

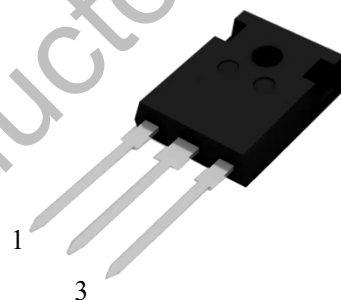
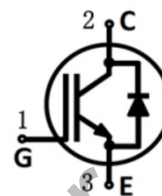
40N65H2 is a **650V40A** IGBT discrete with high speed soft switching of Trench Field stop technology. The product with a anti-parallel diode, has the characteristics of low V_{CESAT} , high junction temperature and strong robustness. It is very suitable for products with high switching frequency.

■ Features

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

■ Applications

- Power
- PV
- Industrial welding
- PFC



TO-247

Part ID	$V_{CE}(V)$	$I_{CNOM}(A)$	$V_{CESAT@25^{\circ}C}(V)$	Package	Marking
40N65H2	650	40	1.45	TO-247	40N65

■ Maximum Rated Values

Symbol	Parameter	Condition	Value	Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}C$	650	V
I_C	DC collector current	$T_C = 25^{\circ}C$ $T_C = 100^{\circ}C$	80 40	A
I_{Cpuls}	Pulse collector current	$T_{vj}\leq 150^{\circ}C$	120	A
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$	650	V
I_F	Diode continuous forward current	$T_C = 25^{\circ}C$ $T_C = 100^{\circ}C$	80 40	A
I_{Fpuls}	Diode pulse current	$T_{vj}\leq 150^{\circ}C$	120	A

V_{GE}	Gate-emitter voltage	$T_{vj}=25^{\circ}\text{C}$ Transient ($t_p \leq 10\mu\text{s}, D < 0.01$)	± 20 ± 30	V
P_{tot}	Power dissipation	$T_C = 25^{\circ}\text{C}$	333	W
T_{vj}	Operating junction temperature		$-40 \sim +175$	$^{\circ}\text{C}$
T_{stg}	Storage temperature		$-50 \sim +150$	$^{\circ}\text{C}$
M	Mounting torque	M3	0.6	Nm

■ Thermal Characteristic

Symbol	Parameter	Maximum	Unit
$R_{thJC-IGBT}$	IGBT thermal resistance junction-case	0.45	K/W
$R_{thJC-FRD}$	FRD thermal resistance junction-case	1.30	K/W
R_{thJA}	Thermal resistance junction-ambient	40	K/W

