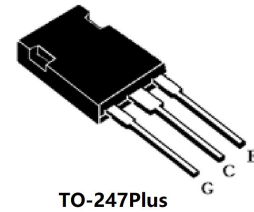


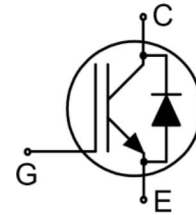
Features

- Very Low Saturation Voltage:
 $V_{CE(sat).type} = 2.1V @ I_C = 160A$
- 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}		650	V
Collector Current-continuous	I_C	$T_C=25^{\circ}C$	240	A
		$T_C=100^{\circ}C$	160	A
Diode forward current	I_F	$T_C=25^{\circ}C$	240	A
		$T_C=100^{\circ}C$	160	A
Collector Current-pulse (note 1)	I_{CM}		480	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
Short Circuit Current	I_{SC}		960	A
Short Circuit Withstand Time	t_{sc}		5	us
Operating Junction Temperature Range	T_J		-40~+175	$^{\circ}C$
Storage Temperature Range	T_{STG}		-55~+150	$^{\circ}C$
Maximum Lead Temperature for Soldering Purposes	T_L		300	$^{\circ}C$

Electrical Characteristics($T_C=25^{\circ}C$, Unless other noted)

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Off-Characteristics						
Collector-Emitter 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	-	-	50	μA
Gate-body leakage current, forward	I _{GESF}	V _{CE} =0V,V _{GE} =30V	-	-	100	nA
Gate-body leakage current, reverse	I _{GESR}	V _{CE} =0V,V _{GE} =-30V	-	-	-100	nA
On-Characteristics						
Gate Threshold Voltage	V _{GE(th)}	V _{CE} =V _{GE} ,I _C =1mA	3.5	-	6.5	V
Collector-Emitter saturation Voltage	V _{CESAT}	V _{GE} =15V I _C =160A	-	2.1	2.4	V
Dynamic Characteristics						
Input capacitance	C _{ies}	V _{CE} =30V, V _{GE} =0V, f=1.0MHz	-	7500	-	pF
Output capacitance	C _{oes}		-	644	-	pF
Reverse transfer capacitance	C _{res}		-	150	-	pF
Switching Characteristics						
Turn-on delay time	t _{d(on)}	V _{CC} =400V,I _C =160A, R _G =5Ω, V _{GE} =15V, Inductive Load T _C =25℃	-	54	-	ns
Turn-On rise time	t _r		-	197	-	ns
Turn-Off delay time	t _{d(off)}		-	98	-	ns
Turn-Off Fall time	t _f		-	141	-	ns
Turn-on Loss	E _{on}		-	12.4	-	mJ
Turn-off Loss	E _{off}		-	5.7	-	mJ
Total Loss	E _{ts}		-	18.1	-	mJ
Turn-on delay time	t _{d(on)}	V _{CC} =400V,I _C =160A, R _G =5Ω, V _{GE} =15V, Inductive Load T _C =175℃	-	50	-	ns
Turn-On rise time	t _r		-	188	-	ns
Turn-Off delay time	t _{d(off)}		-	104	-	ns
Turn-Off Fall time	t _f		-	169	-	ns
Turn-on switching Loss	E _{on}		-	21	-	mJ
Turn-off switching Loss	E _{off}		-	14	-	mJ
Total switching Loss	E _{ts}		-	35	-	mJ
Gate Charge	Q _g	V _{CC} =400V,I _C =160A V _{GE} =15V	-	660	-	nC
Gate to Emitter Charge	Q _{ge}		-	98	-	nC
Gate to Collector Charge	Q _{gc}		-	162	-	nC
Anti-Parallel Diode Characteristics and Maximum Ratings						
Drain-Source Diode	V _F	I _F =160A	-	1.7	-	V

Forward Voltage						
Diode Reverse recovery time	t_{rr}	$V_{CE}=400V, I_F=160A$ $di_F/dt=200A/\mu s$	-	132	-	ns
Diode Reverse recovery charge	Q_{rr}		-	3.3	-	μC

