IGBT for PFC Applications 650 V, 50 A, TO-247-3L

FGHL50T65SQ

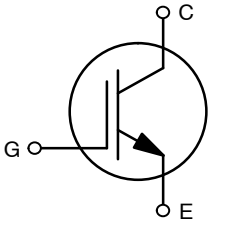
BV_{CES}	$V_{CE(sat)}$ TYP	I_C MAX
650 V	1.6 V	200 A

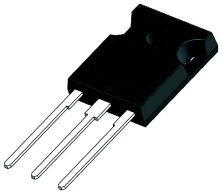
Features

- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Co−efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)}$ =1.6 V (Typ.) @ I_C = 50 A
- 100% of the Parts Tested for ILM (Note 1)
- High Input Impedance
- Fast Switching
- Tighten Parameter Distribution
- RoHS Compliant

Typical Applications

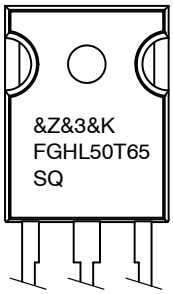
- Solar Inverter, UPS, Welder, Telecom, ESS, PFC





TO−247 LONG LEADS
CASE 340CX

MARKING DIAGRAM



&Z	= Assembly Plant Code
&3	= 3−Digit Date Code
&K	= 2−Digit Lot Traceability Code
FGHL50T65SQ	= Specific Device Code

MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Collector−to−Emitter Voltage		V_{CES}	650	V
Gate−to−Emitter Voltage		V_{GES}	±20	V
Transient Gate−to−Emitter Voltage		V_{GES}	±30	V
Collector Current	T_C = 25°C	I_C	100	A
	T_C = 100°C		50	
Pulsed Collector Current (Note 2)	T_C = 25°C	I_{CM}	200	A
Maximum Power Dissipation	T_C = 25°C	P_D	268	W
	T_C = 100°C		134	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +175	°C
Maximum Lead Temperature for Soldering Purposes (1/8″ from case for 5 s)		T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. V_{CC} = 400 V, V_{GE} = 15 V, I_C = 200 A, Inductive Load
2. Repetitive rating: Pulse width limited by max. Junction temperature
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted

ORDERING INFORMATION

Device	Package	Shipping
FGHL50T65SQ	TO−247−3L	30 Units / Rail

Table 1. THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Case − Steady State	$R_{\theta JC}$	0.56	°C/W
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	40	

4. Repetitive rating: Pulse width limited by max. Junction temperature

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector to Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA	650			V
Temperature Coefficient of Breakdown Voltage	$\Delta V_{CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 1 mA		0.6		V/°C
Collector Cut−Off Current	I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0 V			250	μA
G−E Leakage Current	I_{GES}	V_{GE} = V_{GES}, V_{CE} = 0 V			±400	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 50 mA	2.6	4.5	6.4	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V T_C = 25°C		1.6	2.1	V
		I_C = 50 A, V_{GE} = 15 V T_C = 175°C		1.92		V
DYNAMIC CHARACTERISTIC						
Input Capacitance	Cies	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz		3209		pF
Output Capacitance	Coes			42		
Reverse Transfer Capacitance	Cres			12		
SWITCHING CHARACTERISTIC						
Turn−On Delay Time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 25 A, R_G = 4.7 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C FWD: FGH50T65SQD		19		ns
Rise Time	t_r			13		ns
Turn−Off Delay Time	$t_{d(off)}$			93		ns
Fall Time	t_f			6.4		ns
Turn−On Switching Loss	E_{on}			410		μJ
Turn−Off Switching Loss	E_{off}			88		μJ
Total Switching Loss	E_{ts}			498		μJ
Turn−On Delay Time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 25 A, R_G = 4.7 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175°C FWD: FGH50T65SQD		18		ns
Rise Time	t_r			15		ns
Turn−Off Delay Time	$t_{d(off)}$			102		ns
Fall Time	t_f			8		ns
Turn−On Switching Loss	E_{on}			641		μJ
Turn−Off Switching Loss	E_{off}			203		μJ
Total Switching Loss	E_{ts}			844		μJ
Total Gate Charge	Q_g	V_{CE} = 400 V, I_C = 50 A, V_{GE} = 15 V		99		nC
Gate−to−Emitter Charge	Q_{ge}			17		nC
Gate−to−Collector Charge	Q_{gc}			23		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

