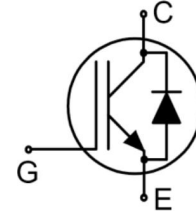
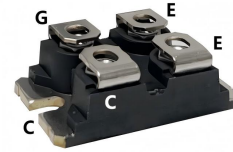


Features

- Very Low Saturation Voltage:
 $V_{CE(sat)(type)} = 0.79V @ I_C = 100A$
- Maximum Junction Temperature: $T_J = 150^{\circ}C$
- 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

- Bottom plate is Collector
- Using two emitter terminals in short circuit mode

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

Parameter	Symbol		Value	Unit
Collector-Emitter Voltage	V _{ces}		350	V
Gate-Emitter Voltage	V _{GES}		±30	V
Collector Current-continuous	I _C	T=25℃	400	A
		T=100℃	200	A
Diode forward current	I _F	T=25℃	200	A
		Tc=100℃	100	A
Collector Current-pulse (note 1)	I _{CM}		800	A
Short Circuit Withstand Current (note 1)	I _{SC}		2220	A
Short Circuit Withstand Time (note 2)	t _{sc}		10	us
Power Dissipation	P _D	Tc=25℃	1250	W
		Tc=100℃	500	W
Operating and Storage Temperature Range	T _J ,T _{STG}		-55~+150	℃
Maximum Lead Temperature for Soldering Purposes	T _L		300	℃

Electrical Characteristics($T_C=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Unit
Off-Characteristics						
Collector-Emitter Voltage	BV_{CES}	$I_C=1mA, V_{GE}=0V$	350	-	-	V

Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=350V, V_{GE}=0V$	-	-	40	μA
		$V_{CE}=350V, V_{GE}=0V,$ $T_C=125^{\circ}C$	-	-	1	mA
Gate-body leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 30V$	-	-	± 400	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=500\mu A$	4.0	5.0	6.0	V
Collector-Emitter saturation Voltage	V_{CESAT}	$V_{GE}=15V, I_C=100A$	-	0.79	-	V
		$V_{GE}=15V$ $I_C=100A, T_C=125^{\circ}C$	-	0.96	-	V
Dynamic Characteristics						
Input capacitance	C_{ies}	$V_{CE}=30V,$ $V_{GE}=0V,$ $f=1.0MHz$	-	3264	-	pF
Output capacitance	C_{oes}		-	240	-	pF
Reverse transfer capacitance	C_{res}		-	150	-	pF

Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=200V, I_C=200A,$ $R_G=5\Omega, V_{GE}=15V,$ Inductive Load $T_C=25^{\circ}C$	-	38	-	ns
Turn-On rise time	t_r		-	142	-	ns
Turn-Off delay time	$t_{d(off)}$		-	172	-	ns
Turn-Off Fall time	t_f		-	215	-	ns
Turn-on Loss	E_{on}		-	4.8	-	mJ
Turn-off Loss	E_{off}		-	3.5	-	mJ
Total Loss	E_{ts}		-	8.3	-	mJ
Turn-on delay time	$t_{d(on)}$	$V_{CC}=200V, I_C=200A,$ $R_G=5\Omega, V_{GE}=15V,$ Inductive Load $T_C=125^{\circ}C$	-	36.5	-	ns
Turn-On rise time	t_r		-	138	-	ns
Turn-Off delay time	$t_{d(off)}$		-	178	-	ns
Turn-Off Fall time	t_f		-	243	-	ns
Turn-on switching Loss	E_{on}		-	7.2	-	mJ
Turn-off switching Loss	E_{off}		-	10.5	-	mJ
Total switching Loss	E_{ts}		-	17.7	-	mJ
Gate Charge	Q_g	$V_{CC}=200V, I_C=100A$ $V_{GE}=15V$	-	215	-	nC
Gate to Emitter Charge	Q_{ge}		-	32	-	nC
Gate to Collector Charge	Q_{gc}		-	90	-	nC

Anti-Parallel Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_F	$I_F=40A$	-	0.75	1.2	V
Diode Reverse Recovery Time	t_{rr}	$I_F=50A$ $-dI_F/dt=100A/us$ $T_J=25^{\circ}C$	-	43	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	10	-	A
Diode Reverse recovery charge	Q_{rr}		-	48	-	nC
Diode Reverse recovery time	t_{rr}	$I_F=50A$ $dI_F/dt=100A/us$ $T_J=125^{\circ}C$	-	53	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	10	-	A
Diode Reverse recovery charge	Q_{rr}		-	68.5	-	nC