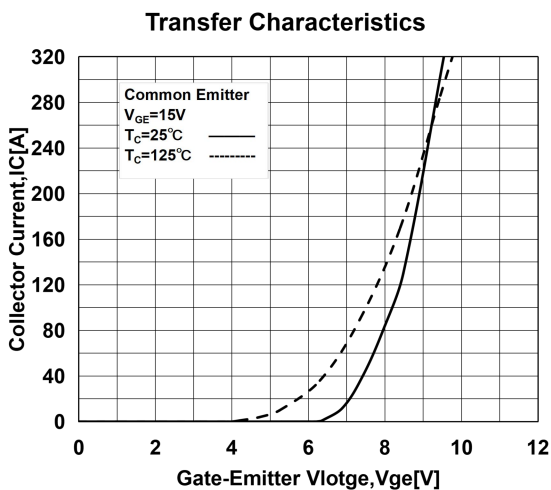
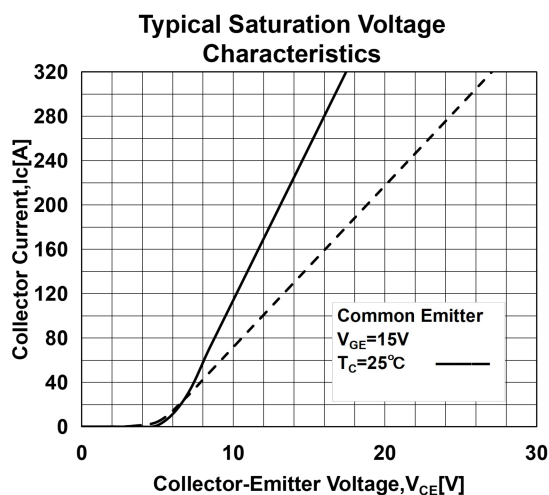
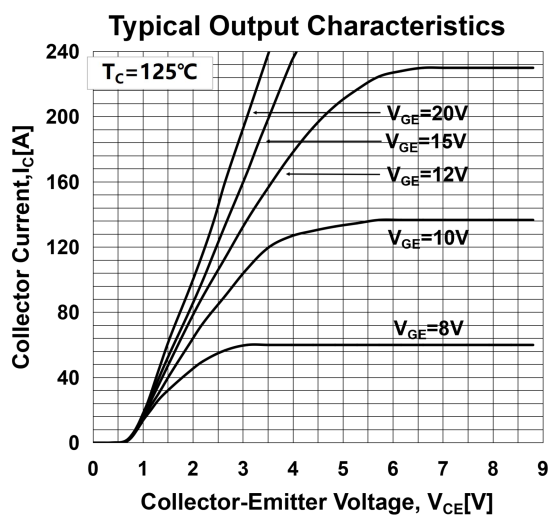
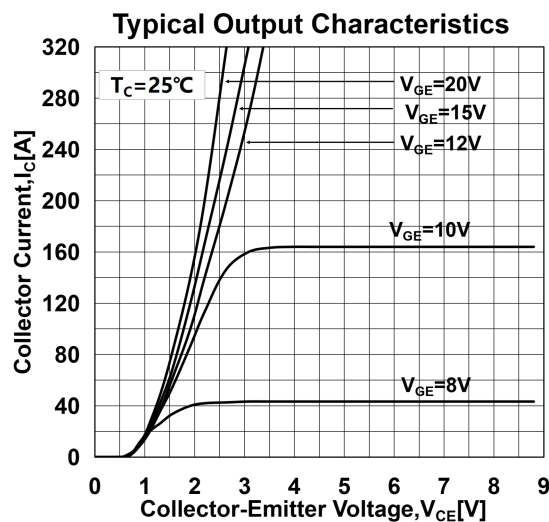
Thermal Characteristic

