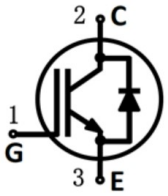
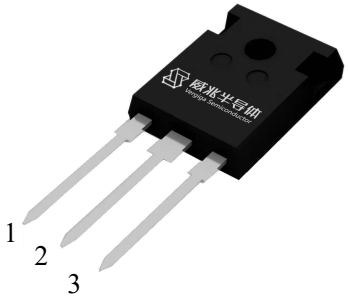
HCKW75N65FH2 is a **650V75A** IGBT discrete with high speed soft switching of Trench Field stop technology.The product with a anti-parallel diode,has the characteristics of low V_{cesat} , high junction temperature and strong robustness. It is very suitable for products with high switching frequency.

■ Features

- CoolWatt ⓒⅡ Trench-FS technology
- Low V_{CESAT}
- Low switching losses
- With anti-parallel fast recovery diode
- Positive temperature coefficient
- High reliability





TO-247

■ Applications

- Inverter power supply
- UPS
- PV

Part ID	V_{CE}(V)	I_{CNOM}(A)	$V_{CESAT@25℃}$(V)	Package	Marking
HCKW75N65FH2	650	75	1.80	TO-247	K75H65F2

■ Maximum Rated Values

Symbol	Parameter	Condition	Value	Unit
V_{CES}	Collector-emitter voltage	T_{vj}=25℃	650	V
I_C	DC collector current	T_C = 25℃ T_C =100℃	150 75	A
I_{Cpuls}	Pulse collector current	T_{vj}≤150℃	225	A
V_{RRM}	Repetitive peak reverse voltage	T_{vj}=25℃	650	V
I_F	Diode continuous forward current	T_C = 25℃ T_C = 100℃	150 75	A
I_{Fpuls}	Diode pulse current	T_{vj}≤150℃	225	A
V_{GE}	Gate-emitter voltage	T_{vj}=25℃ Transient（tp≤10uS,D＜0.01）	±20 ±30	V

P_{tot}	Power dissipation	T_C = 25℃	625	W
T_{vj}	Operating junction temperature		-40~+175	℃
T_{stg}	Storage temperature		-50~ +150	℃
M	Mounting torque	M3	0.6	Nm

■ Thermal Characteristic

Symbol	Parameter	Maximum	Unit
$R_{thJC-IGBT}$	IGBT thermal resistance junction-case	0.24	K/W
$R_{thJC-FRD}$	FRD thermal resistance junction-case	0.31	K/W
R_{thJA}	Thermal resistance junction-ambient	40	K/W

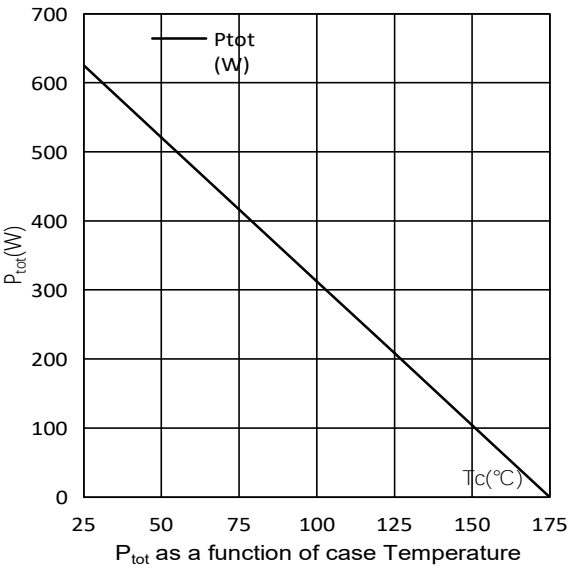
■ Electrical Characteristic

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)CES}$	Collector-emitter breakdown voltage	V_{GE} = 0V, I_C=0.25mA,T_{vj}=25℃	650	—	—	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}=15V, I_C=75A, T_{vj}=25℃ T_{vj}=150℃	— —	1.80 2.30	2.00 —	
$V_{GE(th)}$	Gate-emitter threshold voltage	V_{GE}= V_{CE},I_C=1.5mA,T_{vj}=25℃	5.10	5.60	6.10	
V_F	Diode forward voltage	V_{GE}= 0V,I_F=75A, T_{vj}=25℃ T_{vj}=150℃	— —	1.50 1.35	1.75 —	
I_{GES}	Zero collector voltage gate current	V_{GE}=30V,V_{CE}=0V	—	—	200	nA
I_{CES}	Zero gate voltage collector current	V_{CE} =650V,V_{GE}=0V, T_{vj}=25℃ T_{vj}=150℃	— —	— —	0.20 1.00	mA
R_{Gin}	Integrated gate resistor	—	—	0	—	Ω
C_{ies}	Input capacitance	V_{GE} = 0V,V_{CE}= 30V, f = 1MHz, T_{vj}=25℃	—	4020	—	pF
C_{oes}	Output capacitance		—	268	—	
C_{res}	Reverse transfer capacitance		—	24.2	—	
Q_g	Gate charge	V_{GE}=0/15V,V_{cc}=400V,I_C=75A, T_{vj}=25℃	—	136	—	nC
Q_{ge}	Gate-emitter charge		—	34.1	—	
Q_{gc}	Gate-collector charge		—	64.0	—	
V_{GE}(pl)	Gate-emitter plateau voltage	I_C =75A,V_{CE}=520V, V_{GE}=0/15V,T_{vj}=25℃	—	10.0	—	V