Thermal Characteristic

Parameter	Symbol	Max	Unit
Thermal Resistance,Junction to Case (IGBT),Max	$R_{th(j-c)}$	0.10	$^{\circ}C/W$
Thermal Resistance,Junction to Case (Diode),Max	$R_{th(j-c)}$	0.20	$^{\circ}C/W$
Thermal Resistance,Junction to Ambient,Max	$R_{th(j-A)}$	30	$^{\circ}C/W$

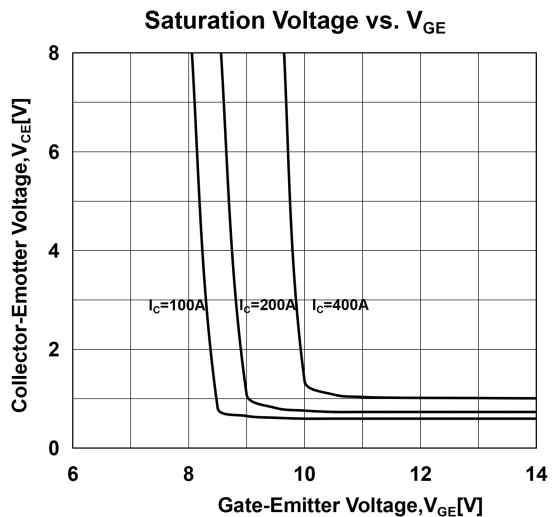
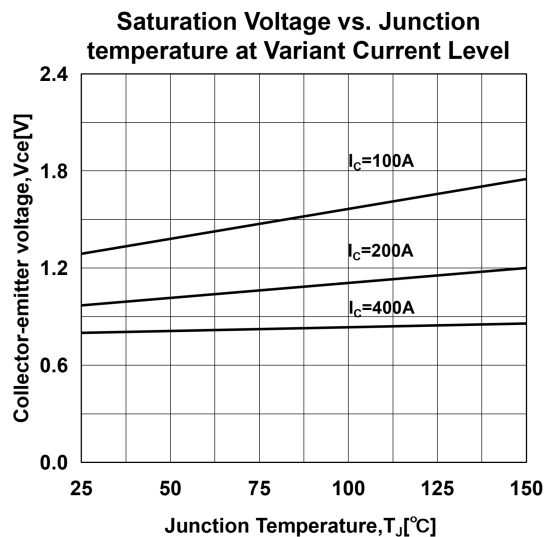
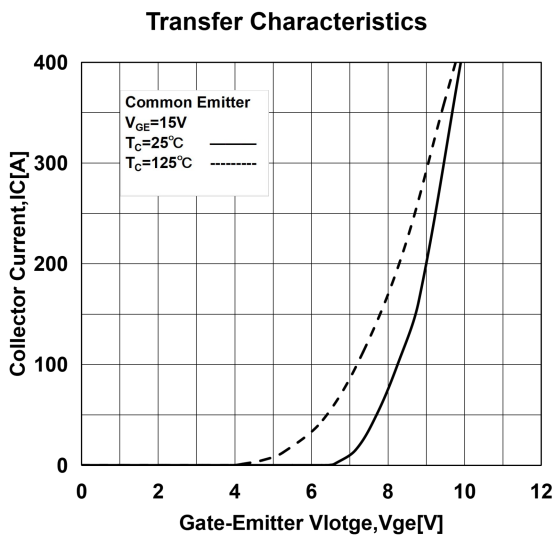
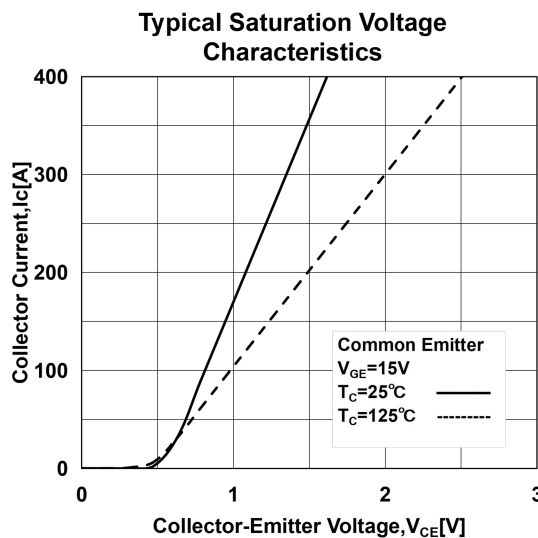
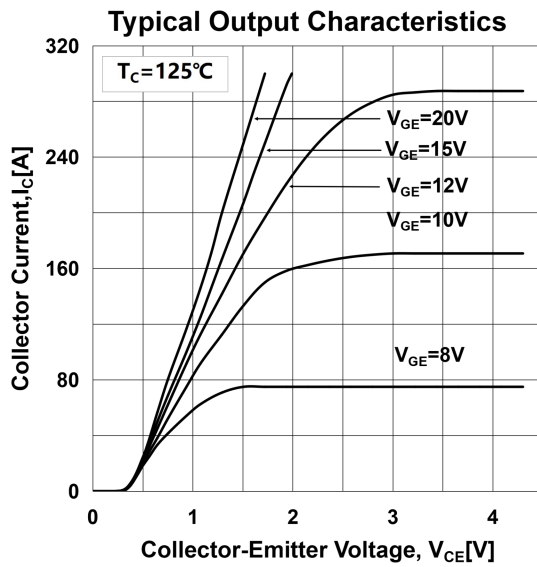
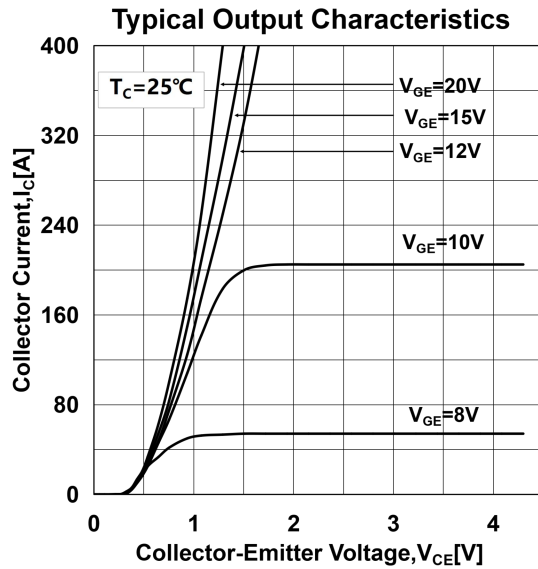
Notes:

