.5	KV

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Off-Characteristics						
Collector-Emitter Voltage	BV_{CES}	Ic=1.6mA,V_{GE}=0V	650	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=650V,V_{GE}=0V, Tc=25℃	-	-	2	μA
Gate-body leakage current, forward	I_{GESF}	V_{CE}=0V,V_{GE}=20V	-	-	100	nA
Gate-body leakage current, reverse	I_{GESR}	V_{CE}=0V,V_{GE}=-20V	-	-	-100	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE}=V_{GE},Ic=250μA	3.5	5.0	6.5	V
Collector-Emitter saturation Voltage	V_{CESAT}	V_{GE}=15V Ic=200A	-	1.7	1.9	V
Dynamic Characteristics						
Input capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V, f=1.0MHZ	-	5012	-	pF
Output capacitance	C_{oes}		-	430	-	pF
Reverse transfer capacitance	C_{res}		-	100	-	pF
Transconductance	g_{fs}	IC=60A,VCE=10V (Note 3)	30	50	-	S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 600 V, V_{GE} = 15 V, t_{SC} ≤ 5μs(Note 4)	-	1200	-	A

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,Ic=200A, R_G=4.7Ω，V_{GE}=15V, Inductive Load Tc=25℃	-	84	-	ns
Turn-On rise time	tr		-	147	-	ns
Turn-Off delay time	$t_{d(off)}$		-	216	-	ns
Turn-Off Fall time	t_f		-	133	-	ns
Turn-on Loss	E_{on}		-	5.4	-	mJ
Turn-off Loss	E_{off}		-	3.8	-	mJ
Total Loss	E_{ts}		-	9.2	-	mJ
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,Ic=200A, R_G=4.7Ω，V_{GE}=15V,	-	80	-	ns
Turn-On rise time	tr		-	160	-	ns

Turn-Off delay time	$t_{d(off)}$	Inductive Load Tc=150℃	-	244	-	ns
Turn-Off Fall time	t_f		-	166	-	ns
Turn-on switching Loss	E_{on}		-	9.7	-	mJ
Turn-off switching Loss	E_{off}		-	5.2	-	mJ
Total switching Loss	E_{ts}		-	14.9	-	mJ
Gate Charge	Qg	V_{CC}=400V,Ic=100A V_{GE}=15V	-	157	-	nC
Gate to Emitter Charge	Qge		-	43	-	nC
Gate to Collector Charge	Qgc		-	64	-	nC
Anti-Parallel Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_F	I_F=200A(T_J=25℃)	-	1.8	2.0	V
Diode Reverse recovery time	t_{rr}	I_F=200A dI_F=/dt=200A/us T_J=25℃	-	62	-	ns
Diode Reverse recovery charge	Q_{rr}		-	164	-	nC

Thermal Characteristic

Parameter	Symbol	Max		
		TO-247Plus	TO-264	Unit
Thermal Resistance,Junction to Case (IGBT)	Rth(j-c)	0.2		℃/W
Thermal Resistance,Junction to Case (Diode)	Rth(j-c)	0.4		℃/W
Thermal Resistance,Junction to Ambient	Rth(j-A)	25		℃/W

Notes:

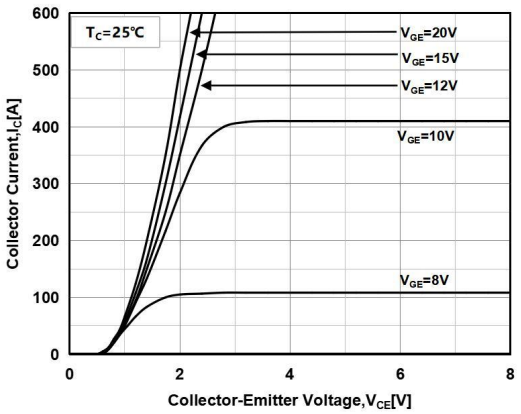
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. VGE=15V,VCE=360V,TJ=150℃，RG=10Ω，Non Repetitive
3. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G
4. Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s

