

## IGBT

### Phase Leg Module

#### Features

- SPT chip (soft-punch-through)
- MOS input control
- Low  $V_{CE(SAT)}$
- Positive temperature coefficient for easy paralleling
- High short-circuit current capability
- Low switching losses
- Isolation voltage 2500 V RMS

#### Applications

- AC and DC motor control
- AC servo and robot devices
- Power supplies
- Welding inverters

#### Maximum Ratings

Parameter	Symbol	Conditions	Values	Units	Circuit Diagram
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#### IGBT

Collector-Emitter Voltage	$V_{CES}$		1200	V	
DC-Collector Current	$I_{CM}$	$T_c=25^\circ\text{C} (85^\circ\text{C})$	450 (300)	A	
Gate Emitter Peak Voltage	$V_{GES}$		$\pm 20$	V	
Operating Temperature	$T_{vj}$		-40 to +125	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$	
Insulation Test Voltage	$V_{ISOL}$	RMS, 1min, 50 Hz	2500	V	

#### Free-wheeling diode

DC-Forward Current	$I_F$	$T_c=25^\circ\text{C} (85^\circ\text{C})$	450 (300)	A
Repetitive Peak Forward Current	$I_{FM}$		$t_p=1\text{ms}$	900 (600)
Forward Surge Current	$I_{FSM}$	$t_p=10\text{ms}, \text{Sin}, T_j=150^\circ\text{C}$	2200	A

#### Thermal Properties

Th. Resistance Junction to Case	$R_{thJC}$	0.06	K/W
Th. Resistance Case to Heat Sink	$R_{thCS}$	0.03	K/W

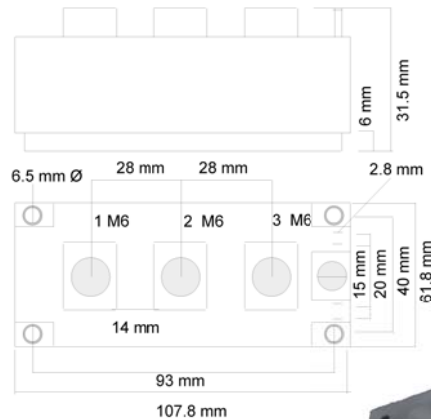
#### Mechanical Properties

	Symbol	Values		
		Min	Typ	Max
Mounting Torque	$M_d$	3	6	Nm
Terminal Connection Torque		2.5	5	Nm
Weight		324		g
Case Color		White		
Dimensions		107.5x62x31		mm

$$V_{CES} = 1200 \text{ V}$$

$$I_{CM} = 300 \text{ A}$$

$$V_{CE(SAT)} = 2 \text{ V}$$



## Characteristic Values

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
<b>IGBT</b>						
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 2mA, T_j = 25^\circ C$		7.5		V
Collector-Emitter Cut-Off Current	$I_{CES,25}$	$V_{GE} = 0V, V_{CE} = V_{CES}, T_j = 25^\circ C$		0.5		mA
	$I_{CES,125}$	$V_{GE} = 0V, V_{CE} = V_{CES}, T_j = 125^\circ C$		1		mA
Gate-Leakage Current	$I_{GES}$	$V_{GE} = 0V, V_{CE} = 20V, T_j = 25^\circ C$	-400		400	nA
Collector-Emitter Threshold Voltage	$V_{CE(TO)}$	$T_j = 25^\circ C$		1		V
Collector-Emitter Slope Resistance	$R_{CE,25}$	$V_{GE} = 15V, T_j = 25^\circ C$		3		m $\Omega$
	$R_{CE,125}$	$V_{GE} = 15V, T_j = 125^\circ C$		4.5		m $\Omega$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 300A, V_{GE} = 15V, T_j = 25^\circ C$		2		V
Input Capacitance	$C_{ies}$	$V_{GE} = 0V, V_{CE} = 25V, f = 1MHz$		26		nF
Output Capacitance	$C_{oes}$			3		nF
Reverse Transfer Capacitance	$C_{res}$			3		nF
Stray Module Inductance	$L_\sigma$			20		nH
Rise Time	$t_R$	$V_{CC} = 600V, I_C = 300A, T_j = 125^\circ C, R_{gon} = R_{goff} = 12\Omega, V_{GE} = \pm 18V$		260		ns
Fall Time	$t_F$			220		ns
Turn-On Energy Loss Per Pulse	$E_{on}$			10.8		mJ
Turn-Off Energy Loss Per Pulse	$E_{off}$			68		mJ
<b>Free-wheeling diode</b>						
Forward Voltage	$V_F$	$I_F = 300A, V_{GE} = 0V, T_j = 25^\circ C$		1.9		V
Threshold Voltage at Diode	$V_{D(TO)}$	$T_j = 25^\circ C$		0.7		V
Peak Reverse Recovery Current	$I_{RRM}$	$I_F = 300A, V_{GE} = 0V, -di/dt = 190 A/\mu s$		43		A
Reverse Recovery Time	$t_{RR}$			1200		ns

