

 D. G. M. E.	DG40N60	版本号：V1.0
	绝缘栅双极型晶体管	

产品概述

IGBT既有功率MOSFET输入阻抗高，控制功率小，易于驱动，控制简单的特点，又有双极晶体管的导通电压低，通态电流大，损耗小的显著优点。在提倡节能减排、低碳经济的时代，具备节能效率高，便于规模化生产等优点的IGBT已成为功率半导体市场发展的主流技术。

产品特点

- 采用NPT技术
- 高开关速度： $t_f = 135\text{ns}$
- 低饱和压降： $V_{CE(sat)} = 1.5\text{V} @ I_c=40\text{A}$
- 高输入阻抗
- 热稳定性好

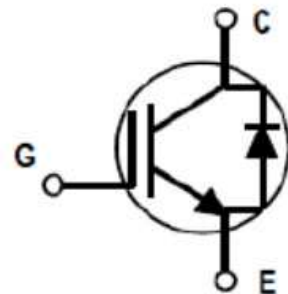
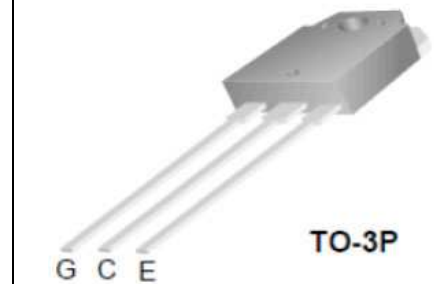
应用领域

主要用于电焊机。

特征参数

符号	额定值	单位
$V_{(BR)CES}$	600	V
I_c	40	A
$V_{CE(sat)}$	2.2	V

封装：TO-3P



极限值

除非另有规定， $T_a=25^\circ\text{C}$

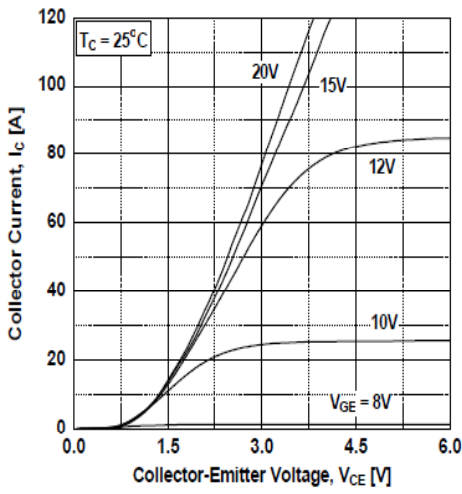
参数名称	符号	额定值	单位
集电极-发射极击穿电压	V_{CE}	600	V
连续集电极	I_c	40	A
脉冲集电极电流	I_{cpuls}	120	A
栅-发射极电压	V_{GE}	± 30	V
耗散功率 $T_c=25^\circ\text{C}$	P_D	300	W
工作温度范围	T_J	-55 to +150	$^\circ\text{C}$
贮存温度范围	T_{STG}	-55 to +150	$^\circ\text{C}$