Order Information

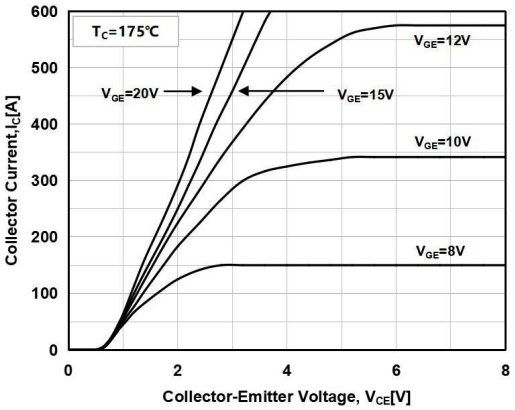
Type Specification	Packaging
MSG200T65HLC1	TO-247Plus
MSG200T65HLB3	TO-264

Electrical Characteristics(curves)

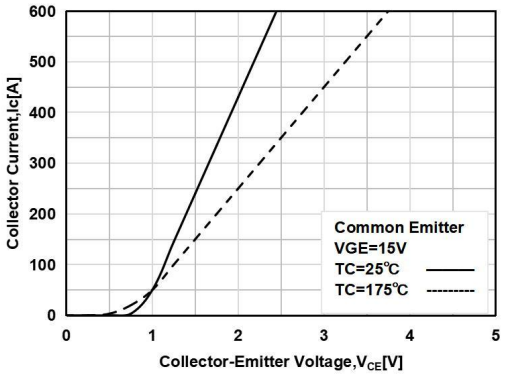
Typical Output Characteristics



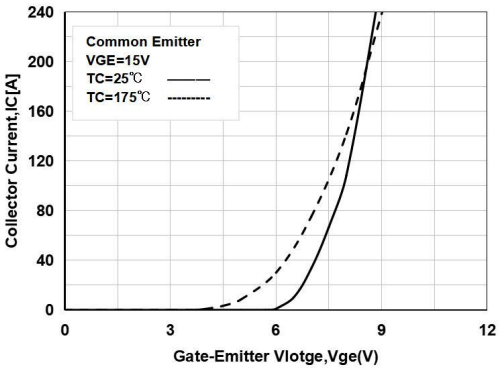
Typical Output Characteristics



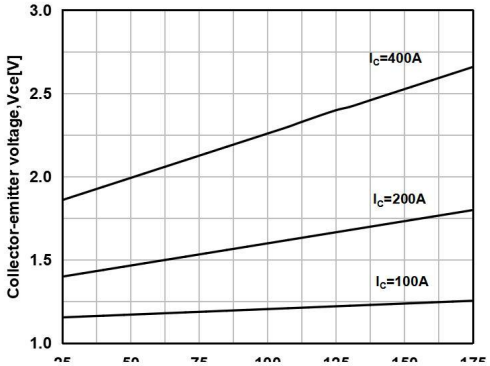
Typical Saturation Voltage Characteristics



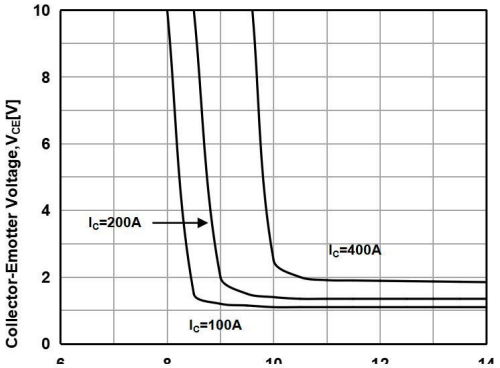
Transfer Characteristics



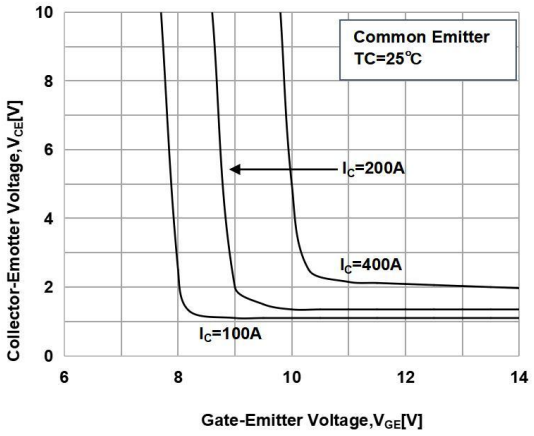
Saturation Voltage vs. Junction temperature at Variant Current Level