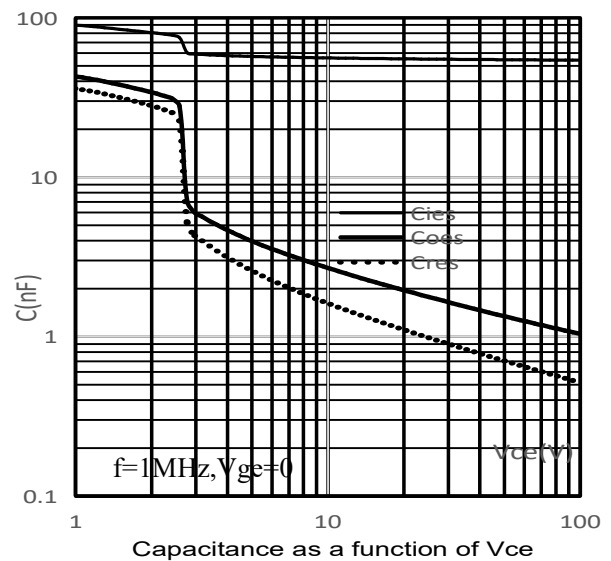
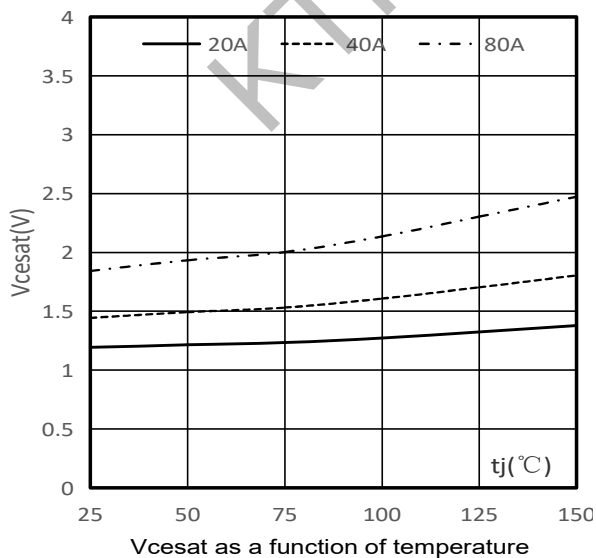
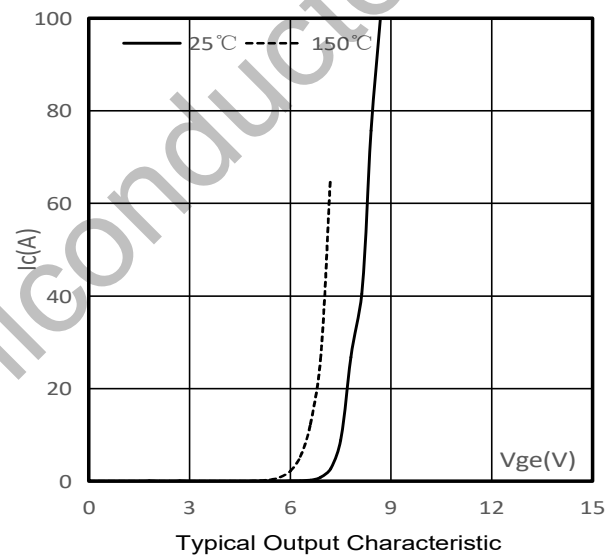
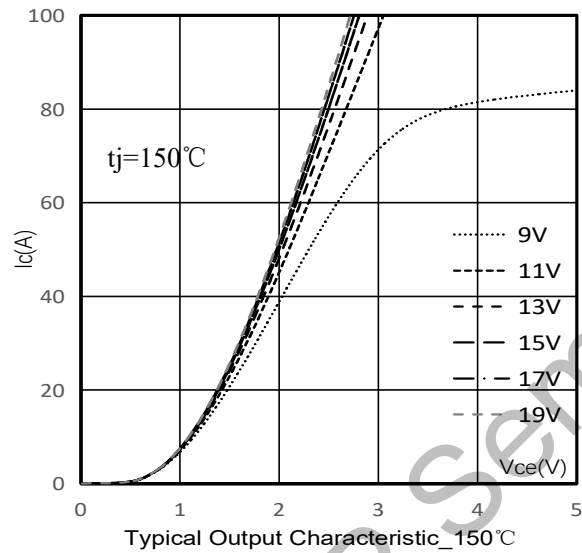
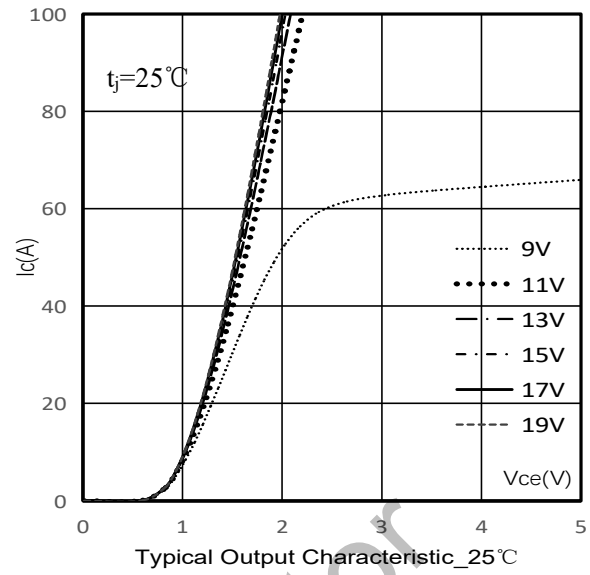
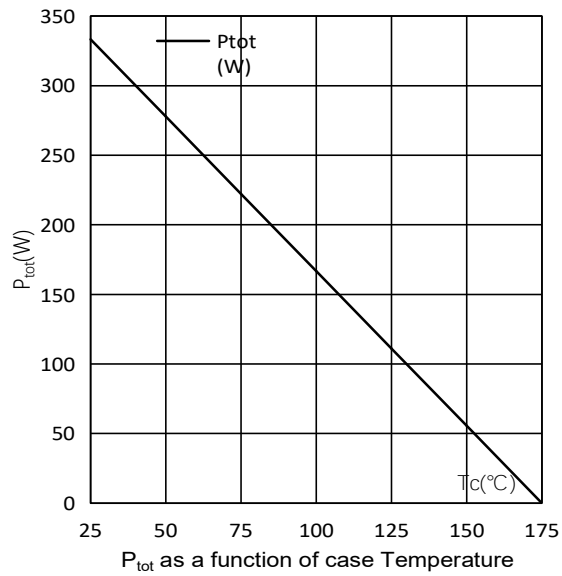
■ Electrical Characteristic

