

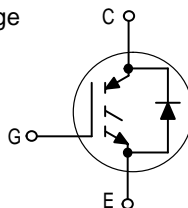
Product Preview Data Sheet

Insulated Gate Bipolar Transistor with Anti-Parallel Diode

N-Channel Enhancement Mode Silicon Gate

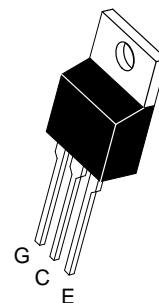
This Insulated Gate Bipolar Transistor (IGBT) is co-packaged with a soft recovery ultra-fast rectifier and uses an advanced termination scheme to provide an enhanced and reliable high voltage blocking capability. Its new 600V IGBT technology is specifically suited for applications requiring both a high temperature short circuit capability and a low $V_{CE(on)}$. It also provides fast switching characteristics and results in efficient operation at high frequencies. Co-packaged IGBTs save space, reduce assembly time and cost. This new E-series introduces an Energy-efficient and short circuit rated device.

- Industry Standard TO-220 Package
- High Speed E_{off} : 44 μ J/A typical at 125°C
- High Short Circuit Capability – 10 μ s minimum at 125°C
- Low On-Voltage – 2.0V typical at 8A, 125°C
- Soft Recovery Free Wheeling Diode is included in the package
- Robust High Voltage Termination



MGP11N60DE

IGBT & DIODE IN TO-220
11 A @ 90°C
15 A @ 25°C
600 VOLTS
SHORT CIRCUIT RATED
LOW ON-VOLTAGE



CASE 221A-06, Style 9
TO-220AB

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	Vdc
Collector-Gate Voltage ($R_{GE} = 1.0 \text{ M}\Omega$)	V_{CGR}	600	Vdc
Gate-Emitter Voltage — Continuous	V_{GE}	± 20	Vdc
Collector Current — Continuous @ $T_C = 25^\circ\text{C}$ — Continuous @ $T_C = 90^\circ\text{C}$ — Repetitive Pulsed Current (1)	I_{C25} I_{C90} I_{CM}	15 11 30	Adc Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	95 0.76	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to 150	°C
Short Circuit Withstand Time ($V_{CC} = 360 \text{ Vdc}$, $V_{GE} = 15 \text{ Vdc}$, $T_J = 125^\circ\text{C}$, $R_G = 20 \Omega$)	t_{sc}	10	μ s
Thermal Resistance — Junction to Case – IGBT — Junction to Case – Diode — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JD}$ $R_{\theta JA}$	1.32 tbid 65	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T_L	260	°C
Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.13 N•m)		

(1) Pulse width is limited by maximum junction temperature.

This document contains information on a new product. Specifications and information are subject to change without notice.

MGP11N60DE**ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-to-Emitter Breakdown Voltage ($V_{GE} = 0\text{ Vdc}$, $I_C = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$B_{V_{CES}}$	600 —	— 870	— —	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Collector Current ($V_{CE} = 600\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$) ($V_{CE} = 600\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{CES}	— —	— —	100 2500	μAdc
Gate-Body Leakage Current ($V_{GE} = \pm 20\text{ Vdc}$, $V_{CE} = 0\text{ Vdc}$)	I_{GES}	—	—	250	nAdc

ON CHARACTERISTICS (1)

Collector-to-Emitter On-State Voltage ($V_{GE} = 15\text{ Vdc}$, $I_C = 4\text{ Adc}$) ($V_{GE} = 15\text{ Vdc}$, $I_C = 4\text{ Adc}$, $T_J = 125^\circ\text{C}$) ($V_{GE} = 15\text{ Vdc}$, $I_C = 8\text{ Adc}$)	$V_{CE(on)}$	— — —	1.57 1.45 2.01	2.05 — 2.75	Vdc
Gate Threshold Voltage ($V_{CE} = V_{GE}$, $I_C = 1\text{ mAdc}$) Threshold Temperature Coefficient (Negative)	$V_{GE(th)}$	4.0 —	6.0 10	8.0 —	Vdc mV/ $^\circ\text{C}$
Forward Transconductance ($V_{CE} = 10\text{ Vdc}$, $I_C = 8\text{ Adc}$)	g_{fe}	—	tbd	—	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{CE} = 25\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{ies}	—	tbd	—	pF
Output Capacitance		C_{oes}	—	tbd	—	
Transfer Capacitance		C_{res}	—	tbd	—	

SWITCHING CHARACTERISTICS (1)

