

XNS40N60TR

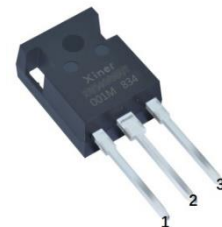
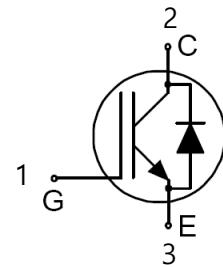
600V/40A 沟槽栅场截止型 IGBT

产品特点/PRODUCT FEATURES

- 先进的沟槽栅+场截止技术
Advanced Trench+FS IGBT technology
- 超低饱和压降
Low Collector-Emitter Saturation voltage
- 高开关速度
High Speed Switching

应用领域/APPLICATIONS

- 功率因数校正
Power Factor Correction



1. Gate/栅极
2. Collector/集电极
3. Emitter/发射极

关键性能和封装信息/Key Performance and Package Parameters

Type	V_{CE}	I_C	$V_{CEsat}, T_{vj}=25^{\circ}C$	T_{vjmax}	Package
XNS40N60TR	600V	40A	1.85V	175 $^{\circ}C$	TO-247-3

深圳芯能半导体技术有限公司
Shenzhen invsemi technology co.,ltd

[IGBT IPM PIM HVIC 深圳芯能半导体技术有限公司 \(invsemi.com\)](http://invsemi.com)

额定值、热阻 Ratings & Thermal Resistance

最大额定值/ Maximum Ratings

符号/Symbol	参数/Parameter	条件/Condition	值/Value	单位/Unit
V_{CES}	集电极-发射极电压 Collector-to-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	600	V
I_C	集电极连续直流电流 DC Collector current	$T_C = 25^{\circ}\text{C}$	80	A
		$T_C = 100^{\circ}\text{C}$	40	
$I_{CRM}^{①}$	集电极可重复脉冲电流 Pulsed drain current	$T_{vj} \leq 175^{\circ}\text{C}$	120	A
I_F	二极管连续直流电流 Diode continuous forward current	$T_C = 25^{\circ}\text{C}$	12	A
		$T_C = 100^{\circ}\text{C}$	6	
$I_{FRM}^{①}$	二极管可重复脉冲电流 Diode pulsed current	$T_{vj} \leq 175^{\circ}\text{C}$	24	A
V_{GES}	栅极-发射极峰值电压 Gate to emitter voltage	$T_{vj}=25^{\circ}\text{C}$	± 30	V
t_{sc}	短路耐量 Short circuit withstand time	$V_{GE}=15\text{V}, V_{CC} \leq 400\text{V}$ $T_{vj}=25^{\circ}\text{C}$	10	μs
P_{tot}	总耗散功率 Power dissipation	$T_C = 25^{\circ}\text{C}$	260	W
T_{vj}	可工作结温 Operating Junction Temperature		$-40 \sim +175$	$^{\circ}\text{C}$
T_{stg}	储存温度 Storage Temperature Range		$-50 \sim +150$	$^{\circ}\text{C}$

①脉宽受限于最高结温/Pulse width limited by T_{vjmax}

热阻/Thermal Resistance

符号/Symbol	参数/Parameter	最大值/Max.Value	单位/Unit
$R_{th(J-C)}$	IGBT 芯片到底板热阻 IGBT thermal resistance Junction-to-Case	0.56	K/W
$R_{th(J-C)}$	二极管芯片到底板热阻 FRD thermal resistance Maximum Junction-to-Case	2.5	K/W
$R_{th(J-A)}$	结到环境热阻 Thermal resistance Junction-to-Ambient	40	K/W

