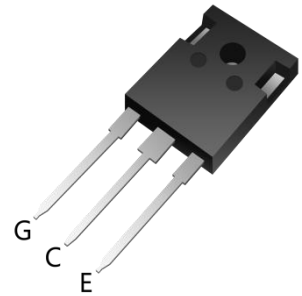
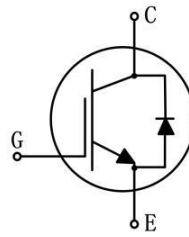


**Trench Field-stop IGBT Discrete**

Parameter	Value	Unit
$V_{CE}$	1200	V
$I_C$	25	A
$V_{CE(sat)}$	1.7	V



TO-247-3L

**Features**

- Trench and field-stop technology
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- Short circuit withstands time 7μs
- High ruggedness performance

**Applications**

- Inverters
- Motor drives

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CES}$	1200	V
Gate-emitter voltage	$V_{GES}$	±20	V
Continuous collector current( $T_C=25^{\circ}C$ )	$I_C$	50	A
Continuous collector current( $T_C=100^{\circ}C$ )		25	A
Pulsed collector current, tp limited by $T_{vjmax}$	$I_{CM}$	100	A
Diode continuous forward current( $T_C=100^{\circ}C$ )	$I_F$	25	A
Diode maximum current, tp limited by $T_{vjmax}$	$I_{FM}$	100	A
Short circuit withstand time	$t_{sc}$	10	μs
Power dissipation( $T_C=25^{\circ}C$ )	$P_{tot}$	428	W
Power dissipation( $T_C=100^{\circ}C$ )		214	
Operating junction temperature range	$T_{vj}$	-40 to+175	°C
Storage temperature range	$T_{stg}$	-55 to+150	°C

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	0.35	°C/W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	0.9	°C/W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	40	°C/W

**Electrical Characteristics of IGBT ( $T_{vj}=25^{\circ}\text{C}$  unless otherwise specified)**
**Static characteristics**

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$B_{V_{CES}}$	$V_{GE}=0V, I_C=250\mu A$	1200	-	-	V
Collector-emitter leakage current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V$	-	-	100	$\mu A$
Gate leakage current, forward	$I_{GES}$	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	$\pm 100$	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA (T_J=25^{\circ}\text{C})$	5.8	6.1	6.3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=25A (T_J=25^{\circ}\text{C})$	-	1.7	-	V
		$V_{GE}=15V, I_C=25A (T_J=175^{\circ}\text{C})$	-	2.3	-	V
Input capacitance	$C_{ies}$	$V_{CE}=30V$	-	2081	-	nF
Output capacitance	$C_{oes}$	$V_{GE}=0V$	-	107	-	pF
Reverse transfer capacitance	$C_{res}$	$f=1\text{MHz}$	-	21	-	pF
Total gate charge	$Q_g$	$V_{CC}=960V V_{GE}=15V I_C=25A$	-	135	-	nC

**Switching Characteristics**

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=25A$ $R_G=10\Omega$ Inductive load	-	33	-	ns
Rise time	$t_r$		-	63	-	ns
Turn-off delay time	$t_{d(off)}$		-	185	-	ns
Fall time	$t_f$		-	61	-	ns
Turn-on energy	$E_{on}$		-	2.1	-	mJ
Turn-off energy	$E_{off}$		-	1.1	-	mJ
Total switching energy	$E_{ts}$		-	3.1	-	mJ
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=25A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^{\circ}\text{C}$	-	35	-	ns
Rise time	$t_r$		-	69	-	ns
Turn-off delay time	$t_{d(off)}$		-	207	-	ns
Fall time	$t_f$		-	89	-	ns
Turn-on energy	$E_{on}$		-	3.3	-	mJ
Turn-off energy	$E_{off}$		-	1.5	-	mJ
Total switching energy	$E_{ts}$		-	4.5	-	mJ

