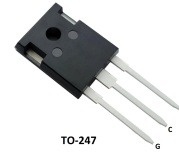


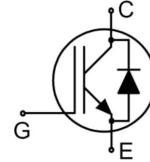
Features

- High Speed Switching & Low Power Loss
- saturation voltage: $V_{CE(sat)}$, type =1.6V, $I_C=30A$ and $T_C=25^{\circ}C$
- $E_{off}=0.35mJ @T_C=25^{\circ}C$
- High input impedance
- Maximum junction temperature $175^{\circ}C$



Applications

- PFC & UPS
- Welder & IH Cooker
- PV Inverter



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

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
*Collector Current-continuous	I_C	$T=25^{\circ}C$	80
		$T=100^{\circ}C$	40
Collector Current-pulse(not 1)	I_{CM}	160	A
*Diode RMS forward current	I_F	$T=25^{\circ}C$	80
		$T=100^{\circ}C$	40
Diode forward current-pulse(not1)	I_{FM}	160	A
Turn-off safe area(not 2)	-	160	A
Gate-Emitter Voltage	V_{GES}	± 20	V
Power Dissipation	P_D	$T_C=25^{\circ}C$	375
		$T_C=100^{\circ}C$	188
Short circuit withstand time(not 3)	t_{sc}	5	μA
Operating Temperature Range	T_J	-55~175	$^{\circ}C$
Storage Temperature Range	T_{STG}	-55~+150	$^{\circ}C$
Soldering temperature wave soldering 1.6mm(0.063 in.) from case for 10s	T_L	260	$^{\circ}C$
Mounting torque、M3 screw Maximum of mounting processes:3	M	0.6	Nm

*Collector current limited by maximum Junction temperature

*Notes:

1. Pulse width limited by maximum junction temperature
2. $V_{CE} \leq 600V, T_{vj} \leq 175^{\circ}C$
3. $V_{CE} \leq 400V, V_{GE} = 15V, T_{vj} = 150^{\circ}C$, Allowed number of short circuits < 1000 Time between short circuits $\geq 1.0s$

Electrical Characteristics($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Tests conditions		Min	Typ	Max	Units
Off-Characteristics							
Collector-Emitter breakdown Voltage	BV_{CES}	$I_C=250\mu A, V_{GE}=0V$		650	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=650V,$ $V_{GE}=0V, T_C=25^{\circ}C$		-	-	40	μA
		$V_{CE}=650V,$ $V_{GE}=0V, T_C=175^{\circ}C$		-	-	1	mA
Gate-body leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	± 100	nA
Transconductance	g_{fs}	$V_{CE}=20V, I_C=40A$		-	17.0	-	S
On-Characteristics							
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE},$ $I_C=600\mu A$		5.0	-	7.0	V
Collector-Emitter saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V,$ $I_C=30A,$	$T_C=25^{\circ}C$	-	1.6	2.05	V
			$T_C=125^{\circ}C$		1.85	-	
			$T_C=175^{\circ}C$		2.05	-	
Dynamic Characteristics							
Input capacitance	C_{ies}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1.0MHz,$		-	1718	-	pF
Output capacitance	C_{oes}			-	150	-	pF
Reverse transfer capacitance	C_{res}			-	45	-	pF
Total Gate Charge	Q_g	$V_{CC}=520V, I_C=40A,$ $V_{GE}=15V$		-	94.5	-	nC
Gate to emitter charge	Q_{ge}			-	17.9	-	
Gate to collector charge	Q_{gc}			-	54.6	-	
Gate resistance	R_g	$f=1MHz, open collector$		-	1.1	-	Ω
Short current Max.1000short circuits Time between short circuits: $\geq 1.0s$	I_{sc}	$V_{GE}=15V, V_{CE}=400V,$ $T_{vj}\leq 150^{\circ}C, t_{sc}\leq 5\mu s$		-	150	-	A
Switching Characteristics							
Turn-On delay time	$t_d(on)$	$V_{CC}=400V, I_C=40A, R_G=$ $7.9\Omega, V_{GE}=15V, inductiv$ $e Load , T_C=25^{\circ}C$		-	30	-	ns
Turn-On rise time	t_r			-	70	-	ns
Turn-off delay time	$t_d(off)$			-	62	-	ns
Turn-off Fall time	t_f			-	40	-	ns
Turn-on energy	E_{on}			-	0.95	-	mJ
Turn-off energy	E_{off}			-	0.35	-	mJ