电气特性 Electrical Characteristic

静态电气特性/Static Electrical Characteristic

符号 Symbol	参数 Parameter	测试条件 Test conditions	Value值			单位 Units
			Min	Typ	Max	
$V_{(BR)CES}$	集电极-发射极击穿电压 Collector - Emitter breakdown voltage	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	600	—	—	V
$V_{CE(sat)}$	集电极-发射极饱和压降 Collector-Emitter Saturation voltage	$V_{GE}=15V, I_C=40A, T_{vj}=25^{\circ}C$	—	1.85	2.1	V
		$V_{GE}=15V, I_C=40A, T_{vj}=175^{\circ}C$	—	2.2	—	
$V_{GE(th)}$	门极开启阈值电压 Gate threshold voltage	$V_{GE}=V_{CE}, I_C=4mA, T_{vj}=25^{\circ}C$	5	5.6	6.5	V
V_F	二极管正向导通压降 Diode Forward Voltage	$V_{GE}=0V, I_F=6A, T_{vj}=25^{\circ}C$	1	1.4	1.8	V
		$V_{GE}=0V, I_F=6A, T_{vj}=175^{\circ}C$	—	1.2	—	
I_{GES}	门极-发射极漏电流 Gate to Emitter Leakage current	$V_{GE}=20V, V_{CE}=0V, T_{vj}=175^{\circ}C$	—	—	200	nA
I_{CES}	集电极-发射极漏电流 Zero gate voltage collector current	$V_{CE}=600V, V_{GE}=0V, T_{vj}=175^{\circ}C$	—	—	400	μA
R_{Gin}	内部门极电阻 Integrated gate resistor	—	—	0	—	Ω

动态电气特性/Dynamic Electrical Characteristic

符号 Symbol	参数 Parameter	测试条件 Test conditions	Value 值			单位 Units
			Min	Typ	Max	
C_{ies}	输入电容 Input capacitance	$V_{GE}=0V, V_{CE}=25V,$ $f=1MHz, T_{vj}=25^{\circ}C$	—	2440	—	pF
C_{oes}	输出电容 Output capacitance		—	186	—	
C_{res}	反向传输电容 Reverse transfer capacitance		—	69	—	
Q_g	门极电量 Total gate charge	$I_C=40A, V_{CE}=480V,$ $V_{GE}=15V, T_{vj}=25^{\circ}C$	—	144	—	nC
Q_{ge}	门极-发射极电量 Gate to emitter charge		—	17	—	
Q_{gc}	门极-集电极电量 Gate to collector charge		—	74	—	
I_{sc}	短路电流 Short circuit collector current	$T_{vj}=25^{\circ}C, V_{CE}=400V,$ $V_{GE}=15V$	—	180	—	A