**Diode Characteristics**

Parameter	Symbol	Test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F=25A, T_{vj}=25^{\circ}C$	-	2.0	-	V
		$I_F=25A, T_{vj}=175^{\circ}C$	-	1.6	-	V
Diode reverse recovery time	$t_{rr}$	$V_R=600V$	-	311	-	ns
Diode peak reverse recovery current	$I_{rrm}$	$I_F=25A$	-	7.1	-	A
Diode reverse recovery charge	$Q_{rr}$	$diF/dt=-250A/\mu s$	-	1039	-	nC
Diode reverse recovery time	$t_{rr}$	$V_R=600V$	-	482	-	ns
Diode peak reverse recovery current	$I_{rrm}$	$I_F=25A$	-	11.1	-	A
Diode reverse recovery charge	$Q_{rr}$	$diF/dt=-250A/\mu s, T_{vj}=175^{\circ}C$	-	3001	-	nC

**Typical Characteristics**

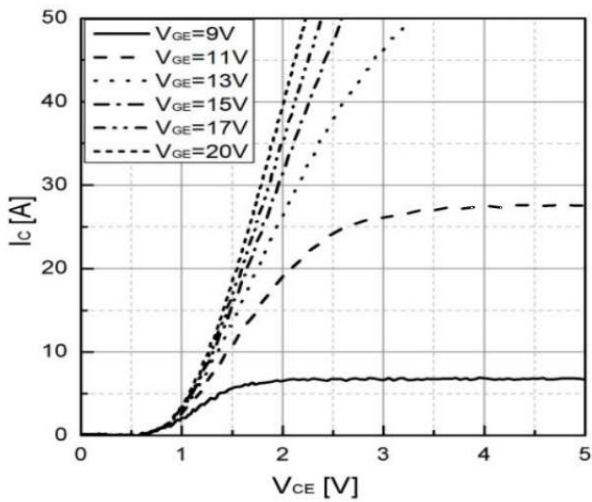


Figure 1. Typical output characteristic ( $T_{vj}=25^{\circ}C$ )

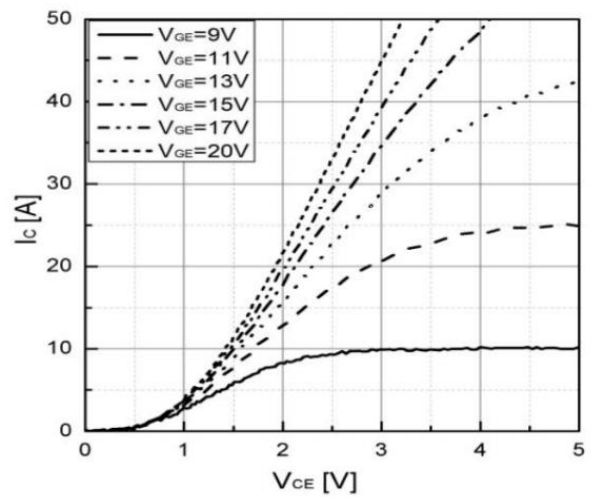


Figure 2. Typical output characteristic ( $T_{vj}=175^{\circ}C$ )

