



TO247-3L Plastic-Encapsulate IGBT

CCGB50T65HDT

IGBT in Trench FS Technology

$V_{(BR)CES}$	V_{CEsat}		I_C	
	650V	$T_{vj}=25^{\circ}C$	1.6V@50A	$T_{vj}=25^{\circ}C$
$T_{vj}=150^{\circ}C$		1.9V@50A	$T_{vj}=150^{\circ}C$	50A

Features:

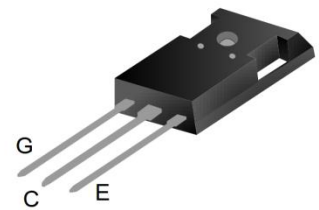
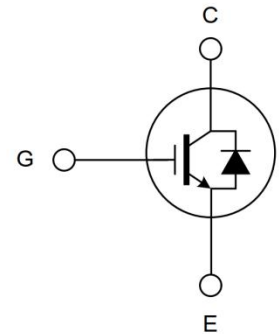
- 650V Trench field-stop technology
- Low conduction and switching losses
- Positive temperature coefficient of forward voltage
- Short Circuit withstand time-10 μ s
- AEC Q101 qualified

Applications:

- Automobile PTC
- Short-Circuit Protector
- UPS Power
- Electric Welding Machine

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat} $T_{vj}=25^{\circ}C@50A$	T_{vjmax}	Marking	Package
CCGB50T65HDT	650V	50A	1.6V	175 $^{\circ}C$	CCGB50T65HDT	PG-TO247-3L



TO-247-3L

Maximum Rated Values

Parameter	Symbol	Value	Unit
Collector emittervoltage	V_{CE}	650	V
DC collector current, $T_C=25^{\circ}C$	I_C	100	A
DC collector current, $T_C=100^{\circ}C$	I_C	50	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cplus}	200	A
Diode forward current, $T_C=25^{\circ}C$	I_F	100	A
Diode forward current, $T_C=100^{\circ}C$	I_F	50	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fplus}	200	A
Gate emitter voltage	V_{GE}	± 20	V
Short circuit with stand time, $V_{GE}=15V$, $V_{CC}=400V$, $T_{vj}=175^{\circ}C$	t_{SC}	10	μs
Power dissipation , $T_C=25^{\circ}C$	P_{tot}	366	W
Operating junction temperature	T_{vj}	-40~+175	$^{\circ}C$
Storage temperature	T_{stg}	-55~+175	$^{\circ}C$

Thermal Resistance

Parameter Characteristic	Symbol	Value	Unit
IGBT thermal resistance, junction-case	R_{thjc}	0.41	K/W
FRD thermal resistance, junction-case	R_{thjc}	0.81	K/W
Thermal resistance junction to ambient	R_{thja}	50	K/W