开关特性、感性负载

Switching Characteristic Inductive Load

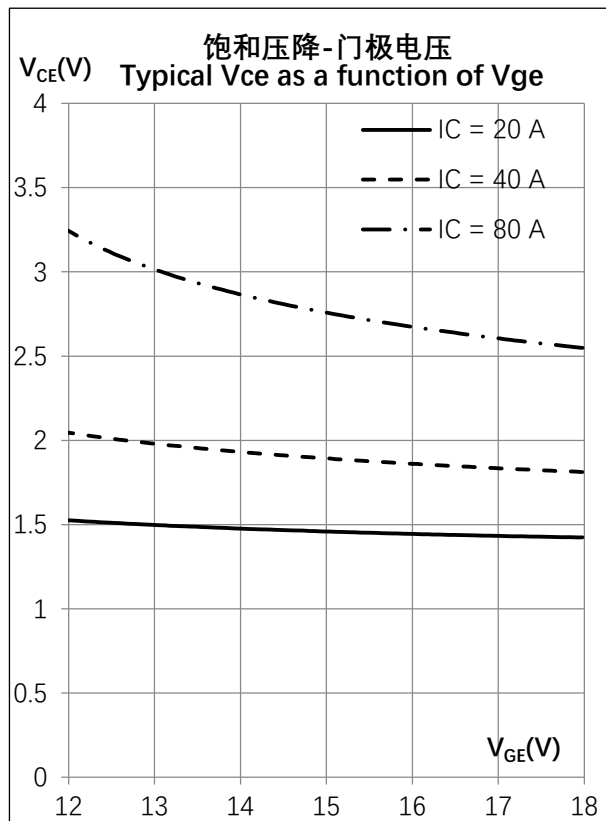
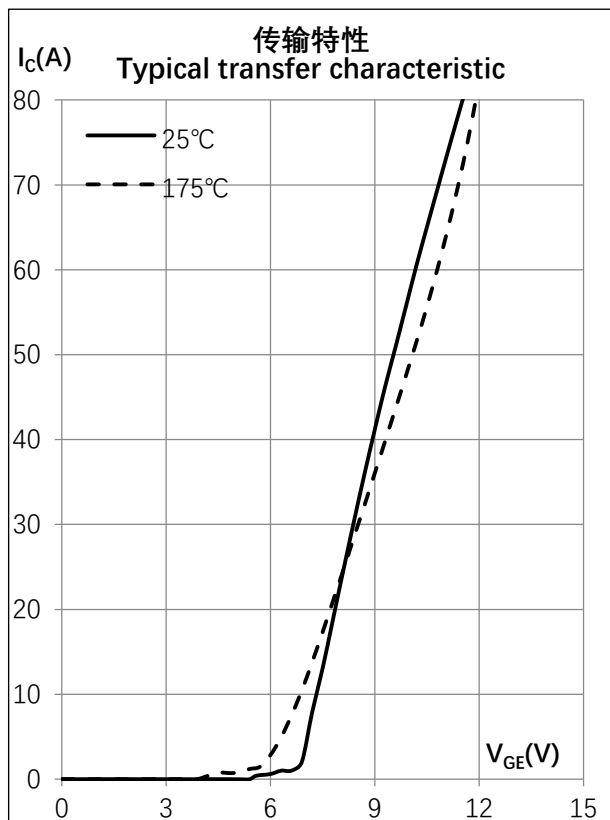
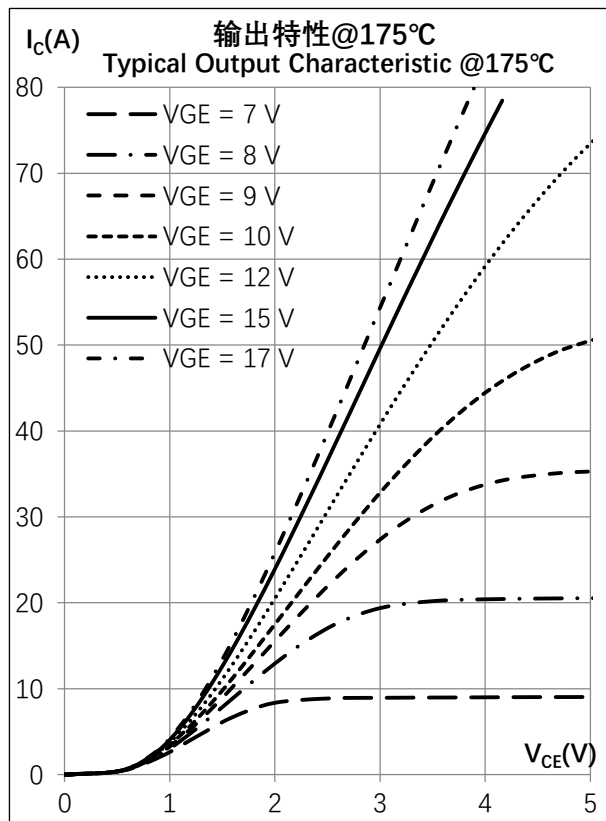
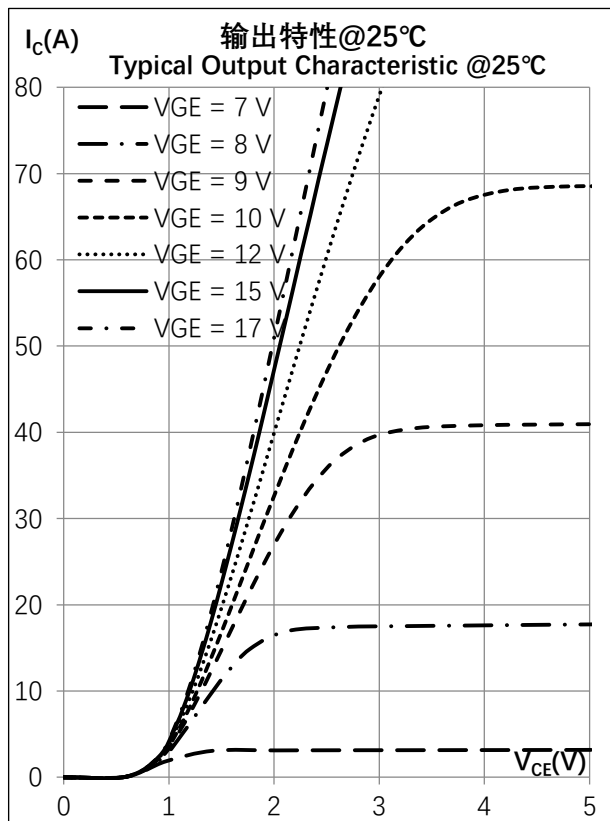
IGBT 特性\IGBT Characteristic