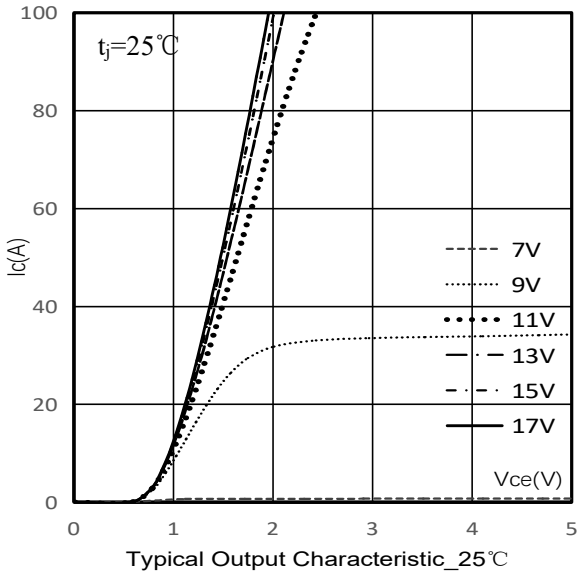
■ Dynamic Characteristic（With inductive load）

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
IGBT Characteristic_25℃：						
$T_{d(on)}$	Turn-on delay time	Vcc=400V,Ic=75A, Ron=10Ω, Roff=10Ω, Cge=0nF,V_{GE}=0/15V, L_{load}=60uH,T_{vj}=25℃	—	81.5	—	ns
T_r	Rise time		—	132	—	
$T_{d(off)}$	Turn-off delay time		—	188	—	
t_f	Fall time		—	70.0	—	
E_{on}	Turn-on energy		—	3.00	—	mJ
E_{off}	Turn-off energy		—	0.72	—	
E_{total}	Total switch energy		—	3.72	—	
IGBT Characteristic_150℃：						
$T_{d(on)}$	Turn-on delay time	Vcc=400V,Ic=75A, Ron=10Ω, Roff=10Ω, Cge=0nF,V_{GE}=0/15V, L_{load}=60uH,T_{vj}=150℃	—	74.0	—	ns
T_r	Rise time		—	132	—	
$T_{d(off)}$	Turn-off delay time		—	210	—	
t_f	Fall time		—	85.0	—	
E_{on}	Turn-on energy		—	5.32	—	mJ
E_{off}	Turn-off energy		—	0.91	—	
E_{total}	Total switch energy		—	6.23	—	
Diode Characteristic_25℃：						
Erec	Reverse recovery energy	I_F =75A,V_R=400V, V_{GE} =0/15V,R_{ON}=10Ω,T_{vj}=25℃	—	266	—	uJ
trr	Diode reverse recovery time		—	147	—	nS
Qrr	Diode reverse recovery charge		—	1250	—	nC
Irrm	Diode peak reverse recovery current		—	16.5	—	A
di_{rr}/dt	Diode peak rate of fall of reverse Recovery current during t_{rr}		—	306	—	A/uS
Diode Characteristic_150℃：						
Erec	Reverse recovery energy	I_F=75A,V_R=400V,V_{GE}=0/15V, R_{ON}=10Ω,T_{vj}=150℃	—	1230	—	uJ
trr	Diode reverse recovery time		—	310	—	nS
Qrr	Diode reverse recovery charge		—	6012	—	nC
Irrm	Diode peak reverse recovery current		—	39.0	—	A
di_{rr}/dt	Diode peak rate of fall of reverse Recovery current during t_{rr}		—	380	—	A/uS

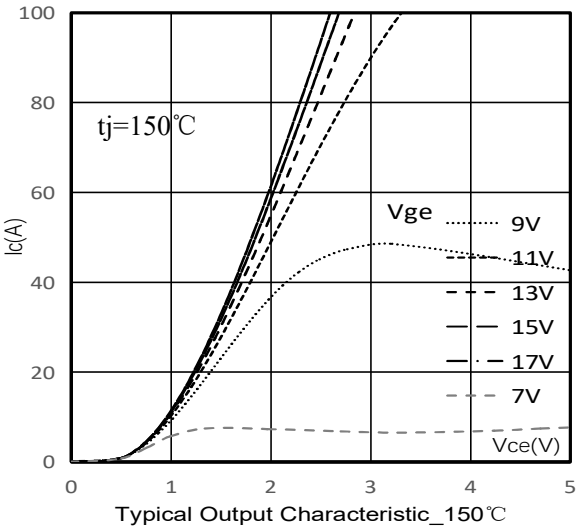
■ Characteristic Curve



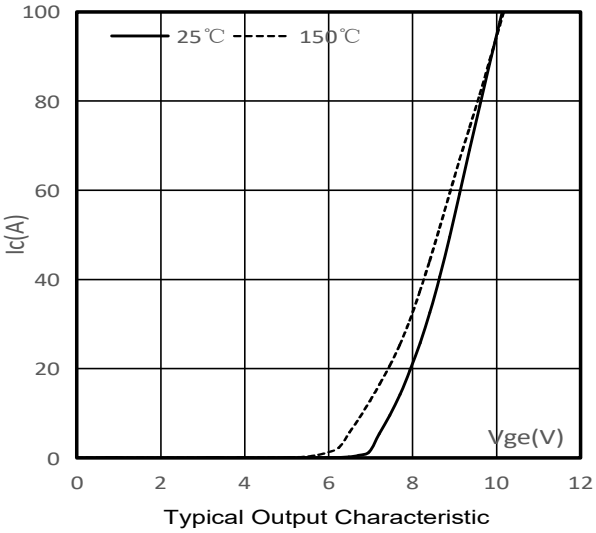
P_{tot} as a function of case Temperature