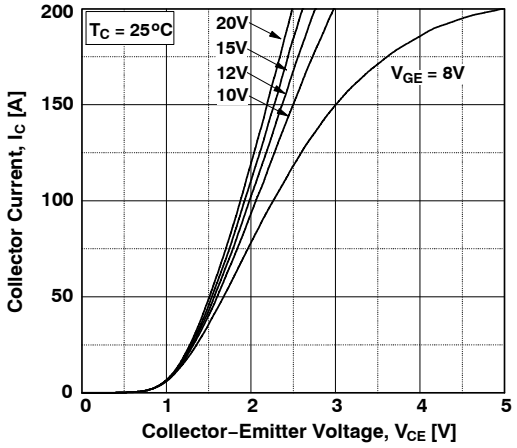


Figure 1. Typical Output Characteristics

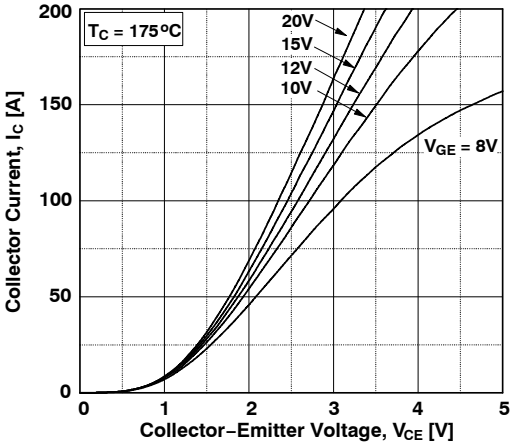


Figure 2. Typical Output Characteristics

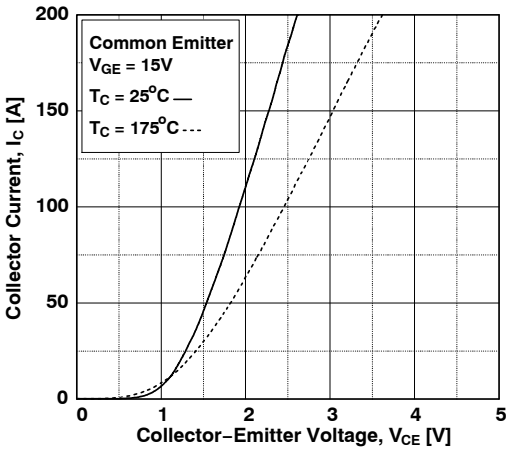


Figure 3. Typical Saturation Voltage Characteristics

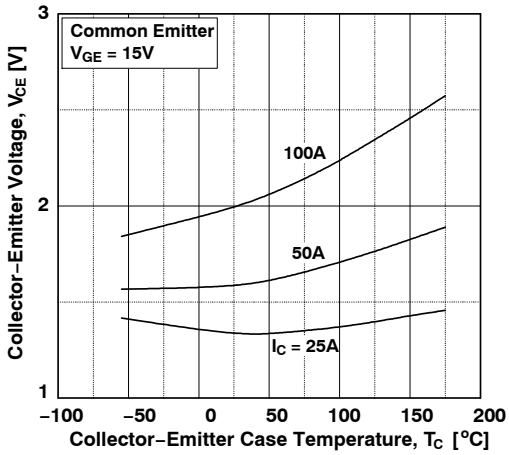


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

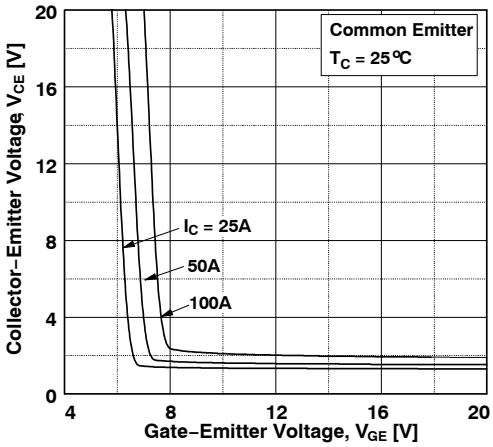


Figure 5. Saturation Voltage vs. V_{GE}

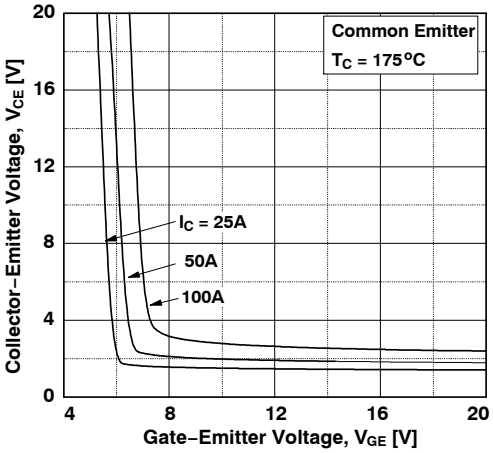


Figure 6. Saturation Voltage vs. V_{GE}

TYPICAL CHARACTERISTICS