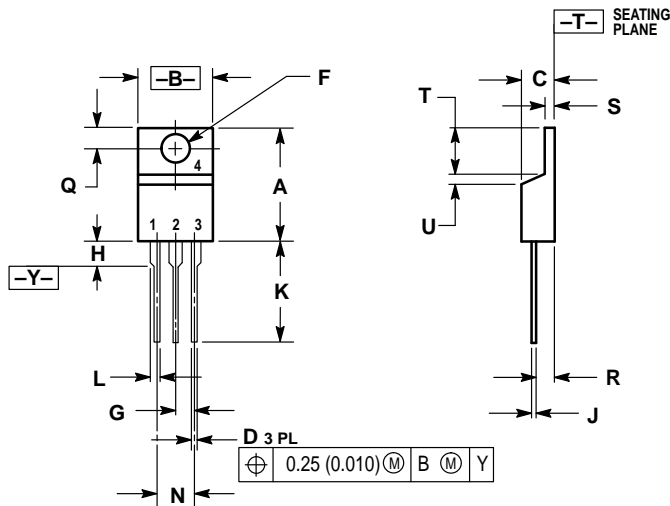
Turn-On Delay Time	$(V_{CC} = 360\text{ Vdc}$, $I_C = 8\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$, $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$, $T_J = 25^\circ\text{C}$) Energy losses include "tail"	$t_{d(on)}$	—	tbd	—	ns
Rise Time		t_r	—	tbd	—	
Turn-Off Delay Time		$t_{d(off)}$	—	tbd	—	
Fall Time		t_f	—	tbd	—	
Turn-Off Switching Loss		E_{off}	—	0.23	0.38	mJ
Turn-On Switching Loss		E_{on}	—	0.27	—	
Total Switching Loss		E_{ts}	—	0.50	—	
Turn-On Delay Time	$(V_{CC} = 360\text{ Vdc}$, $I_C = 8\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$, $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$, $T_J = 125^\circ\text{C}$) Energy losses include "tail"	$t_{d(on)}$	—	tbd	—	ns
Rise Time		t_r	—	tbd	—	
Turn-Off Delay Time		$t_{d(off)}$	—	tbd	—	
Fall Time		t_f	—	tbd	—	
Turn-Off Switching Loss		E_{off}	—	0.35	—	mJ
Turn-On Switching Loss		E_{on}	—	0.48	—	
Total Switching Loss		E_{ts}	—	0.83	—	
Gate Charge	$(V_{CC} = 360\text{ Vdc}$, $I_C = 8\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$)	Q_T	—	tbd	—	nC
		Q_1	—	tbd	—	
		Q_2	—	tbd	—	

ELECTRICAL CHARACTERISTICS — continued ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
DIODE CHARACTERISTICS						
Diode Forward Voltage Drop ($I_{EC} = 4\text{ Adc}$) ($I_{EC} = 4\text{ Adc}$, $T_J = 125^\circ\text{C}$) ($I_{EC} = 8\text{ Adc}$)		V_{FEC}	— — —	tbd tbd tbd	tbd — tbd	Vdc
Reverse Recovery Time	(If = 8 Adc, VR = 360 Vdc, dIf/dt = 200 A/μs)	t _{rr}	—	tbd	—	ns
		t _a	—	tbd	—	
		t _b	—	tbd	—	
Reverse Recovery Stored Charge		Q _{RR}	—	tbd	—	μC
Reverse Recovery Time	(If = 8 Adc, VR = 360 Vdc, dIf/dt = 200 A/μs, $T_J = 125^\circ\text{C}$)	t _{rr}	—	tbd	—	ns
		t _a	—	tbd	—	
		t _b	—	tbd	—	
Reverse Recovery Stored Charge		Q _{RR}	—	tbd	—	μC
INTERNAL PACKAGE INDUCTANCE						
Internal Emitter Inductance (Measured from the emitter lead 0.25" from package to emitter bond pad)		L _E	—	7.5	—	nH

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

PACKAGE DIMENSIONS




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.560	0.625	14.23	15.87
B	0.380	0.420	9.66	10.66
C	0.140	0.190	3.56	4.82
D	0.020	0.045	0.51	1.14
F	0.139	0.155	3.53	3.93
G	0.100 BSC		2.54 BSC	
H	—	0.280	—	7.11
J	0.012	0.045	0.31	1.14
K	0.500	0.580	12.70	14.73
L	0.045	0.070	1.15	1.77
N	0.200 BSC		5.08 BSC	
Q	0.100	0.135	2.54	3.42
R	0.080	0.115	2.04	2.92
S	0.020	0.055	0.51	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27

- STYLE 9:
- PIN 1: GATE
- 2: COLLECTOR
- 3: EMITTER
- 4: COLLECTOR

CASE 221A-06
TO-220AB
ISSUE Y

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