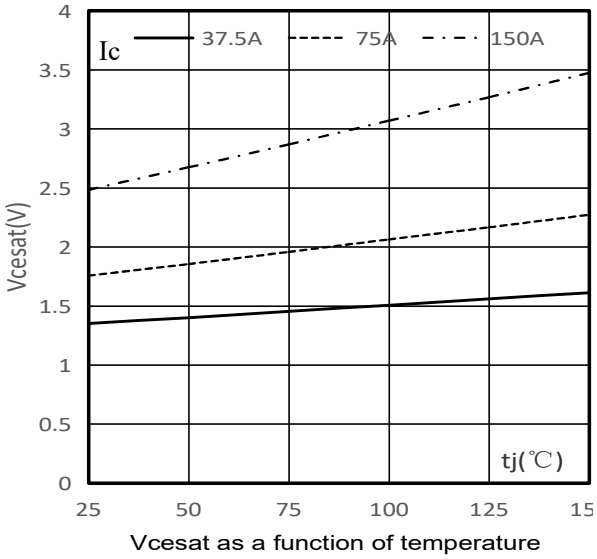
Typical Output Characteristic_25℃



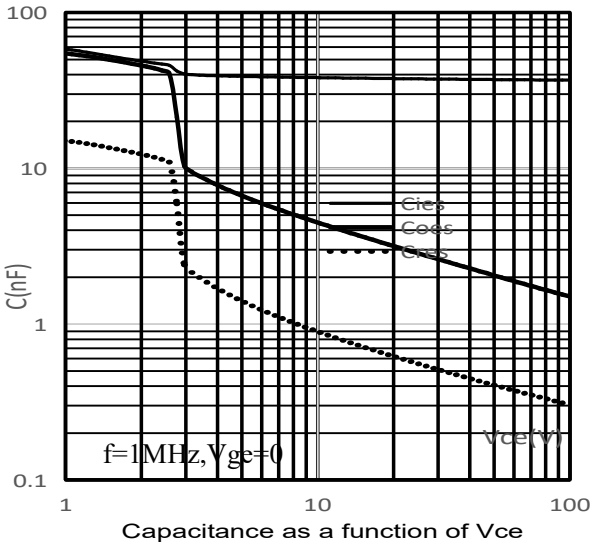
Typical Output Characteristic_150℃



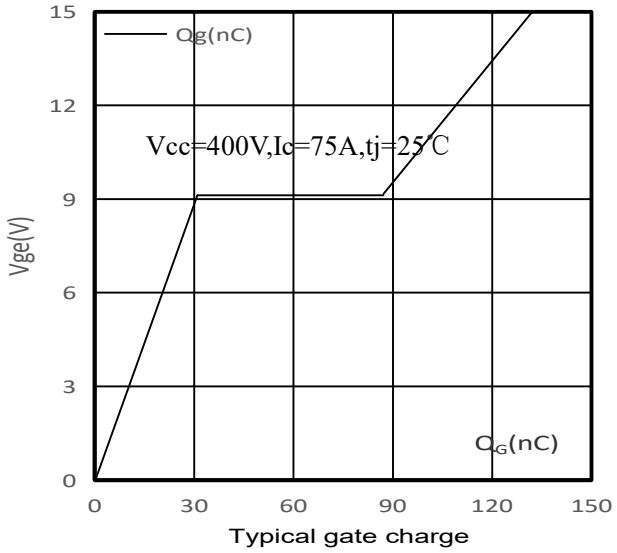
Typical Output Characteristic

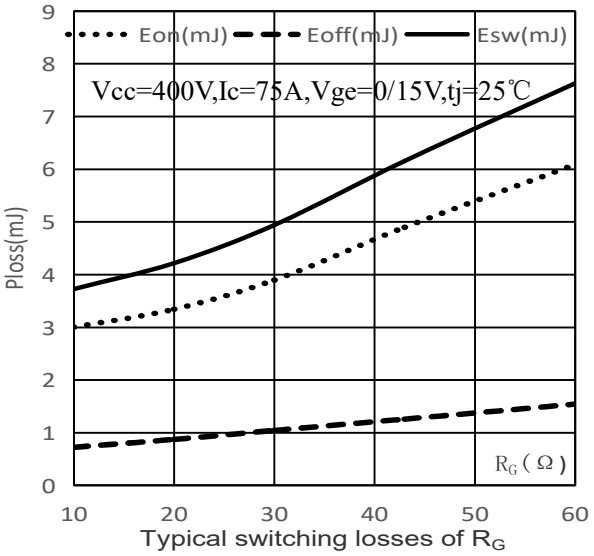


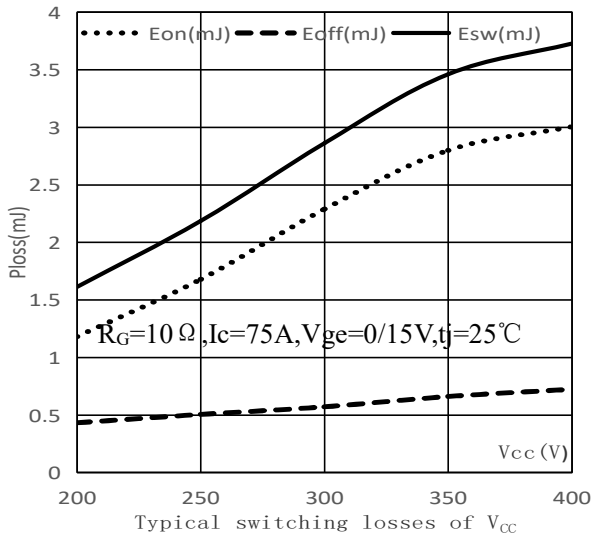
Vcesat as a function of temperature

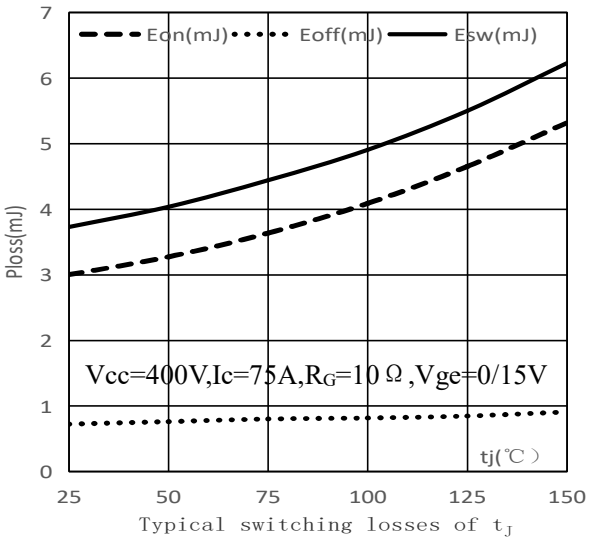


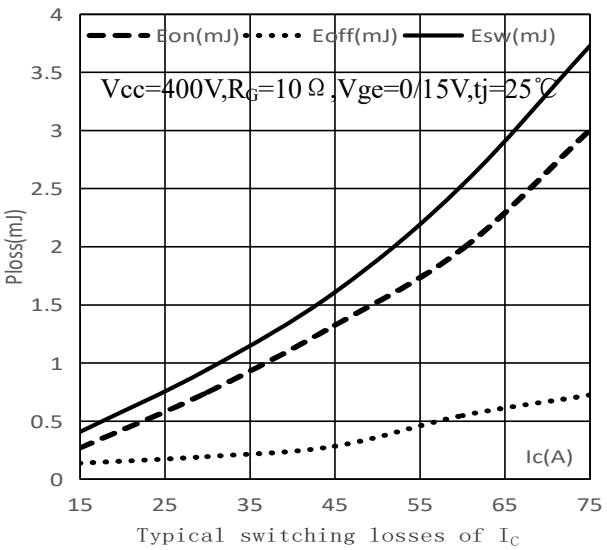