Static Characteristics, $T_C=25^\circ\text{C}$, unless otherwise specified

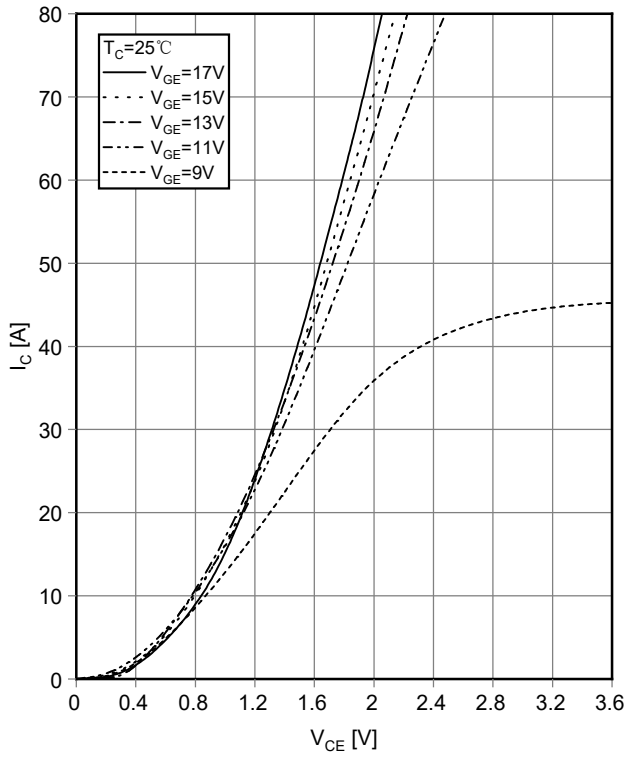
Parameter	Symbol	Conditions	Value			Unit	
			min	typ	max		
Collector emitter break down voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=1mA$	650	-	-	V	
Collector emitter saturation voltage	V_{CEsat}	$V_{GE}=15V, I_C=50A$	$T_{vj}=25^\circ\text{C}$	-	1.6	1.9	V
			$T_{vj}=150^\circ\text{C}$	-	1.9		
Diode forward voltage	V_F	$V_{GE}=0V, I_F=50A$	$T_{vj}=25^\circ\text{C}$	-	1.83	2.1	V
			$T_{vj}=150^\circ\text{C}$	-	1.68		
Gate emitter threshold voltage	V_{GEth}	$I_C=1mA, V_{CE}=V_{GE}$	4.8	5.7	6.2	V	
Zero gate voltage collector current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	-	-	4	μA	
Gate emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	200	nA	

Switching Characteristic, at $T_C=25^\circ\text{C}$, unless otherwise specified

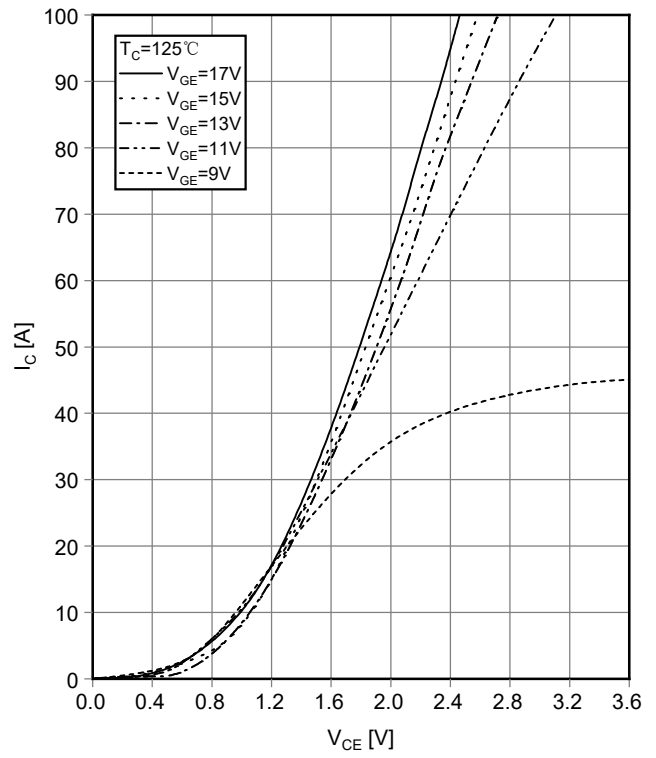
Parameter	Symbol	Conditions	Value			Unit	
			min	typ	max		
IGBT Characteristic							
Input capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=100kHz$	-	2220	-	pF	
Output capacitance	C_{oes}		-	125	-		
Reverse transfer capacitance	C_{res}		-	27	-		
Gate resistance	R_g	$f=100kHz$	-	3.1	-	Ω	
Turn-on delay time	t_{don}	$V_{CE}=400V, V_{GE}=-8V/+15V, R_g=10\Omega, I_C=40A, \text{Inductive Load}$	-	46	-	ns	
Rise time	t_r		-	154	-	ns	
Turn-off delay time	t_{doff}		-	120	-	ns	
Fall time	t_f		-	134	-	ns	
Turn-on energy	E_{on}		-	2.5	-	mJ	
Turn-off energy	E_{off}		-	1.1	-	mJ	
FRD Characteristic							
Reverse recovery time	t_{rr}		$V_R=400V, R_g=10\Omega, I_F=40A, \text{Inductive Load}$	-	33	-	ns
Recovery charge	Q_r	-		65	-	μC	
Peak recovery current	I_{RM}	-		25	-	A	