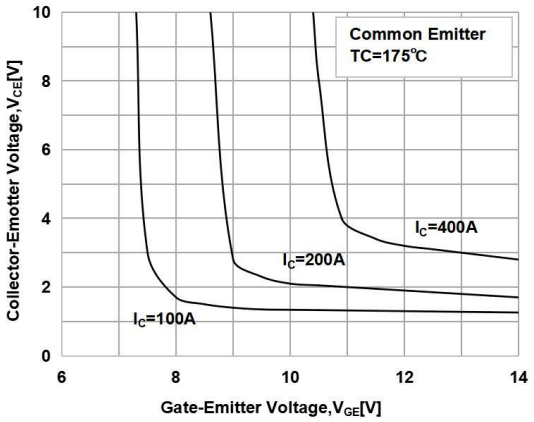
Saturation Voltage vs. V_{GE}



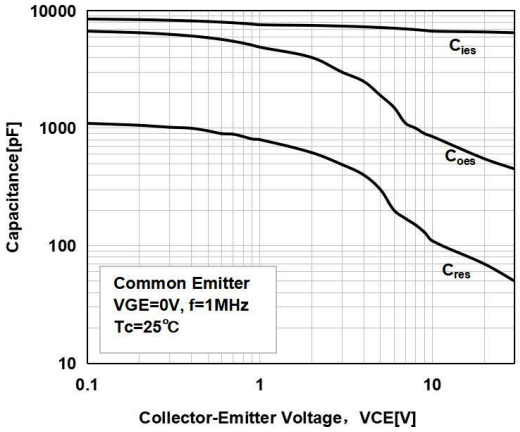
Saturation Voltage vs. V_{GE}



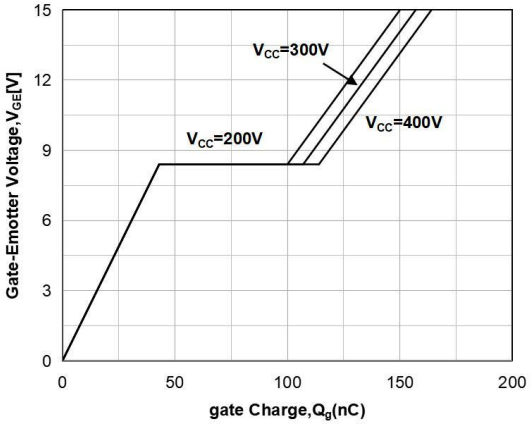
Saturation Voltage vs. V_{GE}



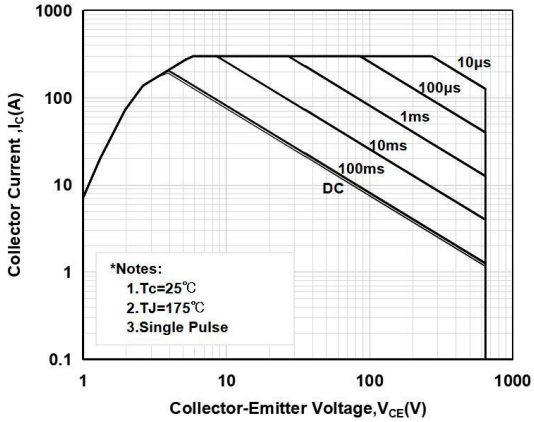
Capacitance Characteristics



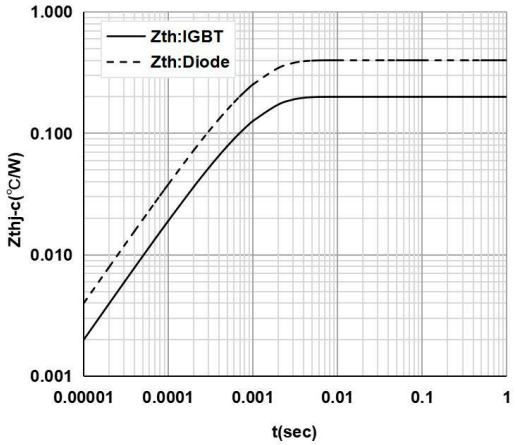
Gate Charge Characteristics



