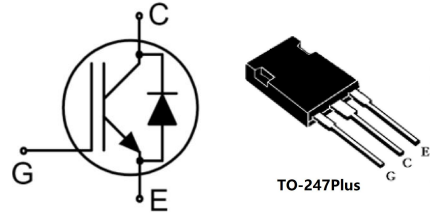


Features

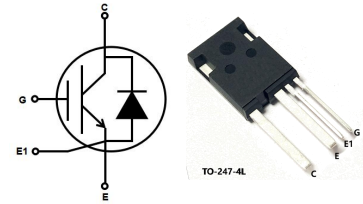
- Very Low Saturation Voltage:
 $V_{CE(sat)} = 1.8V @ I_C = 120A$
- Maximum Junction Temperature: $T_J = 175^{\circ}C$
- Positive Temperature Co-Efficient
- Tight Parameter Distribution
- High Input Impedance



Applications

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

MSG120T65HLC1



MSG120T65HLC6

Absolute Ratings($T_c=25^{\circ}C$)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Collector Current-continuous	I_C $T=25^{\circ}C$ $T=100^{\circ}C$	240	A
		120	A
Diode forward current	I_F $T=25^{\circ}C$ $T_c=100^{\circ}C$	240	A
		120	A
Collector Current-pulse (note 1)	I_{CM}	378	A
Gate-Emitter Voltage	V_{GES}	± 30	V
Power Dissipation	PD $T_c=25^{\circ}C$ $T_c=100^{\circ}C$	882	W
		441	W
Operating and Storage Temperature Range	T_J, T_{STG}	$-55 \sim +175$	$^{\circ}C$
Short Circuit Withstand Time	t_{sc}	5	μs
Maximum Lead Temperature for Soldering Purposes	T_L	300	$^{\circ}C$
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	BV_{CES}	$I_C=1mA, V_{GE}=0V$	650	-	-	V

Voltage						
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	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_c=0.6mA$	3.5	5.0	6.5	V
Collector-Emitter saturation Voltage	V_{CESAT}	$V_{GE}=15V, I_c=120A$	-	-	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

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, I_c=120A,$ $R_G=5\Omega, V_{GE}=15V,$ 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	$t_{d(on)}$	$V_{CC}=400V, I_c=120A,$ $R_G=5\Omega, V_{GE}=15V,$ Inductive Load $T_c=175^{\circ}C$	-	50	-	ns
Turn-On rise time	t_r		-	133	-	ns
Turn-Off delay time	$t_{d(off)}$		-	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} =400V,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 =160A dI _F =dt=200A/us T _J =25°C	-	123	-	ns
Diode Reverse recovery charge	Q _{rr}		-	2.8	-	μC

Thermal Characteristic

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

Notes:

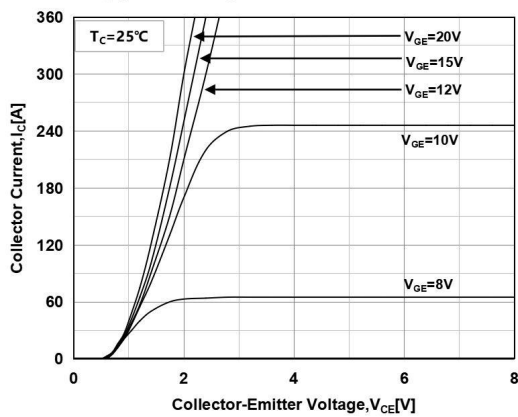
1. Repetitive Rating: Pulse width limited by maximum junction temperature

Order Information

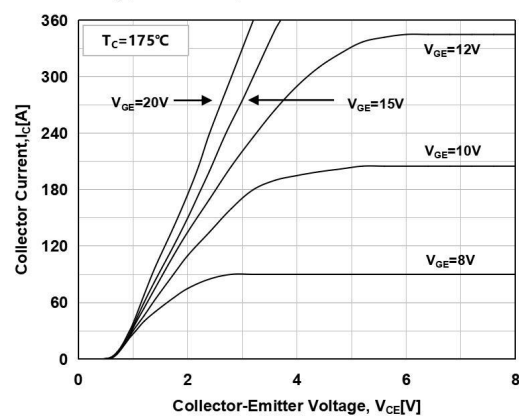
Making	Package
MSG120T65HLC0	TO-247
MSG120T65HLC6	TO-247-4L

