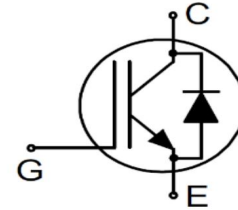




Features

- 650V, 15A IGBT
- Easy paralleling capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Low EMI
- Low Gate Charge
- Low Saturation Voltage $V_{CE(SAT)}$



Application

- UPS
- EV-Charging
- Three-Phase Solar String Inverter
- Energy Storage



Key Performance and Package Parameters

Device	V_{CE}	I_C ($T_C = 25^\circ\text{C}$)	$V_{CE(SAT)}$ ($T_{VJ} = 25^\circ\text{C}$, $V_{GE} = 15\text{V}$)	T_{vjmax}	Package	Packing
MSG15T65FL	650V	15A	1.79V	175	TO-220F	50PCS

Absolute Maximum Ratings (@ $T_{VJ} = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Units
V_{CE}	Collector emitter voltage	650	V
I_C	DC collector current ⁽¹⁾	$T_C = 25^\circ\text{C}$	30
		$T_C = 100^\circ\text{C}$	15
I_{CM}	Pulsed collector current ⁽¹⁾	$T_C = 25^\circ\text{C}$	60
I_F	Maximum Diode forward current	$T_C = 25^\circ\text{C}$	30
		$T_C = 100^\circ\text{C}$	15
I_{FM}	Diode pulsed current	$T_C = 25^\circ\text{C}$	150
V_{GE}	Gate-Emitter voltage	$T_{VJ} = 25^\circ\text{C}$	± 20
P_{tot}	Power Dissipation	$T_C = 25^\circ\text{C}$	250
		$T_C = 100^\circ\text{C}$	125
T_{VJ}	Operating Junction Temperature Range	-40 to +175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$



Thermal Resistance

Symbol	Parameter	Conditions	Max.	Unit
$R_{\theta JA}$	Thermal resistance: junction - ambient		60	°C/W
$R_{\theta JC}$	IGBT Thermal resistance: junction - case	IGBT	1.5	°C/W
$R_{\theta JC}$	Diode Thermal resistance: junction - case	Diode	2.0	°C/W

Electrical Characteristics (@ $T_{VJ} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
$V_{(BR)CES}$	Collector - Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 0.5mA$	650	-	-	V
V_{CESAT}	Collector - Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 15A$	-	1.79	-	V
		$V_{GE} = 15V, I_C = 15A, T_{VJ} = 125^{\circ}\text{C}$	-	2.2	-	V
		$V_{GE} = 15V, I_C = 15A, T_{VJ} = 175^{\circ}\text{C}$	-	2.4	-	V
V_F	Diode forward voltage	$V_{GE} = 0V, I_C = 15A$	-	1.68	-	V
		$V_{GE} = 0V, I_C = 15A, T_{VJ} = 125^{\circ}\text{C}$	-	1.48	-	V
		$V_{GE} = 0V, I_C = 15A, T_{VJ} = 175^{\circ}\text{C}$	-	1.40	-	V
$V_{GE(th)}$	Gate-Emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 400\mu A$	-	6.4	-	V
I_{CES}	Zero Gate voltage Collector current	$V_{CE} = 650V, V_{GE} = 0V$	-	-	1.0	μA
I_{GES}	Gate-Emitter leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 100	nA
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{GE} = 0V, V_{CE} = 25V,$ $f = 1MHz$	-	1470	-	pF
C_{oes}	Output Capacitance		-	34	-	pF
C_{res}	Reverse Transfer Capacitance		-	11	-	pF
R_G	Gate input resistance	$f = 1M HZ$	-	1.2	-	Ω
Q_g	Gate Charge	$V_{GE} = 0 \text{ to } 15V$ $V_{CE} = 520V, I_C = 15A$	-	51	-	nC
Q_{ge}	Gate to Emitter charge		-	8	-	nC
Q_{gc}	Gate to Collector charge		-	20	-	nC
Q_{gth}	Gate to collector charge		-	7	-	nC
L_E	Internal Emitter Inductance		-	13	-	nH
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	$T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = 15V, V_{CC} = 400V$ $I_C = 15A, R_G = 39\Omega$	-	46	-	ns
t_r	Turn-On Rise Time		-	32	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	156	-	ns
t_f	Turn-Off Fall Time		-	40	-	ns
E_{on}	Turn-on energy		-	0.4	-	mJ
E_{off}	Turn-off energy		-	0.19	-	mJ
E_{ts}	Total switching energy		-	0.59	-	mJ
Diode Recovery Characteristics						
T_{rr}	Reverse recovery time	$T_{vj} = 25^{\circ}\text{C}$ $V_{CE} = 400V, I_C = 15A, V_{GE} = 15V$ $R_G = 39\Omega$	-	159	-	ns
Q_{rr}	Reverse recovery charge		-	0.65	-	μC
I_{rrm}	Peak reverse recovery current		-	7.8	-	A
E_{res}	Reverse recovery energy		-	-420	-	mJ