Foward Bias Safe Operating Area

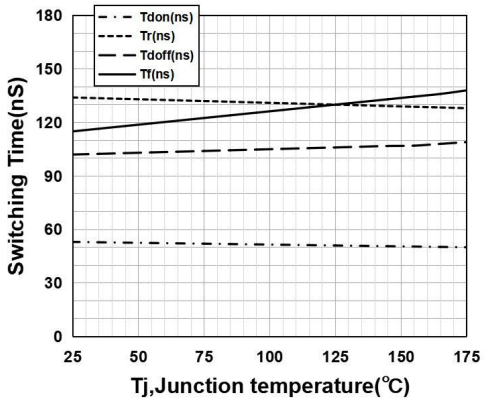


Transient Thermal Impedance



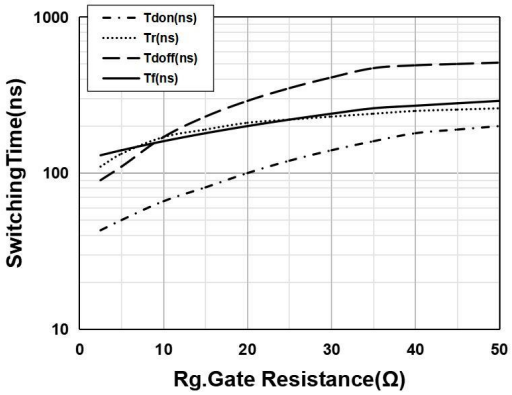
Switching Time vs. Tj

Vge=15V,VCE=400V,IC=200A,Rg=5Ω



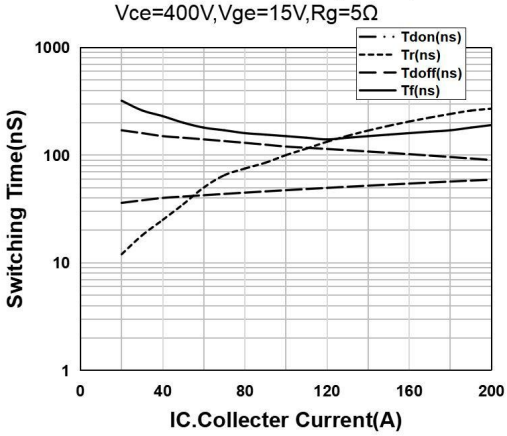
Switching Time Vs. Rg(175℃)

Vge=15V,VCE=400V,Ic=200A



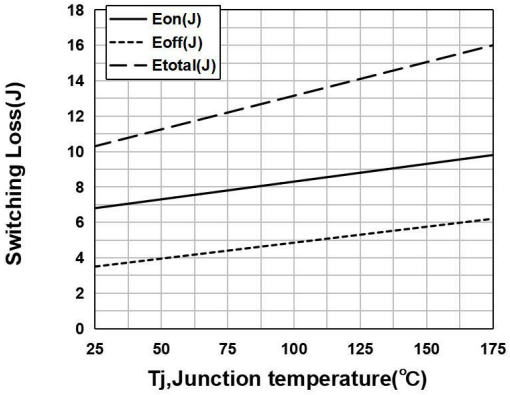
Switching Time vs. IC(175℃)