Electrical Characteristics(curves)

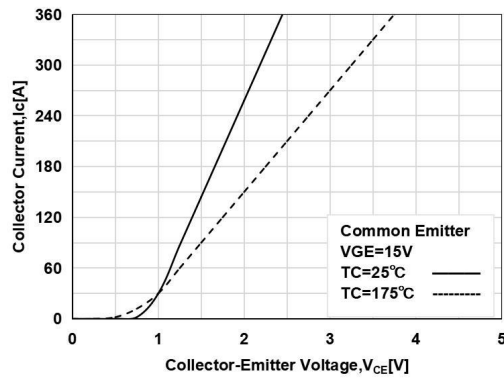
Typical Output Characteristics



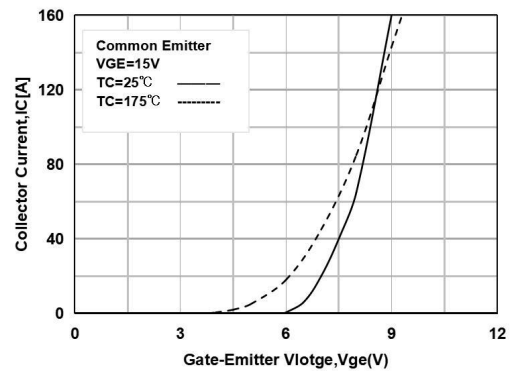
Typical Output Characteristics



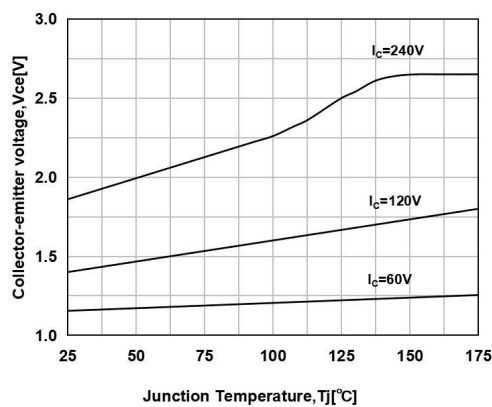
Typical Saturation Voltage Characteristics



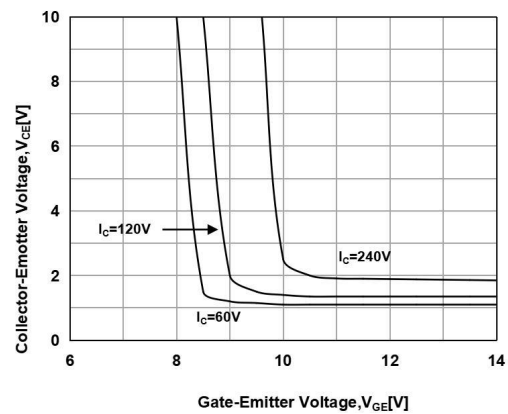
Transfer Characteristics



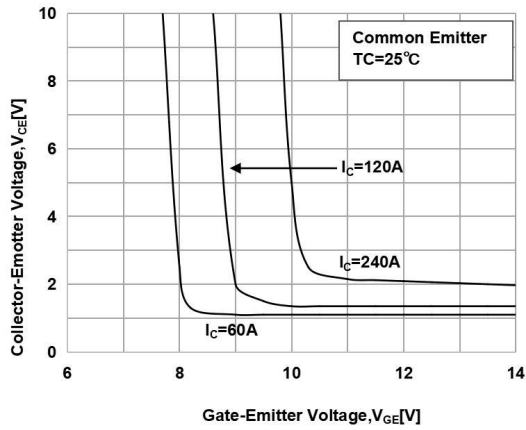
Saturation Voltage vs. Junction temperature at Variant Current Level