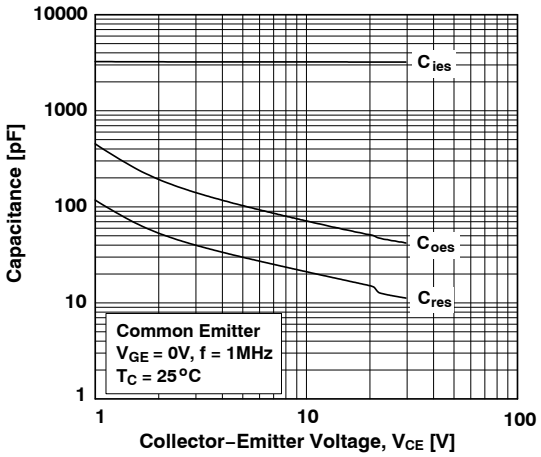


Figure 7. Capacitance Characteristics

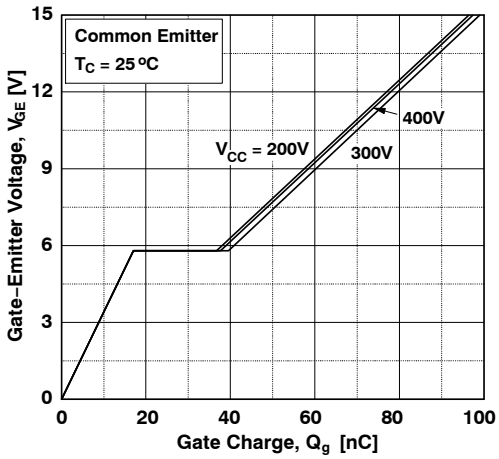


Figure 8. Gate Charge Characteristics

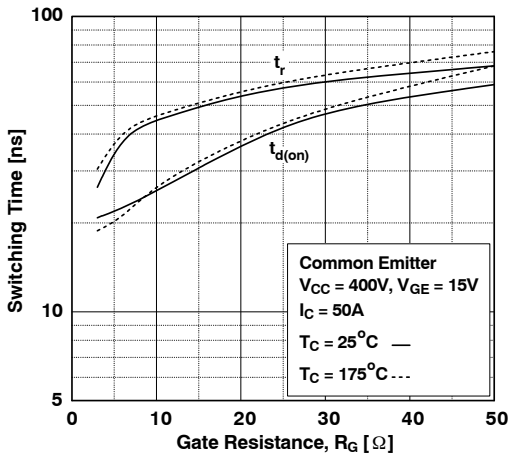


Figure 9. Turn−on Characteristics vs. Gate Resistance

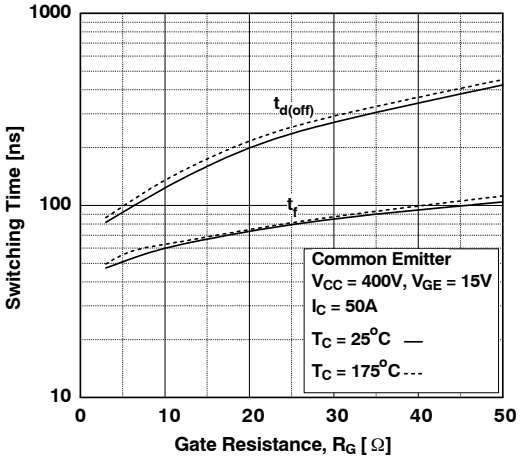


Figure 10. Turn−off Characteristics vs. Gate Resistance

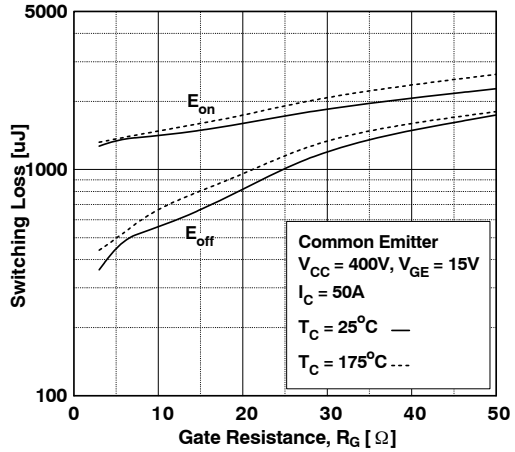


Figure 11. Switching Loss vs. Gate Resistance

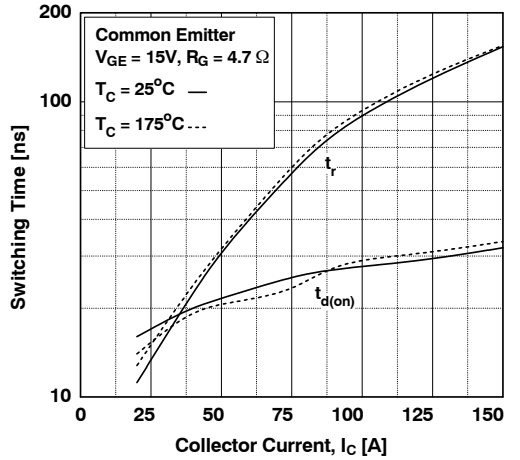


Figure 12. Turn−on Characteristics vs. Collector Current

TYPICAL CHARACTERISTICS