Notes: 1. The max Collector current rating is package limited



Typical Performance Characteristics

Fig.1 Output characteristics(25°C)

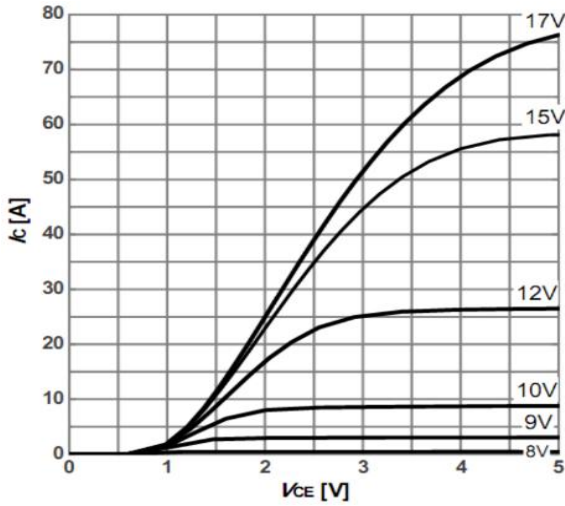


Fig.2 Saturation Voltage vs. VGE (25°C)

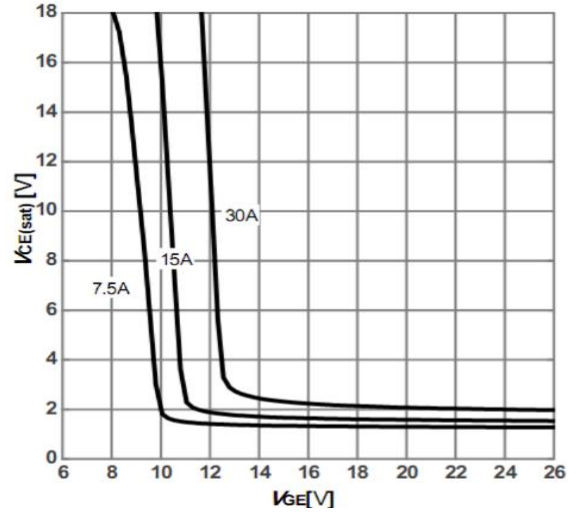


Fig.3 Reverse Bias SOA (25°C)