Total switching Energy	E _{tot}			-	1.30	-	mJ
Turn-On delay time	t _d (on)	V _{CC} =400V,I _c =40A,R _G = 7.9Ω,V _{GE} =15V T _c =175°C		-	28	-	ns
Turn-On rise time	t _r			-	67	-	ns
Turn-off delay time	t _d (off)			-	66	-	ns
Turn-off Fall time	t _f			-	48	-	ns
Turn-on energy	E _{on}			-	1.37	-	mJ
Turn-off energy	E _{off}			-	0.4	-	mJ
Total switching Energy	E _{tot}			-	1.77	-	mJ
Anti-Parallel Diode Characteristics							
Diode Forward Voltage	V _F	V _{GE} =0V, I _F =20A.	T _{vj} =25°C		1.25	1.9	V
			T _{vj} =125°C		1.15		
			T _{vj} =175°C		1.1		
Diode Reverse recovery time	t _{rr}	V _{GE} =0V, V _{CC} =400V,I _F =40A, dI _F /dt=100A/us T _{vj} =25°C		-	140	-	ns
Reverse recovery charge	Q _{rr}			-	100	-	nC
Diode Reverse recovery Current	I _{rrm}			-	1.4	-	A
Diode Reverse recovery time	t _{rr}	V _{GE} =0V,V _{CC} =400V, I _F =40A,dI _F /dt=100A/us T _{vj} =175°C		-	245	-	ns
Reverse recovery charge	Q _{rr}			-	650	-	nC
Diode Reverse recovery Current	I _{rrm}			-	5.2	-	A

Thermal Characteristic

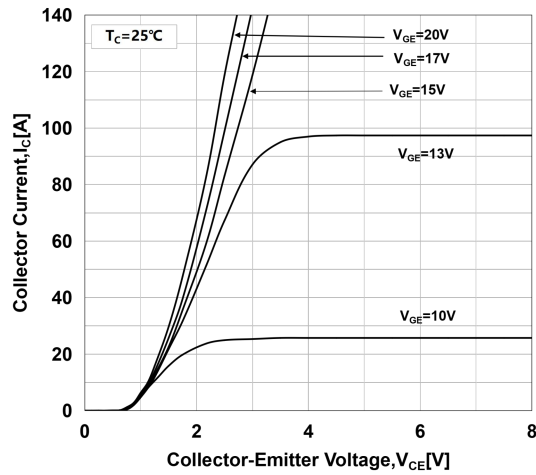
Parameter	Symbol	Max.	Unit
Thermal Resistance,Junction to Case(IGBT)	$R_{th(j-c)}_{IGBT}$	0.4	$^\circ C/W$
Thermal Resistance,Junction to Case(FRD)	$R_{th(j-c)}_{FRD}$	1.2	$^\circ C/W$
Thermal Resistance,Junction to Ambient	$R_{th(j-A)}$	40	$^\circ C/W$

Ordering information

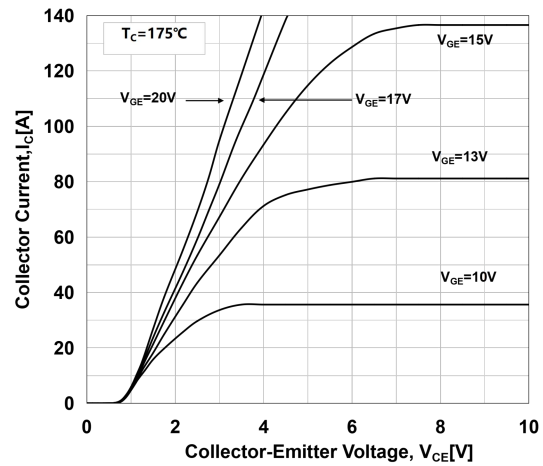
Marking	Package	Temp. range	Package	packing	RoHS Status
MSG40T65FL	40T65FL	-55~175 $^\circ C$	TO-247	Tube	Halogen Free