Typical Characteristic Curve

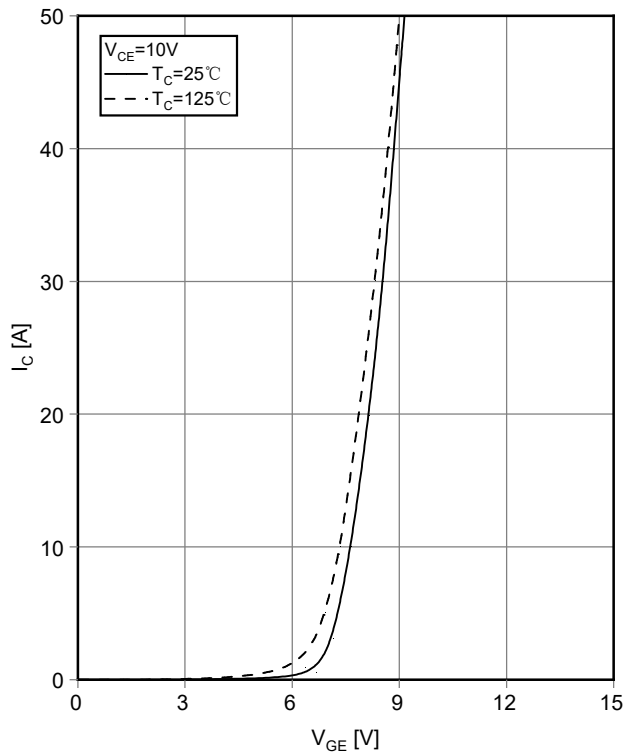
Typical output characteristic ($T_c=25^\circ\text{C}$)



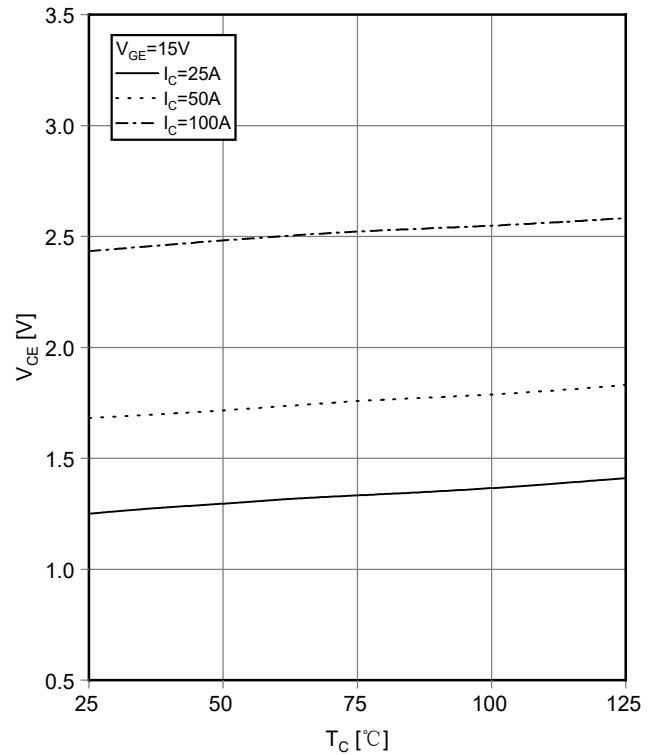
Typical output characteristic ($T_c=125^\circ\text{C}$)



