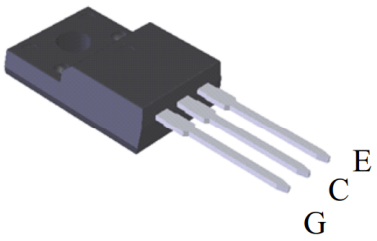
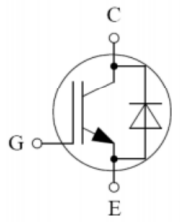


TO-220F Pin Configuration

IGBT Discrete

V_{CE}	650	V
I_C	10	A
$V_{CE(SAT)}$ I_C=10A	1.5	V

Circuit



Applications

- General purpose inverters
- Motor Control

Features

- Low gate charge
- Maximum junction temperature 175℃
- Trench FS Technology
- Fast switching speed
- Low switching losses

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	V
DC Collector Current, limited by T_{jmax} T_C= 25°C T_C= 100°C	I_C	 20 10	A
Diode Forward Current, limited by T_{jmax} T_C= 25°C T_C= 100°C	I_F	 20 10	A
Continuous Gate-Emitter Voltage	V_{GE}	±30	V
Pulsed Collector Current, V_{GE}=15V, tp limited by T_{jmax}	I_{CM}	40	A
Power Dissipation , Tj=175°C,Tc=25°C	P_{tot}	37	W
Operating Junction Temperature	T_j	-55...+175	°C
Storage Temperature	T_s	-55...+150	°C
Soldering Temperature, wave soldering 1.6mm(0.063in.) from case for 10s	-	300	°C

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	$R_{th}(j\text{-}c)$	4.0	K/W
Diode Thermal Resistance, Junction - Case	$R_{th}(j\text{-}c)$	4.9	K/W
Thermal Resistance, Junction - Ambient	$R_{th}(j\text{-}a)$	62.5	K/W

Electrical Characteristics of the IGBT（T_j= 25℃ unless otherwise specified）:

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-Emitter Breakdown Voltage	BV_{CES}	V_{GE}=0V, I_C=250μA	650	-	-	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=250μA	5.5	6.0	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=10A T_j=25°C, T_j=175°C	 - -	 1.5 1.8	 1.9 2.2	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=650V, V_{GE}=0V T_j= 25°C,	-	-	10	uA
Gate-Emitter Leakage Current	I_{GES}	V_{CE}= 0V, V_{GE}= ± 20V	-	-	200	nA
Input Capacitance	C_{ies}	V_{CE}= 25V, V_{GE}= 0V, f = 1MHz	-	649	-	pF
Output Capacitance	C_{oes}		-	54	-	
Reverse Transfer Capacitance	C_{res}		-	15	-	
Gate Charge	Q_G	V_{CC}=100V,I_C= 10A, V_{GE}=15V	-	20.2	-	nC
Gate-Emitter Charge	Q_{GE}		-	7	-	
Gate-Collector Charge	Q_{GC}		-	9.4	-	

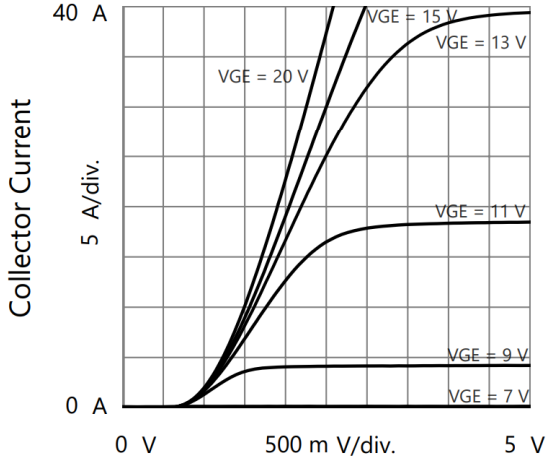
Switching Characteristic, Inductive Load （T_j= 25℃unless otherwise specified）:

