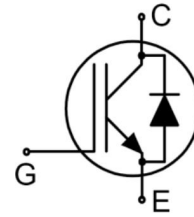
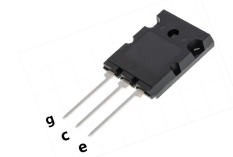
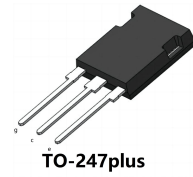


Features

- Very Low Saturation Voltage:
 $V_{CE(sat)} = 1.6V @ I_C = 120A$
- Maximum Junction Temperature: $T_J = 175^{\circ}C$
- 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($T_c=25^{\circ}C$)

Parameter	Symbol		Value	Unit
Collector-Emitter Voltage	V_{ces}		1200	V
Collector Current-continuous	I_C	$T_C=25^{\circ}C$	240	A
		$T_C=100^{\circ}C$	120	A
Diode forward current	I_F	$T_C=25^{\circ}C$	240	A
		$T_C=100^{\circ}C$	120	A
Collector Current-pulse (note 1)	I_{CM}		360	A
Gate-Emitter Voltage	V_{GES}		± 30	V
Power Dissipation	P_D	$T_C=25^{\circ}C$	882	W
		$T_C=100^{\circ}C$	441	W
Operating Temperature Range	T_J		-40~+175	$^{\circ}C$
Storage Temperature Range	T_{STG}		-55~+150	
Short Circuit Withstand Time (note 2)	t_{sc}		5	us
Maximum Lead Temperature for Soldering Purposes	T_{sold}		260	$^{\circ}C$
Isolation Voltage for Case to Terminal	V_{ISO}		3.0	KV

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Off-Characteristics						
Collector-Emitter Voltage	BV_{CES}	$I_C=250\mu A, V_{GE}=0V$	1200	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_C=25^\circ C$	-	-	40	μA
Gate-body leakage current, forward	I_{GESF}	$V_{CE}=0V, V_{GE}=30V$	-	-	250	nA
Gate-body leakage current, reverse	I_{GESR}	$V_{CE}=0V, V_{GE}=-30V$	-	-	-250	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=250\mu A$	4.5	5.5	6.5	V
Collector-Emitter saturation Voltage	V_{CESAT}	$V_{GE}=15V, I_C=120A$	-	1.6	1.8	V
Dynamic Characteristics						
Input capacitance	C_{ies}	$V_{CE}=30V, V_{GE}=0V, f=1.0MHz$	-	5764	-	pF
Output capacitance	C_{oes}		-	495	-	pF
Reverse transfer capacitance	C_{res}		-	115	-	pF
Transconductance	g_{fs}	$I_C = 120 A, V_{CE} = 20 V, T_{vj} = 175^\circ C$ (Note 4)	-	51	-	S
Short-circuit collector current	I_{SC}	$V_{CC} \leq 600 V, V_{GE} = 15 V, t_{SC} \leq 5\mu s$, (Note 4)	-	720	-	A

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, I_C=120A, R_G=5\Omega, V_{GE}=15V, \text{ Inductive Load } T_C=25^\circ C$	-	53	-	ns
Turn-On rise time	t_r		-	134	-	ns
Turn-Off delay time	$t_{d(off)}$		-	102	-	ns
Turn-Off Fall time	t_f		-	115	-	ns
Turn-on Loss	E_{on}		-	6.8	-	mJ
Turn-off Loss	E_{off}		-	3.5	-	mJ
Total Loss	E_{ts}		-	10.3	-	mJ
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, I_C=120A, R_G=5\Omega, V_{GE}=15V,$	-	50	-	ns
Turn-On rise time	t_r		-	133	-	ns