电参数

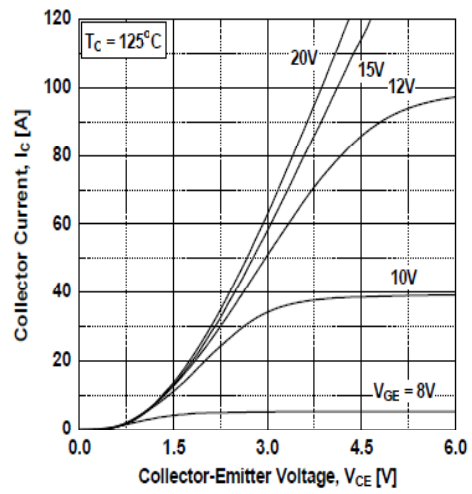
除非另有规定, $T_a=25^{\circ}\text{C}$

参数名称	符号	测试条件	规范值			单位
			最小	典型	最大	
$V_{(BR)CES}$	集电极-发射极击穿电压	$V_{GE}=0$ $I_C=250\mu\text{A}$	600			V
I_{CES}	集电极-发射极泄漏电流	$V_{GE}=0$ $V_{CE}=600\text{V}$			280	μA
I_{GSS}	栅极-发射极泄漏电流	$V_{CE}=0$ $V_{GE}=20\text{V}$			300	nA
$V_{GE(th)}$	开启电压	$V_{GE}=V_{CE}, I_D=250\mu\text{A}$	3.0		6.0	V
$V_{CE(sat)}$	集电极-发射极饱和压降	$V_{GE}=15\text{V},$ $I_C=40\text{A}$		2.2	2.5	V
g_{fs}	跨导	$V_{CE}=40\text{V}, I_C=15\text{A}$		11		S
C_{iss}	输入电容	$V_{CE}=30\text{V},$ $V_{GE}=0,$ $f=1\text{MHz}$		2000		pF
C_{oss}	输出电容			200		pF
C_{rss}	反向恢复电容			65		pF
Q_g	栅电荷	$V_{CC}=400\text{V}, I_C=40\text{A}$ $V_{GE}=15\text{V}$		125	175	nC
$t_{d(on)}$	导通延时	$V_{CC}=400\text{V},$ $I_C=40\text{A},$ $R_G=10\ \Omega$ 感性负载		33		ns
t_r	上升时间			45		ns
$t_{d(off)}$	关断延时			123		ns
t_f	下降时间			105		ns
E_{on}	开启能量			0.53		mJ
E_{off}	关断能量			1.84		mJ
$t_{d(on)}$	导通延时	$V_{CC}=400\text{V},$ $I_C=40\text{A},$ $R_G=10\ \Omega$ $T_C=150^{\circ}\text{C}$ 感性负载		31		ns
t_r	上升时间			46		ns
$t_{d(off)}$	关断延时			131		ns
t_f	下降时间			115		ns
E_{on}	开启能量			0.68		mJ
E_{off}	关断能量			2.05		mJ
V_{FM}	二极管正向压降	$I_F=20\text{A}$		1.9	2.7	V
t_{rr}	二极管反向恢复时间	$I_F=20\text{A}$ $di/dt=200\text{A}/\mu\text{s}$		50		ns
Q_{rr}	二极管反向恢复电荷			80		nC

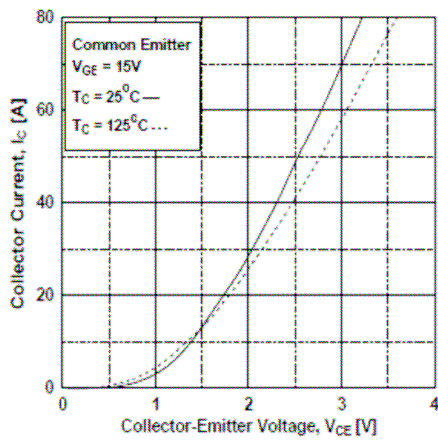
典型特性曲线



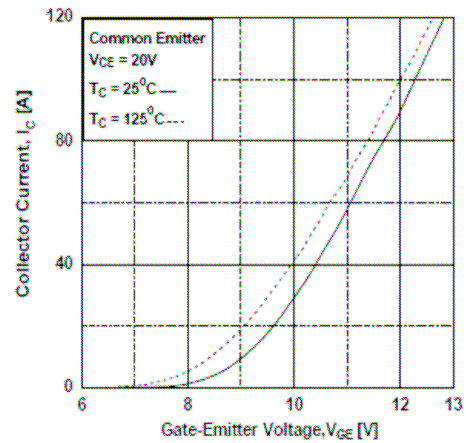
典型输出特性曲线 (T=25°C)



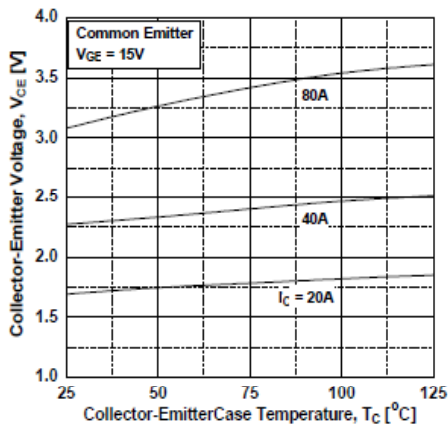
典型输出特性曲线 (T=125°C)