Capacitance as a function of Vce

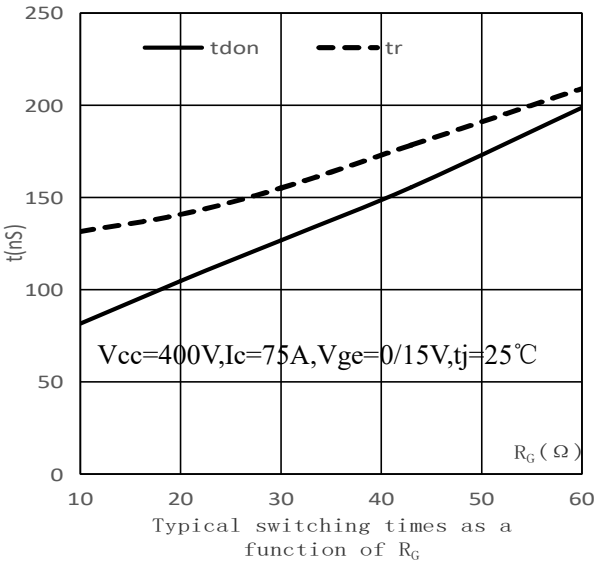

Qg(nC)
Vcc=400V,Ic=75A,tj=25℃
Vge(V)
Q_G(nC)
Typical gate charge

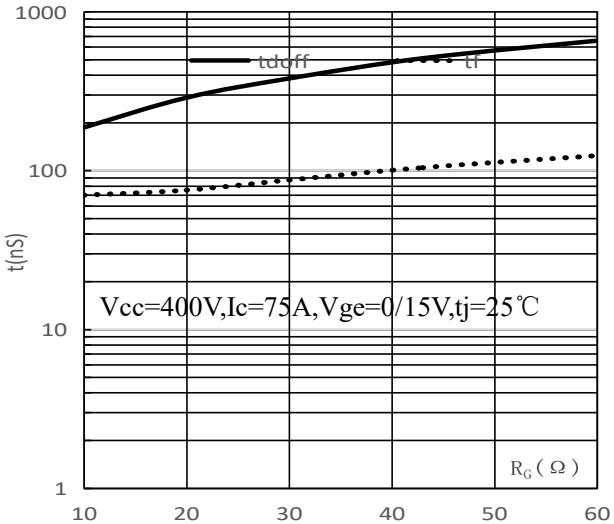

Eon(mJ)
Eoff(mJ)
Esw(mJ)
Vcc=400V,Ic=75A,Vge=0/15V,tj=25℃
Ploss(mJ)
R_G(Ω)
Typical switching losses of R_G


Eon(mJ)
Eoff(mJ)
Esw(mJ)
R_G=10Ω,Ic=75A,Vge=0/15V,tj=25℃
Ploss(mJ)
Vcc(V)
Typical switching losses of V_{CC}