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

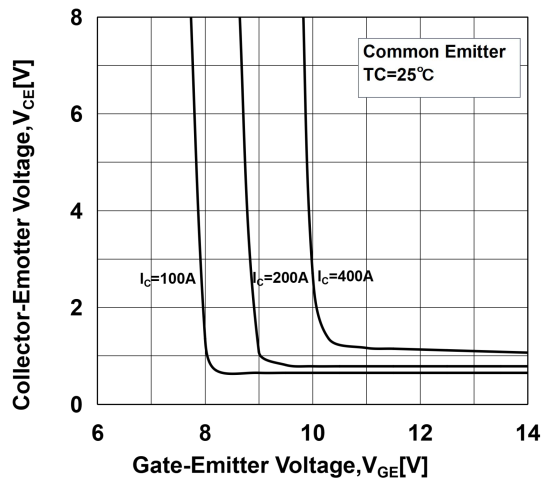
Order Information

Making	Package
MSG200N38HLF4	SOT-227

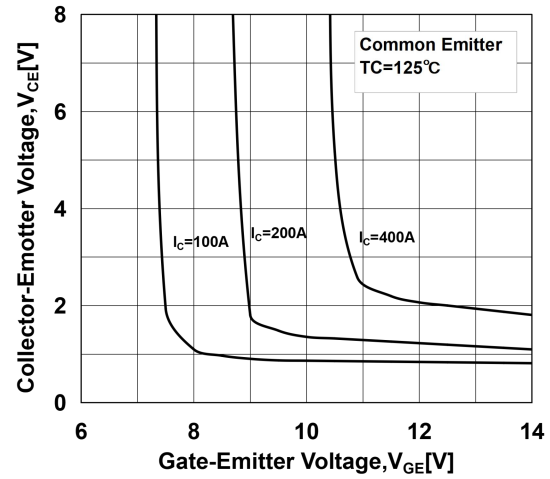
Electrical Characteristics(curves)