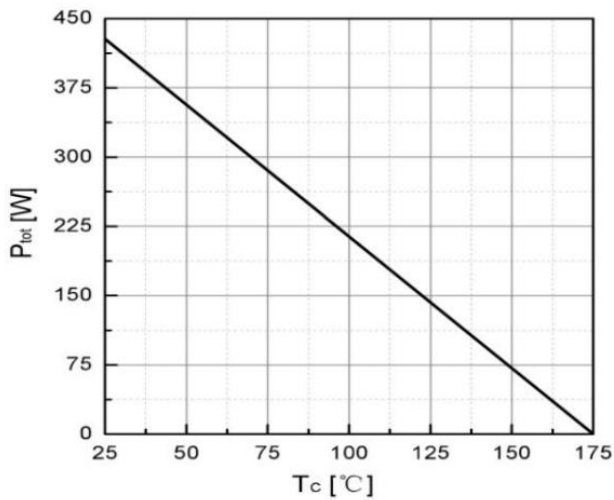


Figure 3. Power dissipation as a function of  $T_c$

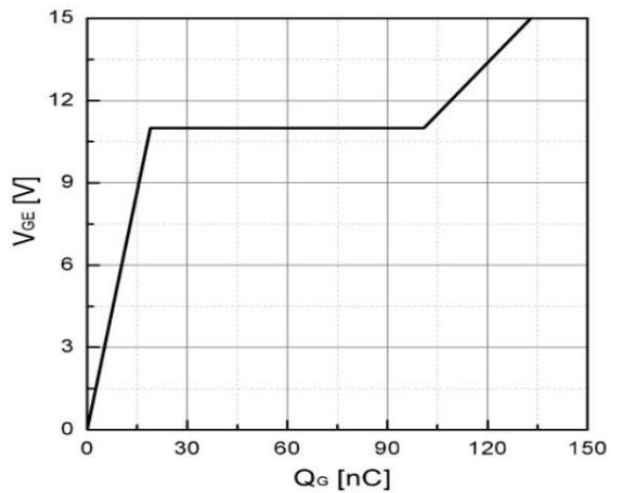


Figure 4. Typical Gate charge

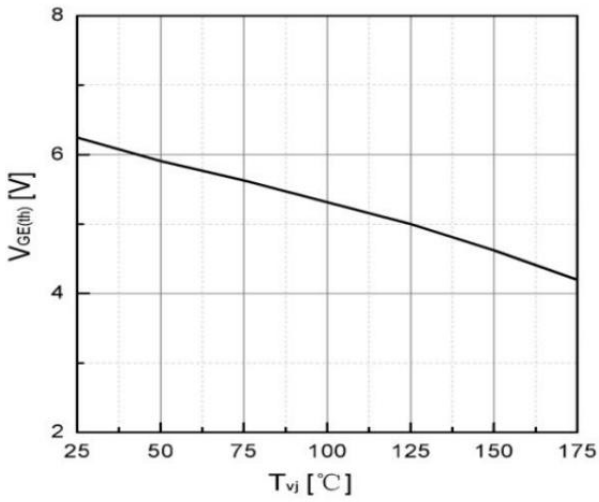


Figure 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}(I_C=1mA)$

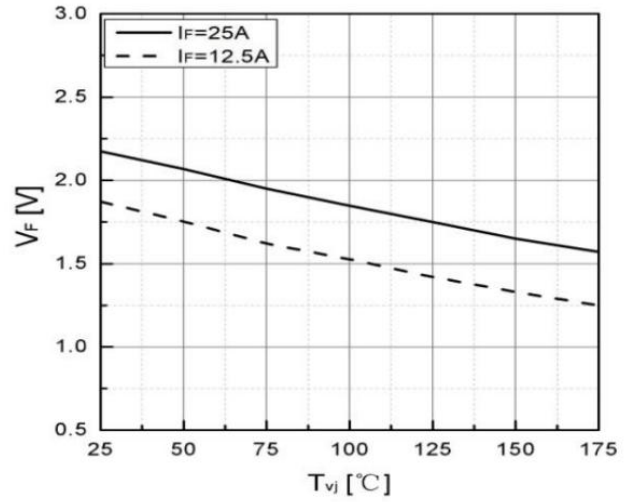


Figure 6. Typical  $V_F$  as a function of  $T_{vj}$