符号 Symbol	参数 Parameter	测试条件 Test conditions		值Value			单位 Units
				Min	Typ	Max	
$T_{d(off)}$	关闭延迟时间 Turn-Off Delay Time	$V_{CC}=400V$ $I_C=40A$	$T_{vj}=25^{\circ}C$	—	331	—	ns
			$T_{vj}=175^{\circ}C$	—	355	—	
t_f	下降时间 Turn-Off Fall Time	$R_{G(on)}=20\Omega$ $R_{G(off)}=20\Omega$ $C=0nF$	$T_{vj}=25^{\circ}C$	—	46	—	ns
			$T_{vj}=175^{\circ}C$	—	39	—	
E_{off}	单次关闭损耗 Turn-off switch loss	$V_{GE}=15V$ $L_{load}=150\mu H$	$T_{vj}=25^{\circ}C$	—	1.2	—	mJ
			$T_{vj}=175^{\circ}C$	—	1.4	—	

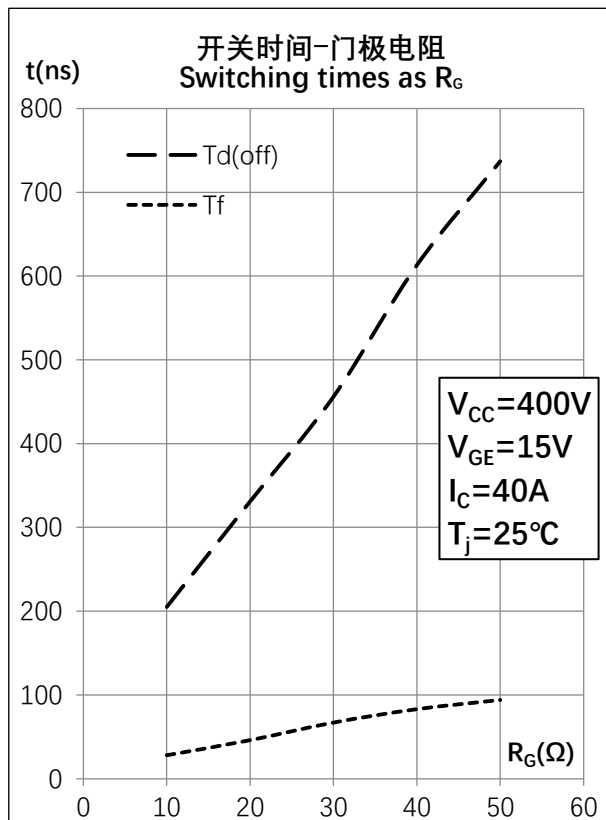
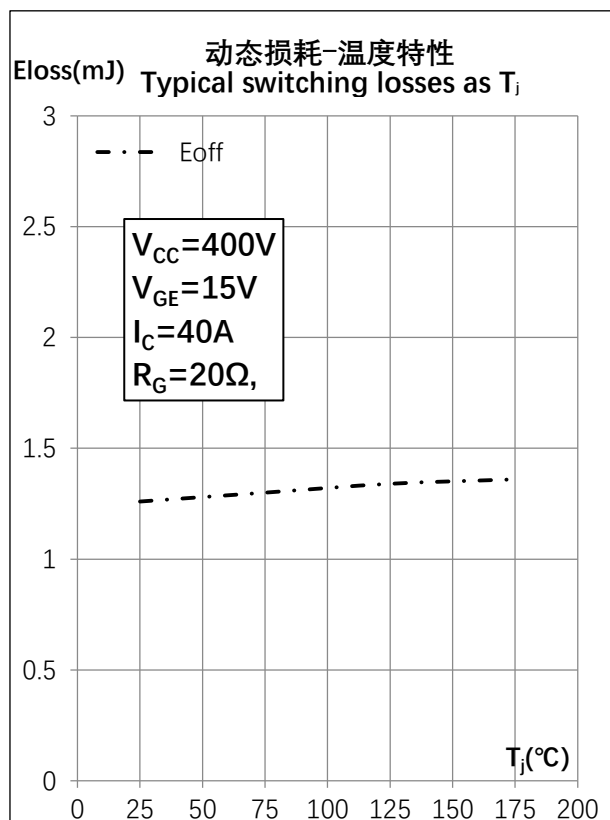
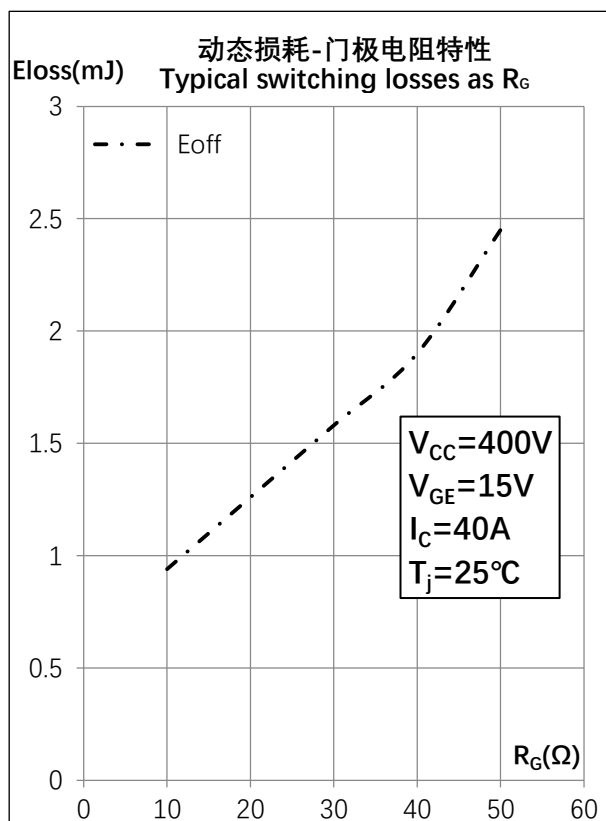
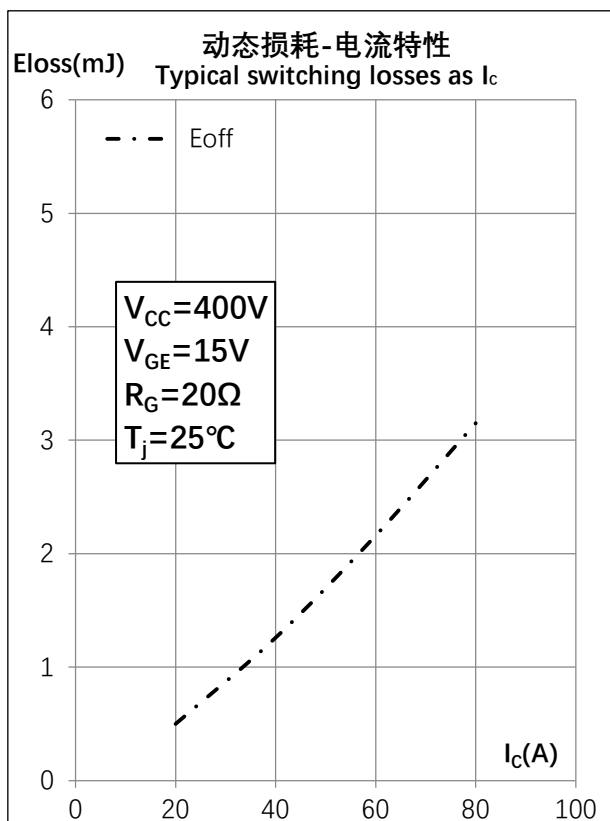
二极管特性\Diode Characteristic