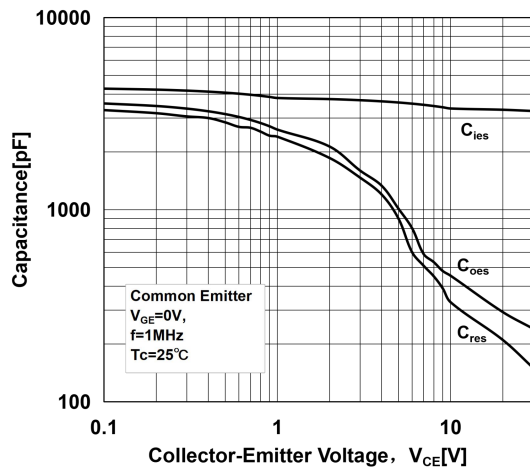
Saturation Voltage vs. V_{GE}



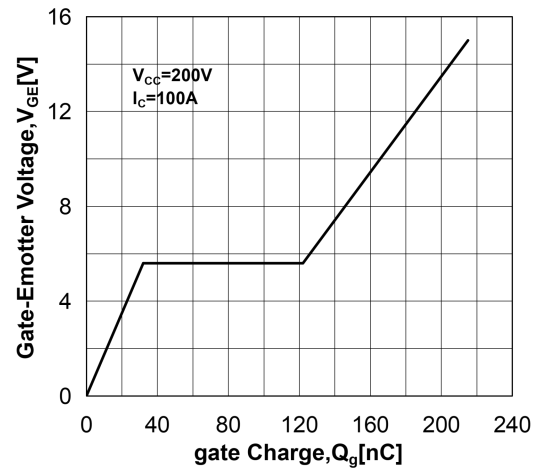
Saturation Voltage vs. V_{GE}



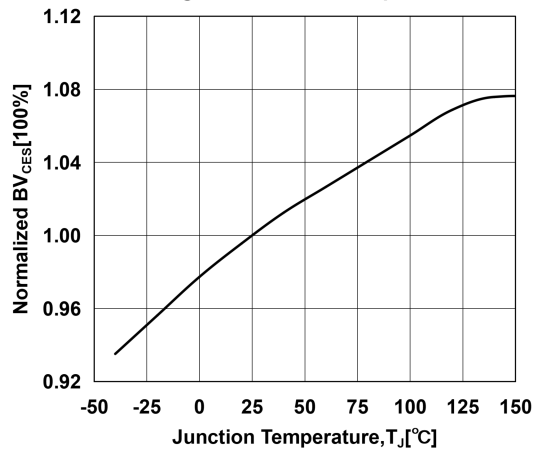
Capacitance Characteristics



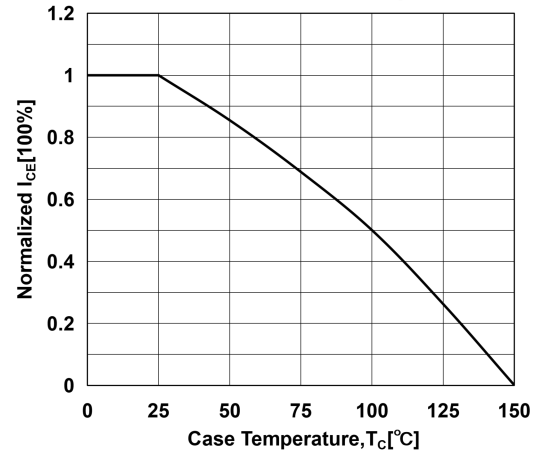