Turn-Off delay time	$t_{d(off)}$	Inductive Load Tc=150°C	-	109	-	ns
Turn-Off Fall time	t_f		-	138	-	ns
Turn-on switching Loss	E_{on}		-	9.8	-	mJ
Turn-off switching Loss	E_{off}		-	4.0	-	mJ
Total switching Loss	E_{ts}		-	13.8	-	mJ
Gate Charge	Q_g	$V_{CC}=600V, I_c=120A$ $V_{GE}=15V$	-	181	-	nC
Gate to Emitter Charge	Q_{ge}		-	49	-	nC
Gate to Collector Charge	Q_{gc}		-	74	-	nC
Anti-Parallel Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_F	$I_F=120A$	-	1.7	-	V
Diode Reverse recovery time	t_{rr}	$I_F=120A$ $di_F/dt=500A/us$ $T_J=25^{\circ}C$	-	123	-	ns
Diode Reverse recovery charge	Q_{rr}		-	1.75	-	μC

Thermal Characteristic

Parameter	Symbol	Max	Unit
Thermal Resistance, Junction to Case (IGBT)	$R_{th(j-c)}$	0.17	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Case (Diode)	$R_{th(j-c)}$	0.32	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	40	$^{\circ}\text{C}/\text{W}$

Notes:

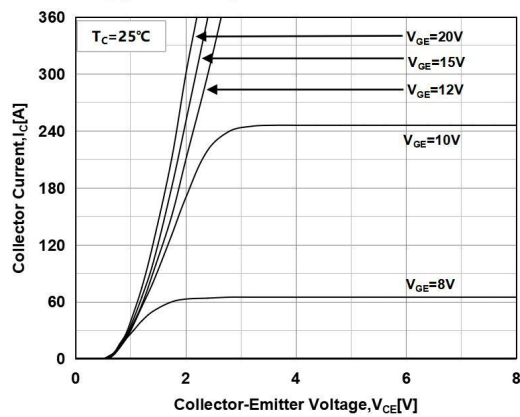
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $V_{CC} \leq 600\text{ V}$, $V_{GE} = 15\text{ V}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$, $T_{vj} = 150^{\circ}\text{C}$
3. Switching times & energy losses may increase for higher $V_{CE}(\text{clamp})$, T_J or R_G
4. Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$

Order Information

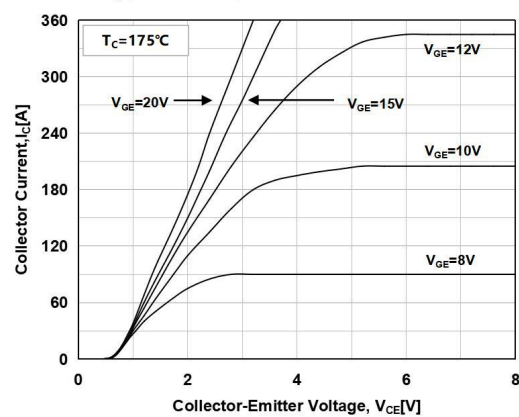
Making	Package
MSG120T120HLC1	TO-247Plus
MSG120T120HLB3	TO-264

Electrical Characteristics(curves)

