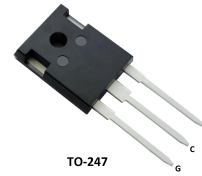


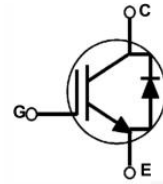
Features

- Low gate charge.
- Trench FS Technology
- Saturation Voltage:
VCE(sat) = 1.6V @ IC = 40 A
- RoHS Compliant



Applications

- General purpose inverters
- UPS



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit	
Collector to Emitter Voltage	V _{CES}	1200	V	
Gate to Emitter Voltage	V _{GES}	±20		
Turn-off safe area	-	160	A	
Collector Current	I _C	T _C =25°C	80	A
		T _C =100°C	40	
Pulsed Collector Current TC=25°C*	I _{CM}	100		
Diode forward current @ TC= 100°C	I _F	40		
Maximum Power Dissipation TC=25°C	P _D	342	W	
Operating Junction Temperature	T _J	-55 to 150	°C	
Storage Temperature Range	T _{stg}	-55 to 150		
Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	T _L	300		

*Collector current limited by maximum junction temperature

Electrical Characteristics T_C = 25°C unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Type	Max	Unit
On/off Characteristics						
Collector to Emitter Breakdown Voltage	BV _{CES}	V _{GE} = 0V, I _C = 250µA	1200	-	-	V
Breakdown Voltage Temperature Coefficient	ΔBV _{CES} /ΔT _J	I _C =0.5mA, referenced to 25°C	-	0.6	-	V/°C
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} =1200V, V _{GE} =0V, TC=25°C	-	-	1	mA
Gate-body leakage current, forward	I _{GESF}	V _{CE} =0V, V _{GE} =20V	-	-	200	nA

Gate-body leakage current, reverse	I_{GESR}	$V_{CE}=0V, V_{GE}=-20V$	-	-	-200	nA
On-Characteristics						
Gate Threshold Voltage	V_{TH}	$V_{CE}=V_{GE}, I_C=250\mu A$	4.5	-	6.5	V
Collector-Emmitter saturation Voltage	V_{CESAT}	$V_{GE}=15V, I_C=40A$ $T_C=25^\circ C$	-	1.6	2.0	V
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz$	-	2700	-	pF
Output Capacitance	C_{oes}		-	165	-	
Reverse Transfer Capacitance	C_{res}		-	110	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=40A,$ $R_G=12\Omega, V_{GE}=15V,$ $T_C=25^\circ C$	-	85	-	nS
Rise Time	t_r		-	50	-	
Turn-Off Delay Time	$t_{d(off)}$		-	260	-	
Fall Time	t_f		-	220	-	
Turn-On energy	E_{on}	$V_{CC}=960V, I_C=40A,$ $V_{GE}=15V$	-	2.63	-	mJ
Turn-off energy	E_{off}		-	1.34	-	
Total switching energy	E_{tot}		-	3.89	-	
Total Gate Charge	Q_g		-	198	-	
Gate to Emitter Charge	Q_{ge}	$V_{CC}=960V, I_C=40A,$ $V_{GE}=15V$	-	31	-	nC
Gate to Collector Charge	Q_{gc}		-	34.7	-	

Electrical Characteristics of the Diode $T_C = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_{FM}	$I_F = 40A$	-	2.2	-	V
Diode Reverse Recovery Time	t_{rr}	$I_F = 40A,$ $di_F/dt = 350A/\mu s$	$T_C=25^\circ C$	-	200	ns
Diode Peak Reverse Recovery Current	I_{rr}		$T_C=25^\circ C$	-	18	A
Diode Reverse Recovery Charge	Q_{rr}		$T_C=25^\circ C$	-	2500	nC

Thermal Characteristics

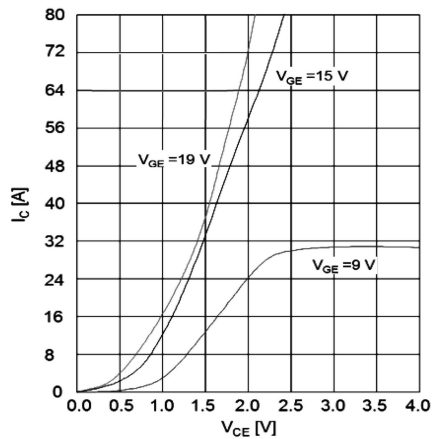
Parameter	Symbol	Typ	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.439	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	31.87	