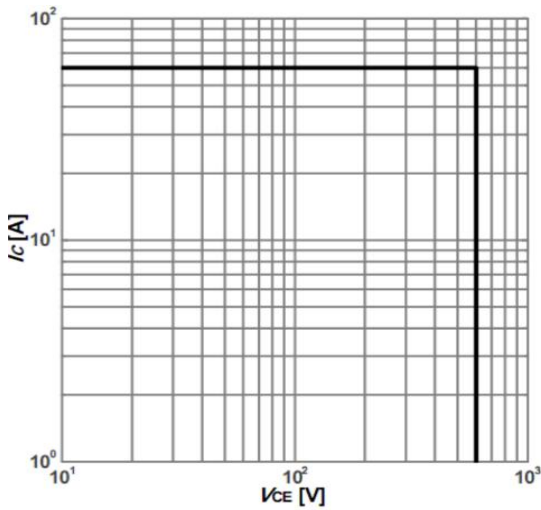


Fig.4 Transfer characteristics

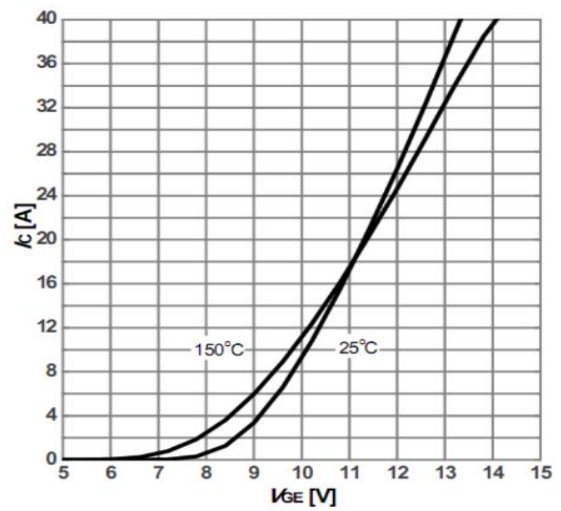


Fig.5 Gate charge

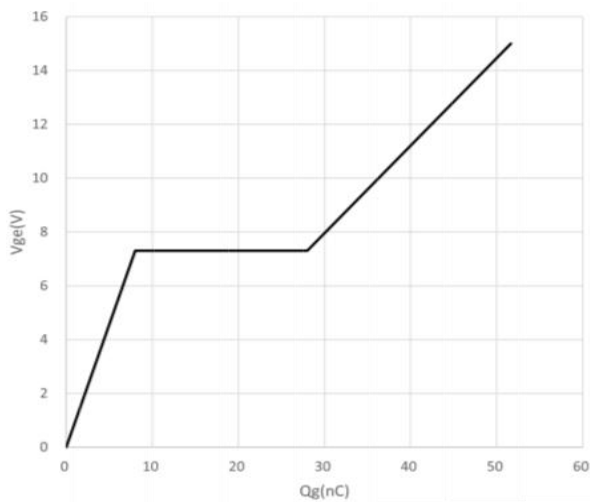
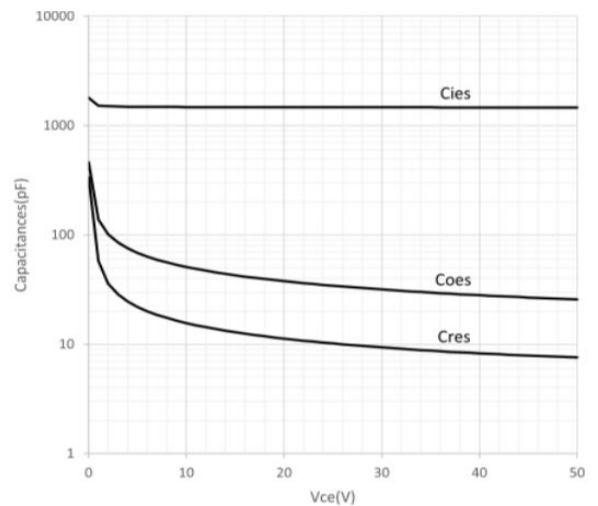
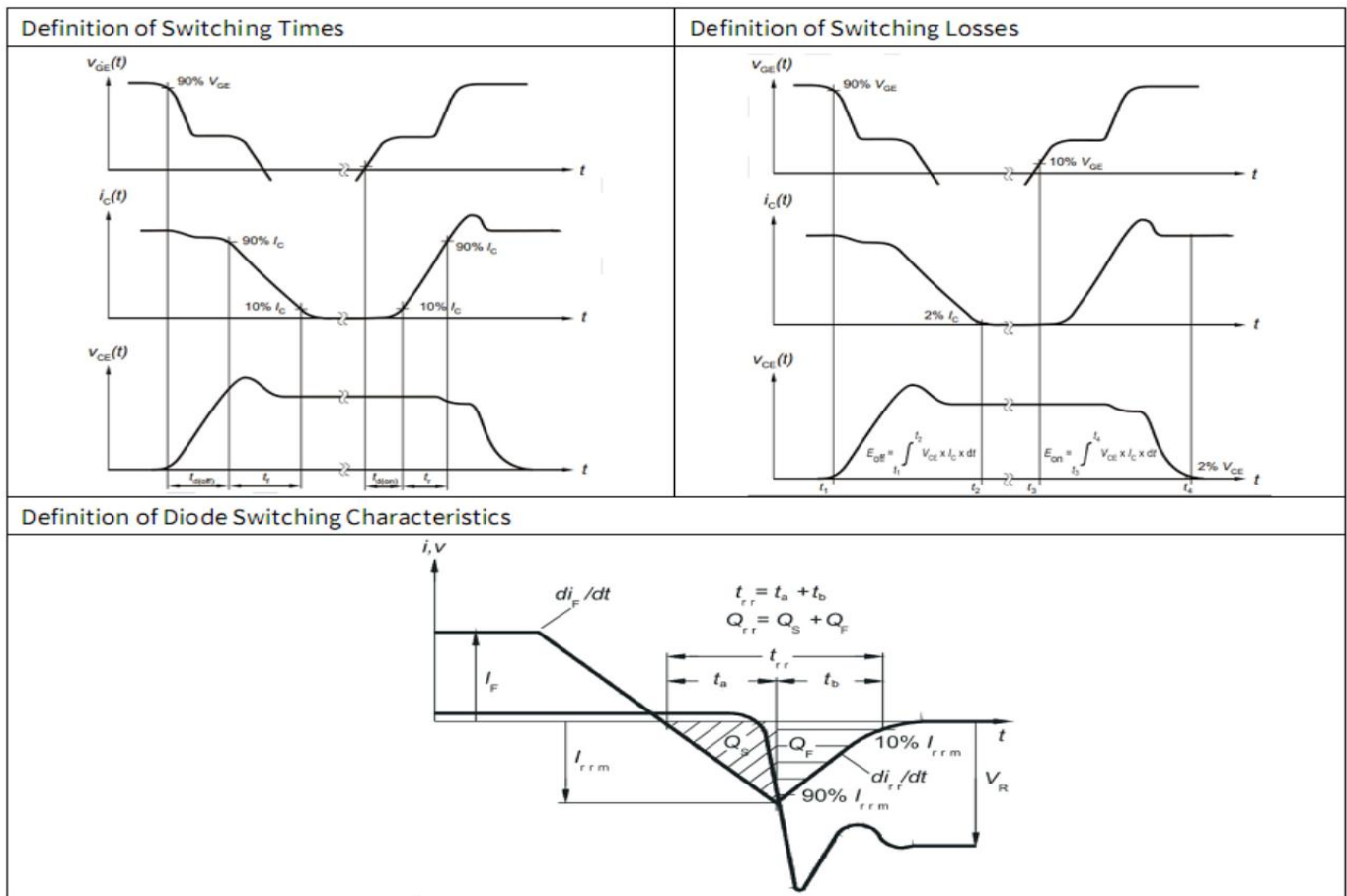
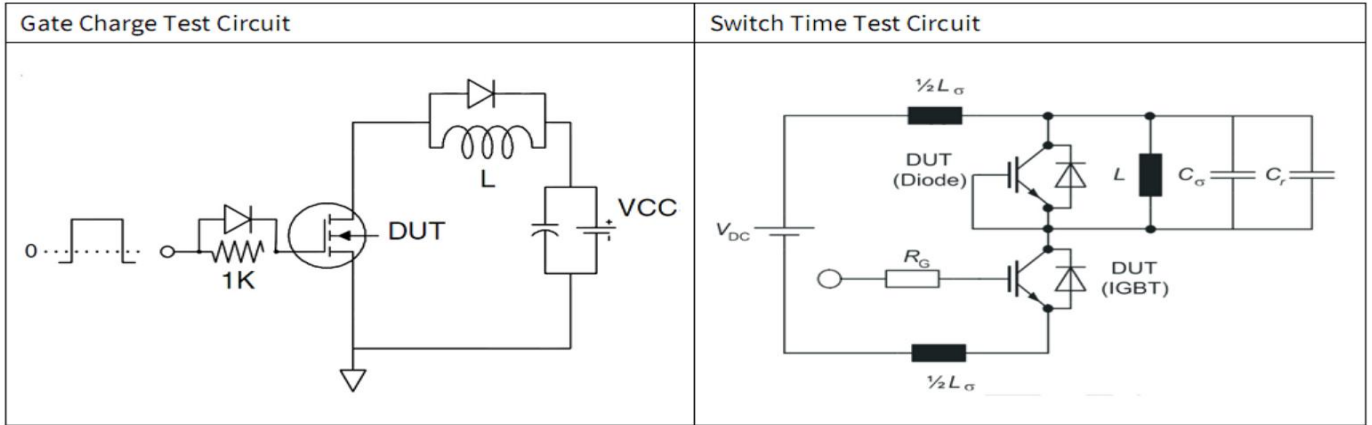