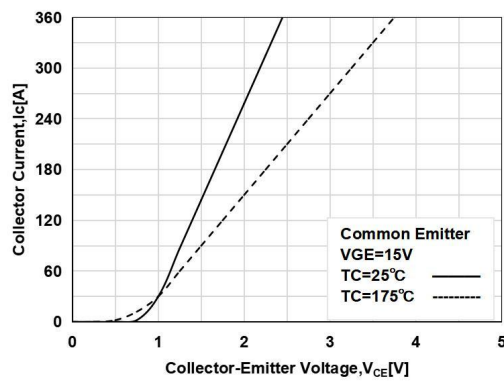
Typical Output Characteristics



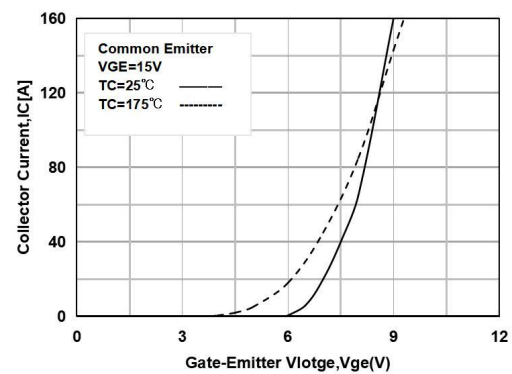
Typical Output Characteristics



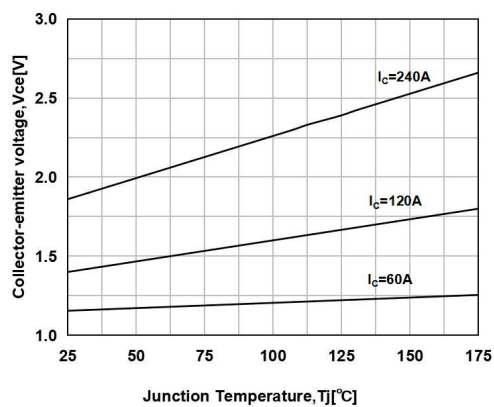
Typical Saturation Voltage Characteristics



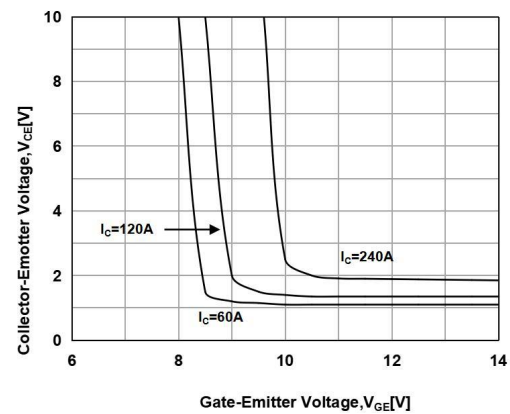
Transfer Characteristics



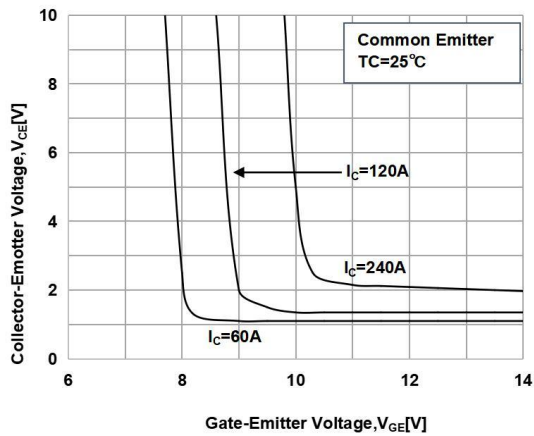
Saturation Voltage vs. Junction temperature at Variant Current Level