Electrical Characteristics(curves)

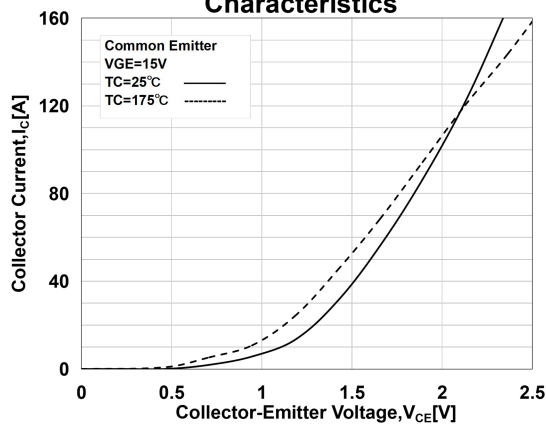
Typical Output Characteristics



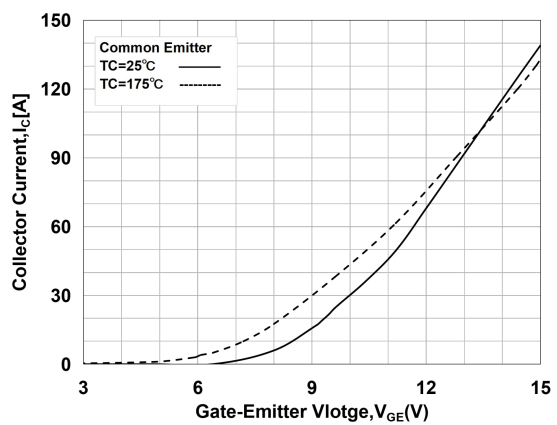
Typical Output Characteristics



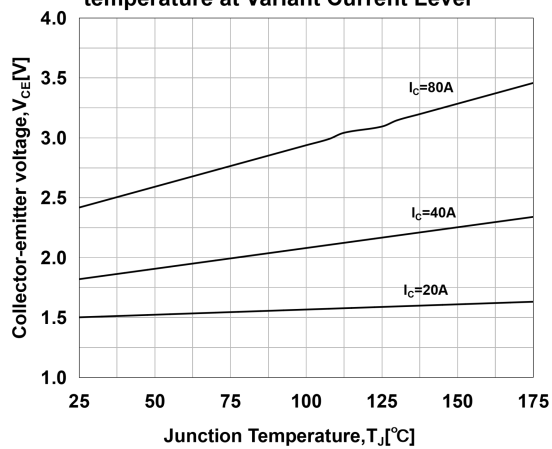
Typical Saturation Voltage Characteristics