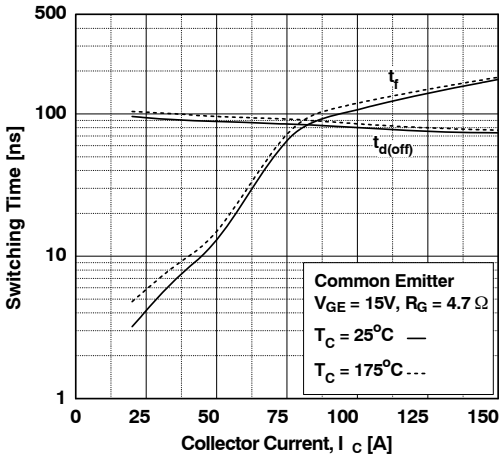


Figure 13. Turn−off Characteristics vs. Collector Current

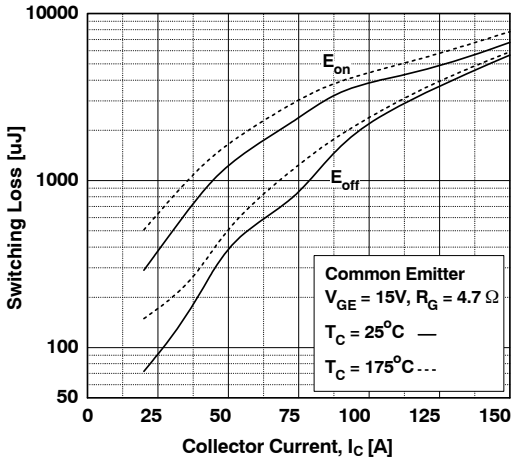


Figure 14. Switching Loss vs. Collector Current

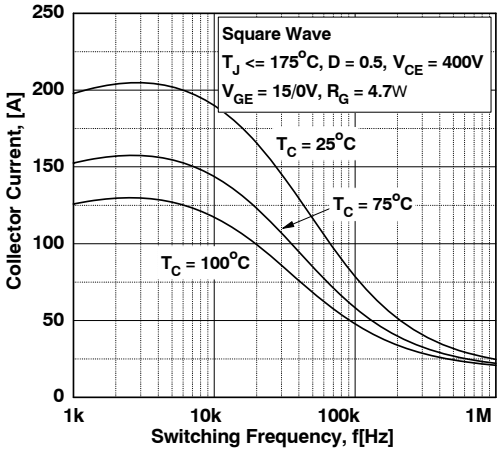


Figure 15. Load Current vs. Frequency

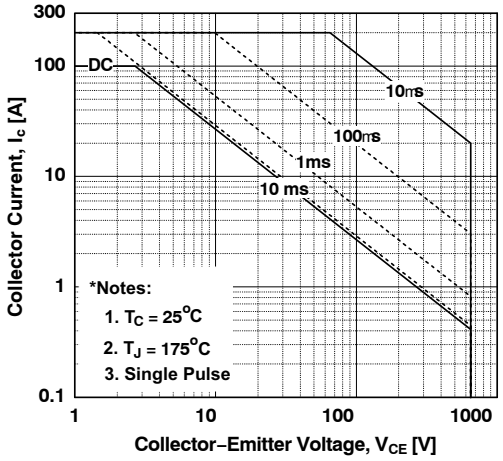


Figure 16. SOA Characteristics

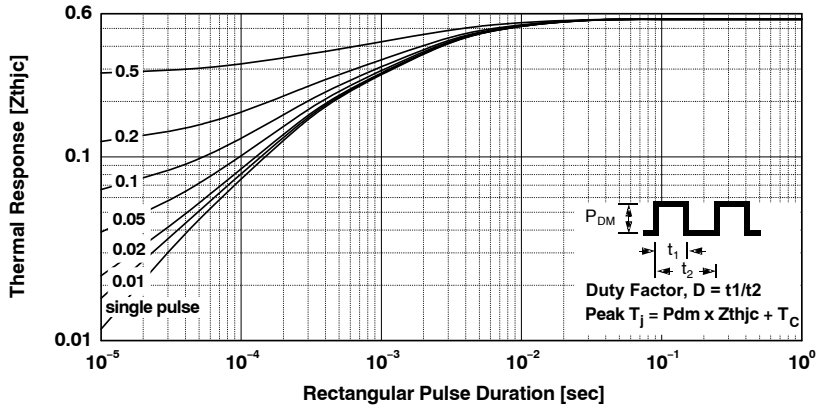
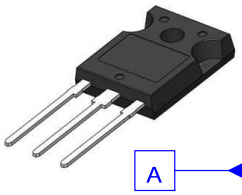
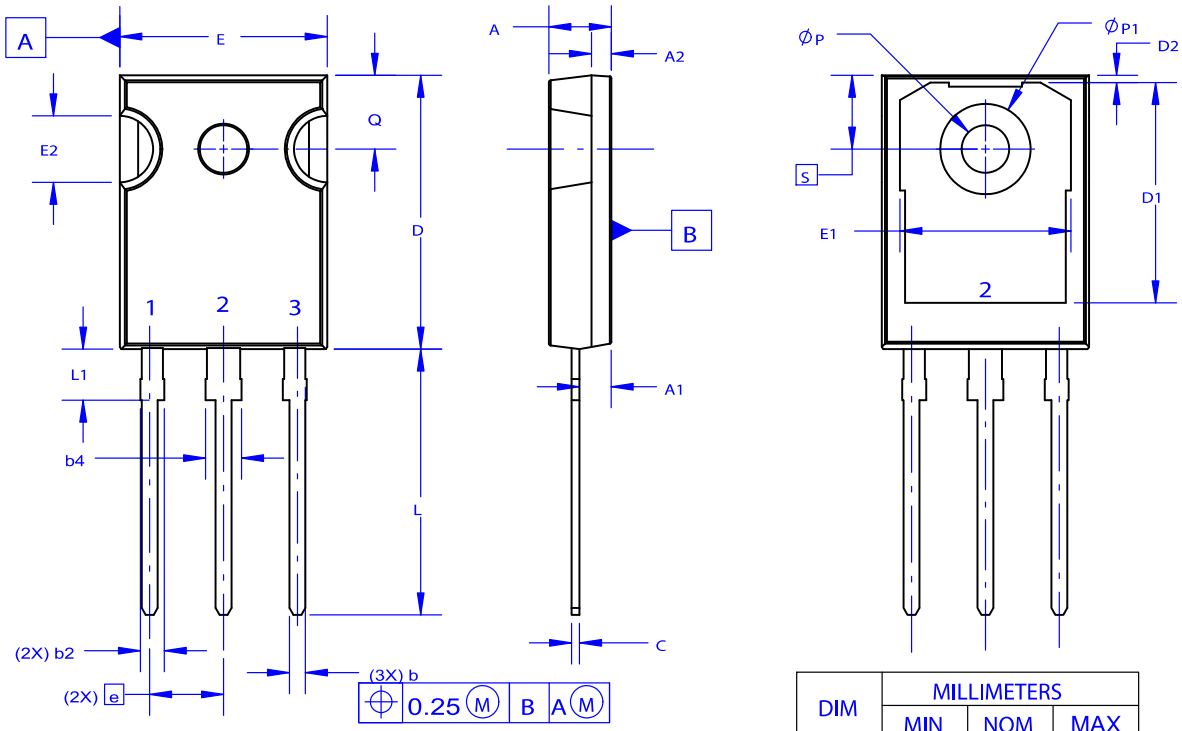


Figure 17. Transient Thermal Impedance of IGBT

TO−247−3LD
CASE 340CX
ISSUE A

DATE 06 JUL 2020





NOTES: UNLESS OTHERWISE SPECIFIED.

A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
D	20.32	20.57	20.82
E	15.37	15.62	15.87
E2	4.96	5.08	5.20
e	~	5.56	~
L	19.75	20.00	20.25
L1	3.69	3.81	3.93
ØP	3.51	3.58	3.65
Q	5.34	5.46	5.58
S	5.34	5.46	5.58
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D1	13.08	~	~
D2	0.51	0.93	1.35
E1	12.81	~	~
ØP1	6.60	6.80	7.00

GENERIC MARKING DIAGRAM*

XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present. Some products may not follow the Generic Marking.

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