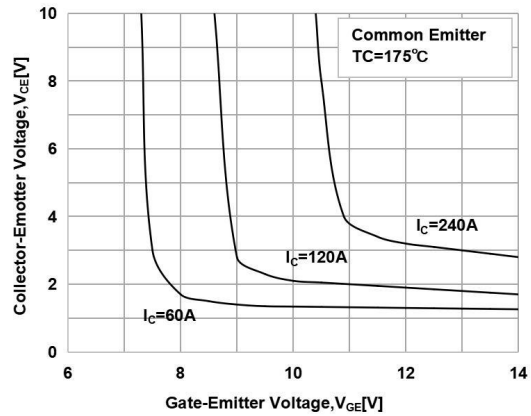
Saturation Voltage vs. V_{GE}



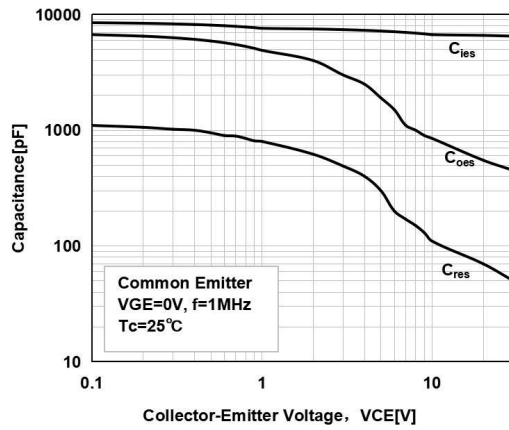
Saturation Voltage vs. V_{GE}



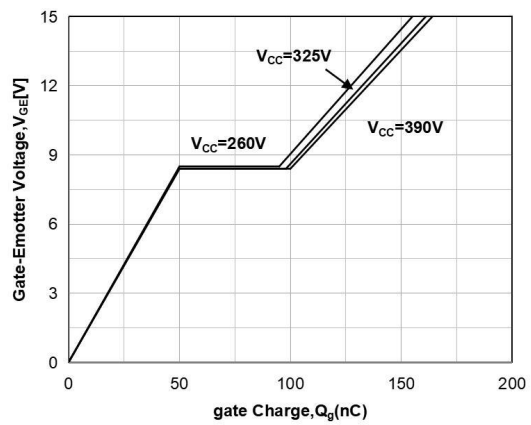
Saturation Voltage vs. V_{GE}



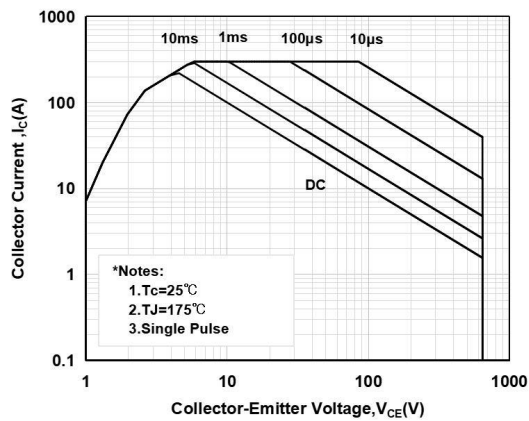
Capacitance Characteristics



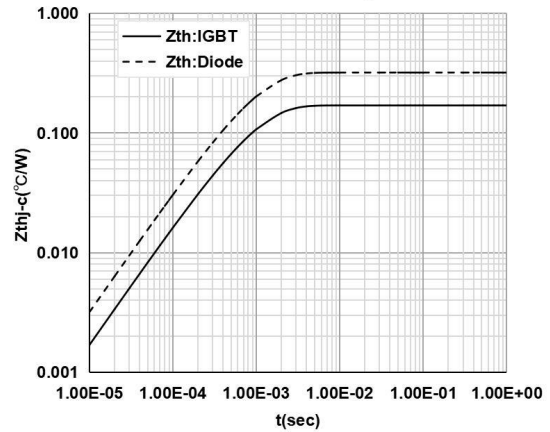
Gate Charge Characteristics



Foward Bias Safe Operating Area

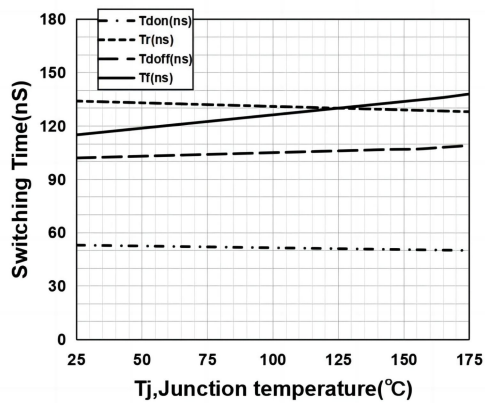