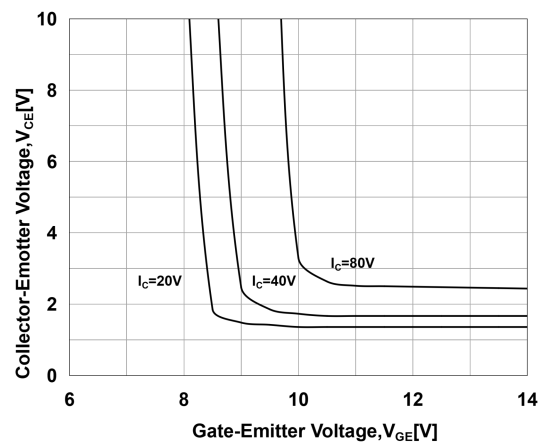
Transfer Characteristics

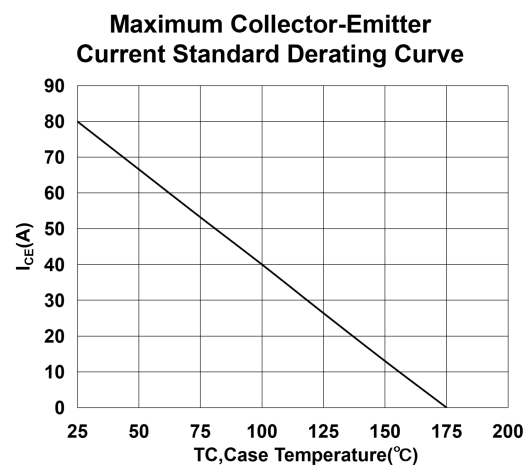
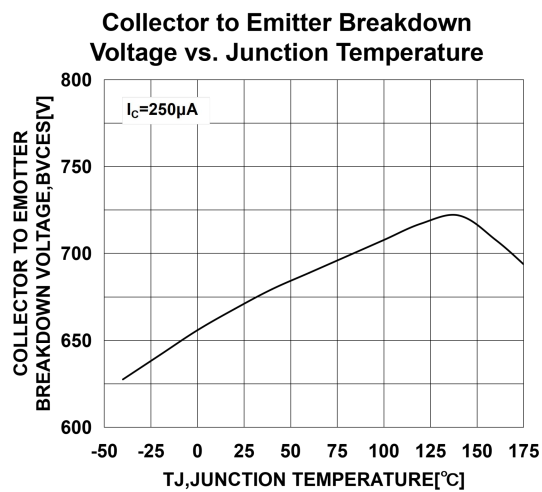
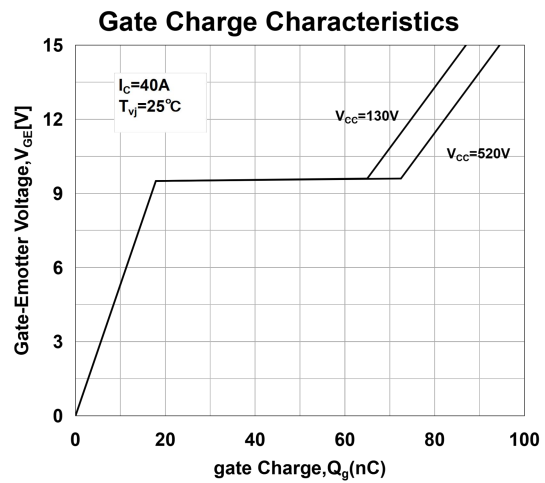
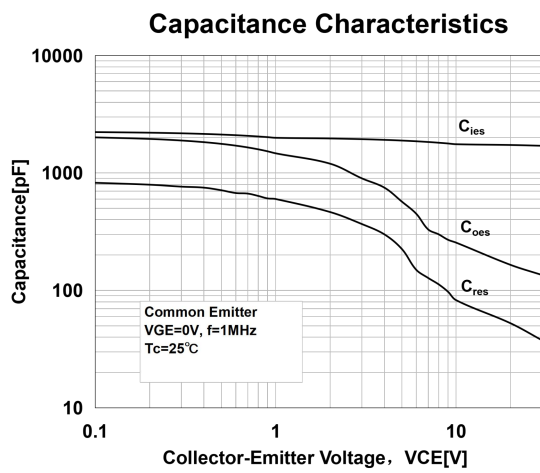
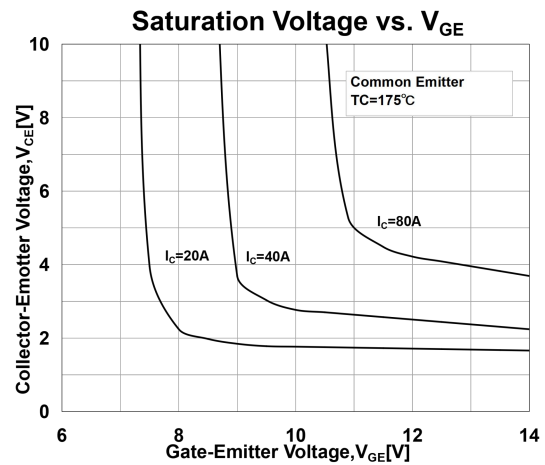
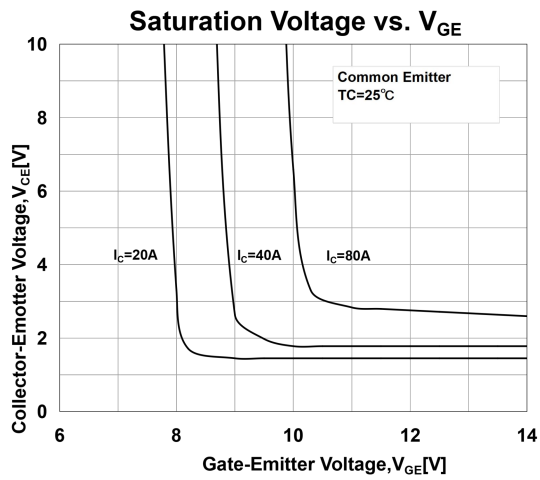