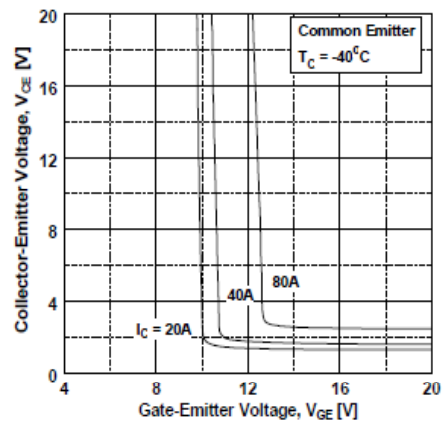
饱和压降特性曲线



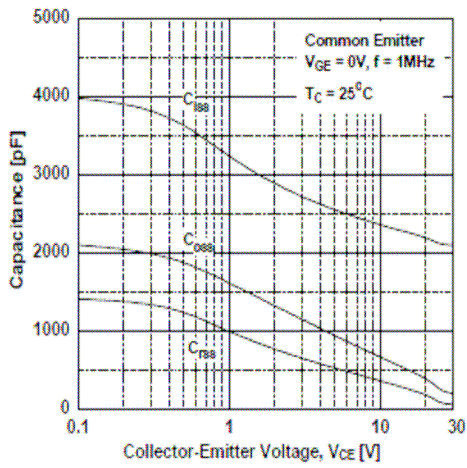
转移特性曲线



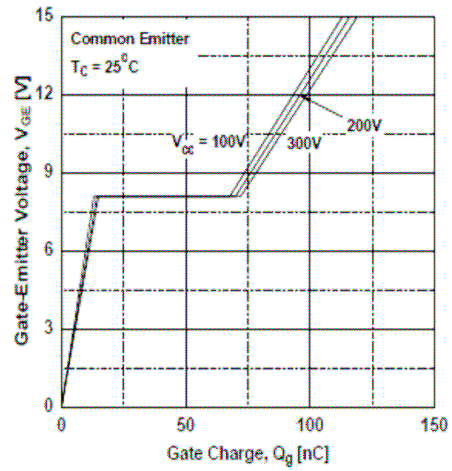
集电极-发射极饱和压降与管壳温度的关系曲线



集电极-发射极饱和压降与 V_{GE} 关系



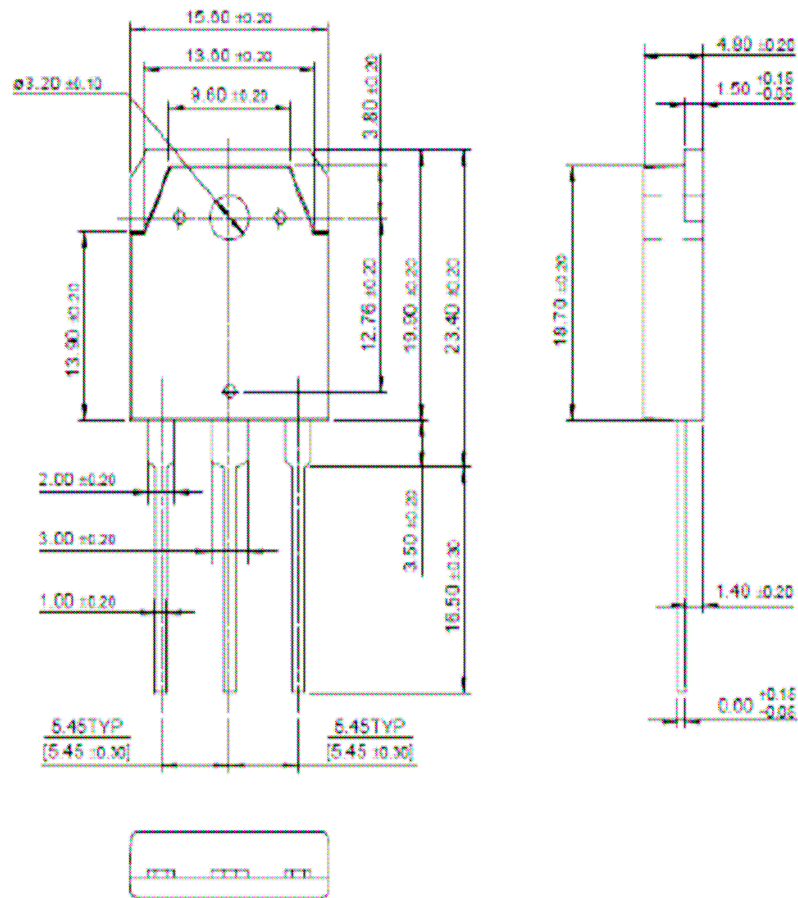
电容特性



栅电荷特性

附录：封装尺寸

TO-3P



 D. G. M. E.	DG40N60	Version No. : V1.0
	IGBT	

General Description

IGBT has been the major switching device in power electronic applications as it has the merits