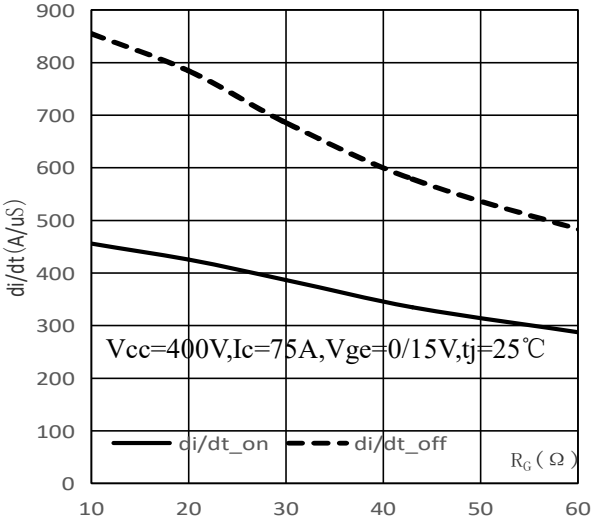

Eon(mJ)
Eoff(mJ)
Esw(mJ)
Vcc=400V,Ic=75A,R_G=10Ω,Vge=0/15V
Ploss(mJ)
tj(℃)
Typical switching losses of t_J


Eon(mJ)
Eoff(mJ)
Esw(mJ)
Vcc=400V,R_G=10Ω,Vge=0/15V,tj=25℃
Ploss(mJ)
Ic(A)
Typical switching losses of I_C

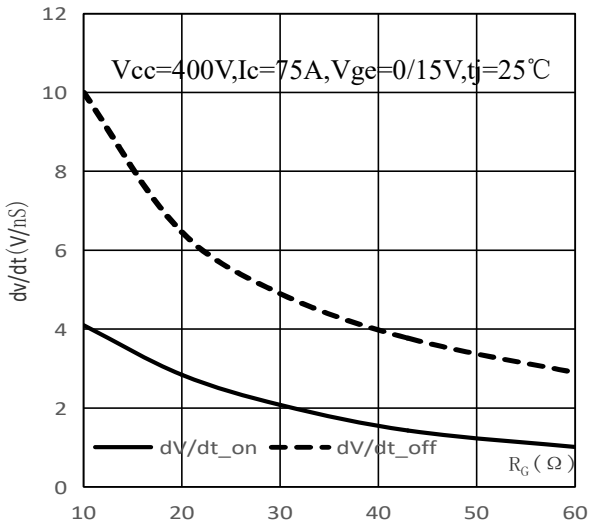

tdon
tr
Vcc=400V,Ic=75A,Vge=0/15V,tj=25℃
t(nS)
R_G(Ω)
Typical switching times as a function of R_G



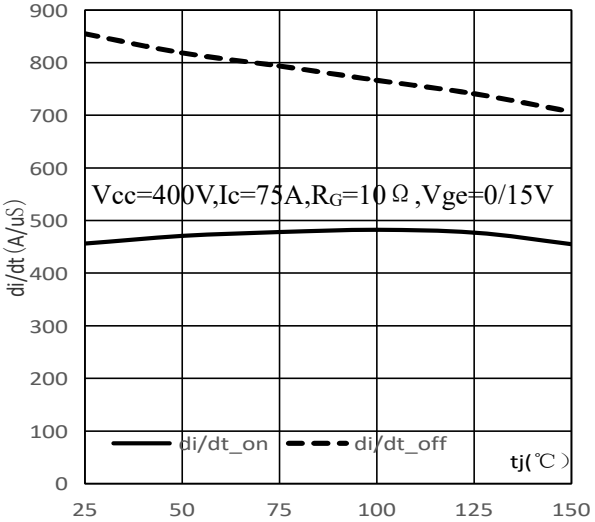
Typical switching times as a function of R_G