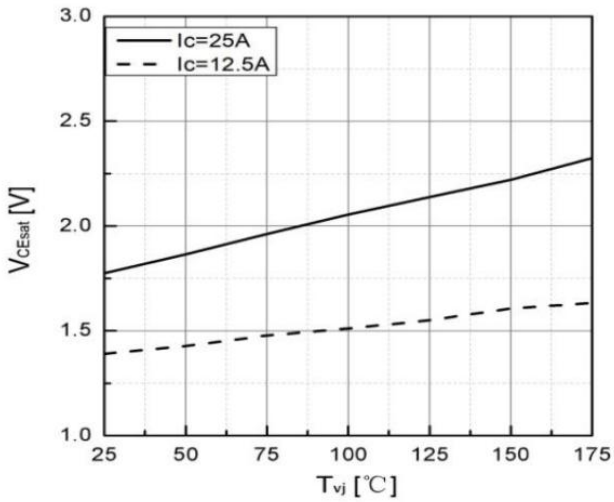


Figure 7. Typical  $V_{CE(sat)}$  as a function of  $T_{vj}$

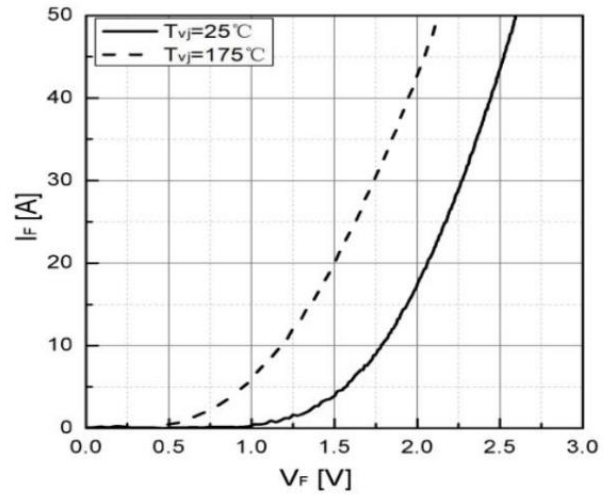


Figure 8. Typical  $I_F$  as a function of  $V_F$

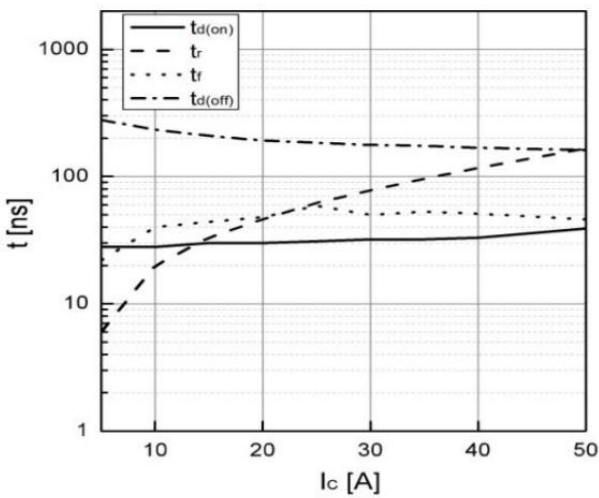


Figure 9. Typical switching time as a function of  $I_C$

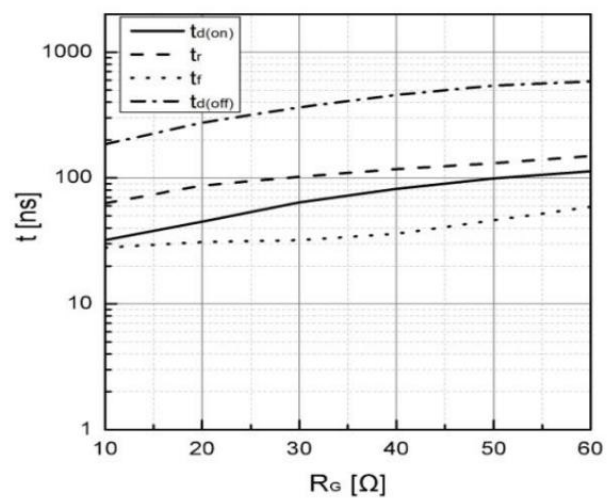


Figure 10. Typical switching times as a function of  $R_G$