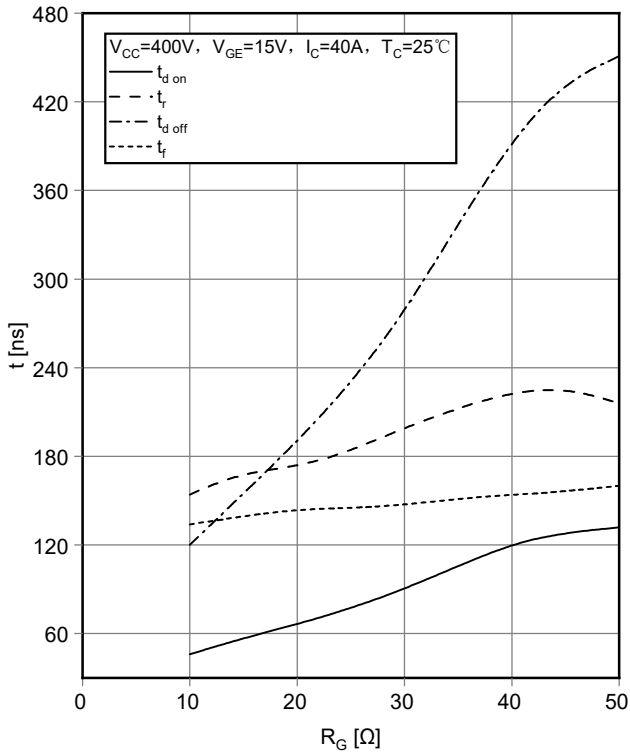
Typical transfer characteristic



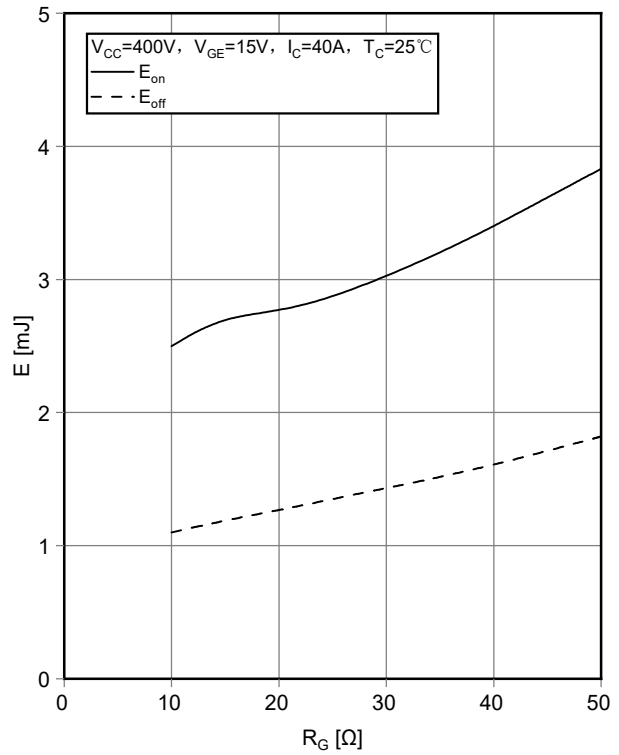
Typical collector-emitter saturation voltage as a function of case temperature