of both power bipolar and power MOSFET. It has been widely used in high voltage field, which ranges from industrial areas such as inverters, high voltage switch, and motor operation to PDP or home appliance.

Features

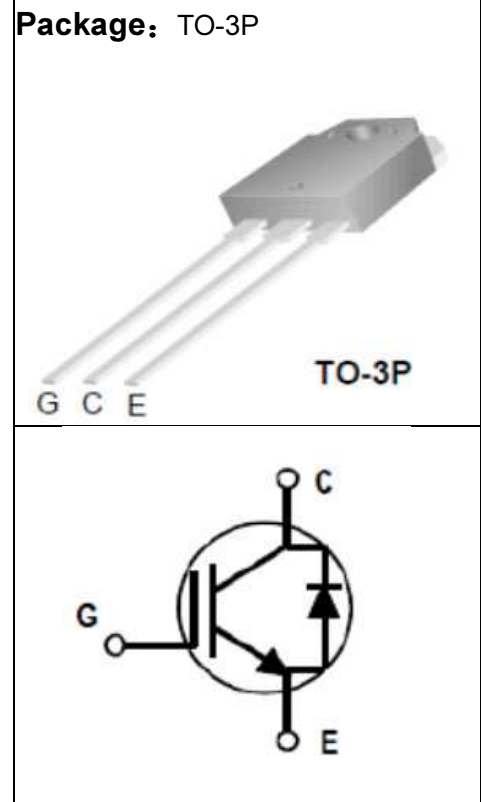
- Employing NPT technology
- High speed switching: $t_f = 135\text{ns}$
- Low saturation voltage: $V_{CE(sat)} = 1.5\text{V} @ I_c = 40\text{A}$
- High input impedance