Gate Charge Characteristics

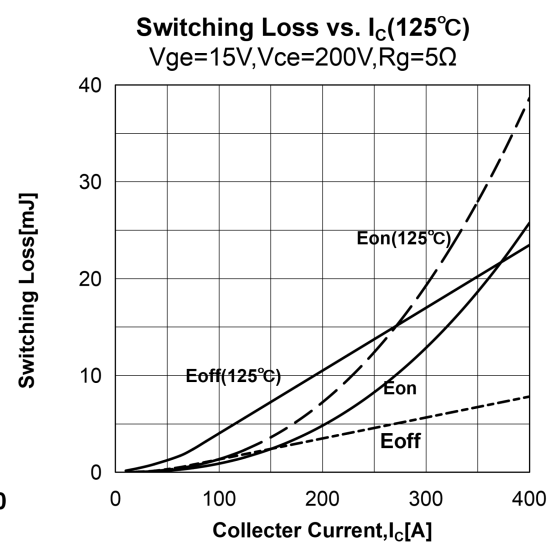
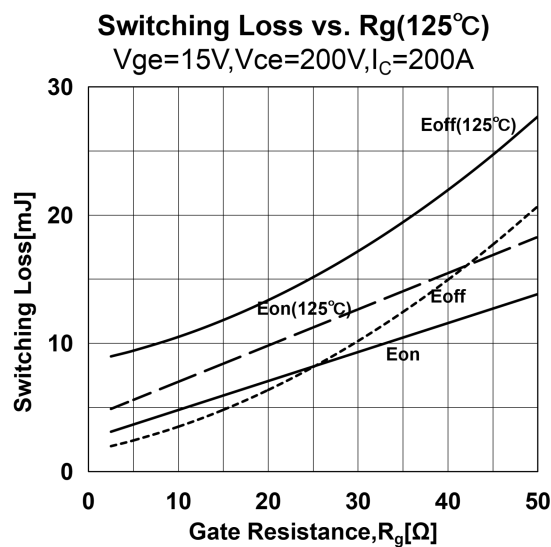
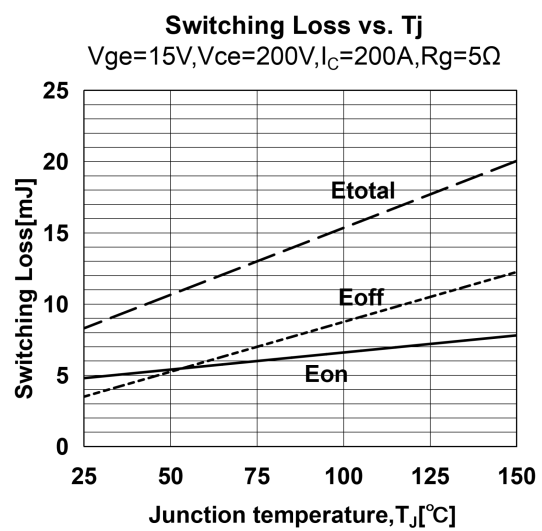
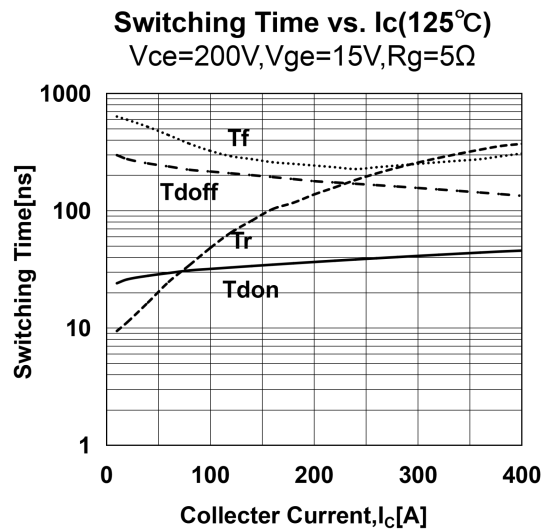
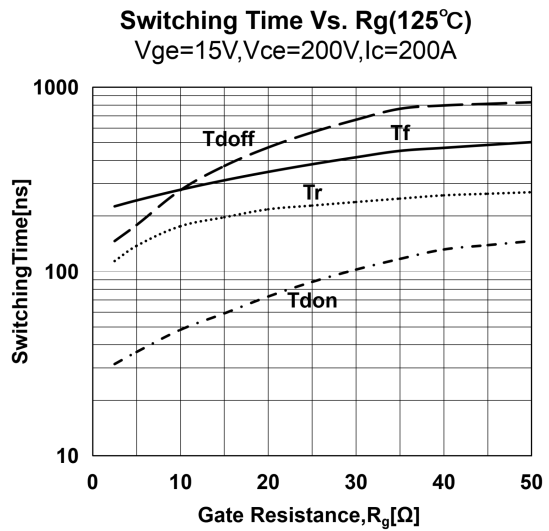
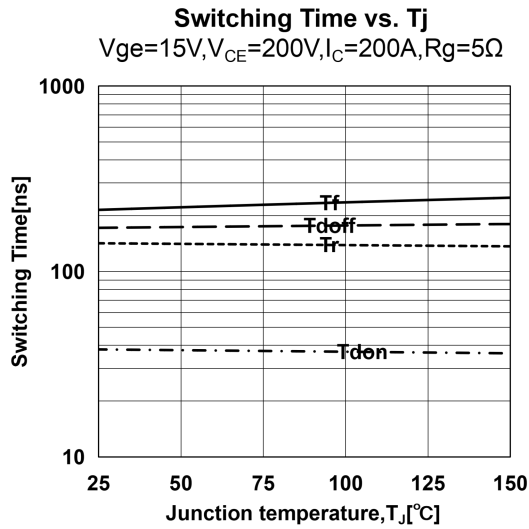