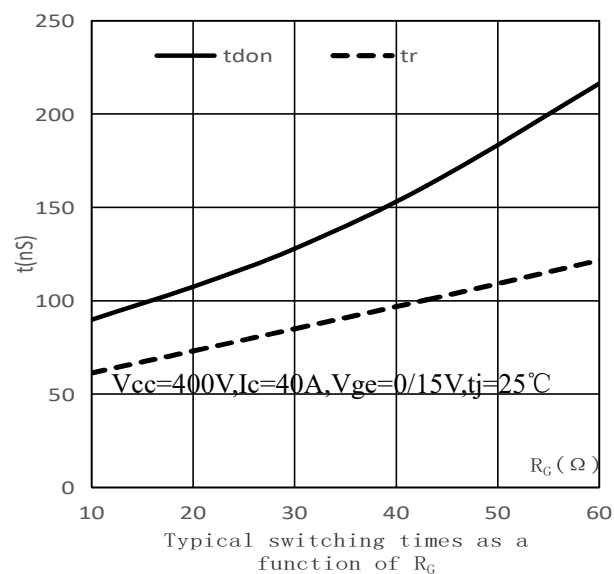
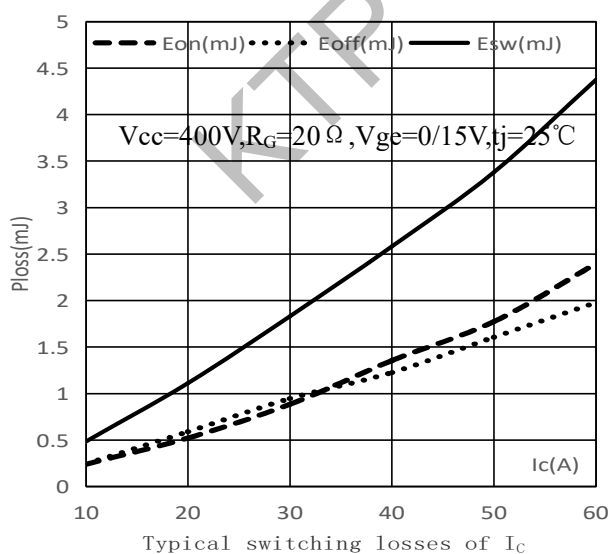
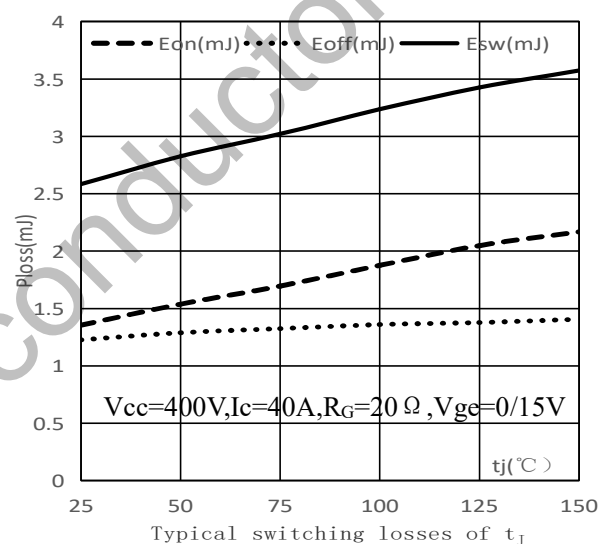
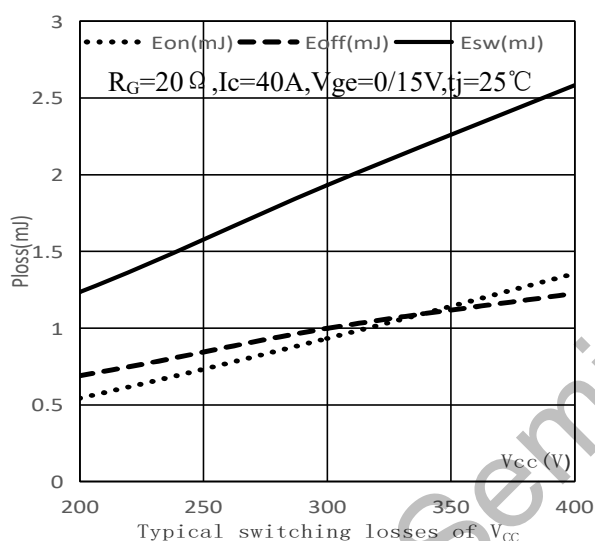
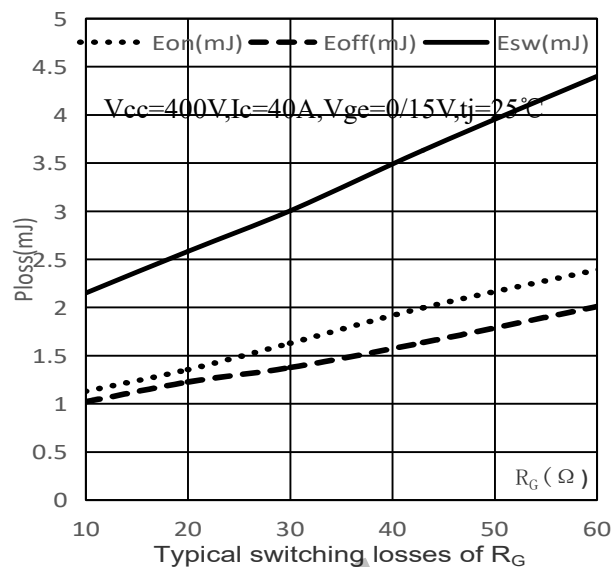
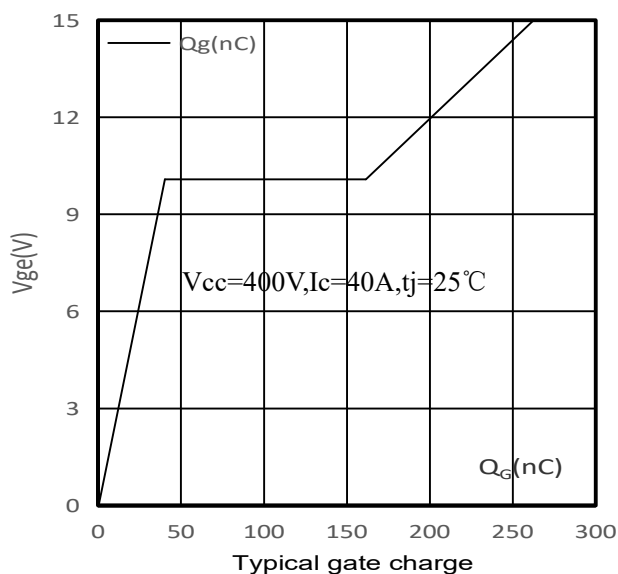
Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0V$, $I_C = 0.25mA$, $T_{vj} = 25^{\circ}\text{C}$	650	—	—	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V$, $I_C = 40A$, $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	— —	1.45 1.80	1.65 —	
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{GE} = V_{CE}$, $I_C = 1.5mA$, $T_{vj} = 25^{\circ}\text{C}$	5.50	5.65	6.50	
V_F	Diode forward voltage	$V_{GE} = 0V$, $I_F = 40A$, $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	— —	1.60 1.45	2.10 —	
I_{GES}	Zero collector voltage gate current	$V_{GE} = 30V$, $V_{CE} = 0V$	—	—	200	nA
I_{CES}	Zero gate voltage collector current	$V_{CE} = 650V$, $V_{GE} = 0V$, $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	— —	— —	0.25 0.50	mA
R_{Gin}	Integrated gate resistor	—	—	0	—	Ω
C_{ies}	Input capacitance	$V_{GE} = 0V$, $V_{CE} = 30V$, $f = 1MHz$, $T_{vj} = 25^{\circ}\text{C}$	—	6080	—	pF
C_{oes}	Output capacitance		—	167	—	
C_{res}	Reverse transfer capacitance		—	97.3	—	
Q_g	Gate charge	$V_{GE} = 0/15V$, $V_{CC} = 520V$, $I_C = 40A$, $T_{vj} = 25^{\circ}\text{C}$	—	266	—	nC
Q_{ge}	Gate-emitter charge		—	39.9	—	
Q_{gc}	Gate-collector charge		—	125	—	
$V_{GE(pl)}$	Gate-emitter plateau voltage	$I_C = 40A$, $V_{CE} = 520V$, $V_{GE} = 0/15V$, $T_{vj} = 25^{\circ}\text{C}$	—	8.2	—	V