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-on Delay Time	$t_{d(on)}$	V_{CC}= 400V, I_C=10A, V_{GE}= 15V R_g=10Ω	-	13	-	ns
Rise Time	t_r		-	20	-	ns
Turn-on Energy	E_{on}		-	0.35	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	47	-	ns
Fall Time	t_f		-	60	-	ns
Turn-off Energy	E_{off}		-	0.1	-	mJ

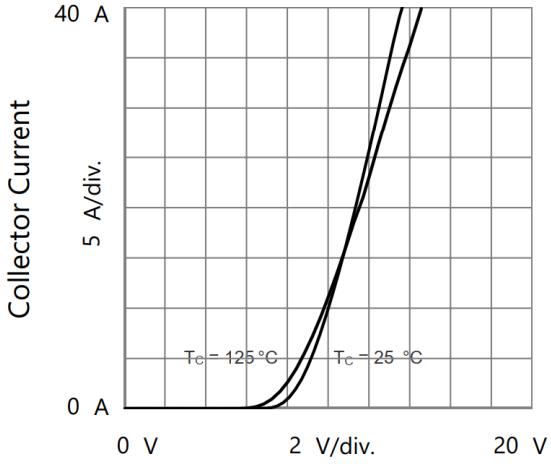
Electrical Characteristics of the DIODE （T_j= 25℃unless otherwise specified）:

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	I_F= 10A	-	1.75	-	V
Reverse Recovery Time	T_{rr}	T_C=25°C,I_F=10A, V_{GE}=0V,d_i/d_t =100A/us	-	53	-	ns
Reverse Recovery Charge	Q_{rr}		-	36	-	nC
Reverse Recovery Time	T_{rr}	T_C=175°C ,I_F=10A, V_{GE}=0V,d_i/d_t =100A/us	-	81	-	ns
Reverse Recovery Charge	Q_{rr}		-	50	-	nC

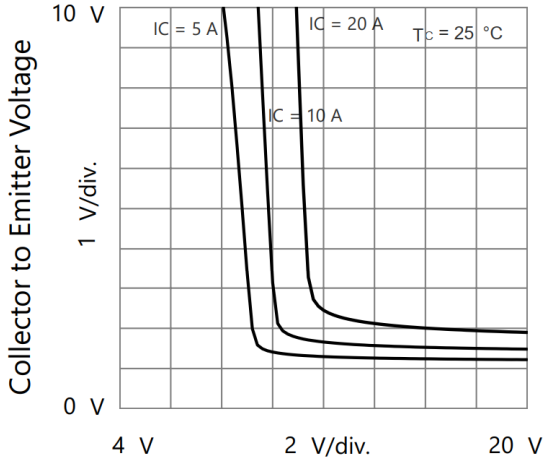
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



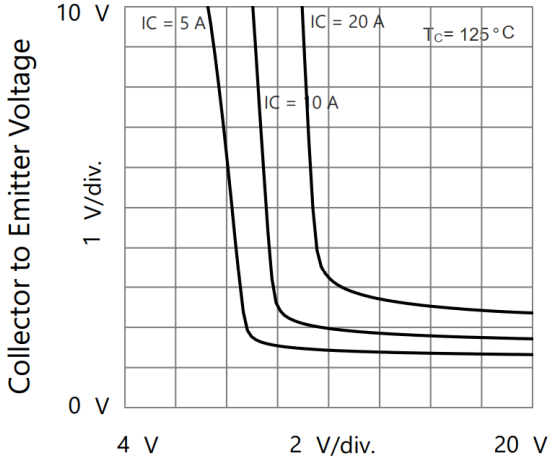
Collector to Emitter Voltage
Output Characteristics