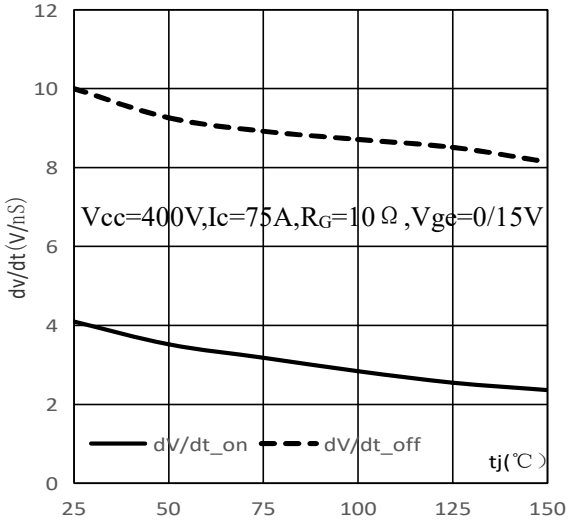
Typical di/dt as a function of R_G



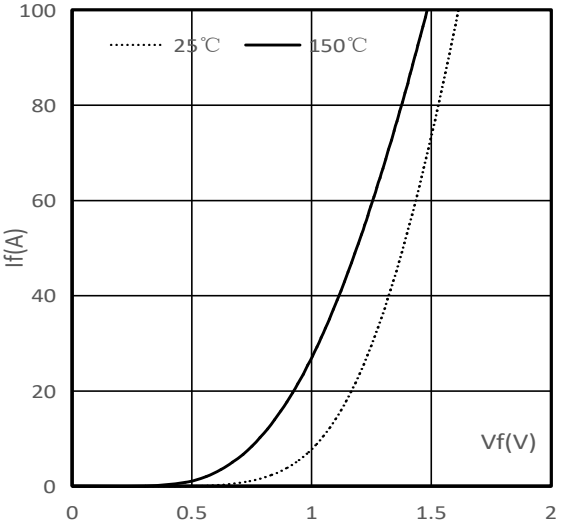
Typical dv/dt as a function of R_G



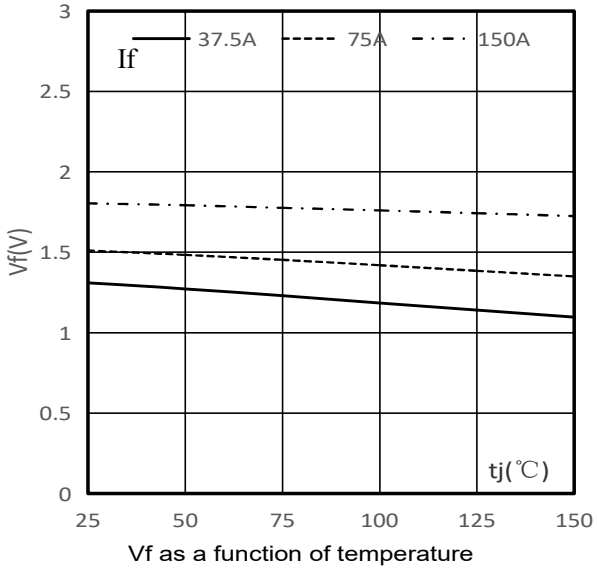
Typical di/dt as a function of t_j



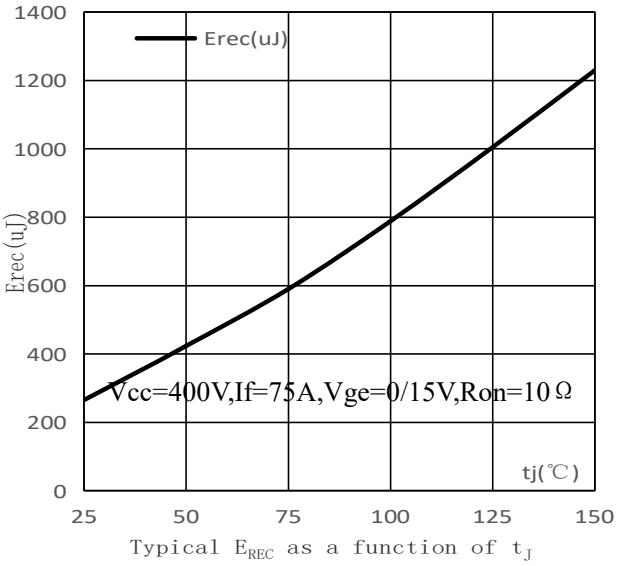
Typical dv/dt as a function of t_j



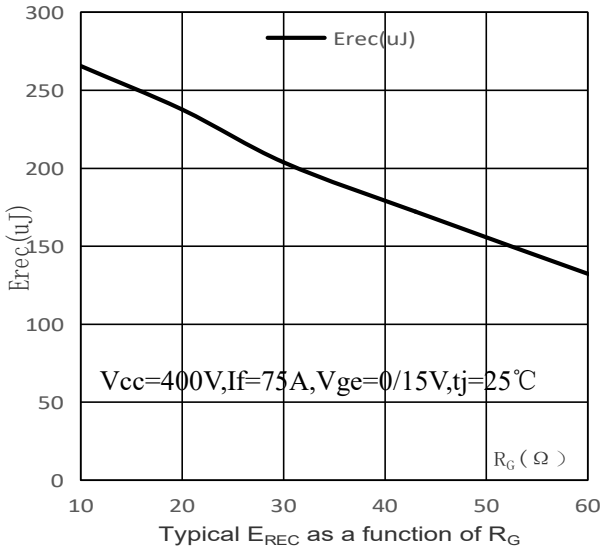
Typical I_F as a function of V_F



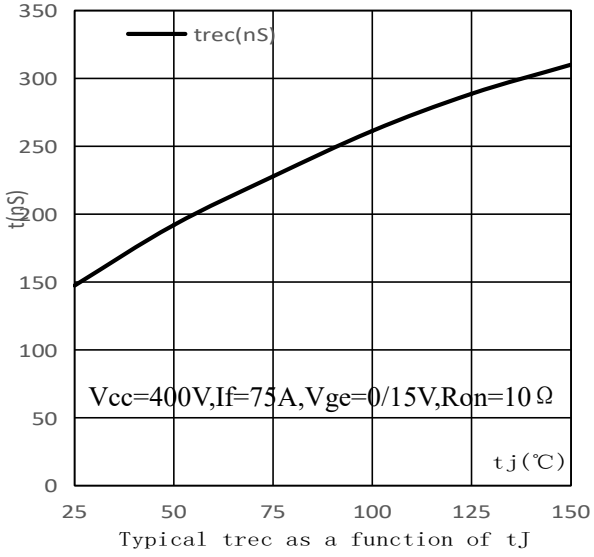
Vf as a function of temperature



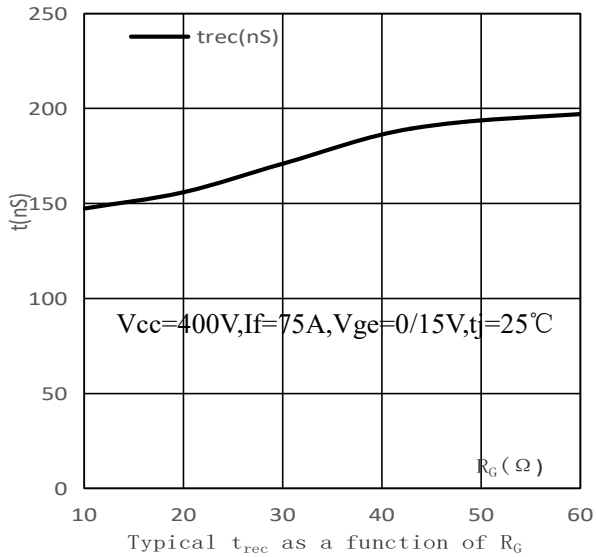
Typical E_{REC} as a function of t_J



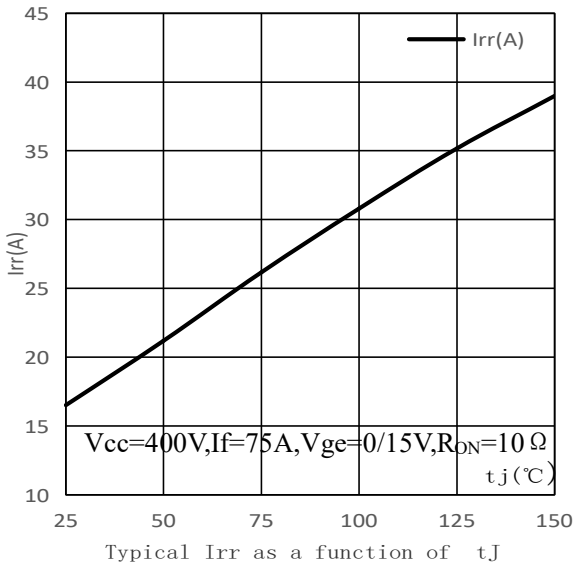
Typical E_{REC} as a function of R_G