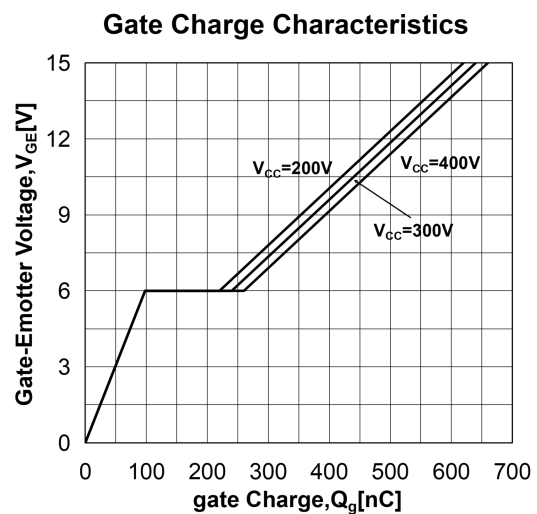
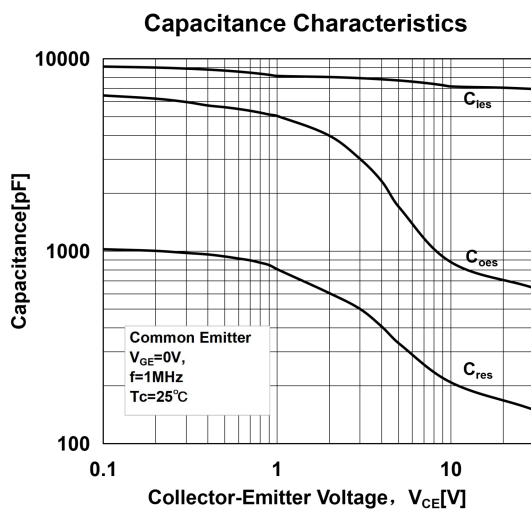
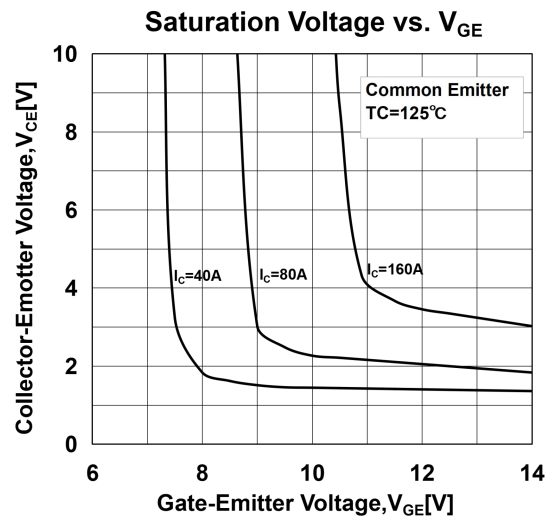
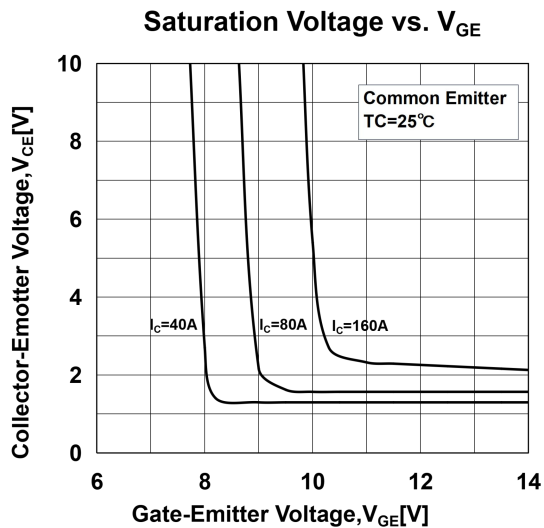
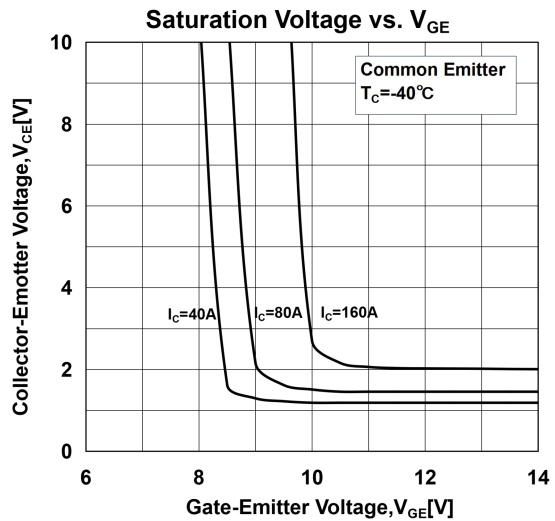
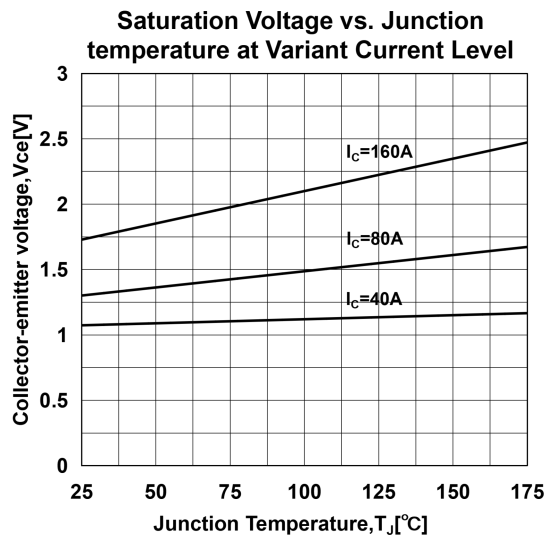
Parameter	Symbol	Max	Unit
Thermal Resistance, Junction to Case (IGBT)	$R_{th(j-c)}$	0.17	$^{\circ}C/W$
Thermal Resistance, Junction to Case (Diode)	$R_{th(j-c)}$	0.32	$^{\circ}C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	40	$^{\circ}C/W$