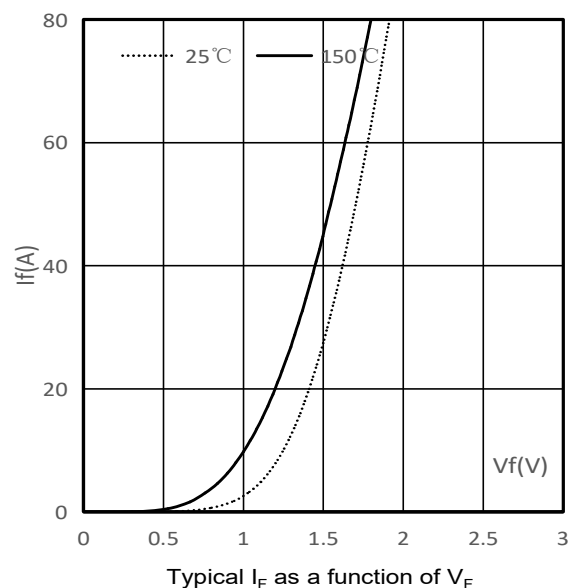
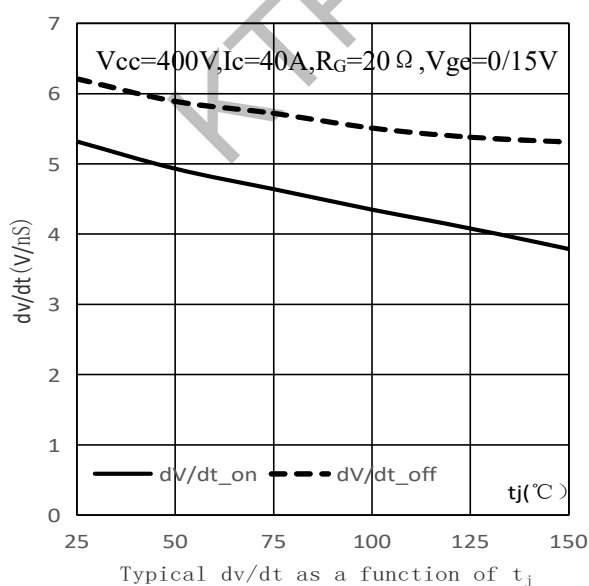
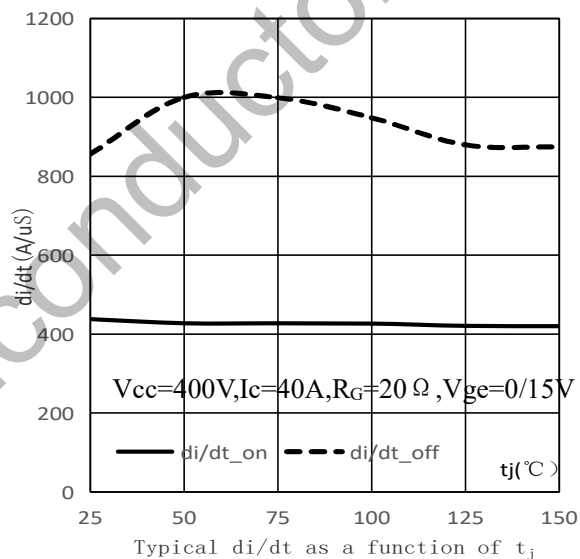
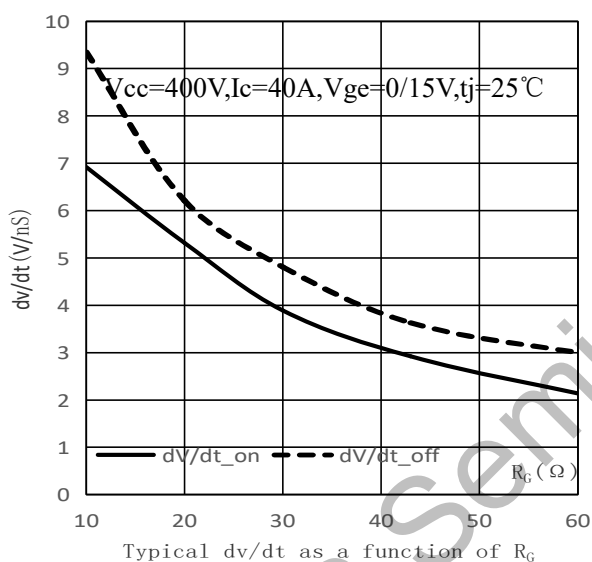
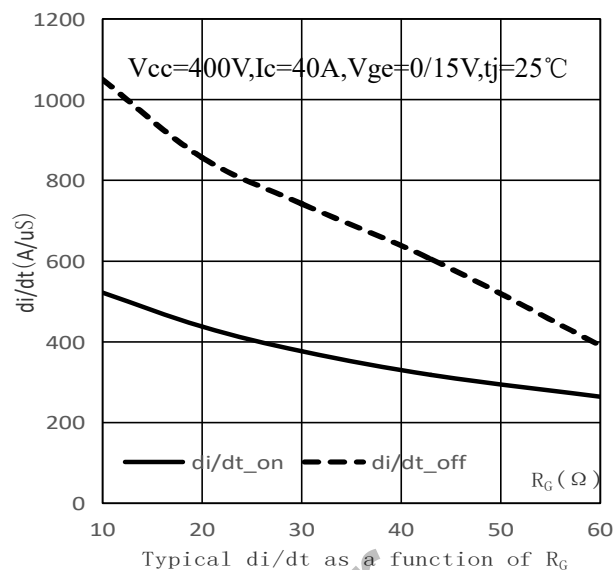
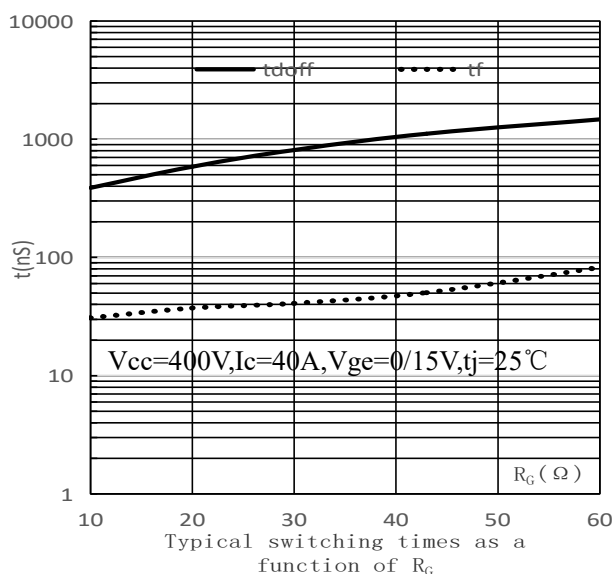
■ Dynamic Characteristic (With inductive load)