Applications

Welder

Characteristic parameter

SYMBOL	Value	Unit
$V_{(BR)CES}$	600	V
I_c	40	A
$V_{CE(sat)}$	2.2	V



Maximum Ratings

$T_c = 25^\circ\text{C}$, unless otherwise specified

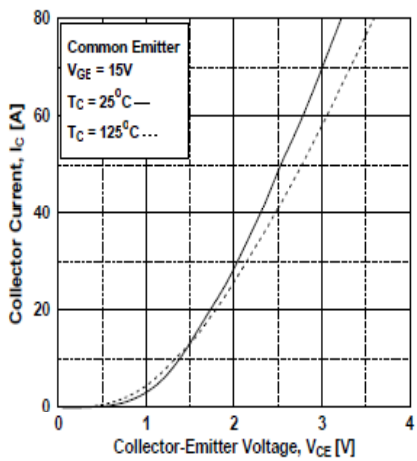
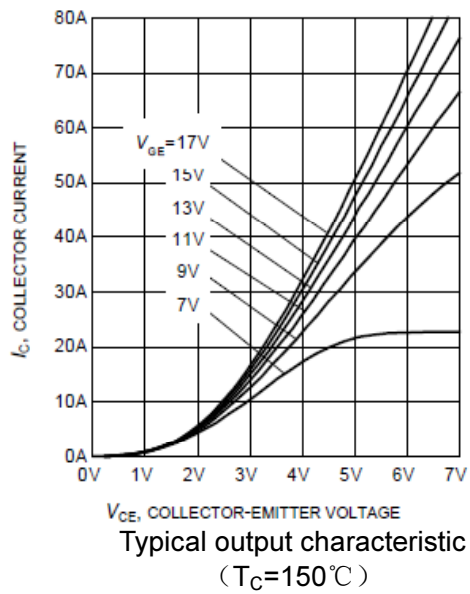
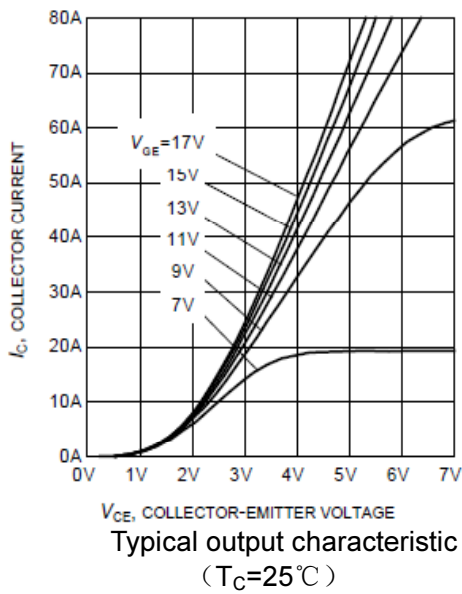
PARAMETER	SYMBOL	Value	Unit
Collector-emitter voltage	V_{CE}	600	V
DC collector	I_c	40	A
Pulsed collector current	I_{cpuls}	120	A
Gate-emitter voltage	V_{GE}	± 30	V
Power dissipation $T_c = 25^\circ\text{C}$	P_D	300	W
Operating junction temperature	T_J	-55 to +150	$^\circ\text{C}$
Storage temperature	T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristic

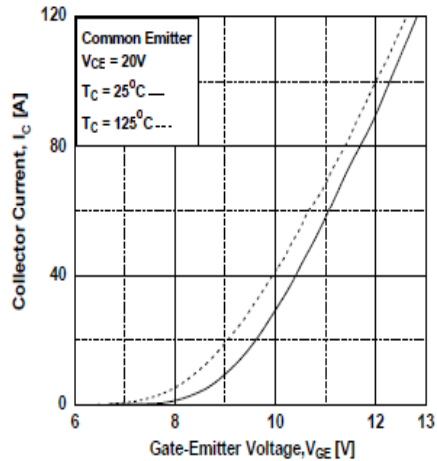
at $T_c=25^\circ\text{C}$, unless otherwise specified

PARAMETER	SYMBOL	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE}=0$ $I_C=250\mu\text{A}$	600			V
I_{CES}	Zero gate voltage collector current	$V_{GE}=0$ $V_{CE}=600\text{V}$			280	μA
I_{GSS}	Gate-emitter leakage current	$V_{CE}=0$ $V_{GE}=20\text{V}$			300	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{GE}=V_{CE}, I_D=250\mu\text{A}$	3.0		6.0	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}$, $I_C=40\text{A}$		2.2	2.5	V
C_{iss}	Input capacitance	$V_{CE}=30\text{V}$, $V_{GE}=0$, $f=1\text{MHz}$		2000		pF
C_{oss}	output capacitance			200		pF
C_{rss}	Reverse transfer capacitance			65		pF
Q_g	Gate charge	$V_{cc}=400\text{V}$ $I_C=40\text{A}$ $V_{GE}=15\text{V}$		125	175	nC
$t_d(on)$	Turn-on delay time	$V_{CC}=400\text{V}$, $I_C=40\text{A}$, $R_G=10\ \Omega$ Inductive load		33		ns
t_r	Rise time			45		ns
$t_d(off)$	Turn-off delay time			123		ns
t_f	Fall time			105		ns
E_{on}	Turn-on energy			0.53		mJ
E_{off}	Turn-off energy			1.84		mJ
$t_d(on)$	Turn-on delay time		$V_{CC}=400\text{V}$, $I_C=40\text{A}$, $R_G=10\ \Omega$ $T_C=150^\circ\text{C}$ Inductive load		31	
t_r	Rise time			46		ns
$t_d(off)$	Turn-off delay time			131		ns
t_f	Fall time			115		ns
E_{on}	Turn-on energy			0.68		mJ
E_{off}	Turn-off energy			2.05		mJ
V_{FM}	Diode forward voltage	$I_F=20\text{A}$		1.9	2.7	V
t_{rr}	Diode reverse recovery time	$I_F=20\text{A}$ $di/dt=200\text{A}/\mu\text{s}$		50		ns
Q_{rr}	Diode reverse recovery charge			80		nC