Notes:

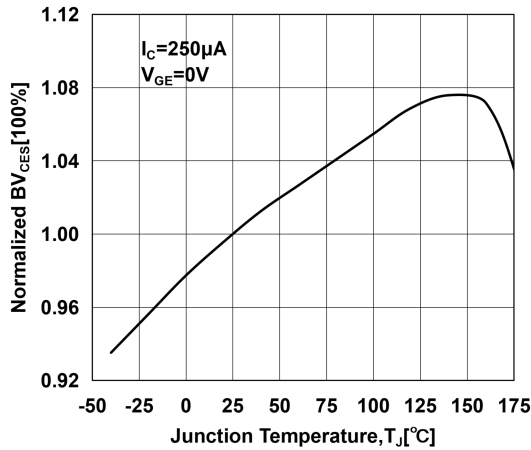
1. Repetitive Rating: Pulse width limited by maximum junction temperature

Electrical Characteristics(curves)

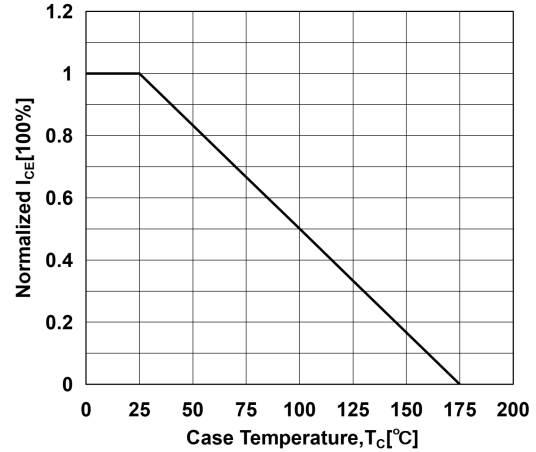




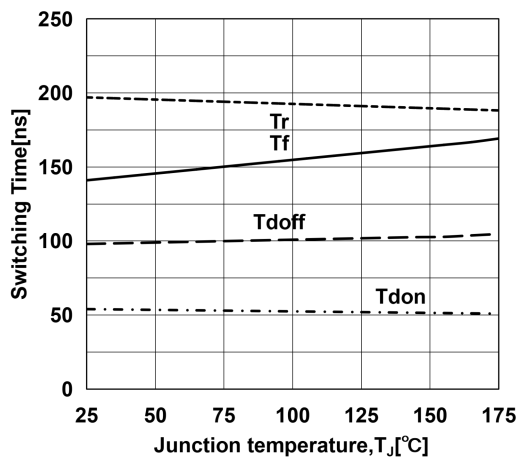
Normalized Collector to Emitter Breakdown Voltage vs. Junction Temperature