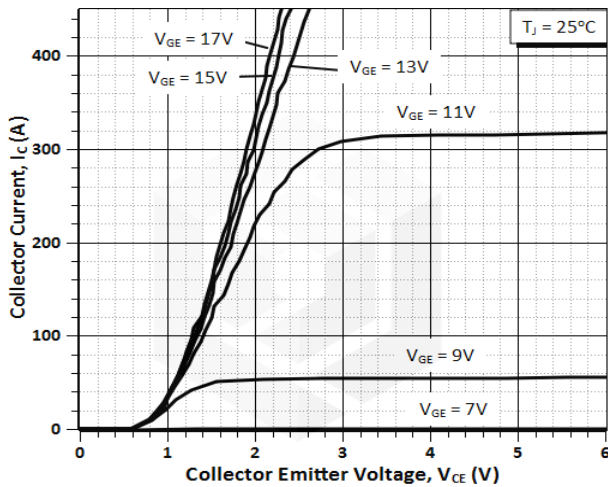


Figure 1: Typical Output Characteristics at 25 °C

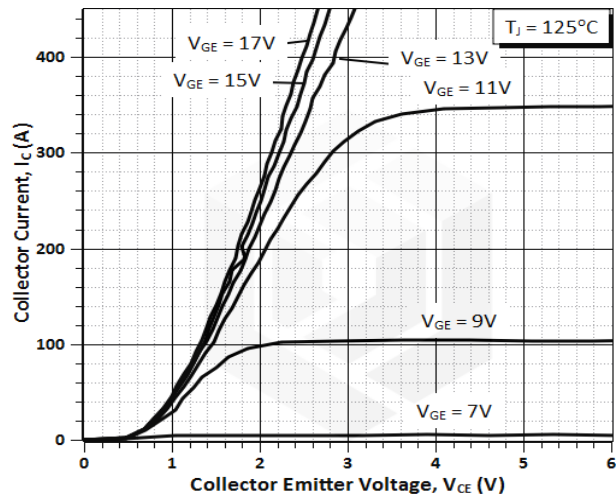


Figure 2: Typical Output Characteristics at 125 °C

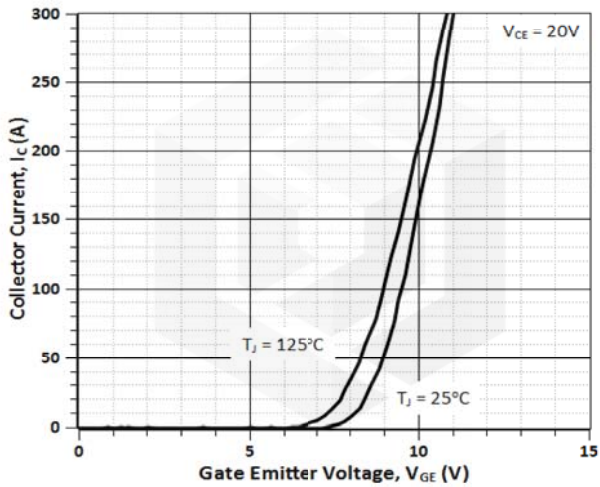


Figure 3: Typical Transfer Characteristics

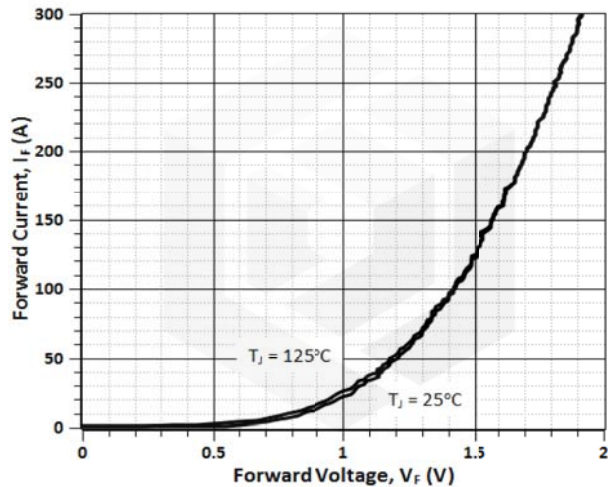


Figure 4: Typical FWD Forward Characteristics

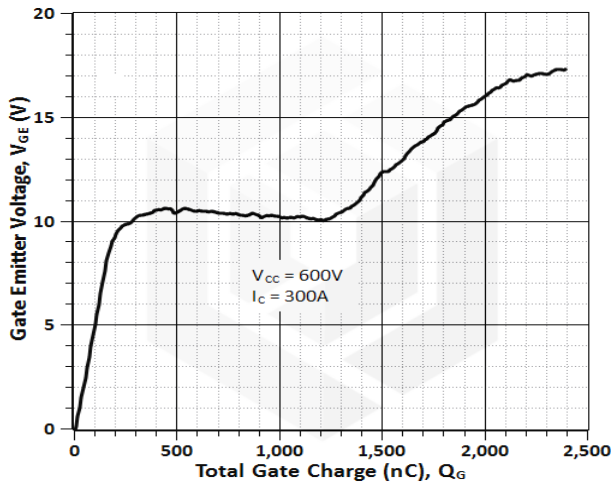