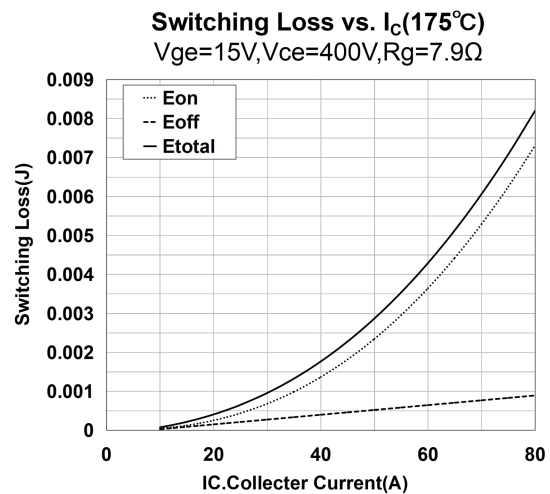
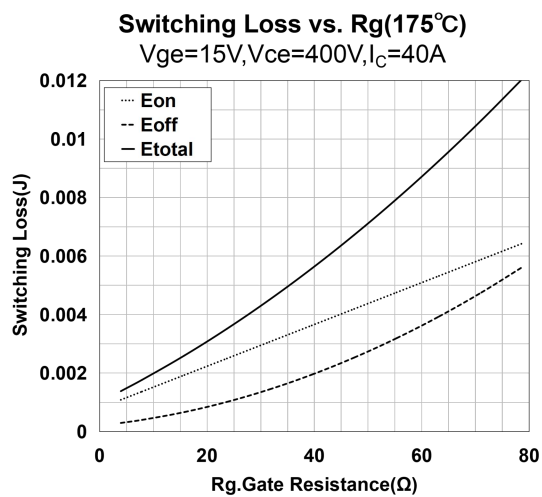
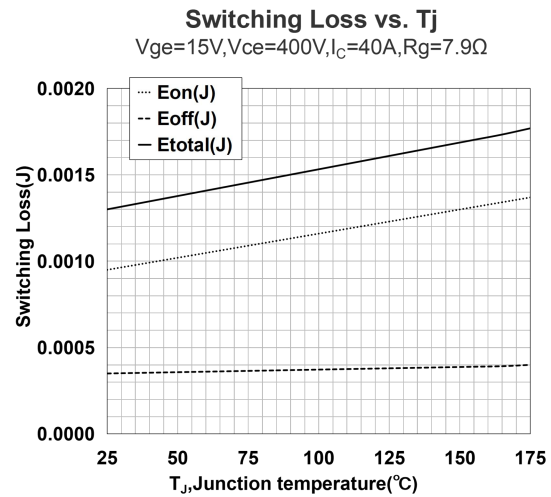
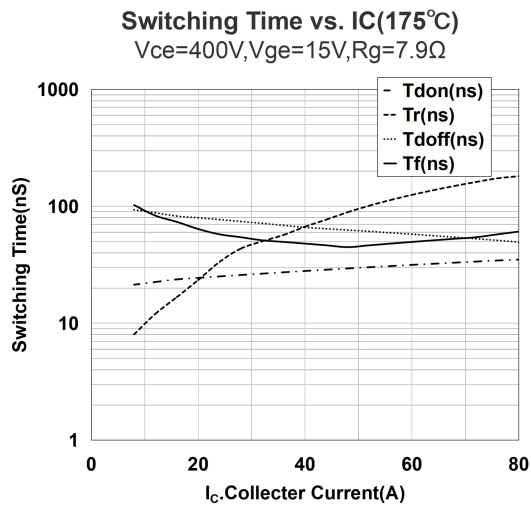
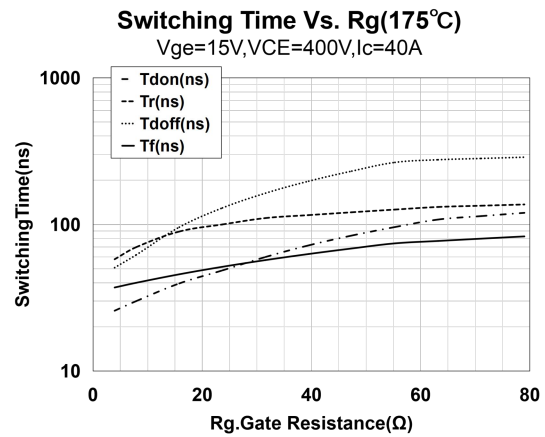
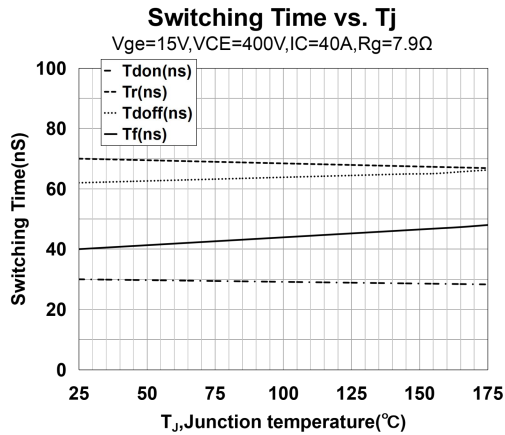
Saturation Voltage vs. Junction temperature at Variant Current Level