Fig.6 Typical capacitance



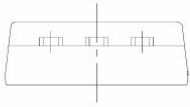


Test Circuit

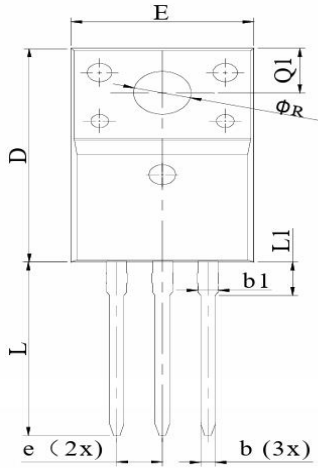




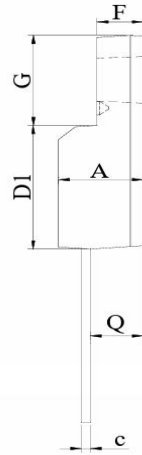
Package Mechanical Data(TO-220F)



Front View



Top View



Side View

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.50	4.70	4.90
D	15.20	15.87	16.10
D1	8.80	--	9.50
E	9.70	10.10	10.40
F	2.44	--	2.75
b	0.70	0.80	0.91
b1	1.10	1.35	1.55
c	0.45	0.50	0.65
e	2.54 BSC		
G	6.40	6.70	6.90
L	12.00	13.10	14.50
L1	3.13	--	3.57
Q	2.60	2.75	2.85
Q1	3.20	3.30	3.40
R	3.05	--	3.28



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