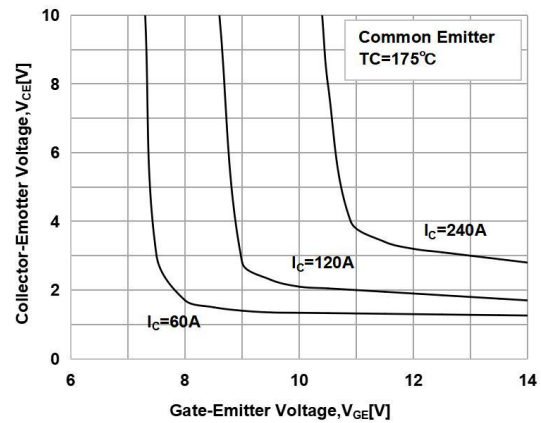
Saturation Voltage vs. V_{GE}



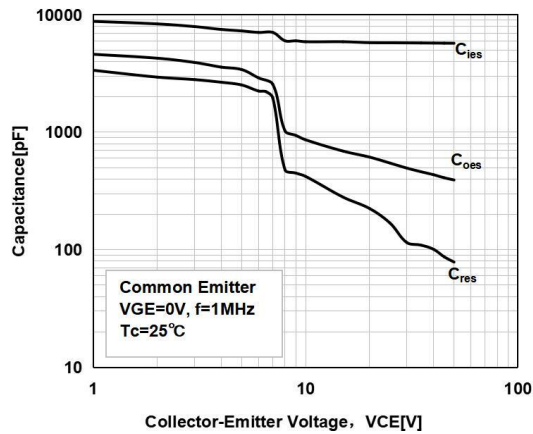
Saturation Voltage vs. V_{GE}



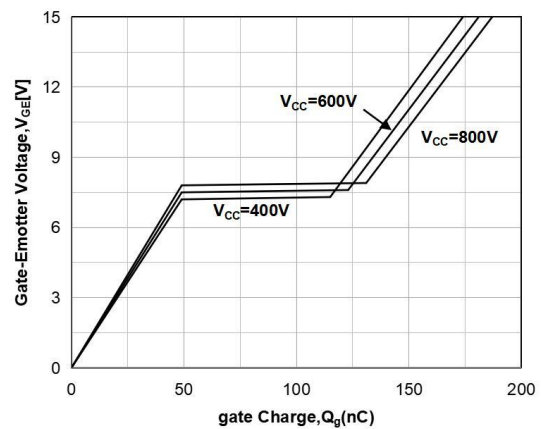
Saturation Voltage vs. V_{GE}



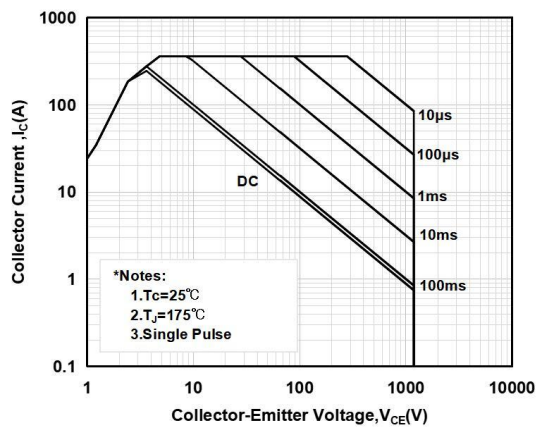
Capacitance Characteristics



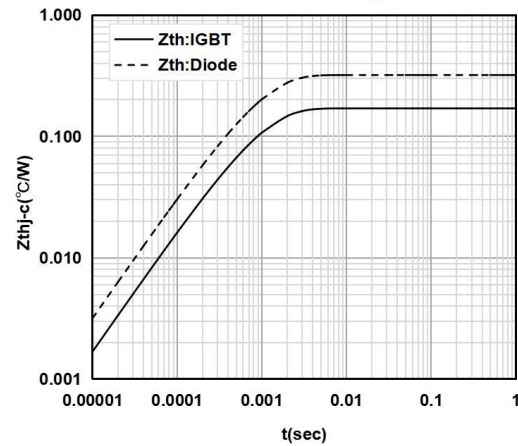
Gate Charge Characteristics



Foward Bias Safe Operating Area

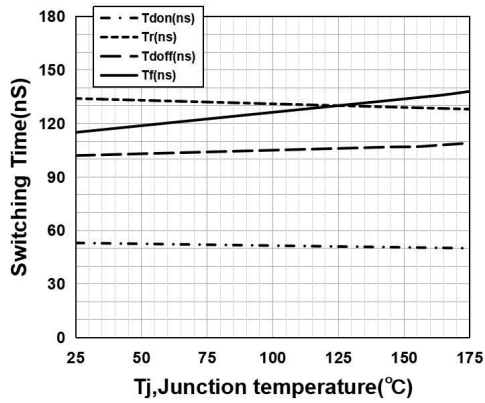