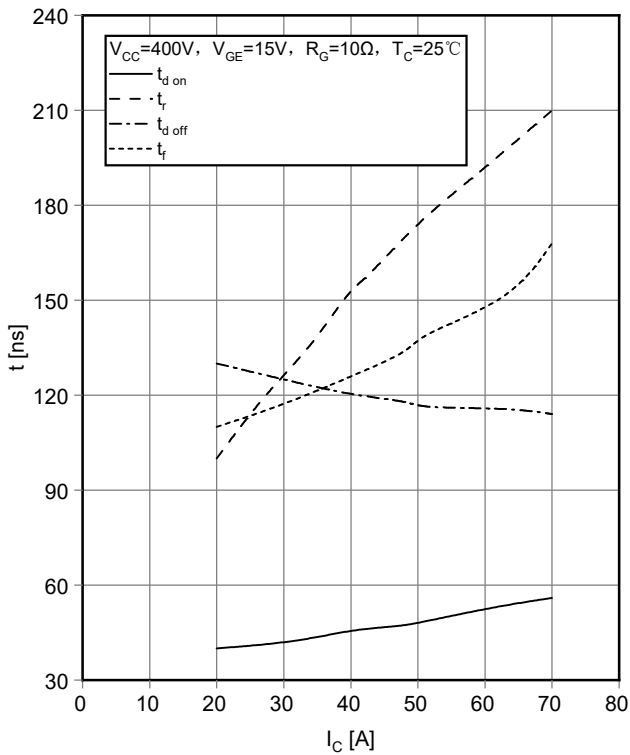
Typical switching times as a function of gate resistor



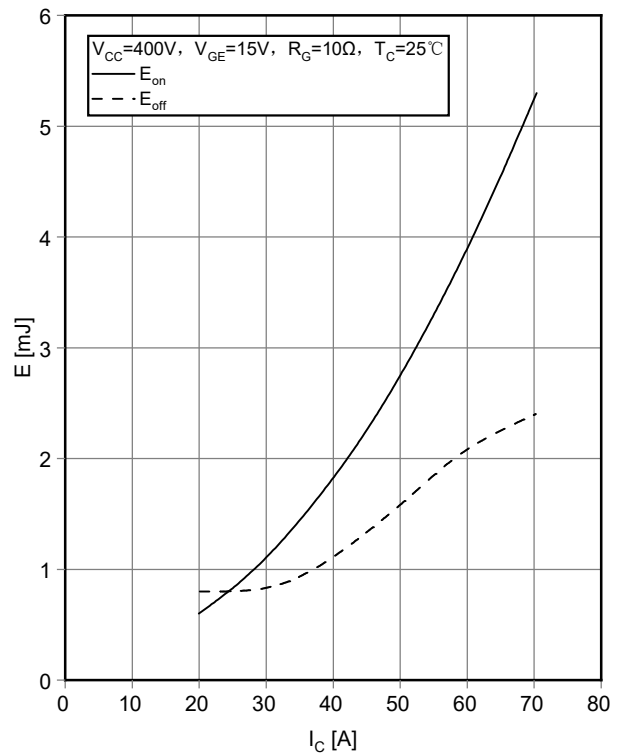
Typical switching energy losses as a function of gate resistor



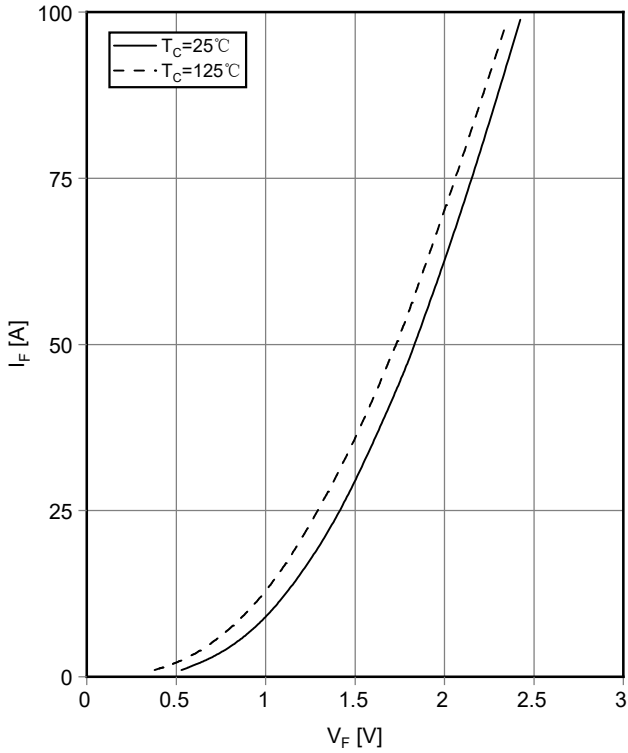
Typical switching times as a function of collector current