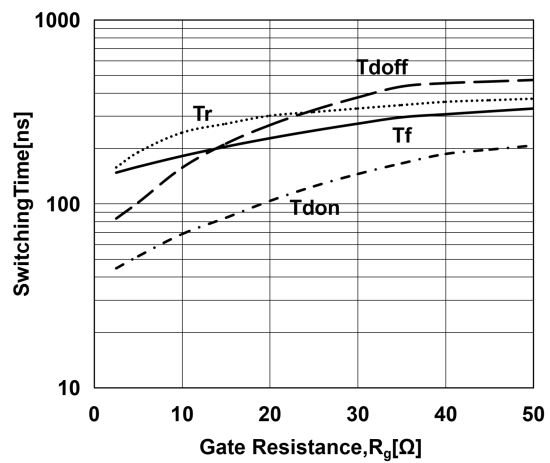
Normalized Collector-Emitter Current Standard Derating Curve



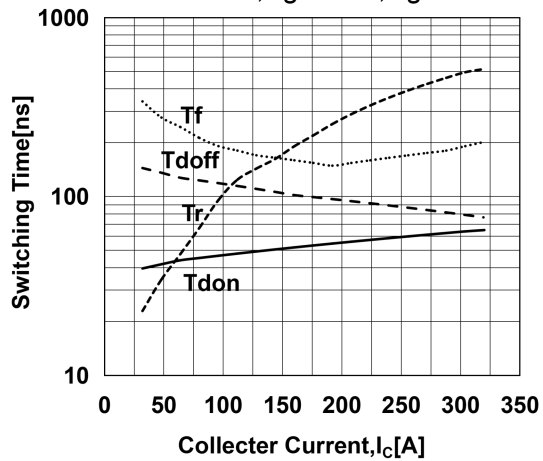
Switching Time vs. T_J
 $V_{GE} = 15V, V_{CE} = 400V, I_C = 160A, R_g = 5\Omega$



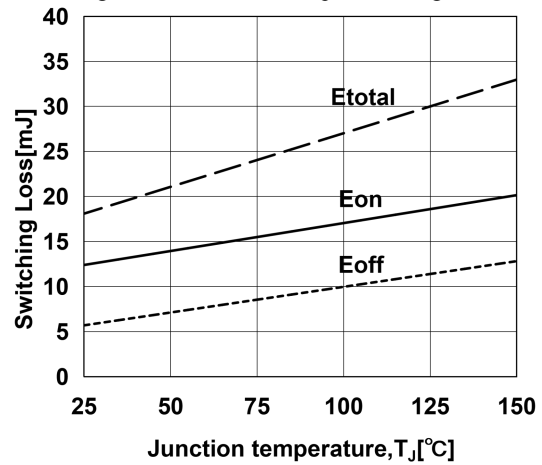
Switching Time Vs. R_g (125°C)
 $V_{GE} = 15V, V_{CE} = 400V, I_C = 160A$



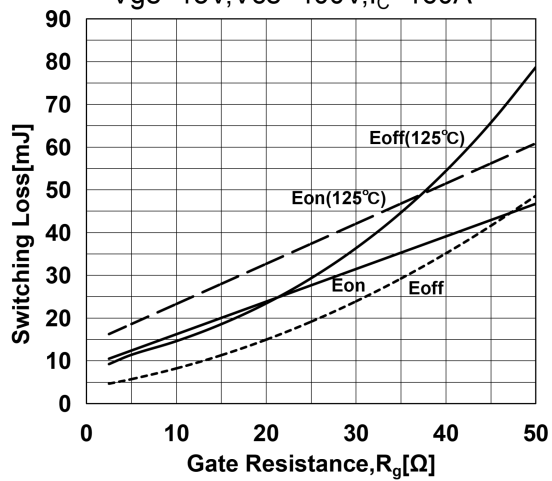
Switching Time vs. I_c (125°C)
 $V_{ce}=400V, V_{ge}=15V, R_g=5\Omega$