Normalized Collector to Emitter Breakdown Voltage vs. Junction Temperature

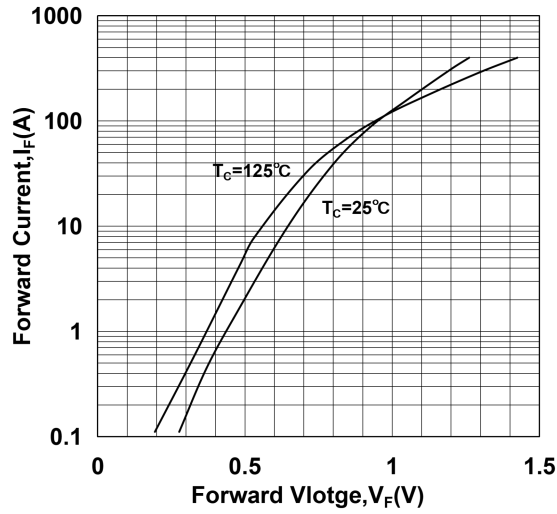


Normalized Collector-Emitter Current Standard Derating Curve

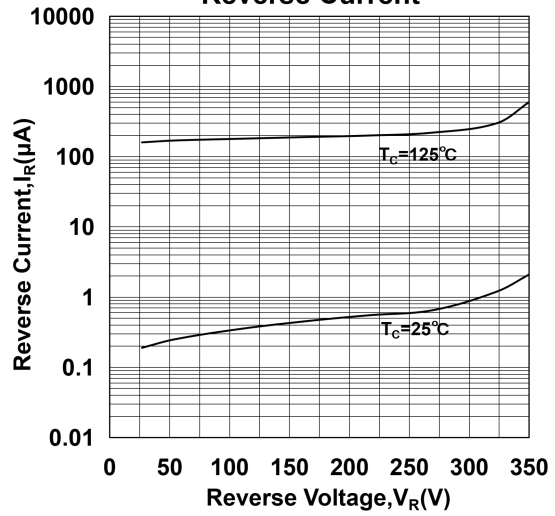




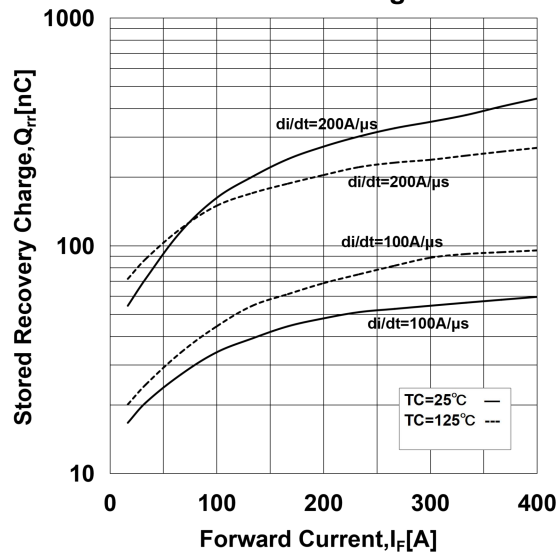
Forward Characteristics



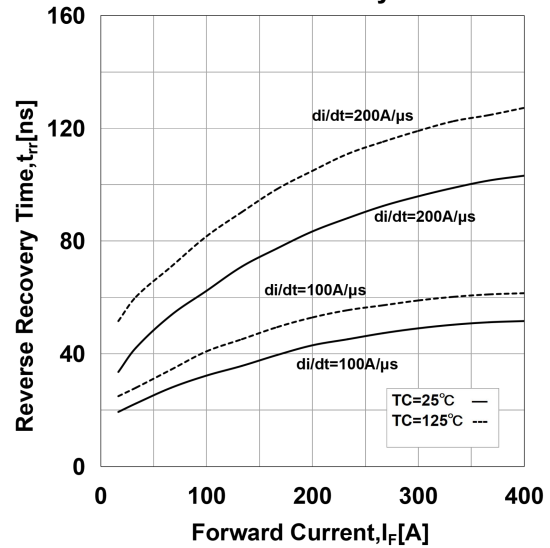
Reverse Current



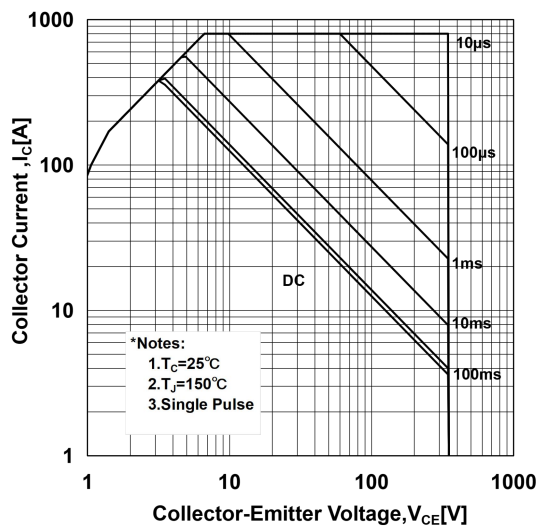
Stored Charge