Figure 5: Typical Turn On Gate Charge

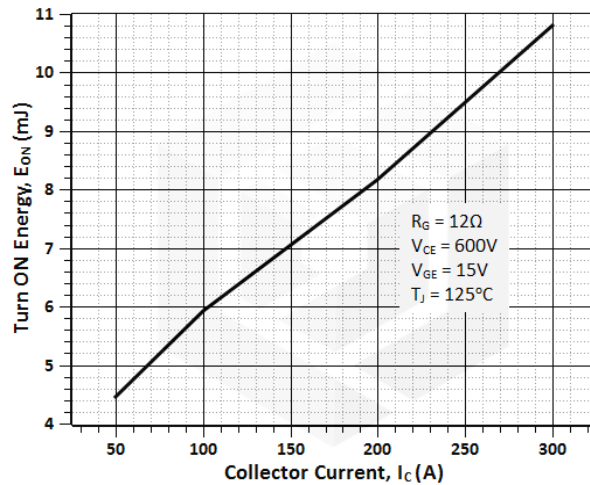


Figure 6: Typical Turn On Energy vs Collector Current

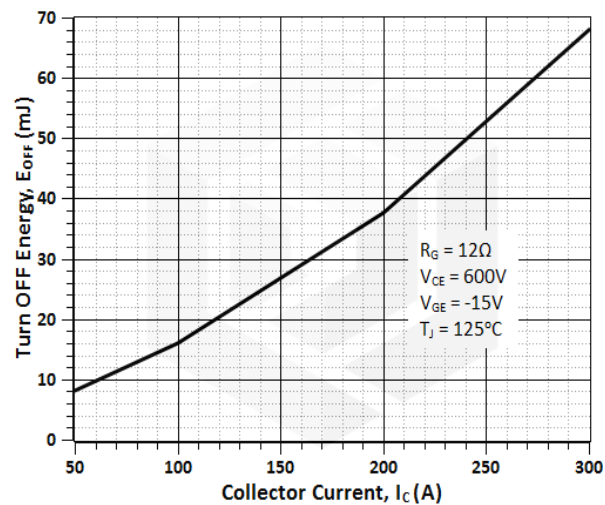


Figure 7: Typical Turn Off Energy vs Collector Current

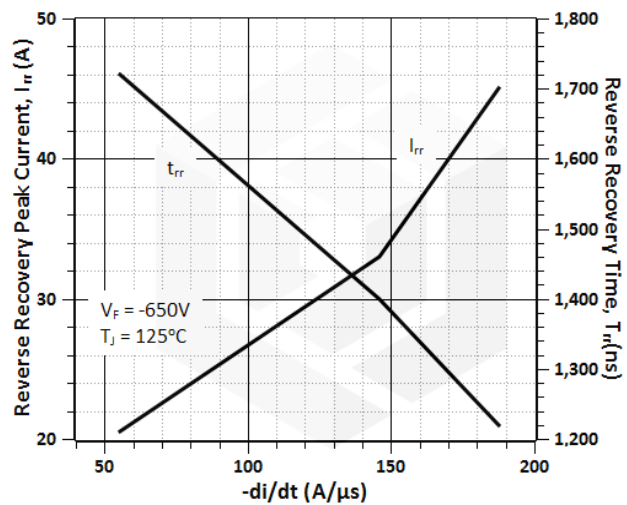


Figure 8: Typical FWD Turn Off Characteristics

Revision History		
Date	Rev.	Notes
2010-10-08	0	Created

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