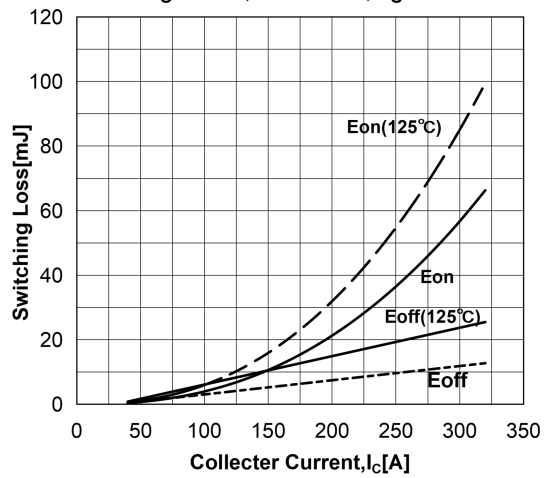
Switching Loss vs. T_j
 $V_{ge}=15V, V_{ce}=400V, I_c=160A, R_g=5\Omega$



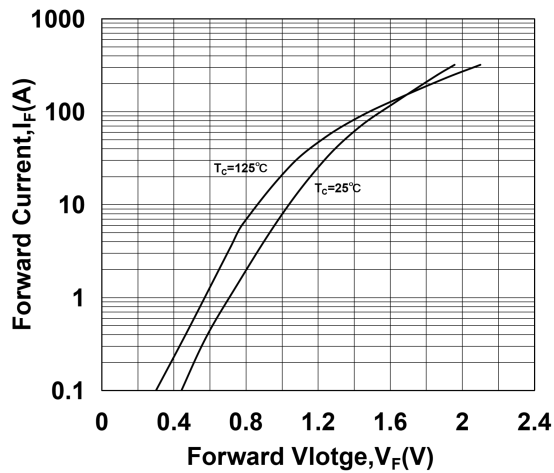
Switching Loss vs. R_g (125°C)
 $V_{ge}=15V, V_{ce}=400V, I_c=160A$



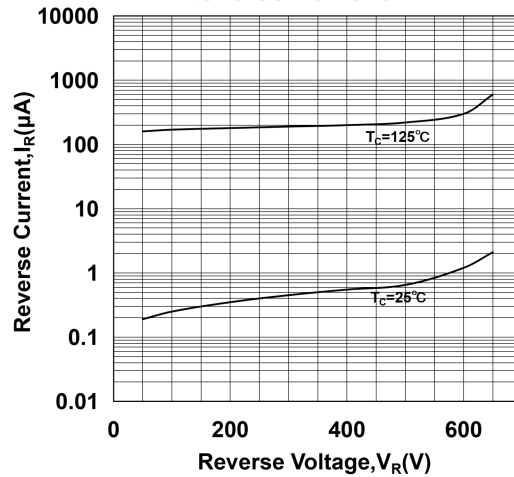
Switching Loss vs. I_c (125°C)
 $V_{ge}=15V, V_{ce}=400V, R_g=5\Omega$