Transient Thermal Impedance



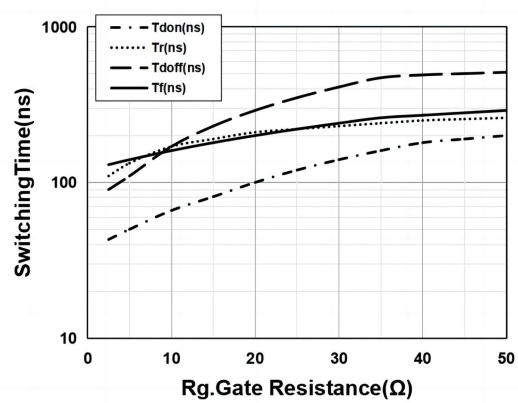
Switching Time vs. T_j

$V_{ge}=15V, V_{ce}=400V, I_c=75V, R_g=5\Omega$



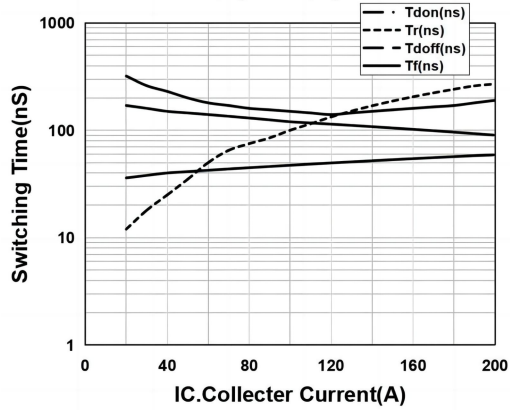
Switching Time vs. $R_g(175^\circ C)$

$V_{ge}=15V, V_{ce}=400V, I_c=120A$



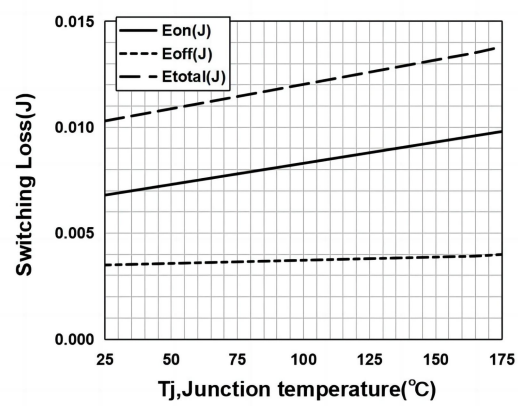
Switching Time vs. $I_c(175^\circ C)$

$V_{ce}=400V, V_{ge}=15V, R_g=5\Omega$