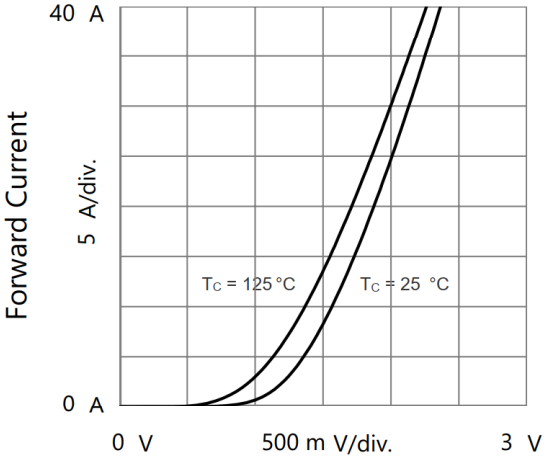
Gate to Emitter Voltage
Transfer Characteristics



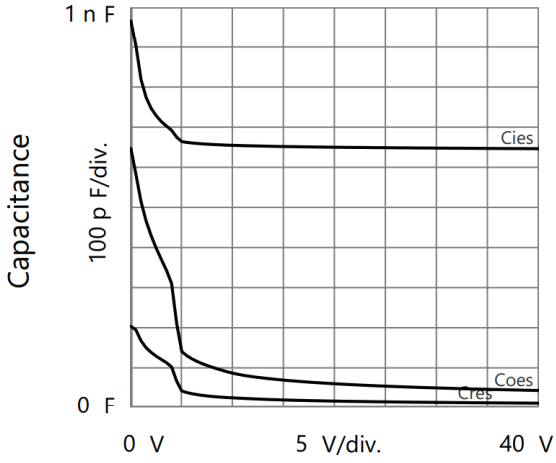
Gate to Emitter Voltage
Collector to Emitter Voltage vs. Gate to Emitter Voltage



Gate to Emitter Voltage
Collector to Emitter Voltage vs. Gate to Emitter Voltage

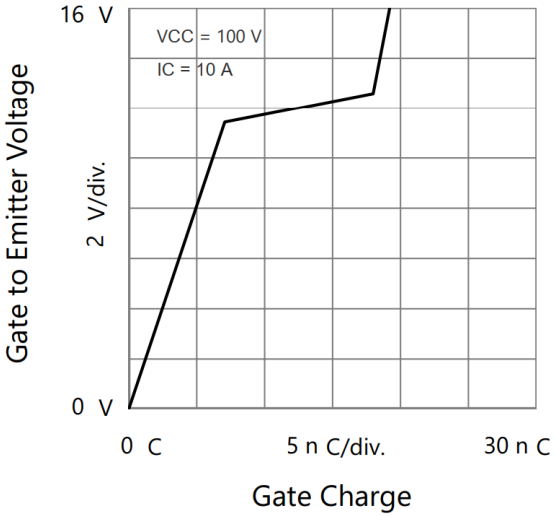


Forward Voltage
Freewheeling Diode Forward Characteristics

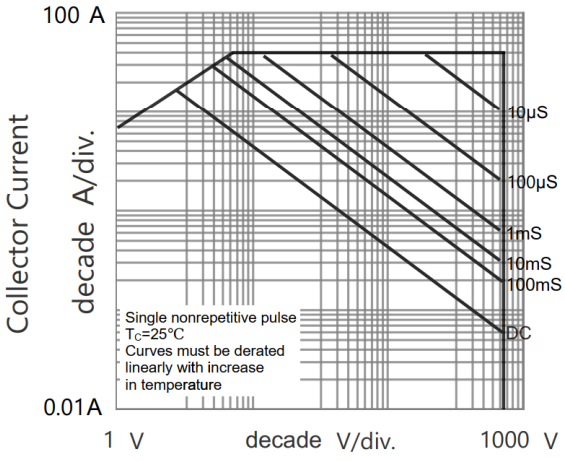


Collector to Emitter Voltage
Capacitances

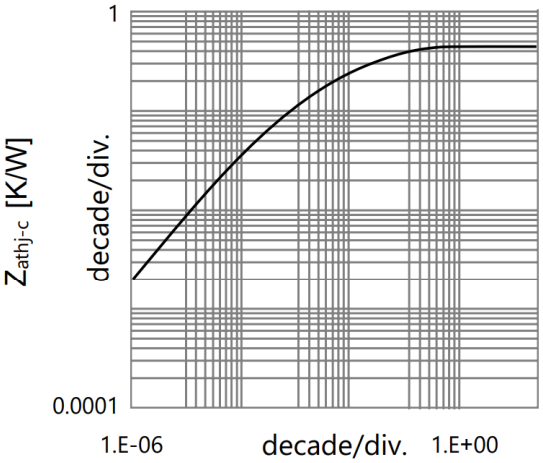
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Gate Charge