Package Marking and Ordering Information

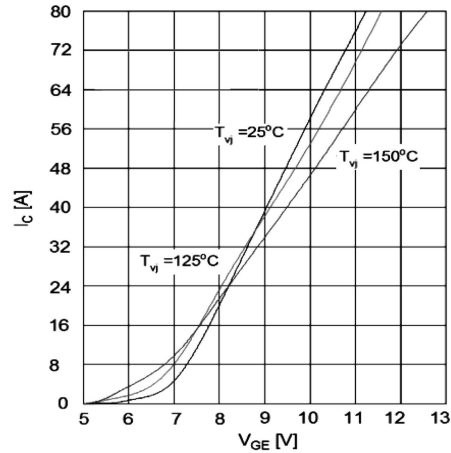
Device Marking	Device	Package
MSG40T120FQC	MSG40T120FQC	TO-247

Typical Performance Characteristics

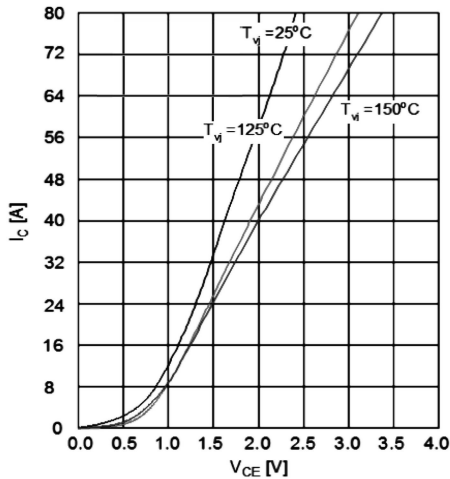
Typical IGBT Output Characteristics at $T_J=25^\circ\text{C}$



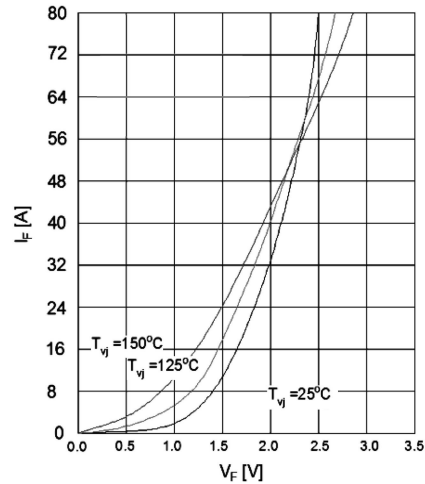
Typical Transfer Characteristics at $V_{CE}=20\text{V}$



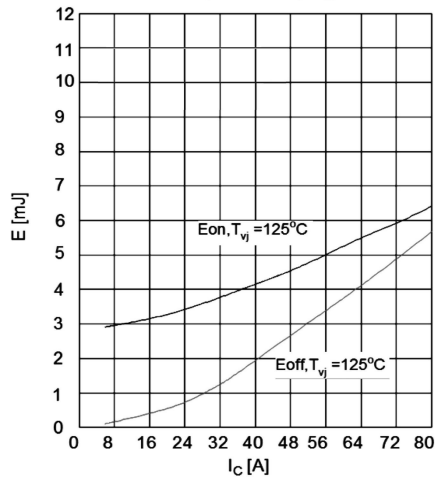
Typical Transfer Characteristics at $V_{CE}=15\text{V}$



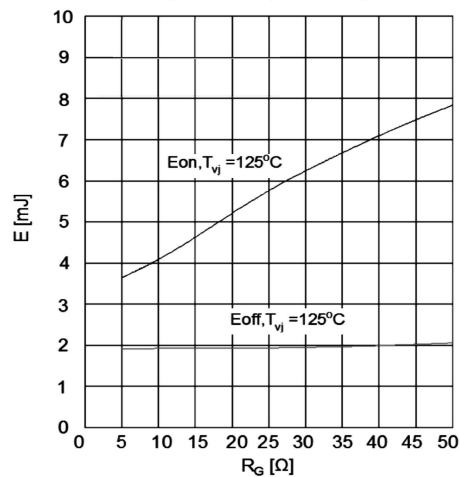
Forward characteristic of Diode-Inverter