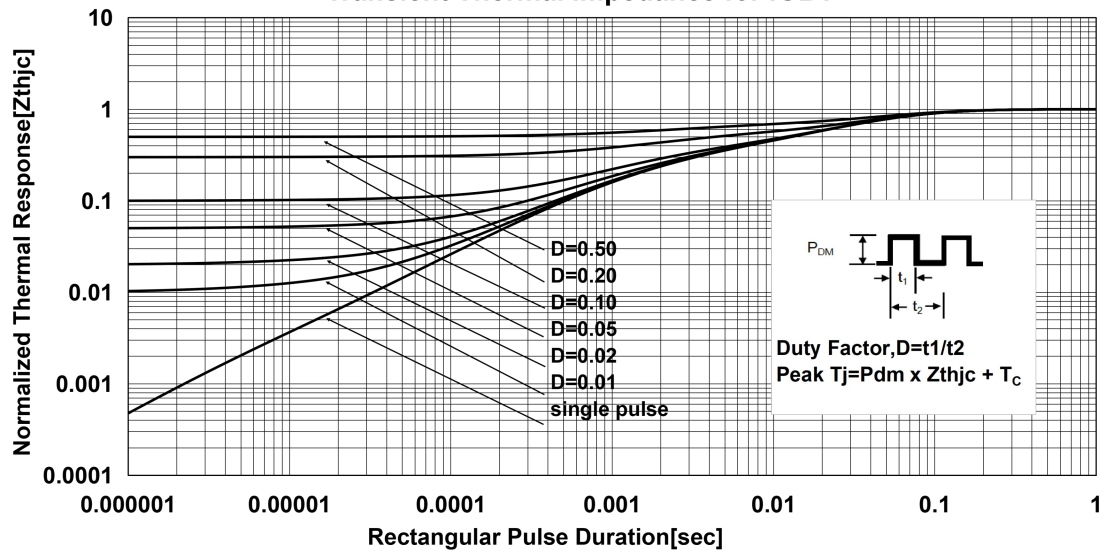
Reverse Recovery Time



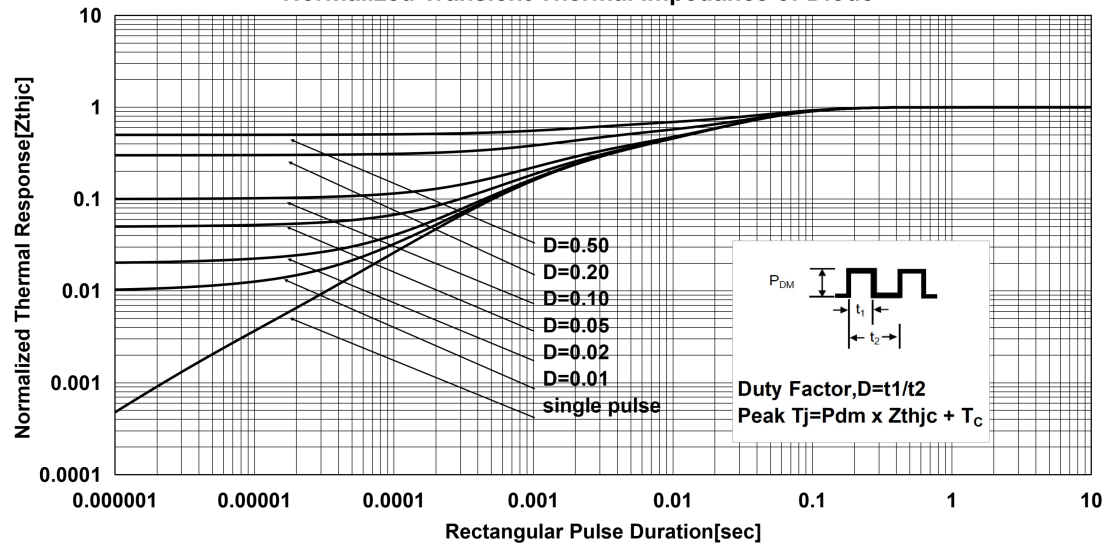
Forward Bias Safe Operating Area



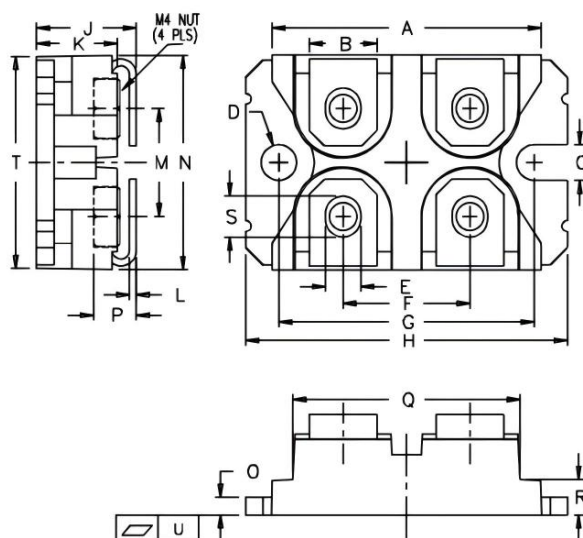
Transient Thermal Impedance for IGBT



Normalized Transient Thermal Impedance of Diode



Package Mechanical DATA



Dim.	Milimeter		Inches	
	Min.	Max.	Min.	Max.
A	31.34	31.74	1.234	1.250
B	7.76	8.16	0.305	0.321
C	4.04	4.44	0.159	0.175
D	4.06	4.46	0.160	0.176
E	3.96	4.36	0.156	0.172
F	14.45	14.85	0.569	0.585
G	30.00	30.40	1.181	1.197
H	37.99	38.39	1.496	1.511
J	11.99	12.39	0.472	0.488
K	8.57	8.97	0.337	0.353
L	0.65	1.05	0.025	0.041
M	12.15	12.55	0.478	0.494
N	24.86	25.26	0.979	0.995
O	1.84	2.24	0.072	0.088
P	4.99	5.39	0.196	0.212
Q	26.76	27.16	1.054	1.069
R	3.80	4.20	0.150	0.165
S	4.99	5.39	0.196	0.212
T	24.02	24.42	0.946	0.962
U	-0.05	0.10	-0.002	0.004