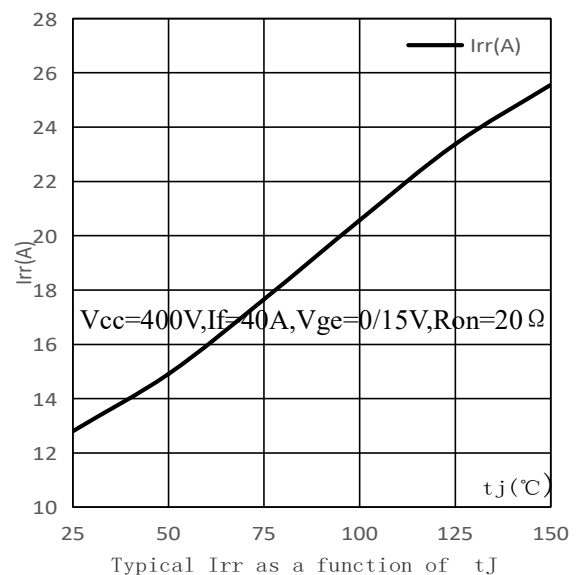
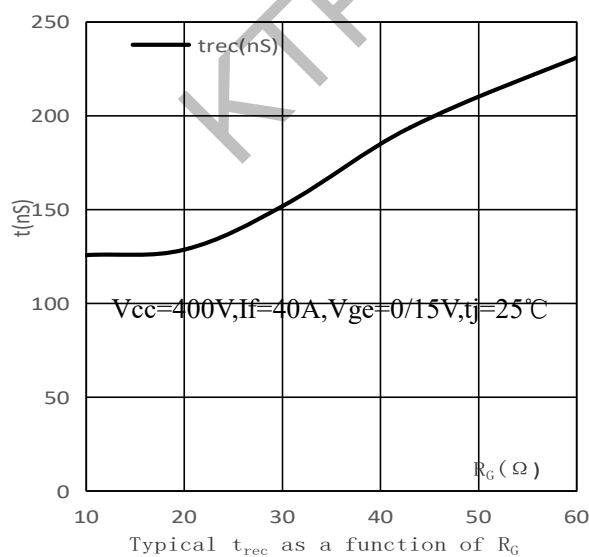
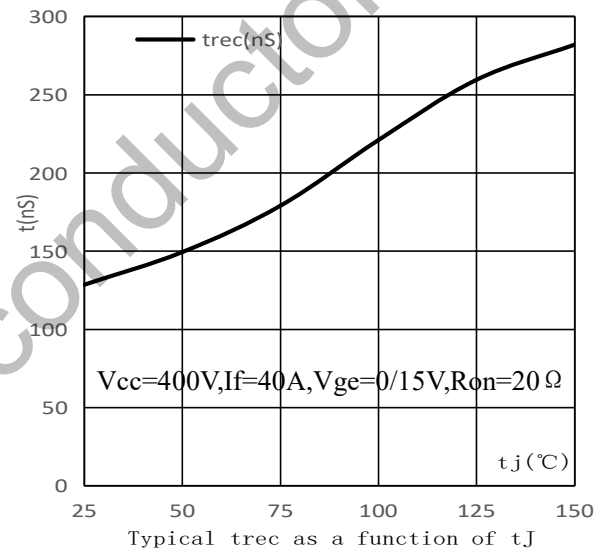
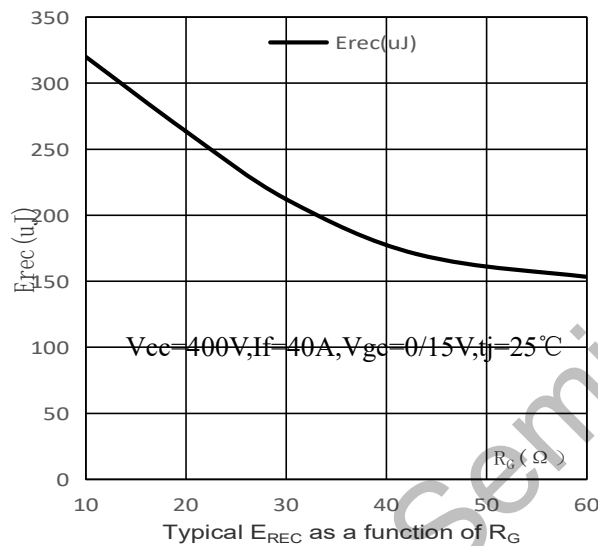
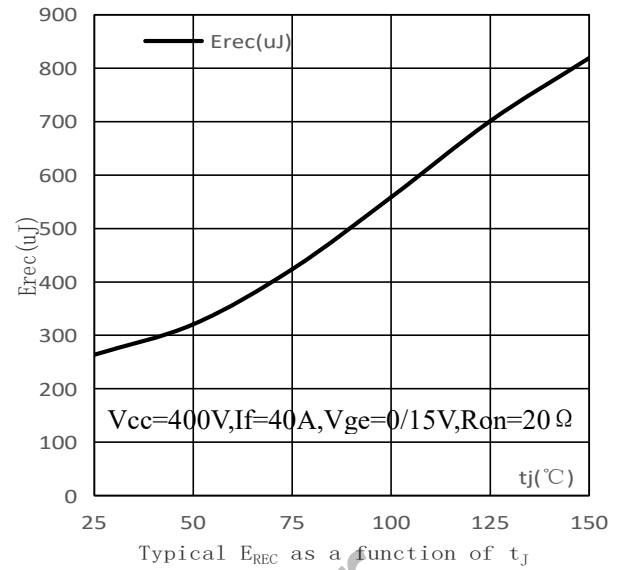
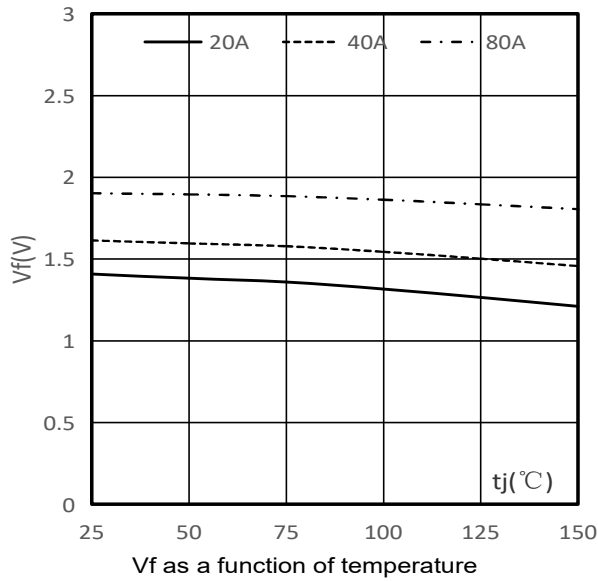
Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
IGBT Characteristic_25℃:						
T _{d(on)}	Turn-on delay time	V _{CC} =400V,I _C =40A, R _{on} =20 Ω , R _{off} =20 Ω , C _{ge} =0nF,V _{GE} =0/15V, L _{load} =100uH,T _{vj} =25℃	—	108	—	ns
T _r	Rise time		—	73.1	—	
T _{d(off)}	Turn-off delay time		—	587	—	
t _f	Fall time		—	37.4	—	
E _{on}	Turn-on energy		—	1.36	—	mJ
E _{off}	Turn-off energy		—	1.23	—	
E _{total}	Total switch energy		—	2.59	—	
IGBT Characteristic_150℃:						
T _{d(on)}	Turn-on delay time	V _{CC} =400V,I _C =40A, R _{on} =20 Ω , R _{off} =20 Ω , C _{ge} =0nF,V _{GE} =0/15V, L _{load} =100uH,T _{vj} =150℃	—	93.1	—	ns
T _r	Rise time		—	76.1	—	
T _{d(off)}	Turn-off delay time		—	649	—	