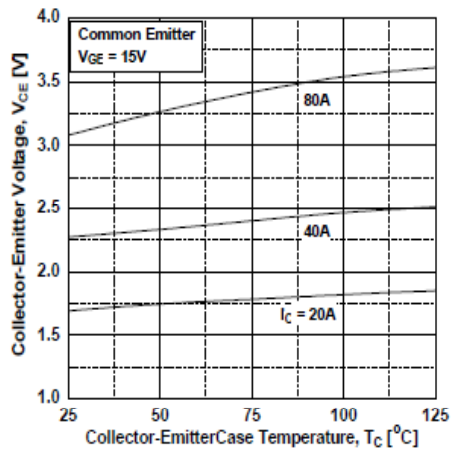
Characteristic curves



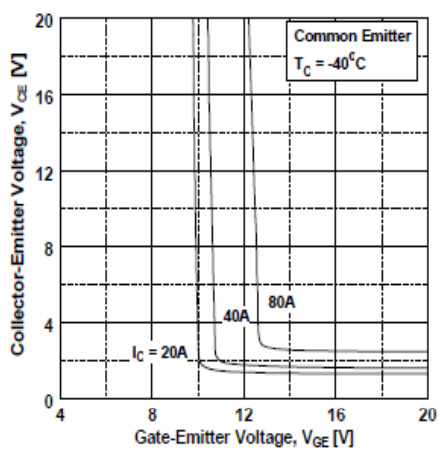
Typical collector-emitter saturation voltage characteristic



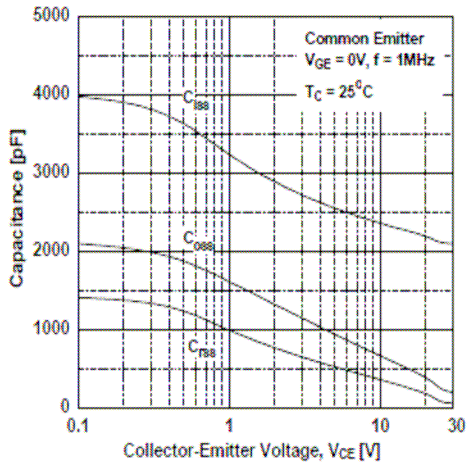
Typical transfer characteristic



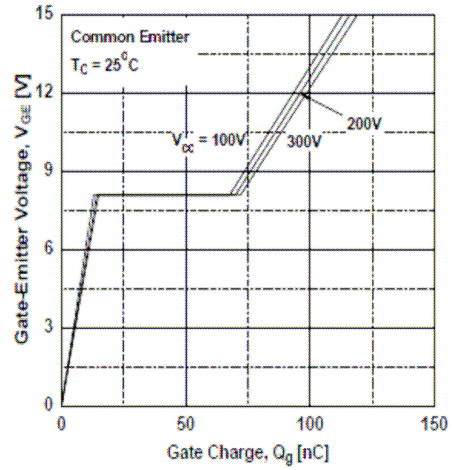
Typical collector-emitter voltage as a function of junction temperature



Typical collector-emitter voltage as a function of Gate-emitter voltage



Typical capacitance as a function of collector-emitter voltage
 ($V_{GE}=0V$ $f=1MHz$)



Typical gate charge

Package Dimension

TO-3P