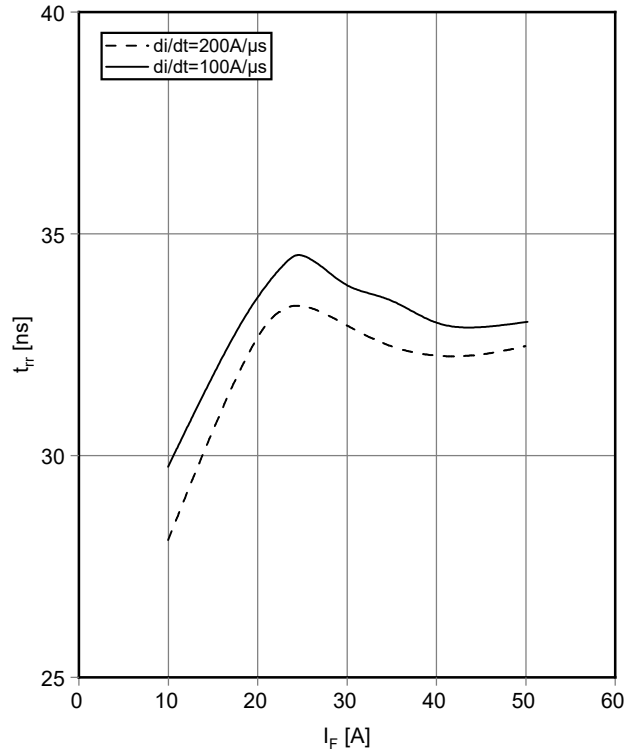
Typical switching energy losses as a function of collector current



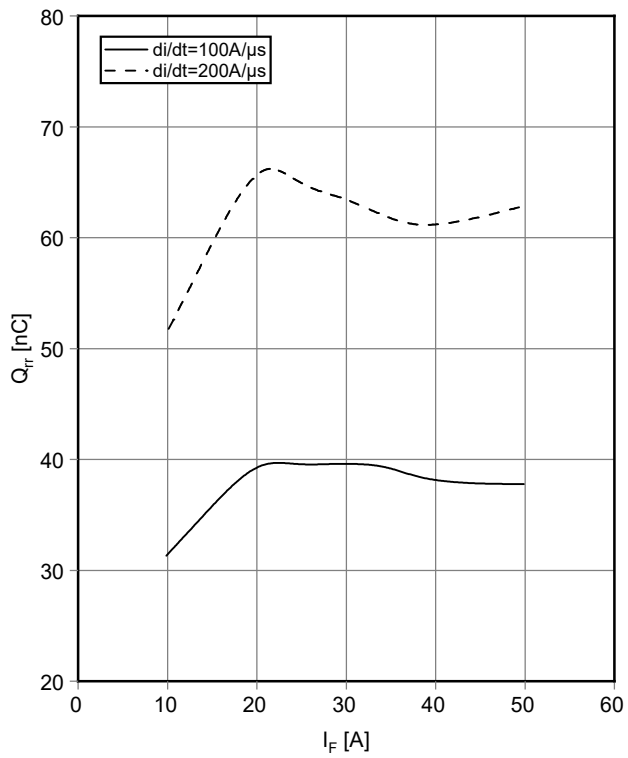
Typical FRD forward current as a function of forward voltage