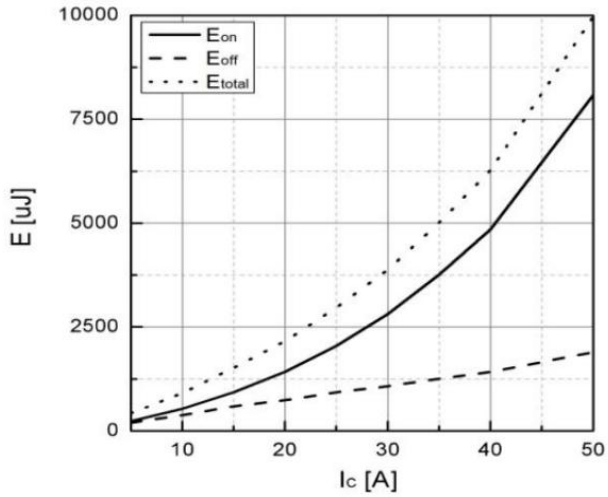


Figure 11. Typical switching energy losses as a function of  $I_c$

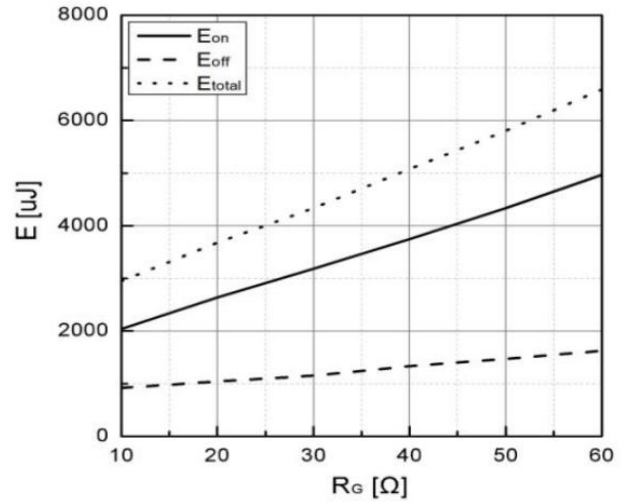


Figure 12. Typical switching energy losses as a function of  $R_G$

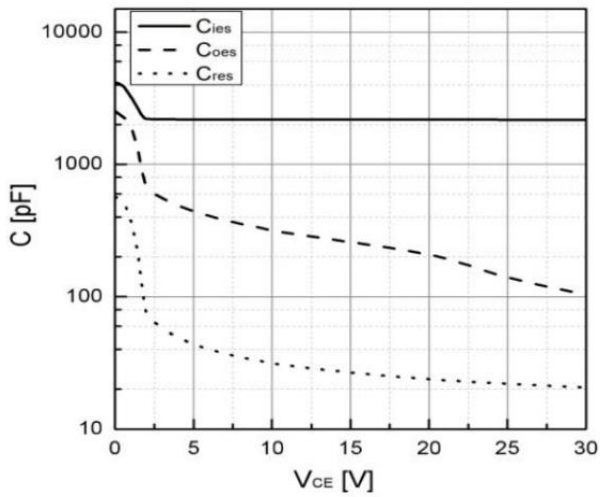


Figure 13. Typical capacitance as a function of  $V_{CE}(f=1\text{Mhz}, V_{GE}=0\text{V})$