t _f	Fall time		—	36.6	—	
E _{on}	Turn-on energy		—	2.17	—	mJ
E _{off}	Turn-off energy		—	1.41	—	
E _{total}	Total switch energy		—	3.58	—	
Diode Characteristic_25℃:						
E _{rec}	Reverse recovery energy	I _F =40A,V _R =400V, V _{GE} =0/15V,R _{ON} =20 Ω ,T _{vj} =25℃	—	264	—	uJ
t _{rr}	Diode reverse recovery time		—	129	—	nS
Q _{rr}	Diode reverse recovery charge		—	945	—	nC
I _{rrm}	Diode peak reverse recovery current		—	12.8	—	A
di _{rr} /dt	Diode peak rate of fall of reverse Recovery current during t _{rr}		—	116	—	A/uS
Diode Characteristic_150℃:						
E _{rec}	Reverse recovery energy	I _F =40A,V _R =400V,V _{GE} =0/15V, R _{ON} =20 Ω ,T _{vj} =150℃	—	819	—	uJ
t _{rr}	Diode reverse recovery time		—	282	—	nS
Q _{rr}	Diode reverse recovery charge		—	3072	—	nC
I _{rrm}	Diode peak reverse recovery current		—	25.6	—	A
di _{rr} /dt	Diode peak rate of fall of reverse Recovery current during t _{rr}		—	192	—	A/uS