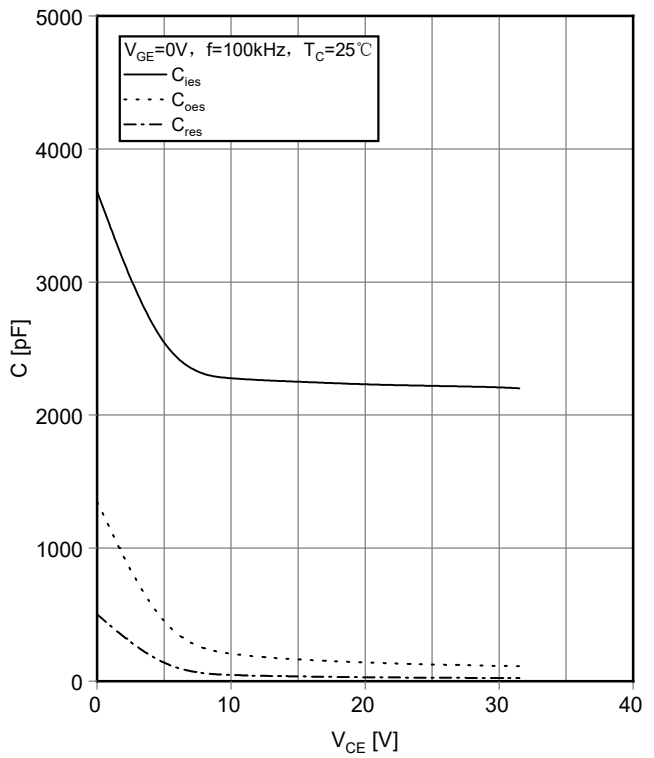
Typical reverse recovery time as a function of FRD forward current



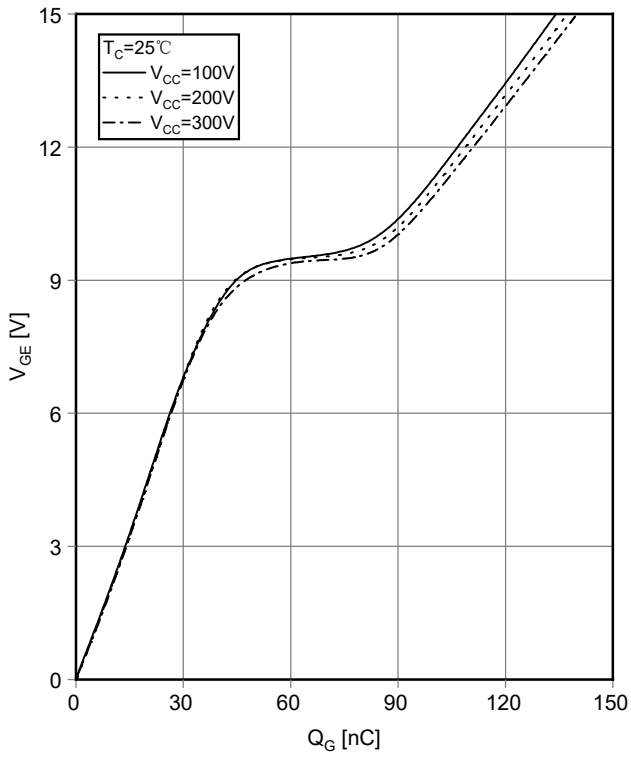
Typical reverse recovery charge as a function of FRD forward current