Transient Thermal Impedance



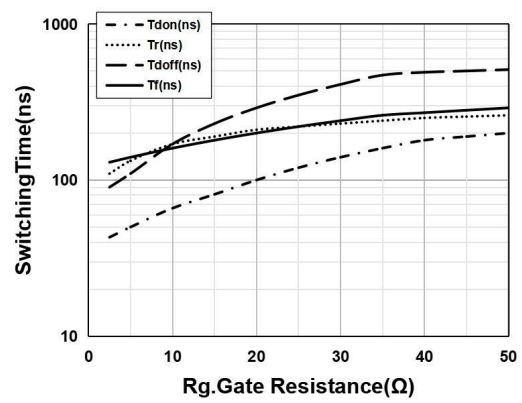
Switching Time vs. T_j

$V_{ge}=15V, V_{ce}=600V, I_c=120A, R_g=5\Omega$



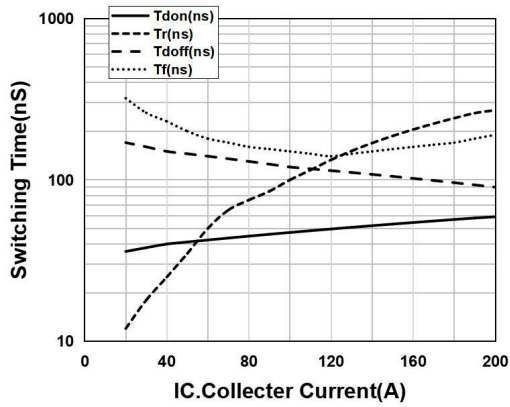
Switching Time vs. $R_g(175^\circ C)$

$V_{ge}=15V, V_{ce}=600V, I_c=120A$



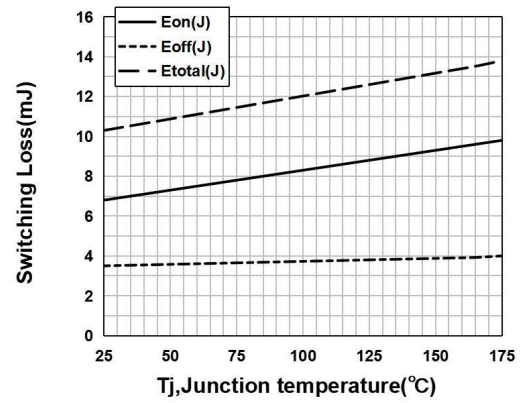
Switching Time vs. $I_c(175^\circ C)$

$V_{ce}=600V, V_{ge}=15V, R_g=5\Omega$