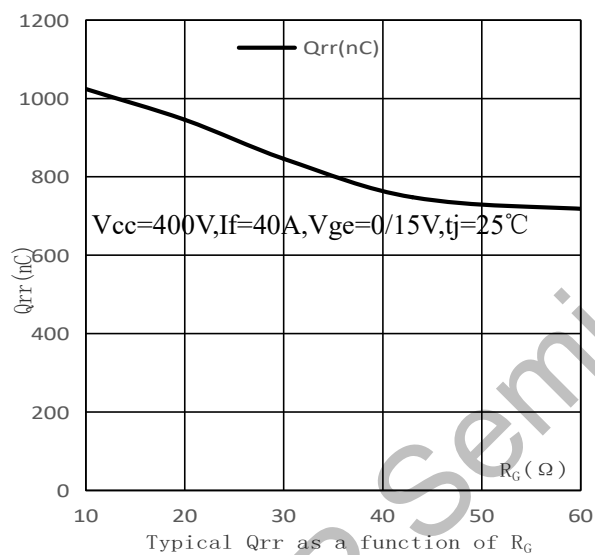
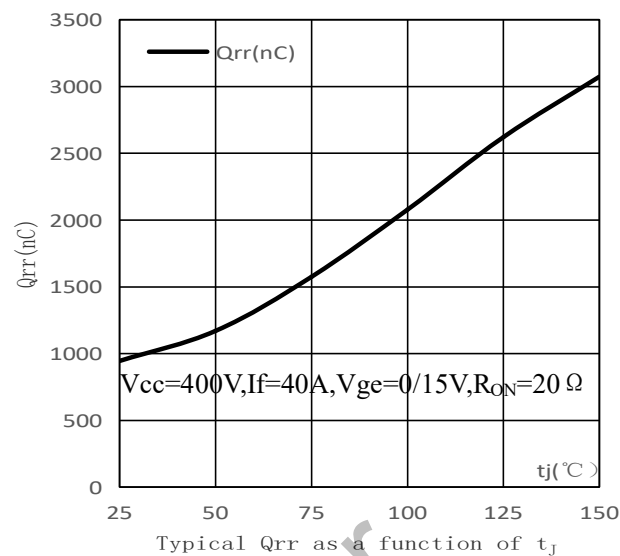
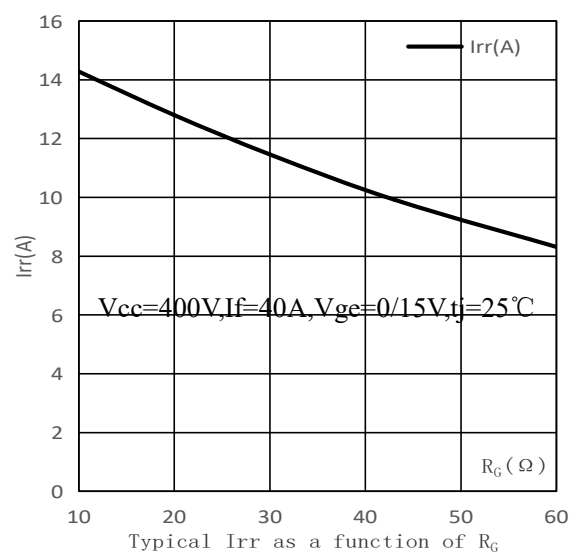
■ Characteristic Curve