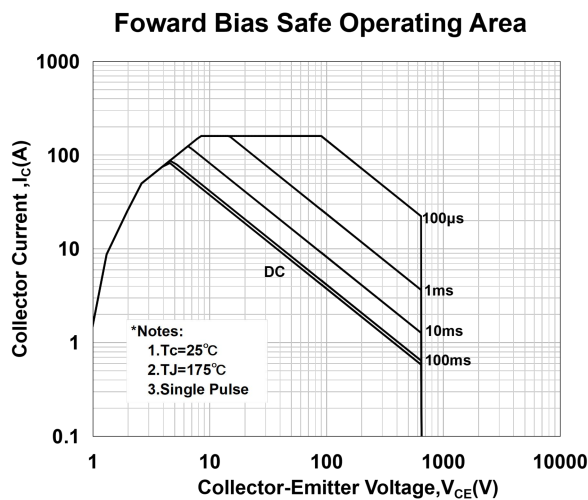
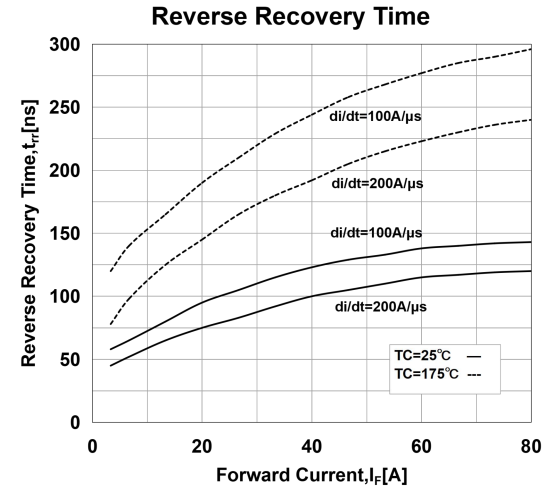
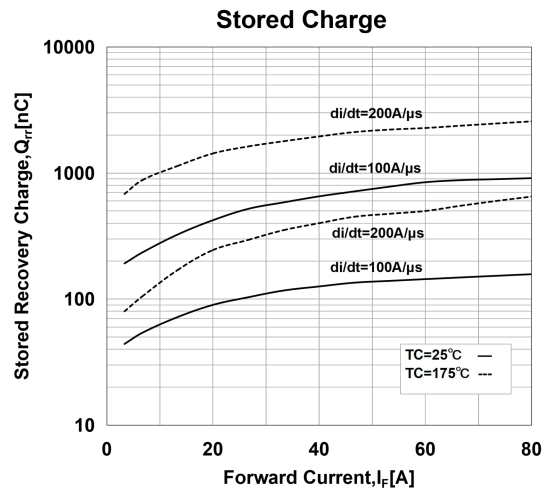
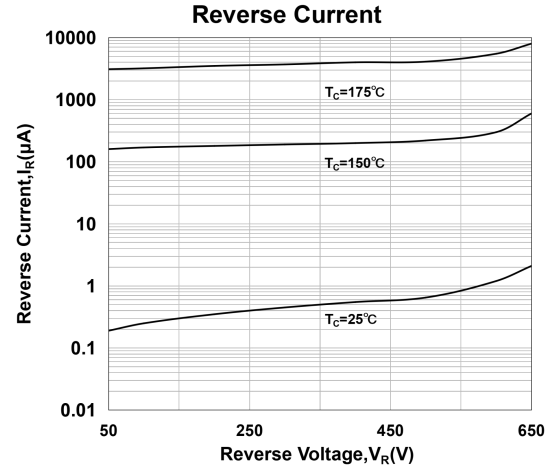
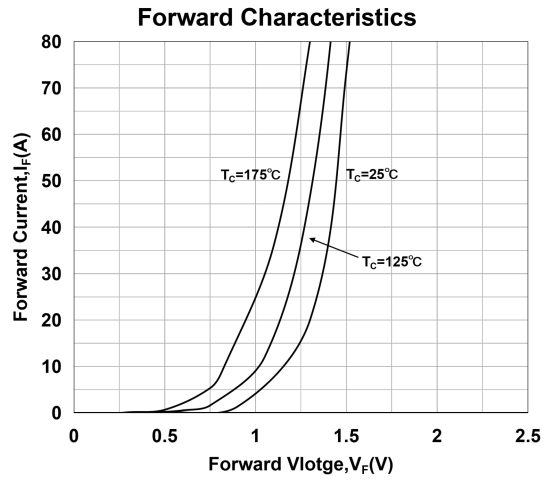