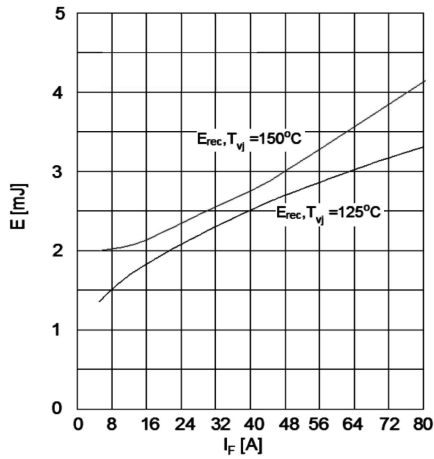
Typical Energy Loss vs. I_c at $T_c=25^\circ\text{C}$,
 $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $R_g=12\Omega$



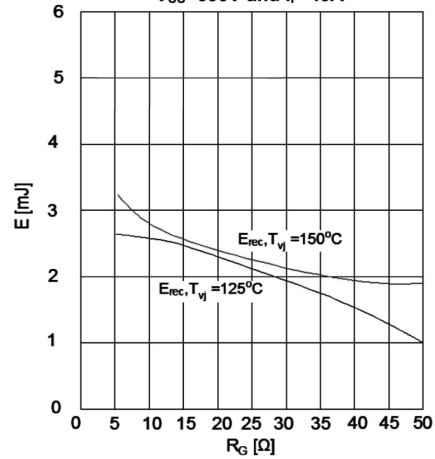
Typical Switching Time vs. R_g at
 $T_c=25^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=15\text{V}$, $I_c=40\text{A}$



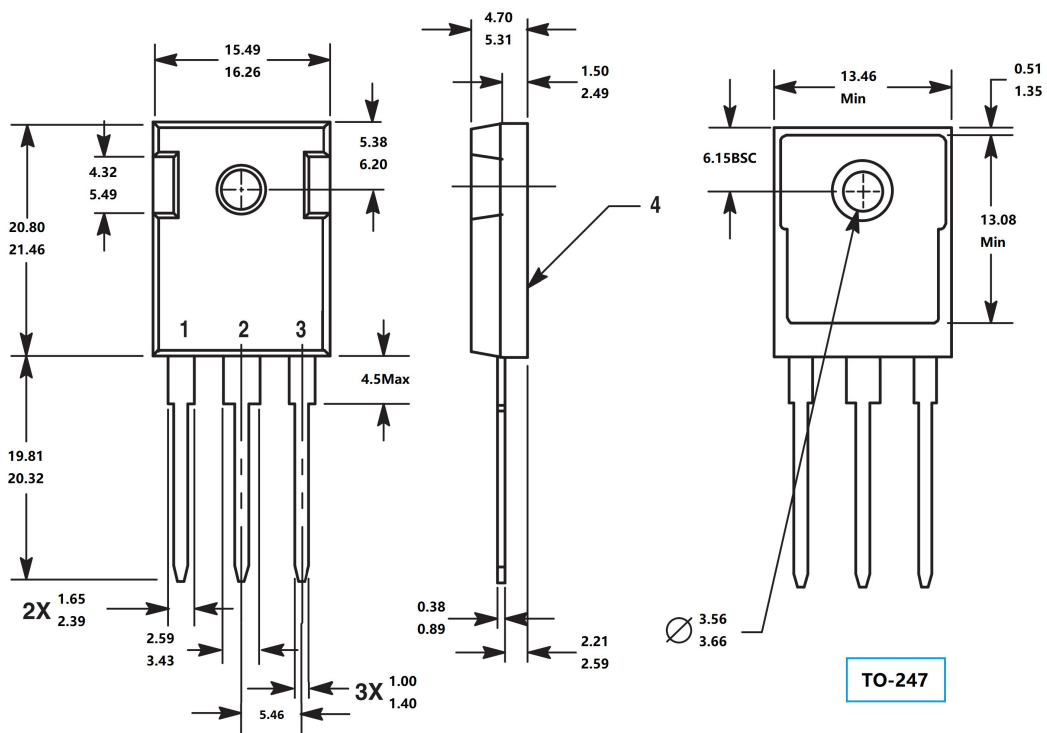
Typical Diode Energy Loss vs. I_C at $V_{CC}=600V$ and $R_G=12\Omega$



Typical Diode Energy Loss vs. R_G at $V_{CC}=600V$ and $I_F=40A$



Package outline dimension



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