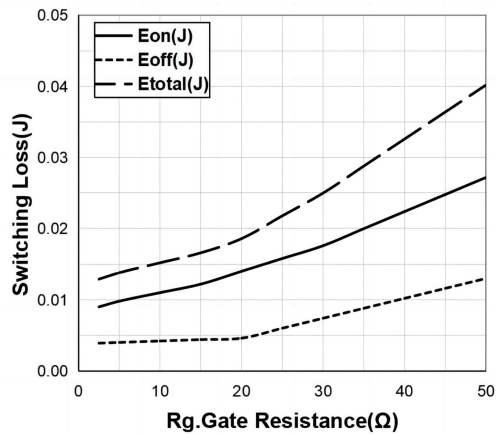
Switching Loss vs. T_j

$V_{ge}=15V, V_{ce}=400V, I_c=120A, R_g=5\Omega$



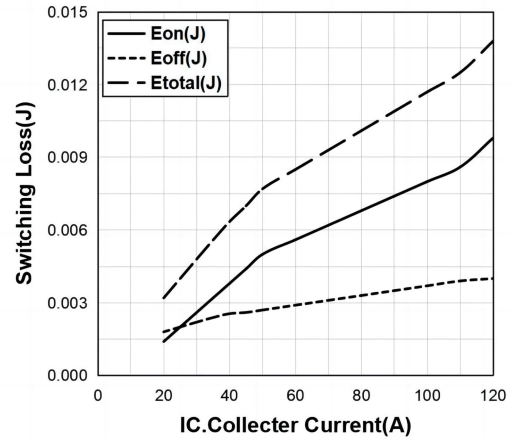
Switching Loss vs. $R_g(175^\circ C)$

$V_{ge}=15V, V_{ce}=400V, I_c=120A$

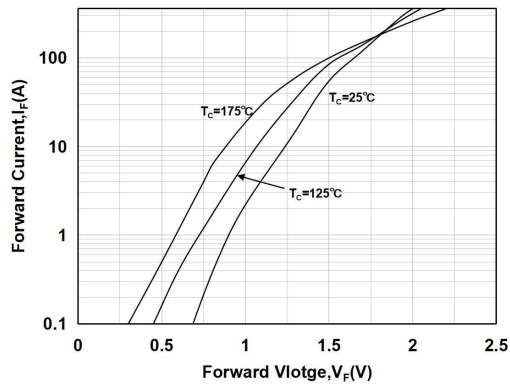


Switching Loss vs. $I_c(175^\circ C)$

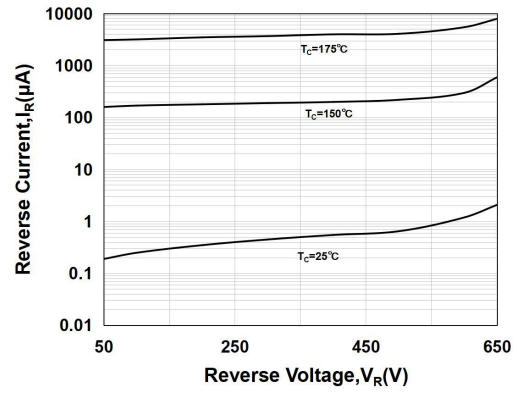
$V_{ge}=15V, V_{ce}=400V, R_g=5\Omega$



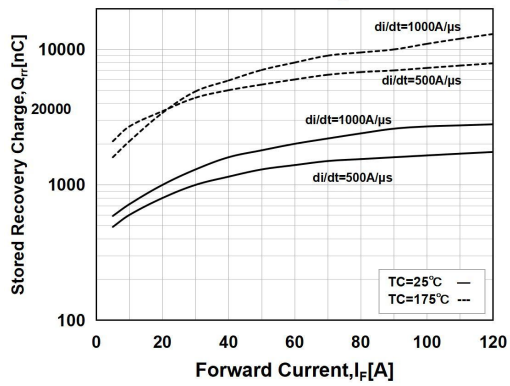