Saturation Voltage vs. V_{ge}

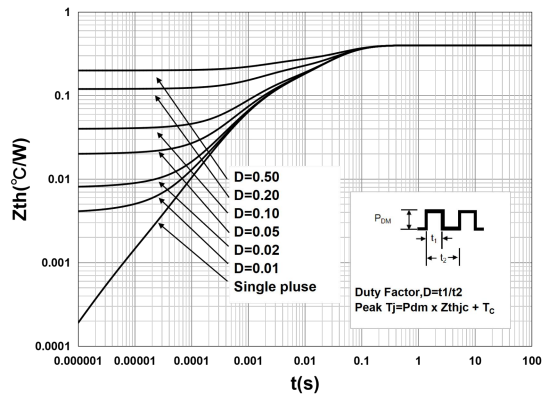




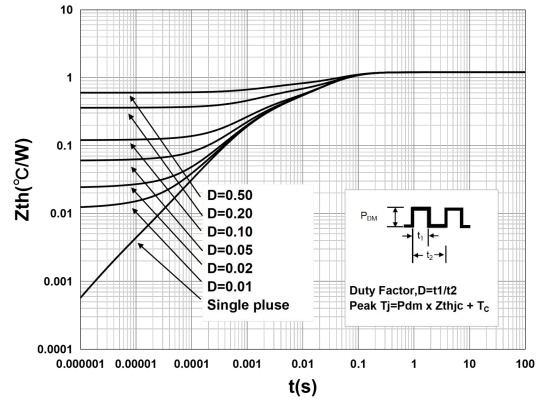




Transient Thermal Impedance of IGBT



Transient Thermal Impedance of Diode



Physical Dimension (Dimensions are in millimeters, unless otherwise specified)