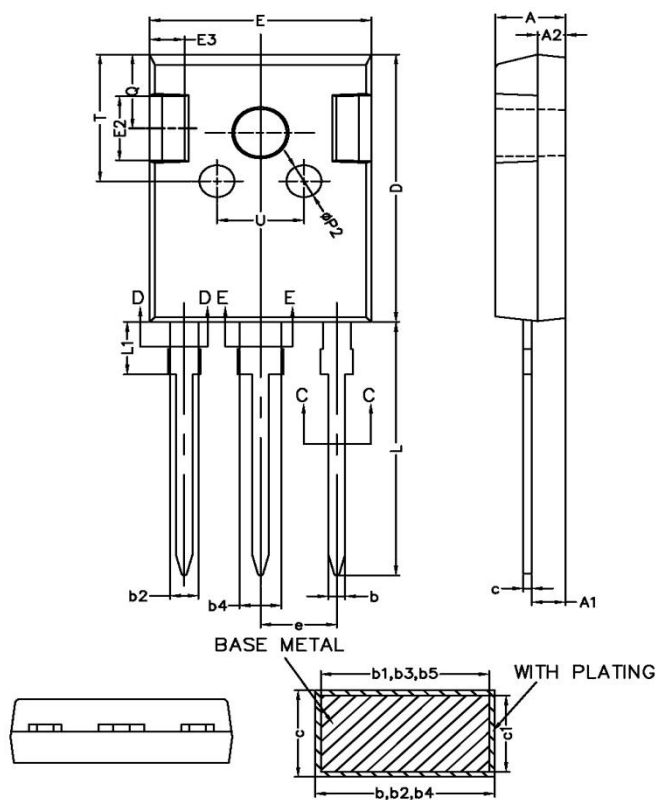








■ Package Outline Data_TO-247



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