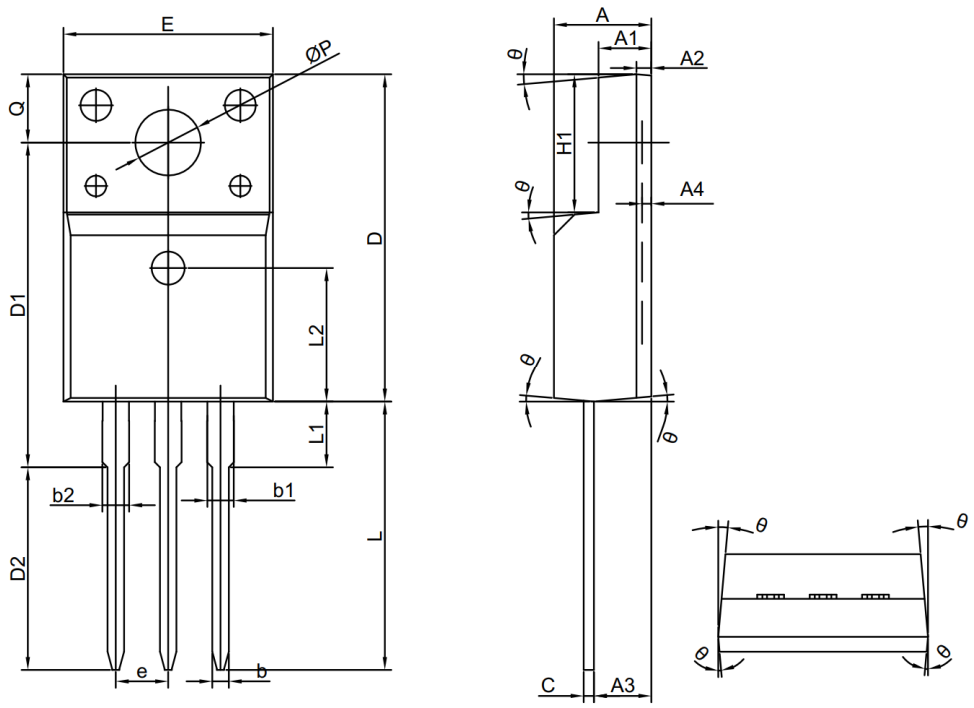


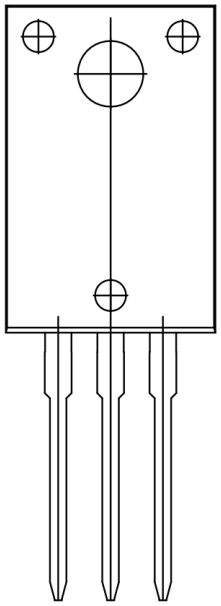
Collector to Emitter Voltage
SOA Characteristics



IGBT Transient Thermal Impedance

TO-220F-3L PACKAGE OUTLINE





COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.30	4.72	5.10
A1	2.25	2.56	2.90
A2		0.72 REF	
A3	2.28	2.78	3.50
A4		0.45 MAX	
b	0.65	-	0.95
b1	1.00	-	1.55
b2	-	-	1.55
c	0.40	0.50	0.65
D	15.47	15.87	16.37
D1	15.35	15.75	16.25
E	9.76	10.16	10.76
e		2.54 BSC	
H1	6.28	6.68	7.08
L	12.48	12.98	13.50
L1	2.90	-	3.80
L2		2.54 BSC	
ØP	2.98	3.18	3.50
Q	3.00	-	3.60
θ	3°	5°	7°

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