Vce=400V,Vge=15V,Rg=5Ω



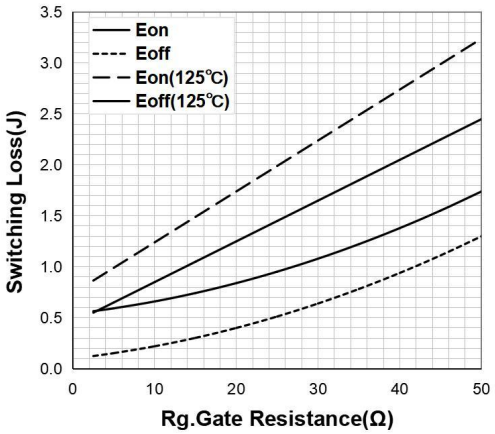
Switching Loss vs. Tj

Vge=15V,Vce=400V,IC=200A,Rg=5Ω



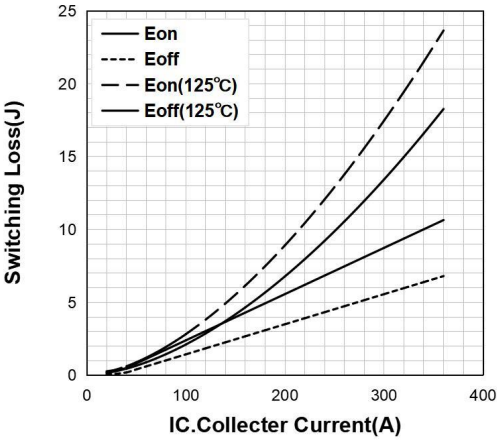
Switching Loss vs. Rg(175℃)

Vge=15V,Vce=400V,IC=200A

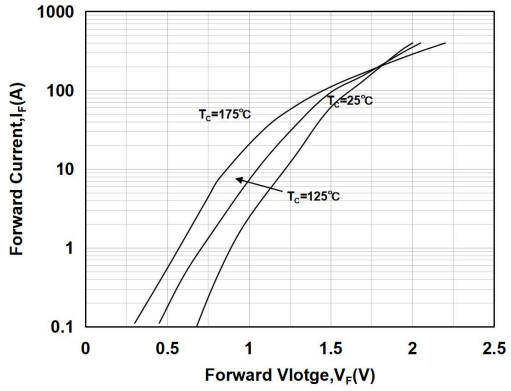


Switching Loss vs. I_C(175℃)