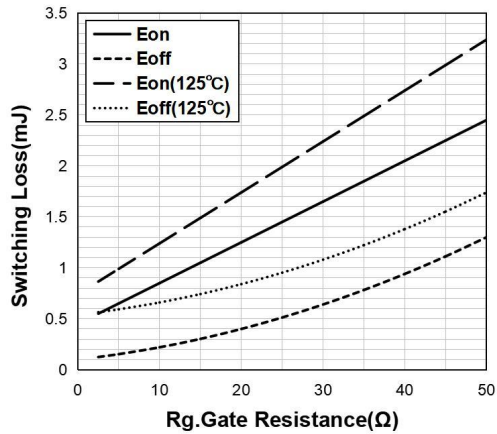
Switching Loss vs. T_j

$V_{ge}=15V, V_{ce}=600V, I_c=120A, R_g=5\Omega$



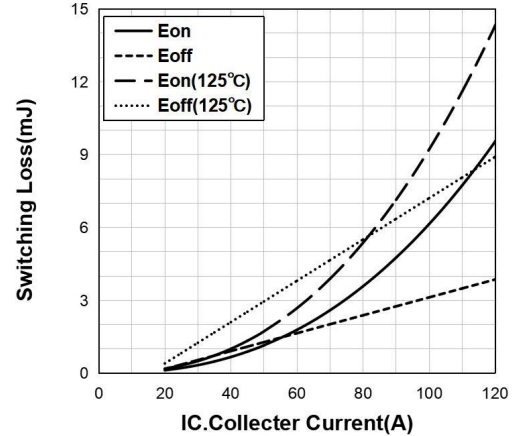
Switching Loss vs. $R_g(175^\circ C)$

$V_{ge}=15V, V_{ce}=600V, I_c=120A$

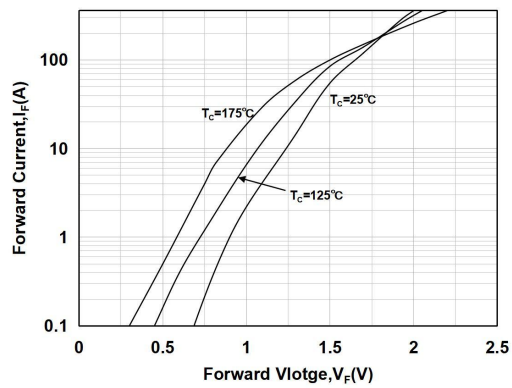


Switching Loss vs. $I_c(175^\circ C)$

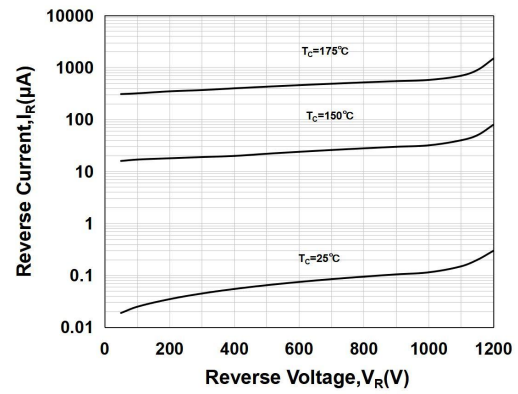
$V_{ge}=15V, V_{ce}=600V, R_g=5\Omega$



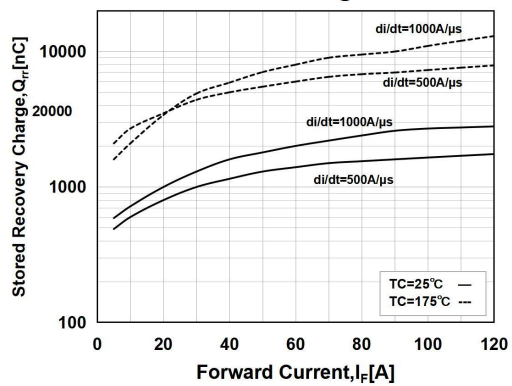