符号 Symbol	参数 Parameter	测试条件 Test conditions		值Value			单位 Units	
				Min	Typ	Max		
t _{rr}	二极管反向恢复时间 Diode Reverse Recovery Time	I _F = 6A V _R =400V di _F /dt=-200A/μs	T _{vj} =25℃	—	74	—	ns	
			T _{vj} =175℃	—	185	—		
Q _{rr}	二极管反向恢复电量 Diode Reverse Recovery Charge		T _{vj} =25℃	—	50	—	nC	
			T _{vj} =175℃	—	240	—		
I _{rrm}	反向恢复峰值电流 Peak reverse recovery current		T _{vj} =25℃	—	1.8	—	A	
			T _{vj} =175℃	—	3	—		
di _{rr} /dt	恢复下降电流最大电流变化率 Peak rate of i _{rr}		T _{vj} =25℃	—	132	—	A/μs	
			T _{vj} =175℃	—	95	—		
E _{rec}	二极管反向恢复损耗 Diode Reverse Recovery loss		T _{vj} =25℃	—	6	—	μJ	
			T _{vj} =175℃	—	35	—		

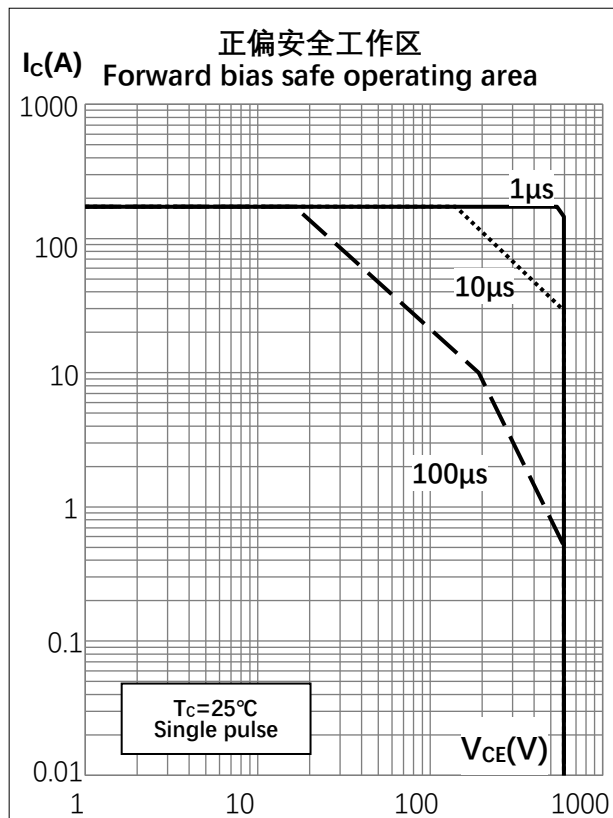
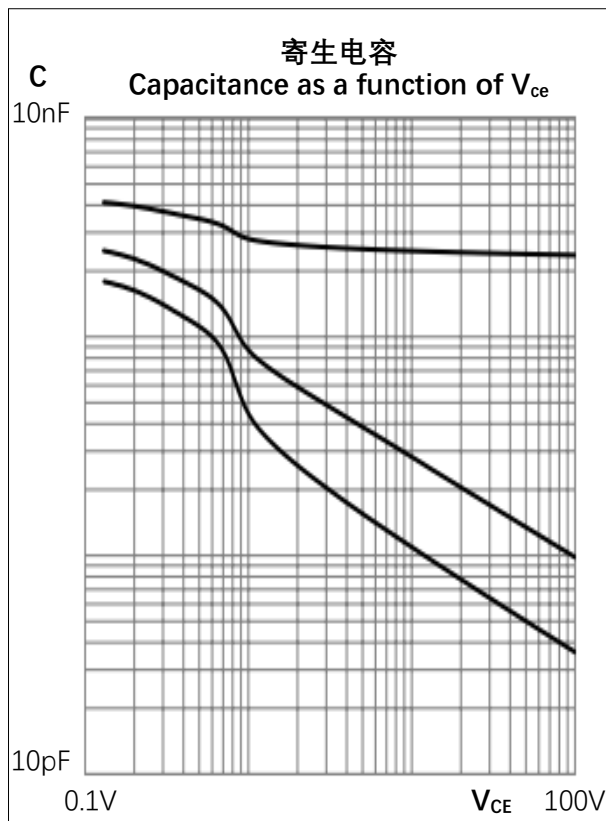
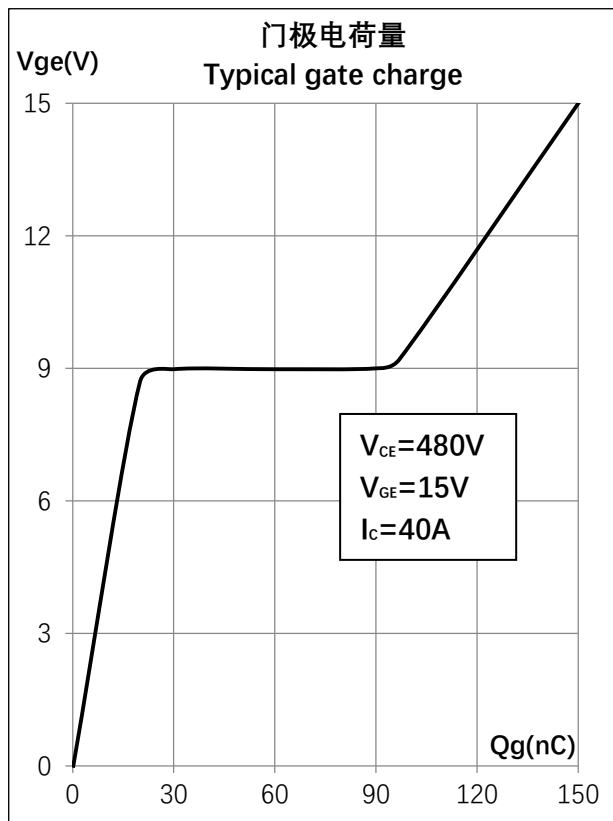
特征曲线 Characteristic Curve