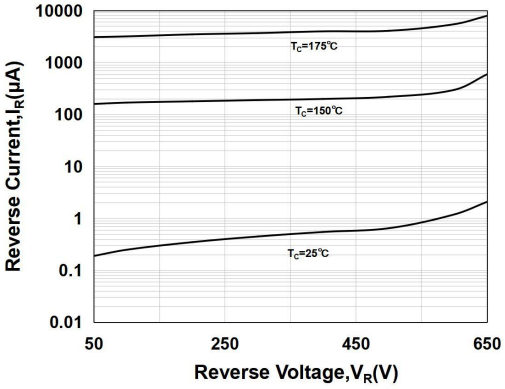
Vge=15V,Vce=400V,Rg=5Ω



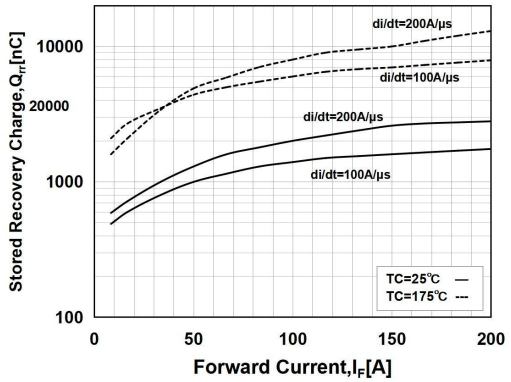
Forward Characteristics



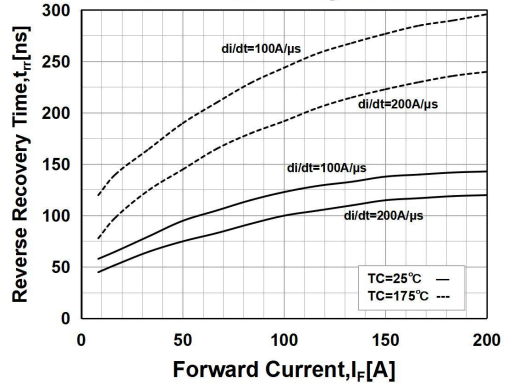
Reverse Current



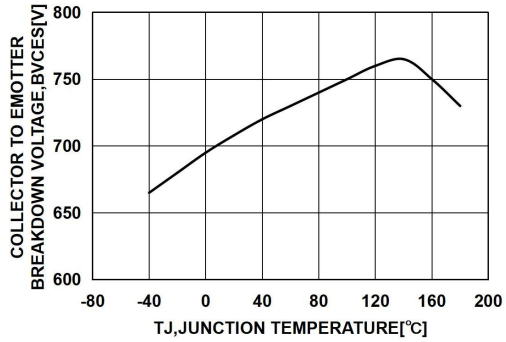
Stored Charge



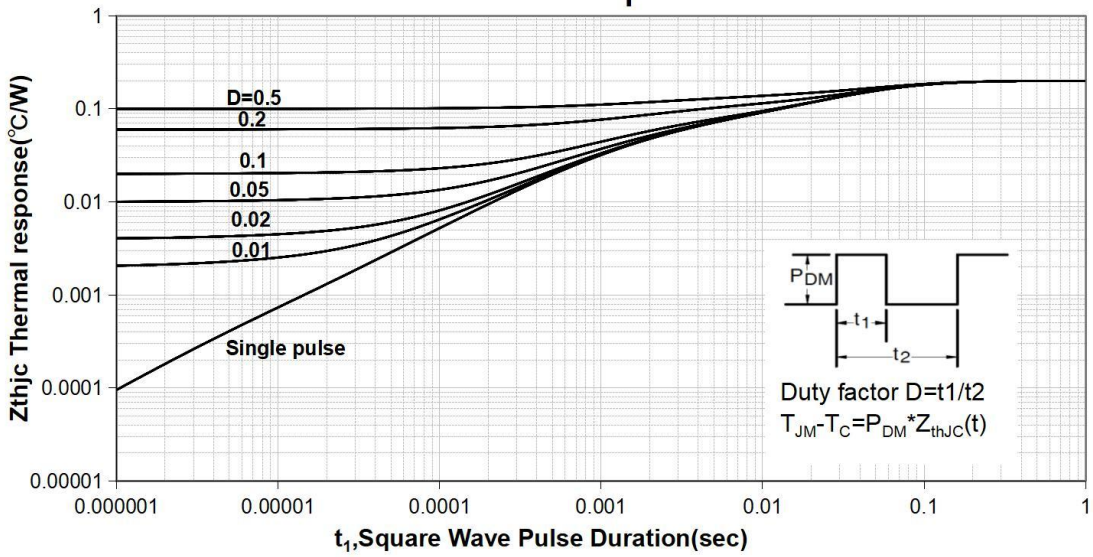
Reverse Recovery Time



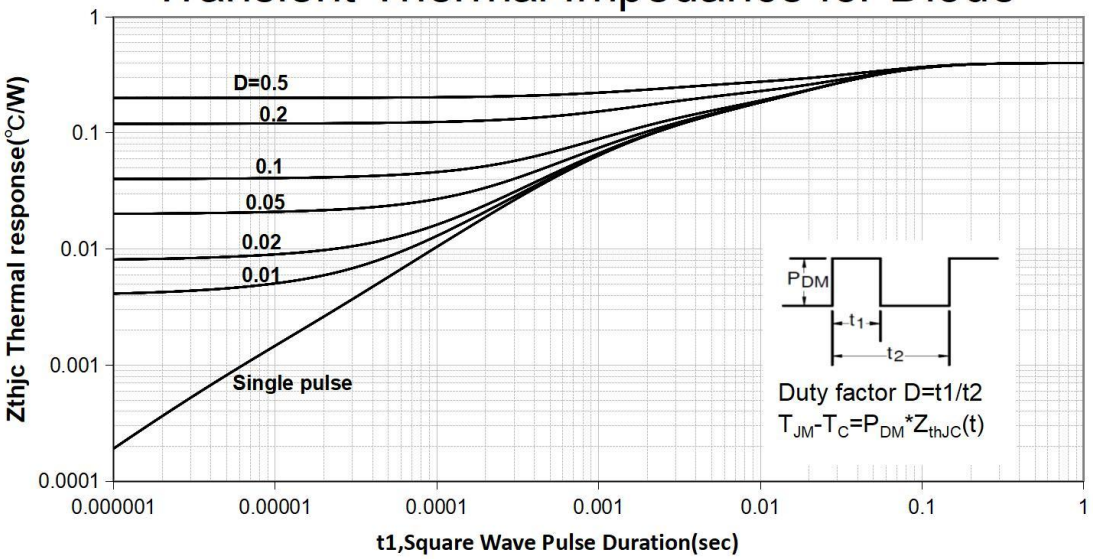
Collector to Emitter Breakdown Voltage vs. Junction Temperature