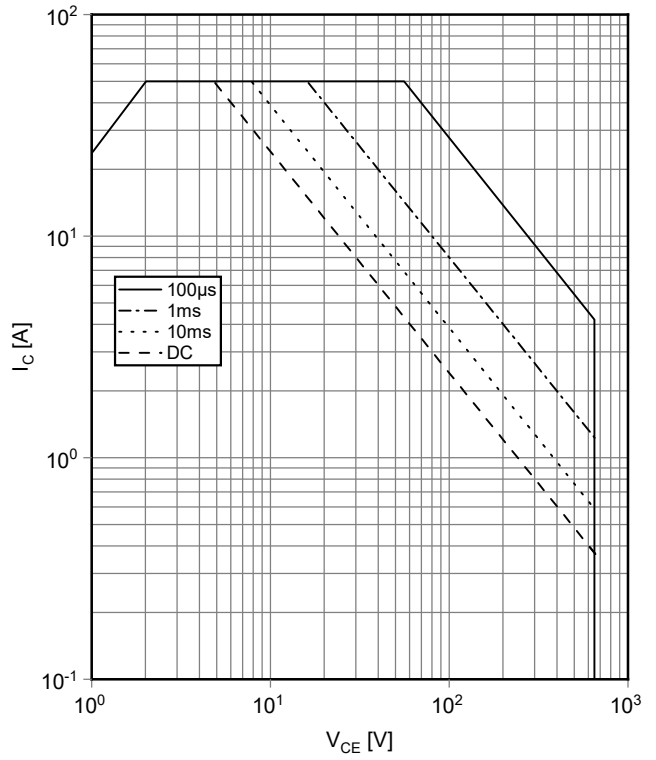
Typical capacitance as a function of collector-emitter voltage



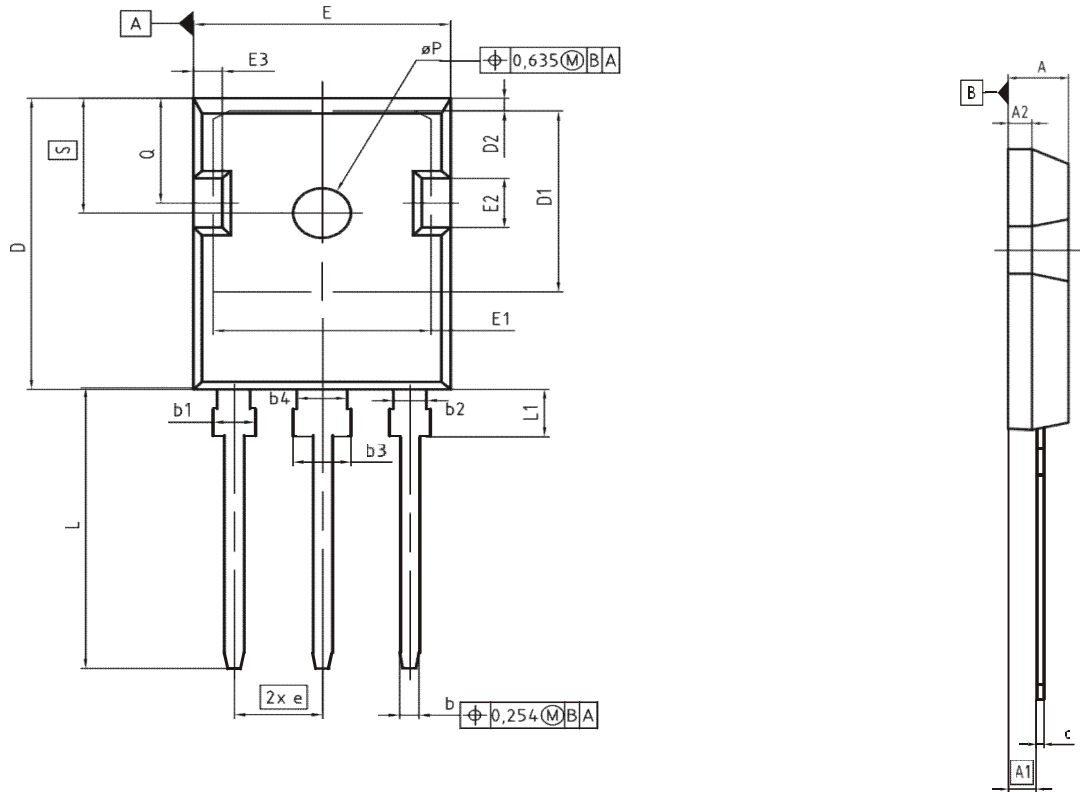
Typical gate charge



FBSOA



PG-TO247-3OutlineDimensions



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
ϕP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

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2023/06/29	A/0	/