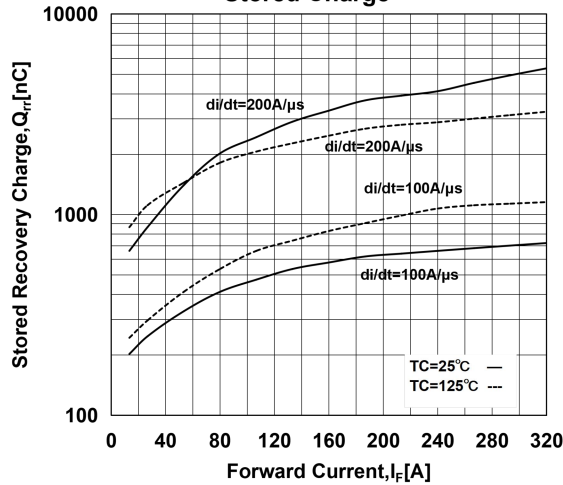
Forward Characteristics



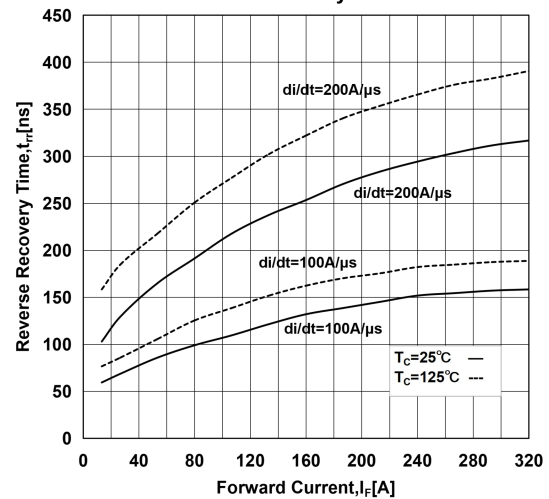
Reverse Current



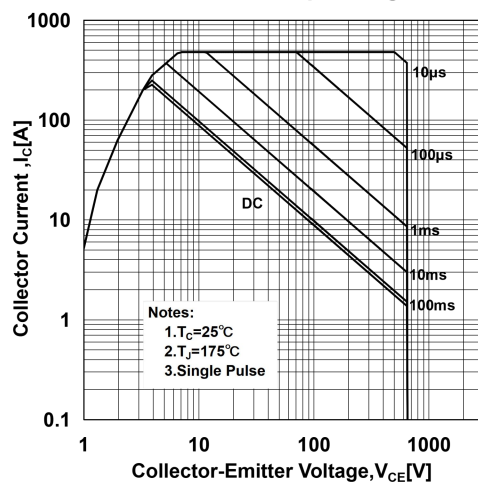
Stored Charge

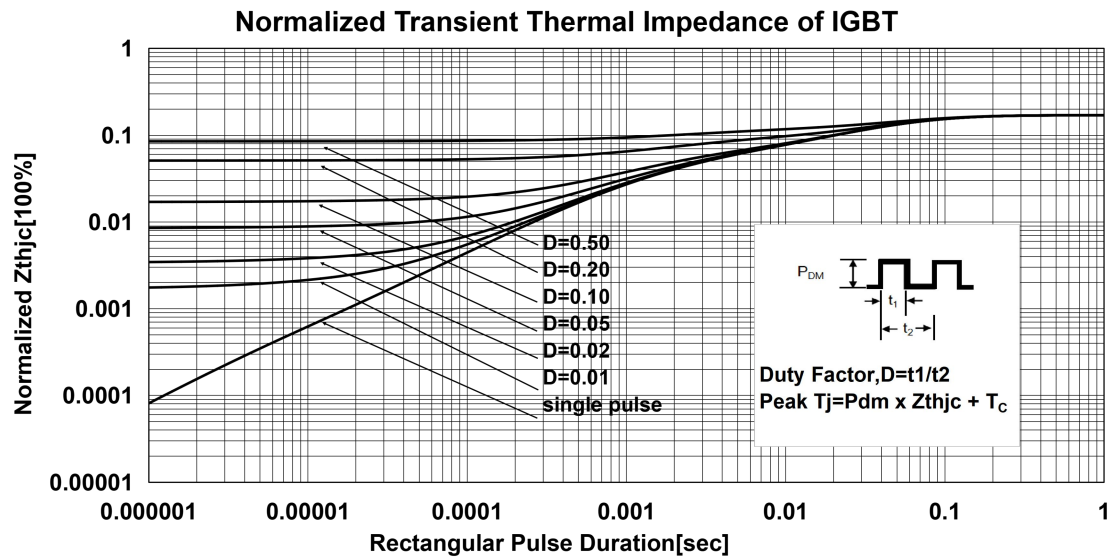
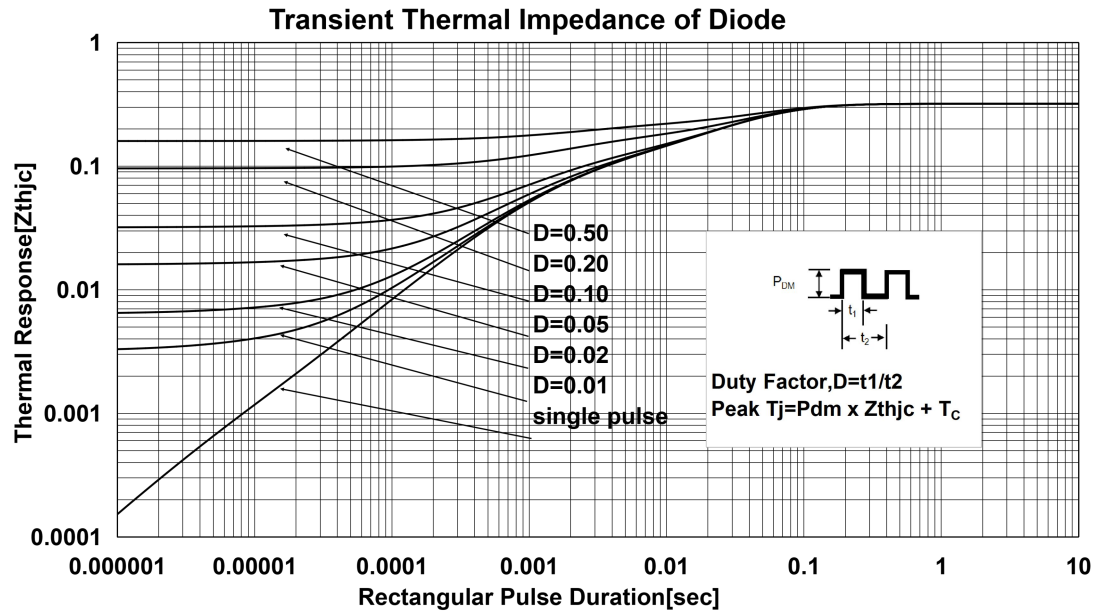


Reverse Recovery Time

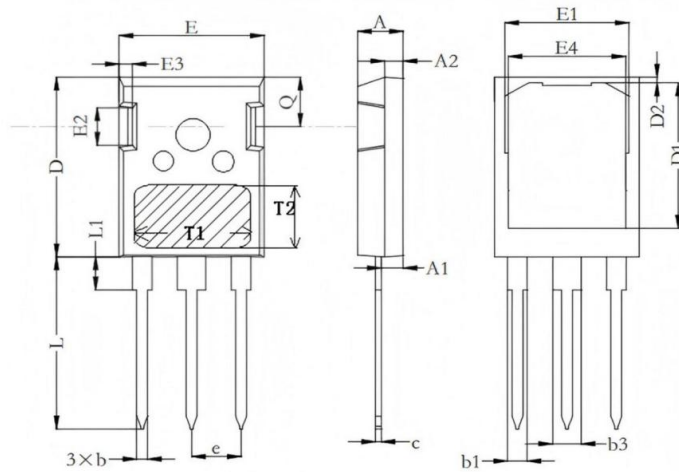


Forward Bias Safe Operating Area





Package Mechanical DATA



Symbol	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.25	2.40	2.55
A2	1.85	2.00	2.15
b	1.10	1.20	1.25
b1	1.90	2.00	2.10
b3	2.90	3.00	3.20
C	0.50	0.60	0.70
e	5.44BSC		
D	20.70	20.90	21.10
D1	16.56	16.76	16.96
D2	0.45	0.55	0.65
E	15.67	15.87	16.07
E1	13.80	14.00	14.20
E2	4.05	4.25	4.45
E3	1.40	1.60	1.80
E4	13.00	13.20	13.40
L	19.60	19.90	20.20
L1	3.66	3.86	4.06
Q	5.35	5.55	5.75
T1	12.47	12.67	12.87
T2	8.14	8.34	8.54