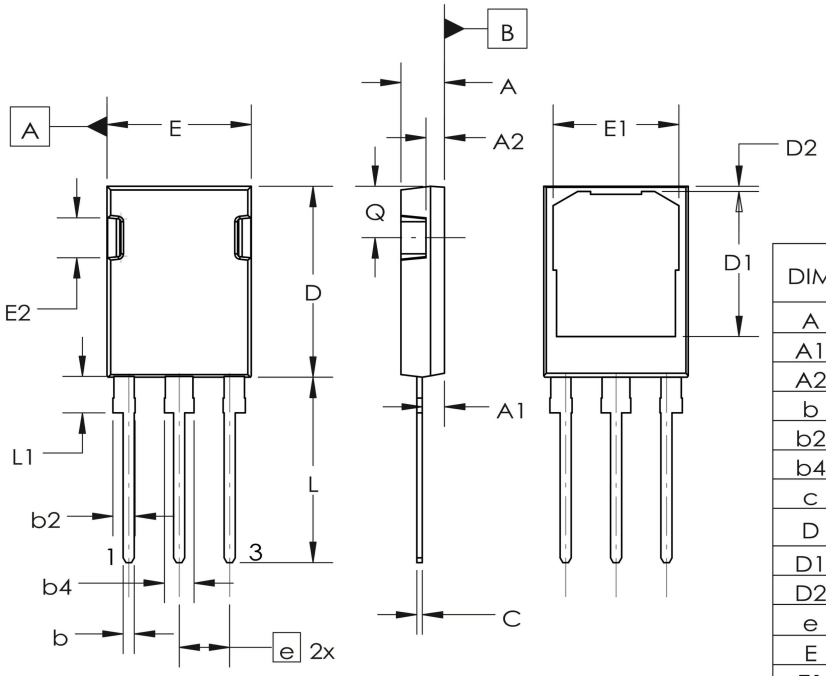
Transient Thermal Impedance for IGBT



Transient Thermal Impedance for Diode

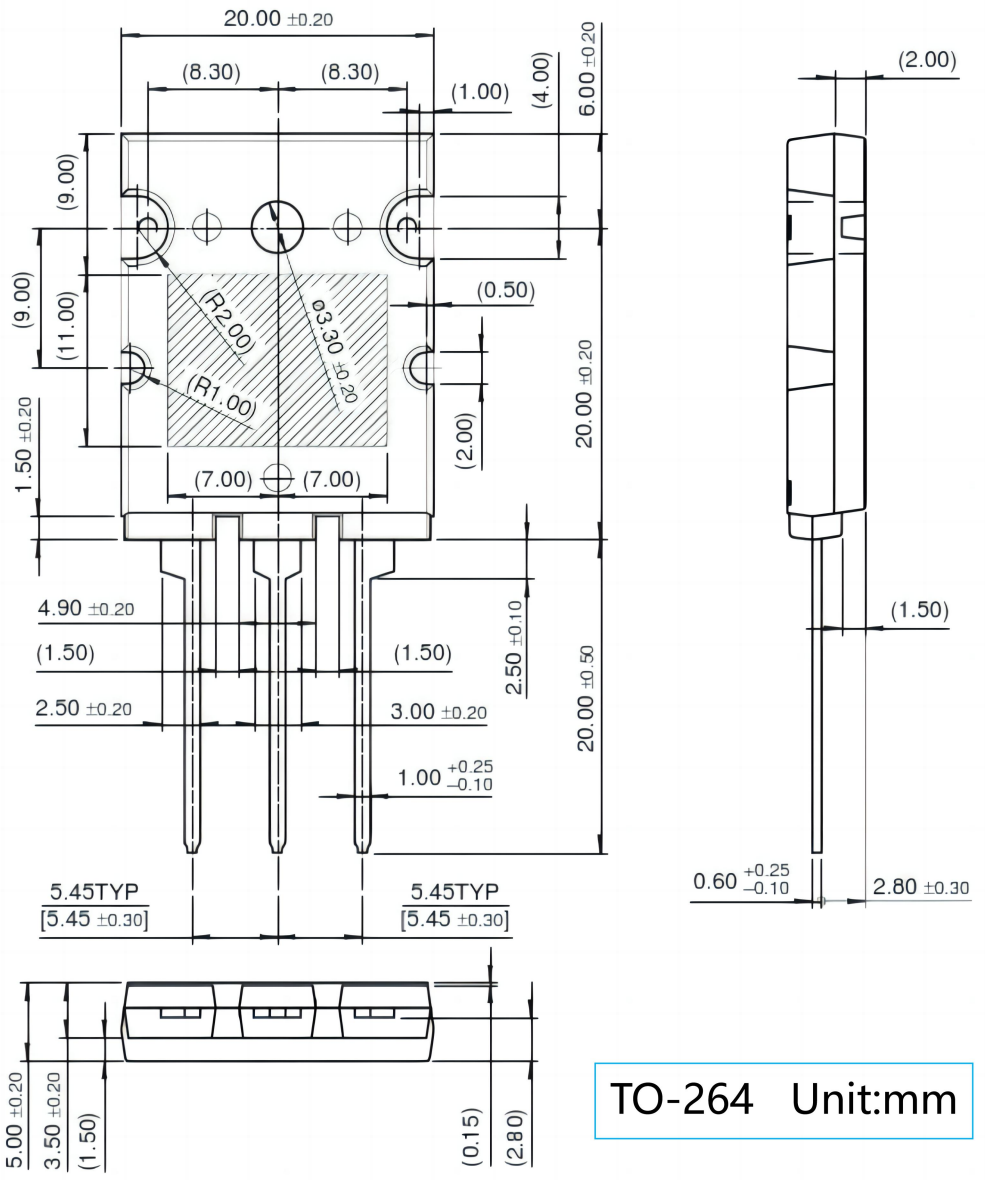


Package Mechanical DATA



TO-247plus Unit:mm

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.60	4.70	4.80
A1	2.10	2.40	2.70
A2	1.70	2.00	2.30
b	1.16	1.20	1.26
b2	2.20	2.40	2.60
b4	3.00	3.20	3.40
c	0.59	0.60	0.66
D	20.40	20.60	20.80
D1	15.47	15.67	15.87
D2	0.25	0.55	0.85
e	5.45 BSC		
E	15.40	15.60	15.80
E1	13.40	13.60	13.80
E2	4.12	4.30	4.52
L	19.70	20.00	20.30
L1	3.65	3.85	4.05
Q	5.35	5.55	5.75


20.00 ±0.20
(8.30)
(8.30)
(1.00)
(4.00)
6.00 ±0.20
(9.00)
(9.00)
(11.00)
(R2.00)
ø3.30 ±0.20
(R1.00)
(0.50)
20.00 ±0.20
(2.00)
1.50 ±0.20
(7.00)
(7.00)
4.90 ±0.20
(1.50)
(1.50)
2.50 ±0.10
2.50 ±0.20
3.00 ±0.20
20.00 ±0.50
1.00 +0.25 −0.10
5.45TYP
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5.45TYP
[5.45 ±0.30]
5.00 ±0.20
3.50 ±0.20
(1.50)
(0.15)
(2.80)
(2.00)
(1.50)
0.60 +0.25 −0.10
2.80 ±0.30
TO-264 Unit:mm