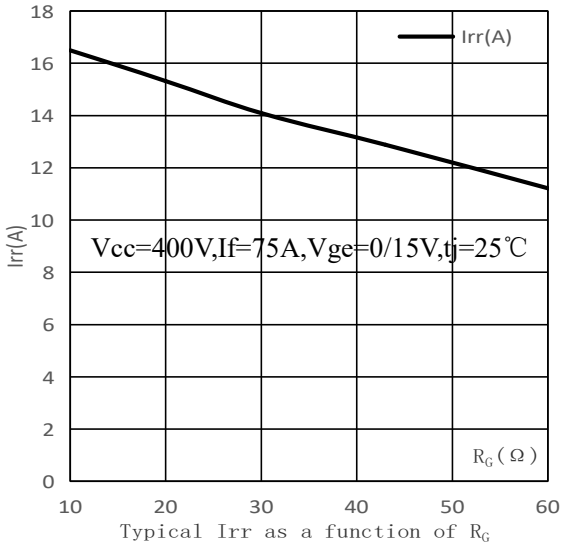
Typical trec as a function of tJ

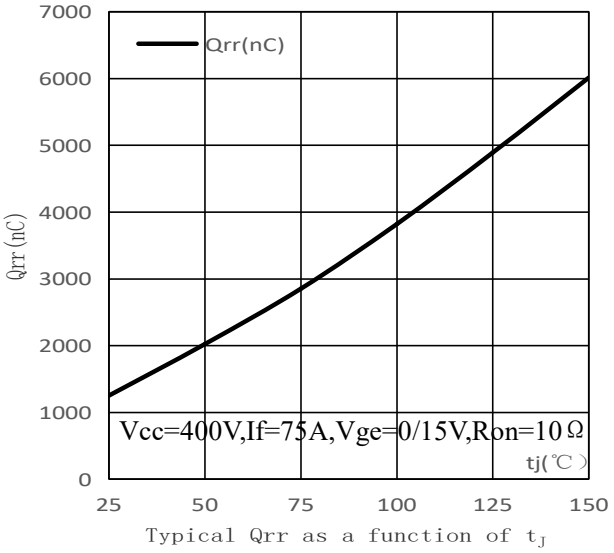


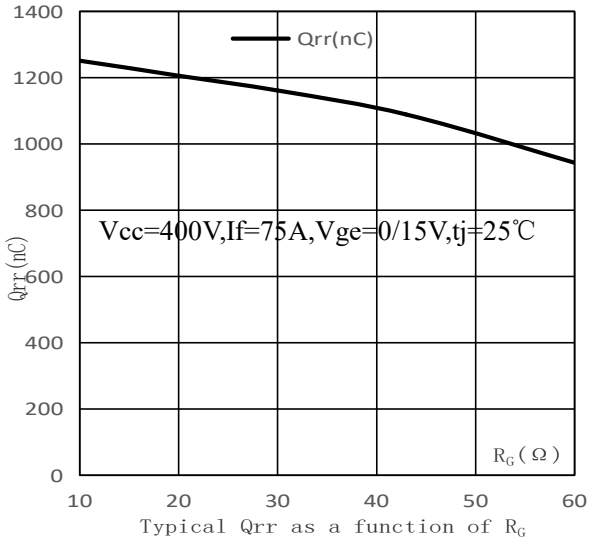
Typical t_{rec} as a function of R_G

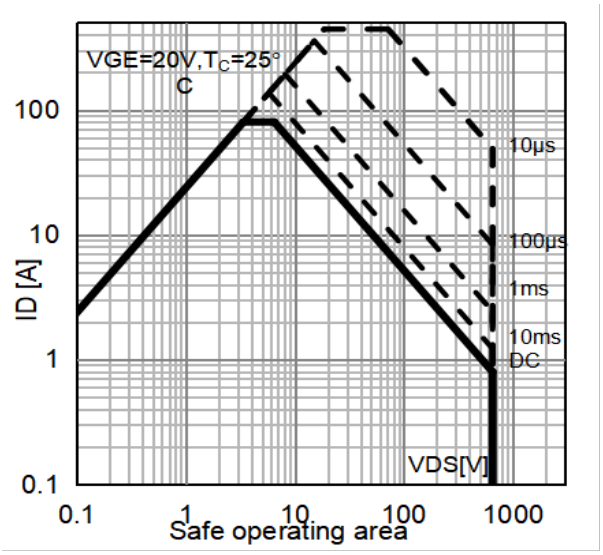


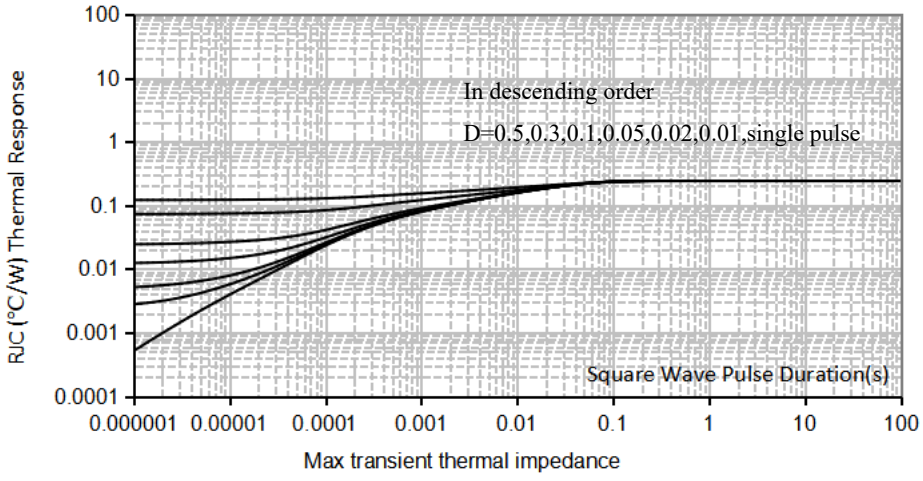
Typical Irr as a function of tJ


Irr(A)
Vcc=400V,If=75A,Vge=0/15V,tj=25℃
Irr(A)
RG(Ω)
Typical Irr as a function of RG

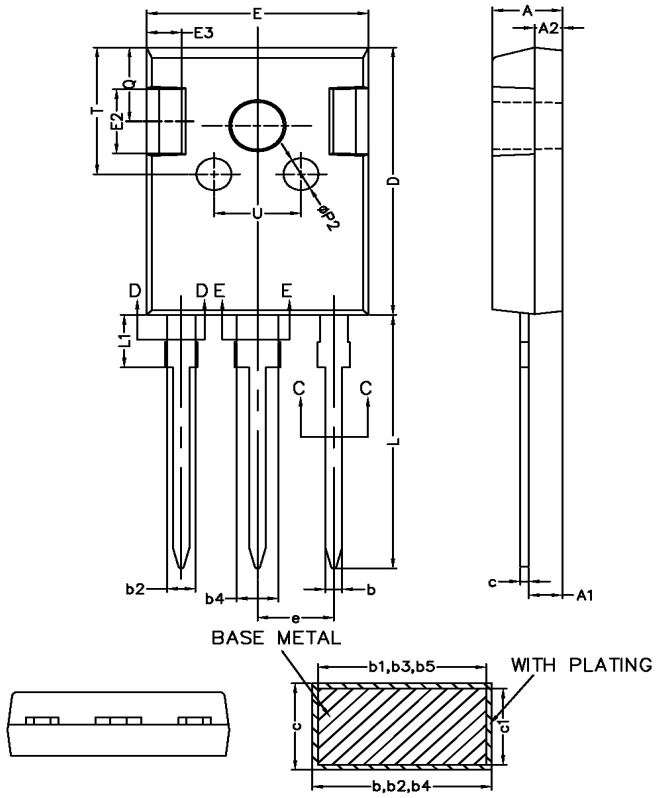

Qrr(nC)
Vcc=400V,If=75A,Vge=0/15V,Ron=10Ω
Qrr(nC)
tj(℃)
Typical Qrr as a function of tJ


Qrr(nC)
Vcc=400V,If=75A,Vge=0/15V,tj=25℃
Qrr(nC)
RG(Ω)
Typical Qrr as a function of RG


VGE=20V,TC=25°C
10μs
100μs
1ms
10ms
DC
ID [A]
VDS[V]
Safe operating area


In descending order
D=0.5,0.3,0.1,0.05,0.02,0.01,single pulse
RUC (°C/W) Thermal Response
Square Wave Pulse Duration(s)
Max transient thermal impedance

■ Package Outline Data_TO-247



SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0	–	0.15
a'	0	–	0.15
b	1.16	–	1.26
b1	1.15	1.2	1.22
b2	1.96	–	2.06
b3	1.95	2.00	2.02
b4	2.96	–	3.06
b5	2.95	3.00	3.02
b6	–	–	2.25
b7	–	–	3.25
c	0.59	–	0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1	–	–	4.30
P	3.50	3.60	3.70
P1	–	–	7.40
P2	2.40	2.50	2.60
Q	5.60	–	6.00
S	6.05	6.15	6.25
T	9.80	–	10.20
U	6.00	–	6.40

Unit:mm