特征曲线 Characteristic Curve

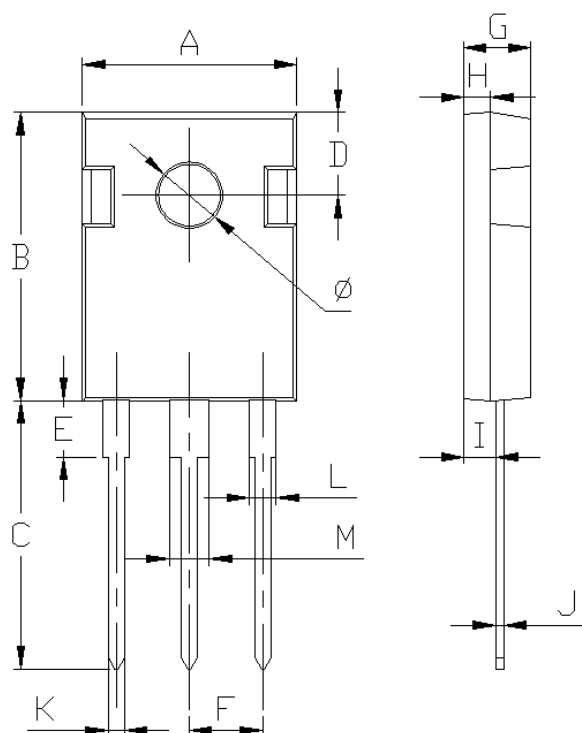


特征曲线 Characteristic Curve



TO-247-3 封装数据

TO-247-3 Package Data



DIM	MILLIMETERS	
	MIN	MAX
A	15.75	15.85
B	20.9	21.05
C	19.85	20.05
D	5.75	5.85
E	4.15	4.25
F	5.44BSC.	
G	4.95	5.05
H	1.97	2.03
I	2.35	2.45
J	0.6	0.65
K	1.17	1.25
L	1.95	2.05
M	2.85	3.11
Ø	3.5	3.7

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