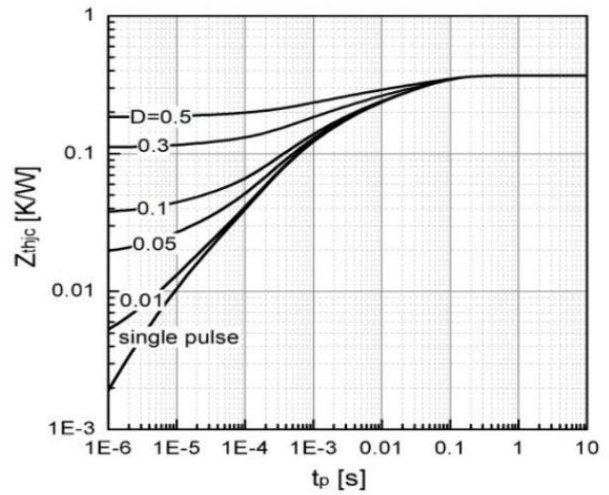
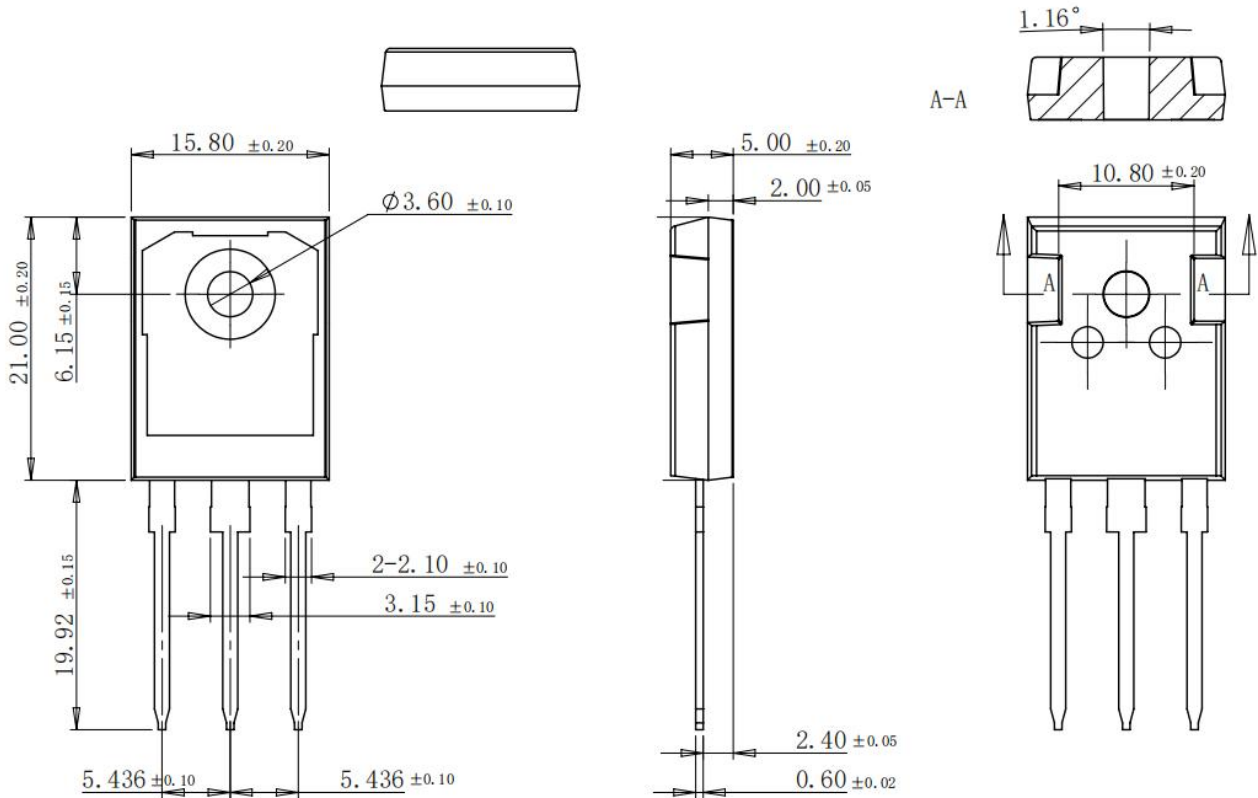


Figure 14. Transient thermal impedance of IGBT

**Package Outlines (Unit: mm)**

**TO-247-3L**



**\*Important Usage Information and Disclaimer**

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