Forward Characteristics



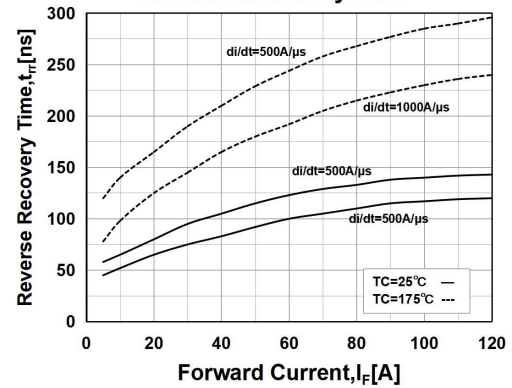
Reverse Current



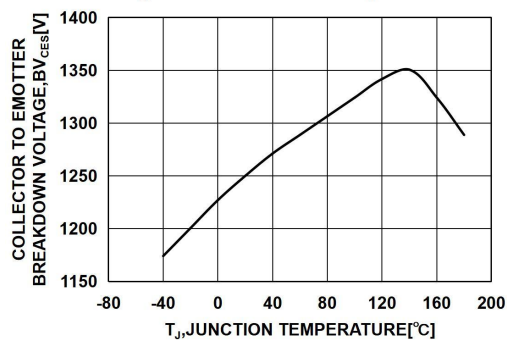
Stored Charge



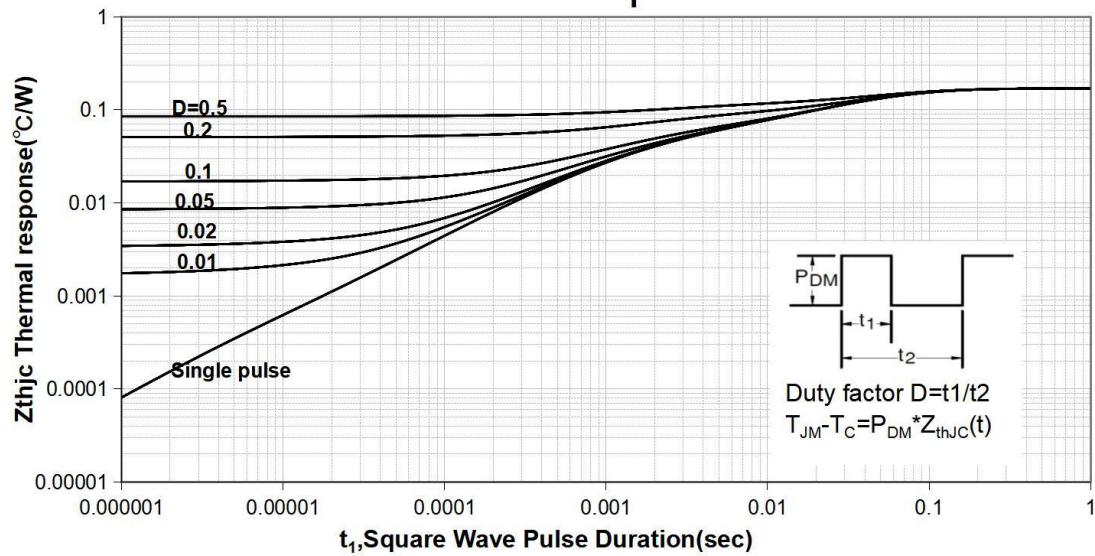
Reverse Recovery Time



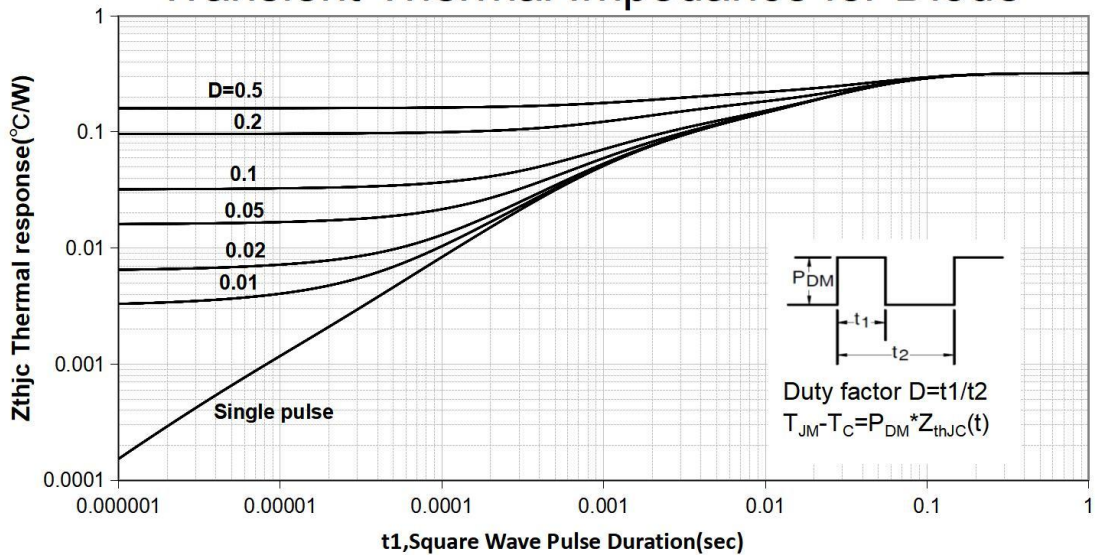
Collector to Emitter Breakdown Voltage vs. Junction Temperature



Transient Thermal Impedance for IGBT



Transient Thermal Impedance for Diode



Package Mechanical DATA