Forward Characteristics



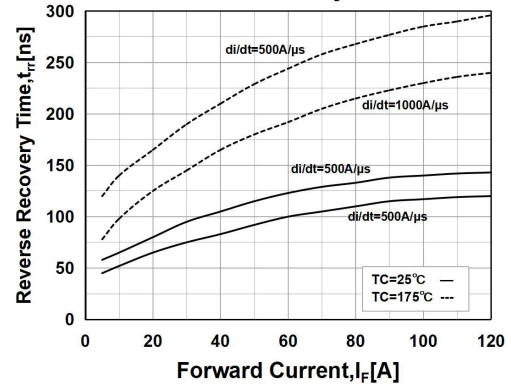
Reverse Current



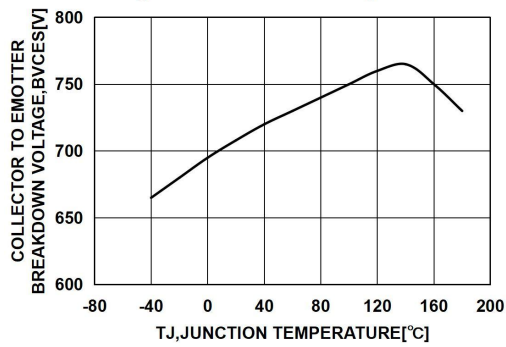
Stored Charge



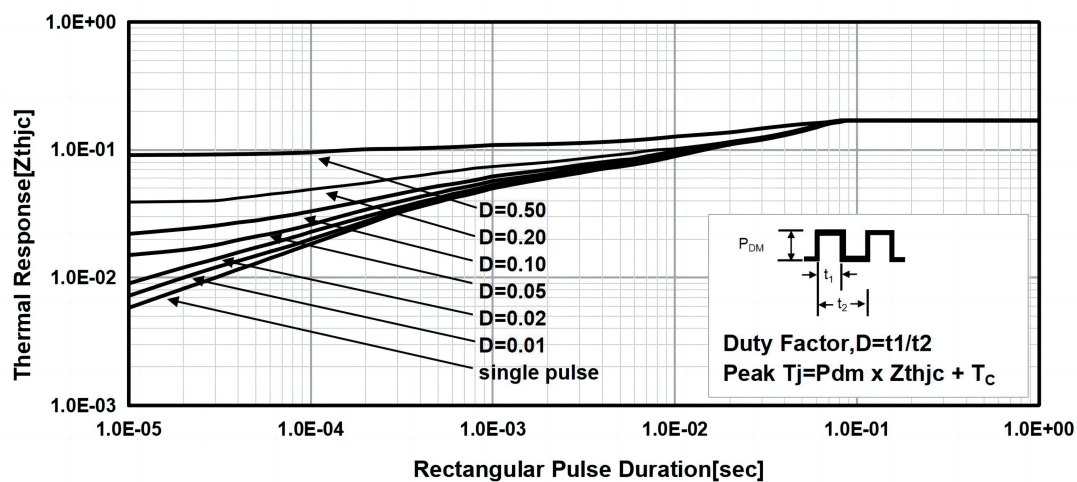
Reverse Recovery Time



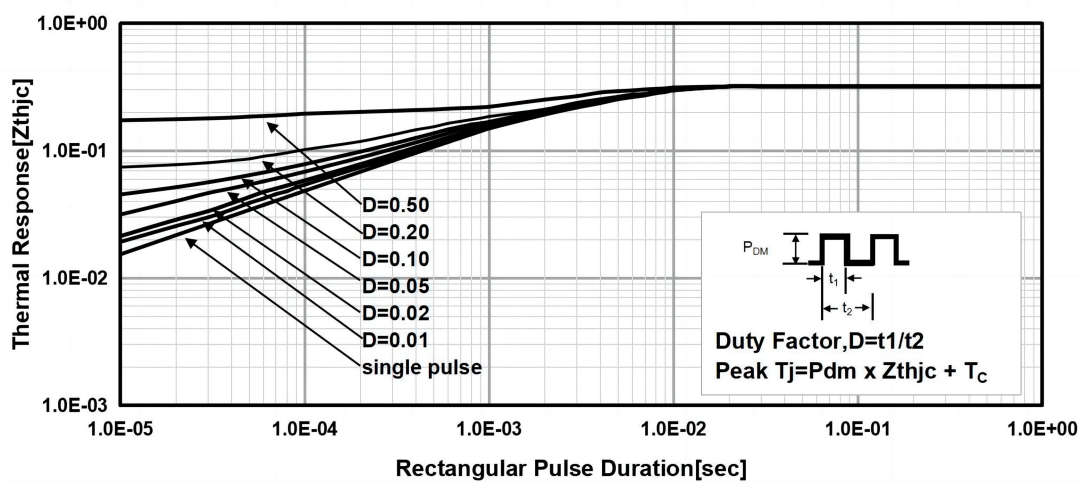
Collector to Emitter Breakdown Voltage vs. Junction Temperature



Transient Thermal Impedance of IGBT



Transient Thermal Impedance of Diode



Package Mechanical DATA

